



GRA, Incorporated

Economic Counsel to the Transportation Industry

ACRP

Project Number 03-36

Using Disaggregated Socioeconomic Data in Air Passenger Demand Studies

Final Report

Appendix C

**Additional Material on Sources of
Disaggregated Socioeconomic Data**

6/28/18

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NAS-NRC

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C.1 Introduction

This appendix to the project final report presents a more detailed analysis and discussion of the sources of disaggregated socioeconomic data addressed in Chapter 3 of the final report. These data sources include both national socioeconomic data as well as data for samples of air travelers obtained from air passenger and household travel surveys. In particular, the appendix documents three specific aspects:

- National socioeconomic trends that underlie past changes in air travel and potential implications of recent trends for future changes in air travel demand
- Analysis of disaggregated data from air passenger and household travel surveys to identify how socioeconomic factors appear to influence air travel demand
- Implications of the findings of the analysis of these sources of disaggregated socioeconomic data undertaken in the project for air passenger demand studies

Section C.2 presents an analysis of national socioeconomic trends and discusses their implications for past changes in air travel demand and potential future changes. Section C.3 documents the findings from an analysis of a wide range of disaggregated socioeconomic and air travel data sources undertaken in the course of the project, including a national survey of consumer spending and a fairly large number of diverse air passenger and household travel surveys, including intercept surveys performed at airports as well as online surveys of air travelers and surveys of household travel activities, including air travel. Finally, Section C.4 discusses the implications of these findings for air passenger demand studies as well as future research needs that were identified in the course of the research.

C.2 Socioeconomic Trends

To estimate passenger demand models, either for forecasting future demand or for analyzing and modeling the factors that influence that demand, it is necessary to rely on historical socioeconomic data at different degrees of aggregation. The U.S. Census Bureau is an important source of these historical data, and the on line availability of these data has improved in recent years. At the national level, these Census sources provide a baseline for demographic and socioeconomic variables that influence air passenger demand, such as household income, showing national trends in household income stratification along a variety of economic and demographic factors. Regional differences in these disaggregated trends can contribute to analyzing and explaining differences in air passenger demand growth across regions. Other types of disaggregation in national and regional data can be developed from consumer spending surveys and other types of spending data.

Figure C-1 shows recent trends in household income distribution, reporting the upper limits of each household annual income quintile since 1946. Household income values are adjusted for inflation and reported in 2015 dollars. Shown are the maximum values in each year's successive income quintiles, with each quintile including 20% of U.S. households.

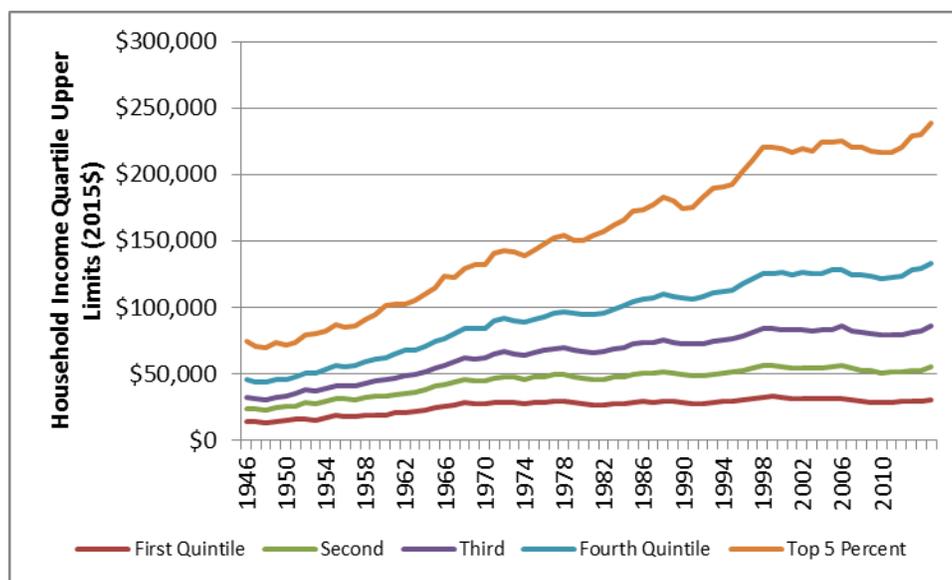


Figure C-1. Quintile Distribution of U.S. Annual Household Income (Census Bureau)

For the lowest earning 20% of U.S. households, annual income has approximately doubled in 2015 dollar terms, rising from around \$15,000 per year in 1946 to around \$30,000 in 2015. Each successive quintile upper limit has grown slightly more in those years, with the next 20% of U.S. households, those in the second quintile, growing about 2.3 times from 1946 to 2015, from \$24,000 to \$55,000 per year. The third quartile upper limit has grown about 2.7 times, from \$32,000 to \$86,000 in 2015 dollars, and the upper income limit on the fourth

quintile, which contains U.S. households between 60% and 80% of ranked incomes, has nearly tripled, from \$46,000 in 1946 to \$135,000 in 2015. Finally, the annual household incomes defining the top 5% of U.S. households has more than tripled over this time, growing from \$75,000 to \$239,000. This income distribution trend expresses a steadily growing separation in incomes across the economy, with important implications for understanding trends in air passenger demand to the extent that those with higher incomes have a greater propensity to use air transportation.

These national trends in income distribution are related to other socioeconomic and demographic trends that are also illuminated by Census Bureau trend data. Household incomes customarily increase as the “householder,” or head of household grows older, at least until the householder has retired from work life. Trends related to these factors can be seen in Figure C-2 and Figure C-3. Figure C-2 shows the number of U.S. households headed by someone within the reported age ranges for each year since 1947. The primary trend in these data is the increasing average age of heads of households. In 1947, about half of households were headed by someone aged 44 or younger, with the remaining half headed by someone older than 44. In contrast, by 2015 only 40% of households were headed by someone 44 or younger, and 60% were headed by someone older than 44. This aging trend in the U.S. population also has influence on air passenger demand trends. Note that it is also possible to see the “baby boom” generational bulge moving through the figure, in the bulge between the mid 1960’s and early 1990’s of households headed by someone between 25 and 34. This bulge moves along in time to other age cohorts, reflecting the aging of the boomers.

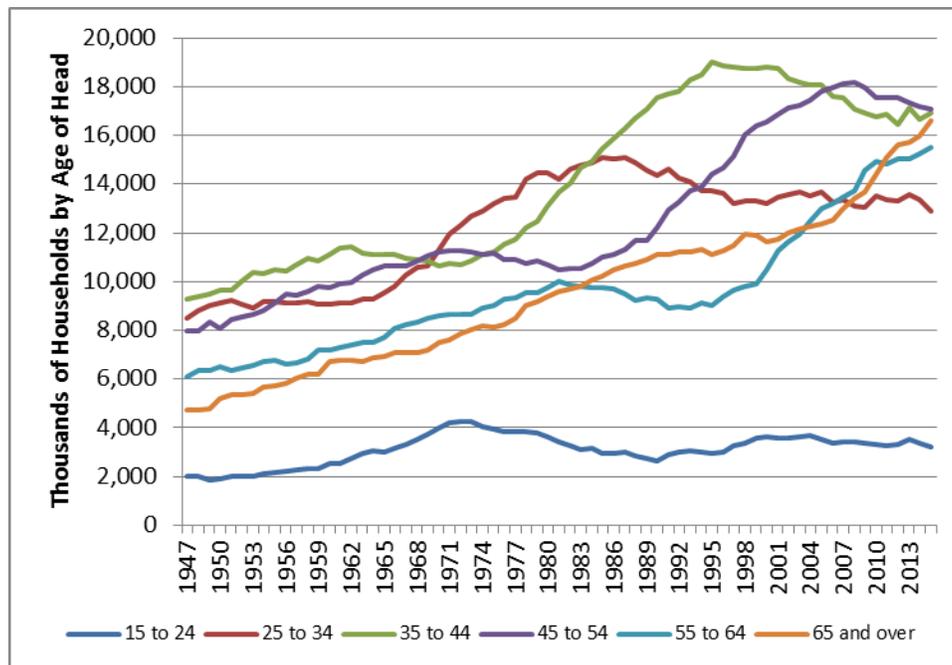


Figure C-2. U.S. Households by Age of Head of Household, 1947 to 2015 (Census Bureau)

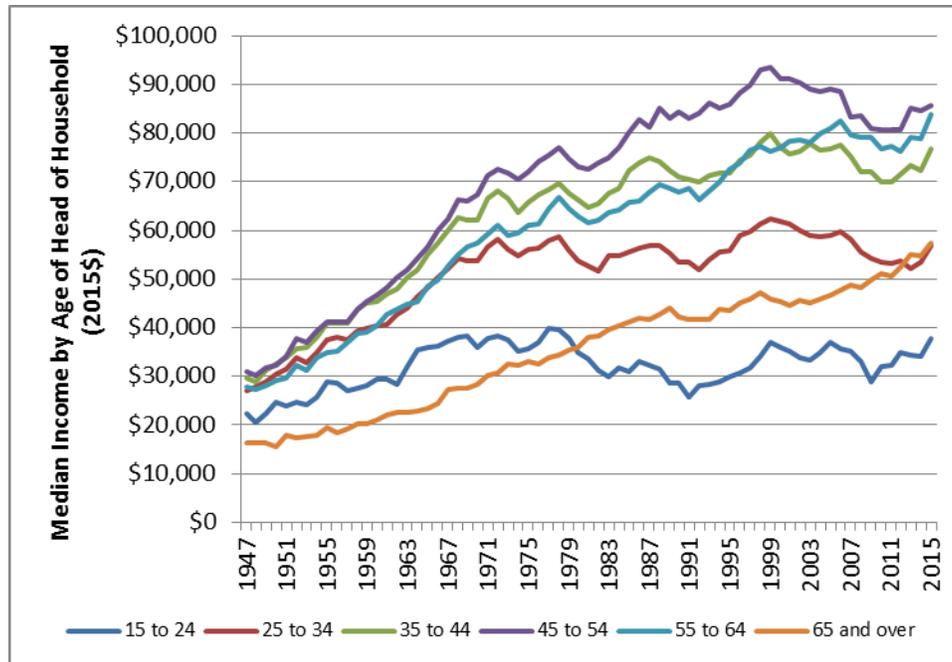


Figure C-3. U.S. Household Median Income by Age of Head of Household, 1947 to 2015 (Census Bureau)

One way in which this aging trend in the population may affect air travel demand is through related changes in household income. These factors can be seen in Figure C-3, which reports trends in average household income according to the age of the householder. In this figure can be seen the persistent rise in median household income with an increase in the age of the head of household (at least during the working lifetime of the householder). The figure also shows a widening dispersion of incomes across these households, at least through the “age 45 to 54” cohort, at which point the growth in household median income begins to be reversed as some householders retire. Finally, the steady growth in median household income for those headed by someone 65 or older is in striking contrast with the trends for households headed by younger persons. For these households, there was steady growth in median household income through the mid 1970s, at which point household income growth slowed or even flattened, as is seen for households headed by someone 34 or younger.

An indicator of income variation that may also vary from region to region or airport service area to area is educational attainment. Figure C-4 shows Census data since 1990 on the number of U.S. households headed by someone with the given level of educational attainment. The figure includes a wide variety of educational attainment levels, from pre-high school levels to achievement of a doctorate. Noteworthy in this figure is the steady rise since 1990 in the number of households headed by persons with a college degree of some form, especially those headed by someone with a bachelor’s degree (marked 1), an associate’s degree (marked 2), or a master’s degree (marked 3). The number of households headed by someone with a doctorate is also increasing, but from a relatively low base. In contrast, the number of households headed by someone with no college experience is flat or declining over the time period.

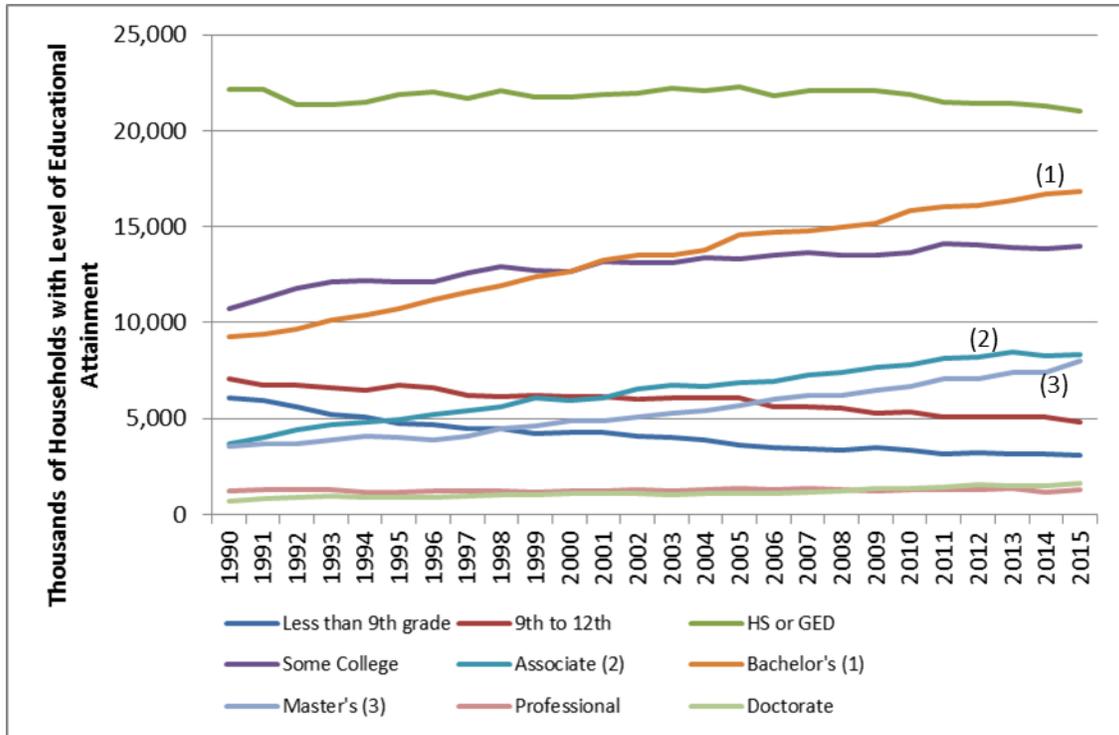


Figure C-4. U.S. Households by Educational Attainment Level of Head of Household, 1990 to 2015 (Census Bureau)

The significance of these trends in educational attainment is expressed in part by Figure C-5, which reports the median household income for each of these educational attainment cohorts. In 2015 dollars, these median incomes have been relatively stable since 1990, but there is a steady pattern of increase as householders move up the educational attainment ladder. Those with college degrees have median household incomes that are double or more the incomes of households with only high school educational backgrounds. It is important to note that in cases of household partnerships, some of the difference may also reflect sorting by like educational status in marriages or partnerships.

For understanding and analyzing factors influencing a region’s air passenger demand, the associations between these demographic variables and income dispersions may represent important contributors to the individual patterns experienced by particular airports and for explaining different patterns of demand across different regions. As the project research continues we will develop other examples of socioeconomic characteristics that can be used to sort a region’s population into cohorts that may exhibit different propensities to use air travel, whether through correlations between cohorts and household income levels, or through other factors that affect air travel behavior.

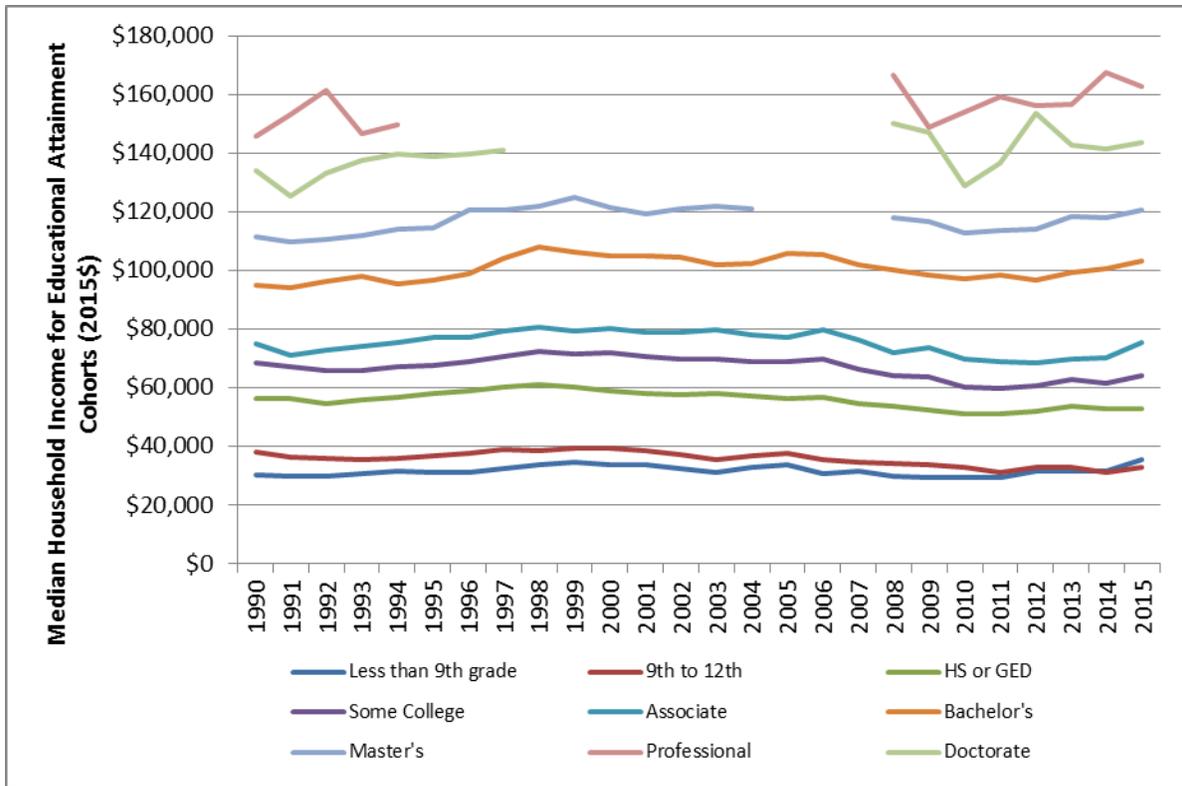


Figure C-5. U.S. Household Median Income (2015\$) by Educational Attainment Level of Head of Household, 1990 to 2015 (Census Bureau)

C.3 Analysis of Air Passenger and Travel Survey Data

This section presents the detailed results of the analysis that has been undertaken by the Research Team on the disaggregated socioeconomic and air travel data sources identified in chapter 3 of the project final report and discussed in more detail in Appendix B of the final report. This analysis has addressed the following data sources:

- Consumer Expenditure Survey
- Air passenger surveys
 - Airport intercept surveys
 - Survey of international air travelers
 - Online surveys of air travelers
- Household travel surveys
 - National household travel surveys
 - State household travel surveys

The Consumer Expenditure Survey of the U.S. Bureau of Labor Statistics provides disaggregated data on how consumer spending on air travel and air travel propensity varies with household socioeconomic characteristics. This analysis can provide a useful comparison with the direct measures of air travel that are typically obtained through travel surveys.

a. Consumer Expenditure Survey

The Public-Use Microdata (PUMD) dataset of the U.S. Bureau of Labor Statistics Consumer Expenditure Survey (CES) includes detailed disaggregated socioeconomic information at the household and/or individual level, as well as data on household expenditures in a wide range of categories, including travel. The travel data includes information on airfare expenditures. As discussed in Appendix B, a significant attraction of the CES data is that it is national in scope, with annual data going back many years using a consistent survey methodology. Thus, these data can be used to explore whether the relationships among airfare expenditures and household characteristics have been changing over time. Although the CES survey only covers consumer expenditures, and therefore excludes reimbursed travel or business travel paid directly by employers, personal travel has been an increasing proportion of all air travel and currently accounts for about two-thirds of all air trips. However, the survey also covers non-reimbursed expenditures on trips largely paid for by employers or others, so some business-related travel is included.

As noted in Appendix B, the CES expenditure files provide information on each air trip or vacation taken by a household, including the number of trips and the duration of each trip, as well as the airfare expenditures for each trip. In addition to the expenditures on airfares, the CES expenditure files also include the expenditures on a range of other travel cost categories, including lodging, meals in restaurants, alcoholic beverages in restaurants and bars, purchased food and beverages, and local transportation. Since most people do not keep detailed records of their expenditures while making personal trips and to the extent that they do have records (e.g. credit card statements) may not take the time to review these records when responding to the survey, it is almost certain that the reported figures are at best highly approximate. Nonetheless,

the CES provides one of the few sources of data on the non-airfare costs of trips taken by air, and hence provides a way to study how these costs have changed relative to airfares over time.

The actual data collection for the CES is performed for the BLS by the U.S. Census Bureau. The CES data is collected in two ways: a quarterly telephone interview of selected households that asks about detailed household characteristics and major expenditures over the previous quarter and a more detailed diary survey that collects expenditure data recorded by the sample households over a one-week period using an expenditure diary provided by the Census Bureau together with detailed household characteristics of the participating households. The households participating in the two different surveys are not the same. Data on air travel and vacations are primarily collected in the quarterly interview survey. A given household will generally be surveyed five times in successive quarters and report expenditures in the last four interviews. Each interview covers household expenditures in the previous three months. Since households are interviewed throughout the quarter, the reported expenditures are not always for a calendar quarter.

For interviews performed in 2014, 6,427 households reported making a long-distance personal trip or taking a vacation in the previous three months. These households reported making 9,344 trips, of which 2,695 involved commercial air travel. It should be noted that some households were interviewed in every quarter, while others were interviewed in fewer quarters and some only once, as different households rotated through the survey panel. The average number of reported trips per household in each quarter varied between 1.42 and 1.48, while the average number of air trips per household in each quarter varied between 0.36 and 0.47. The highest average number of air trips per household reported in each quarter occurred in interviews performed in the first quarter, while the lowest occurred in interviews performed in the third quarter. However, it should be noted that interviews performed in the first quarter included travel during the Christmas period of the previous year, and in many cases also the previous Thanksgiving period. Although the lowest average number of air trips per household reported in interviews conducted in each quarter occurred in interviews in the third quarter, those interviews reported the highest average number of trips per household by all modes, suggesting a higher use of private vehicles for summer vacation trips than for trips during the rest of the year.

One limitation in the PUMD data is that the survey did not ask how many household members went on each trip. Since the objective of the survey is to measure consumer expenditures at the household level, whether one or more household members went on each trip was not considered relevant. It may be possible to obtain a rough estimate of the number of people on each trip from the reported meal expenses, which should vary with the number of household members in the travel party. While different households obviously spend different amounts of money per person per day on meals, a given household is probably fairly consistent across the various trips that they take in a year, although this may vary somewhat by destination.

The CES data provides detailed information on the characteristics of the consumer units (CUs) participating in the survey. Most CUs are households, although a few comprise sub-household individuals or families (*e.g.* unrelated individuals sharing a house but keeping their finances separate, or two families living in the same house). For simplicity and to conform to common terminology, CUs are referred to as households in the remainder of this Appendix.

Analysis of 2014 Data

The 2014 PUMD dataset included the data from interviews conducted during the five quarters from the first quarter of 2014 through the first quarter of 2015. Since households (referred to in the data as consumer units) were interviewed throughout each quarter and reported their expenditures and travel details for the preceding three months, interviews in all five quarters included trips taken during 2014, as well as some trips taken in the fourth quarter of 2013 and the first quarter of 2015. For the purpose of the preliminary analysis, these distinctions were not considered important and the analysis was performed on the full data from the five quarters.

Because households rotate through the survey panel and some households miss one or more quarterly interviews (the Census Bureau was unable to reach them to interview in those quarters), the number of interviews for a given household in the dataset varies from one to four. This some households reported all the trips they have made in a year while others only reported the trips they had made in fewer quarters (or only one). Table C-1 shows the distribution of the number of air trips reported by households that were interviewed in different numbers of quarters. As can be expected, the total number of trips reported by a given household tends to increase the more interviews that were completed. The most complete distribution is therefore from those households that completed four interviews.

Table C-1. Air Trips per Household by Number of Reported Quarters of Data (2014)

Air Trips	Quarters of Data					Cumulative Percent	
	1	2	3	4	Total	4 Quarters	Total
1	374	414	370	298	1456	57.5%	68.7%
2	48	109	118	123	398	81.3%	87.5%
3	14	27	56	39	136	88.8%	93.9%
4	4	13	16	30	63	94.6%	96.8%
5		7	12	11	30	96.7%	98.3%
6	1	4	5	6	16	97.9%	99.0%
7		1	3	2	6	98.3%	99.3%
8				3	3	98.8%	99.4%
9		1		1	2	99.0%	99.5%
11			1		1	99.0%	99.6%
12			1	1	2	99.2%	99.7%
13			1	1	2	99.4%	99.8%
14			1	1	2	99.6%	99.9%
17			1		1	99.6%	99.9%
20				1	1	99.8%	100.0%
22				1	1	100.0%	100.0%
Total	441	576	585	518	2,120		
Total trips	534	840	1,016	1,000	3,390		
Average trips per household	1.21	1.46	1.74	1.93	1.60		

Almost 60% of households (58%) that completed interviews for four consecutive quarters and reported making one or more air trips made only one such trip. Less than 6% of households

that completed interviews for four consecutive quarters and reported making air trips made more than four air trips. Households that completed interviews for four consecutive quarters and reported making air trips made an average of 1.96 air trips per year. Those households that completed fewer than four interviews reported fewer air trips on average as could be expected, since presumably at least some of those households made air trips in the quarter(s) they did not report.

A significant number of households did not report taking any air trips during the quarters for which they reported their travel expenses and trip details. In total, 2,185 households completed interviews for four quarters, suggesting that 76% of all households did not make any air trips over the 12-month period for which they reported their expenses.

It is worth noting that the highest number of air trips reported by any household in the survey was 22, while less than one percent of households that completed interviews for four consecutive quarters and reported making air trips reported more than 10 trips. This upper limit is considerably fewer air trips than the highest number of air trips per year typically reported in air passenger surveys conducted at airports and a much smaller percentage than the proportion of air parties that report making more than 10 air trips per year in such surveys. However, there are two factors that may explain these differences. The first is that most air passenger surveys only ask how many air trips the respondents had made, not how many were paid for by the respondents (as covered by the CES). The air passenger survey responses therefore include business trips that were paid for by the travelers' employers, business, or others, which would of course increase the number of annual trips reported. The other factor is the difference between a sample of households (as the CES was) and a sample of air passengers. Obviously, individuals who make a large number of air trips per year have a higher likelihood of being intercepted in an air passenger survey than those who only make a few air trips per year. This will tend to increase the proportion of air passenger survey respondents who report making a large number of air trips per year compared to the respondents to a survey of households.

Household Income Distribution

The distribution of the reported annual household income before taxes by all CES respondents as well as those that reported making air trips is shown in Figure C-6. As might be expected, households that reported making air trips had generally higher incomes than households that did not (a higher percentage of households that reported making air trips had incomes above any given level than households overall).

Figure C-6 also shows the income distribution for those households that reported making air trips and completed interviews for four consecutive quarters. There is not a large difference between this distribution and that for all households that reported making air trips, although households that completed four interviews appear to have a slightly higher income distribution than that for all households that reported making air trips, at least below an annual income of about \$260,000.

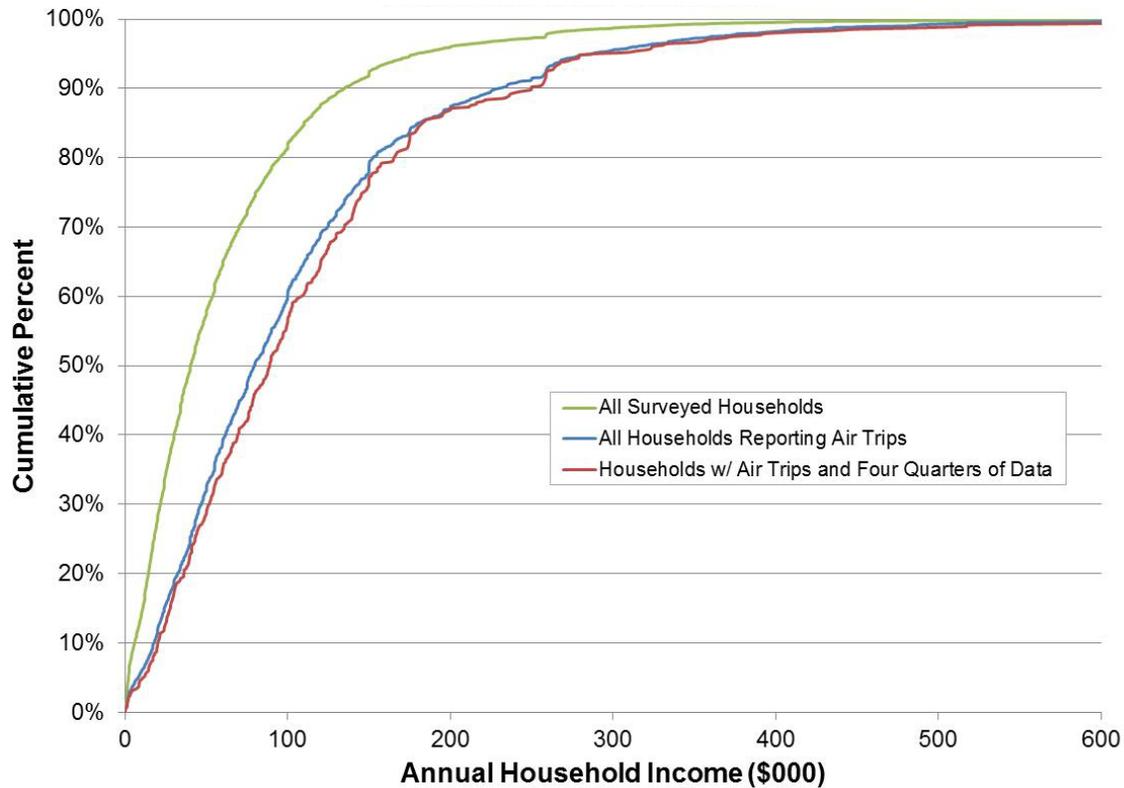


Figure C-6. Cumulative Distribution of Annual Household Income Reported by CES Respondents

Air Travel Propensity

The following analysis of the variation in air trip propensity by household characteristics is based on an analysis of data from households reporting four quarters of data, since those reporting fewer quarters of data could well have failed to report some air trips that occurred in the quarter(s) they did not report.

The average number of reported air trips per year increased with household income, as expected, particularly when expressed in terms of all households. Households with an income less than \$20,000 per year reported making only 0.14 air trips in the previous year on average, whereas those with an income of \$300,000 or more reported making 2.97 air trips in the previous year, or 21 times the average air trip propensity for households with an income of less than \$20,000 per year. The average number of air trips per year for households that made at least one air trip per year also generally increased with income, although remained relatively constant for households with an income below \$150,000 per year then increased fairly steadily with increasing income. What appears to be occurring is that although air trip propensity for households with an income below \$150,000 per year was increasing with income, so too was the percentage of households that made at least one air trip. The combined effect resulted in the average number of air trips per year for households that made at least one air trip remaining relatively flat until household income exceeded \$150,000 per year, when the average air trip propensity increased faster than the percentage of households that made at least one air trip.

Table C-2 shows the average number of air trips per year (air trip propensity) by annual household income. Overall, those households that reported making an air trip in the previous year reported making 1.9 trips on average. However, only 24% of all households reported making at least one air trip. As expected, the percentage of households that reported making at least one air trip in the previous year increased with income from only 8% for households with an income less than \$20,000 per year to 74% for households with an income of \$300,000 or more. The average air trip propensity across all households was 0.46 air trips per year.

The average number of reported air trips per year increased with household income, as expected, particularly when expressed in terms of all households. Households with an income less than \$20,000 per year reported making only 0.14 air trips in the previous year on average, whereas those with an income of \$300,000 or more reported making 2.97 air trips in the previous year, or 21 times the average air trip propensity for households with an income of less than \$20,000 per year. The average number of air trips per year for households that made at least one air trip per year also generally increased with income, although remained relatively constant for households with an income below \$150,000 per year then increased fairly steadily with increasing income. What appears to be occurring is that although air trip propensity for households with an income below \$150,000 per year was increasing with income, so too was the percentage of households that made at least one air trip. The combined effect resulted in the average number of air trips per year for households that made at least one air trip remaining relatively flat until household income exceeded \$150,000 per year, when the average air trip propensity increased faster than the percentage of households that made at least one air trip.

Table C-2. Air Trips per Household by Household Income (2014)

Household Income	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
Less than \$20,000	33	55	1.7	397	18.2%	92%	0.14
\$20,000 - \$39,999	56	87	1.6	467	21.4%	88%	0.19
\$40,000 - \$59,999	68	115	1.7	360	16.5%	81%	0.32
\$60,000 - \$79,999	66	100	1.5	268	12.3%	75%	0.37
\$80,000 - \$99,999	61	99	1.6	181	8.3%	66%	0.55
\$100,000 - \$124,999	62	109	1.8	199	9.1%	69%	0.55
\$125,000 - \$149,999	43	72	1.7	83	3.8%	48%	0.87
\$150,000 - \$199,999	45	102	2.3	85	3.9%	47%	1.20
\$200,000 - \$249,999	45	123	2.7	84	3.9%	46%	1.46
\$250,000 - \$299,999	16	46	2.9	26	1.2%	38%	1.77
\$300,000 or more	23	92	4.0	31	1.4%	26%	2.97
Total	518	1,000	1.9	2,181	100%	76%	0.459

The average number of reported air trips per year increased with household income, as expected, particularly when expressed in terms of all households. Households with an income less than \$20,000 per year reported making only 0.14 air trips in the previous year on average, whereas those with an income of \$300,000 or more reported making 2.97 air trips in the previous year, or 21 times the average air trip propensity for households with an income of less than \$20,000 per year. The average number of air trips per year for households that made at least one air trip per year also generally increased with income, although remained relatively constant for

households with an income below \$150,000 per year then increased fairly steadily with increasing income. What appears to be occurring is that although air trip propensity for households with an income below \$150,000 per year was increasing with income, so too was the percentage of households that made at least one air trip. The combined effect resulted in the average number of air trips per year for households that made at least one air trip remaining relatively flat until household income exceeded \$150,000 per year, when the average air trip propensity increased faster than the percentage of households that made at least one air trip.

Table C-2 also shows the percentage of households participating in the survey that were in each of the household income ranges. The largest percentage of participating households, 21%, reported household incomes between \$20,000 and \$40,000. Over three-quarters of the households participating in the survey (77%) reported incomes below \$100,000 and only 10% reported incomes of \$150,000 or more.

The distribution of the average number of air trips in the previous year by the age of the survey respondent is shown in Households with respondents age 45 to 64 accounted for 40% of survey respondents, while the other households were fairly equally divided between those with respondents in the younger and older age ranges. Households with respondents in the lowest age range, from 18 to 24, had a significantly lower average air trip propensity than those with respondents in older age groups below age 70. However, they also had a somewhat higher percentage of households that reported making no air trips in the previous year, which resulted in an average number of air trips for those households that reported making at least one such trip that was not significantly different from the average across all survey respondents.

Table C-3. There does not appear to be a large variation across the different age ranges, although households with respondents between ages 45 and 64 had a somewhat higher air trip propensity than those ages 44 or less, whereas households with respondents ages 65 or over had a significantly lower average air trip propensity than households with respondents in any of the younger age groups. Not surprisingly, households with respondents ages 80 or over had the lowest average air trip propensity, about 32% or less than a third of the average air trip propensity for all survey respondents.

Households with respondents age 45 to 64 accounted for 40% of survey respondents, while the other households were fairly equally divided between those with respondents in the younger and older age ranges. Households with respondents in the lowest age range, from 18 to 24, had a significantly lower average air trip propensity than those with respondents in older age groups below age 70. However, they also had a somewhat higher percentage of households that reported making no air trips in the previous year, which resulted in an average number of air trips for those households that reported making at least one such trip that was not significantly different from the average across all survey respondents.

Table C-3. Air Trips per Household by Respondent Age (2014)

Respondent Age	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
18 - 24	12	23	1.92	67	3.1%	82%	0.34
25 - 29	34	55	1.62	122	5.6%	72%	0.45
30 - 34	40	97	2.43	169	7.7%	76%	0.57
35 - 39	41	80	1.95	168	7.7%	76%	0.48
40 - 44	44	73	1.66	169	7.7%	74%	0.43
45 - 49	41	69	1.68	182	8.3%	77%	0.38
50 - 54	67	122	1.82	236	10.8%	72%	0.52
55 - 59	58	145	2.50	229	10.5%	75%	0.63
60 - 64	62	144	2.32	226	10.3%	73%	0.64
65 - 69	52	88	1.69	215	9.8%	76%	0.41
70 - 74	33	50	1.52	146	6.7%	77%	0.34
75 - 79	15	32	2.13	103	4.7%	85%	0.31
80 or over	19	22	1.16	152	7.0%	88%	0.14
Total	518	1,000	1.93	2,184	100%	76%	0.459
25 - 44	159	305	1.92	628	28.8%	75%	0.49
45 - 64	228	480	2.11	873	40.0%	74%	0.55
65 or over	119	192	1.61	616	28.2%	81%	0.31

Table C-4 shows the corresponding data for the average number of air trips in the previous year by the race/ethnicity of the survey respondents. There was significant variation in air travel propensity by the race/ethnicity of the survey respondents. Households with Asian respondents had the highest average air trip propensity (other than households with Pacific Islander respondents, which were too few for statistically significant results), followed by households with white respondents. Households with Hispanic respondents had less than half the average air trip propensity of those with white respondents, while households with black respondents had the lowest average air trip propensity, at only 32% of the average air trip propensity across all survey respondents.

Table C-4. Air Trips per Household by Respondent Race/Ethnicity (2014)

Respondent Race/Ethnicity	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
White	399	800	2.01	1484	67.9%	73%	0.54
Hispanic	40	66	1.65	290	13.3%	86%	0.23
Black	26	38	1.46	261	11.9%	90%	0.15
Asian	45	79	1.76	117	5.4%	62%	0.68
Native American				6	0.3%	100%	
Pacific Islander	3	5	1.67	5	0.2%	40%	1.00
Multiple races	5	12	2.40	22	1.0%	77%	0.55
Total	518	1,000	1.93	2,185	100%	76%	0.459
NA / PI / Multiple (1)	8	17	2.13	33	1.5%	76%	0.52

Note: 1. Native American, Pacific Islander, and multiple races combined.

Because there were so few households with Native American, Pacific Islander, or multiple race respondents, the total for these three categories has been included in Table C-4, although given the small number of these respondents the results do not appear to be statistically different from the average for all survey respondents.

The percentage of households that reported making no air trips in the previous year varied with the race/ethnicity of the respondent, with households with Asian respondents having the highest percentage reporting making one or more air trips in the previous year (apart from households with Pacific Islander respondents, which were too few for statistically significant results). This resulted in the average number of air trips reported by households with Asian respondents reporting making one or more air trips in the previous year being somewhat less than the average number of air trips reported by household with white respondents reporting making one or more air trips in the previous year.

Although the results for households with Native American or Pacific Islander (which would include Hawaiian) respondents are not statistically significant, due to the small sample size, it is not unreasonable that Pacific Islanders would have a fairly high air trip propensity, due to the need to make air trips to visit family or friends in their island of origin. Similarly, it is not unreasonable that households with Native American respondents would tend to have a very low air trip propensity due to economic and geographical considerations.

Comparison with U.S. Air Passenger Trip Data

In order to determine how the results from the CES compare to the air passenger traffic statistics reported by the U.S. DOT, the number of air trips reported by survey respondents was compared to the corresponding number of air trips estimated from the U.S. DOT data. This comparison was not straightforward, since there are significant differences between the air trips reported by survey respondents and the air passenger traffic data reported by the U.S. DOT, in particular:

- The CES data do not indicate how many household members went on each trip
- The CES data only cover air trips that were fully or partially paid for by the households responding to the survey and contains no explicit information on trip purpose
- The CES data only cover air trips made by U.S. residents and the PUMD data do not distinguish between domestic and international trips (although that information is collected in the survey interviews)

Therefore, it was necessary to estimate from the U.S. DOT and other data how many air party trips were made by U.S. residents in 2014. It was also necessary to expand the number of air trips reported in the CES data to the total by all U.S. residents and adjust for fully-reimbursed air trips that would not have been reported by survey respondents. The resulting calculations are shown in Table C-5, together with the assumptions and data sources.

Table C-5. Comparison Between Reported Air Trips in 2014 CES and U.S. Air Passenger Trip Data

Air Traffic Measure or Assumption	Line	Estimate	Source
CES Estimates			
Air trips per household (fully or partially paid)	1	0.459	
Percent partially reimbursed	2	11.6%	(1)
Fully reimbursed air trips per household	3	0.104	(1)
Number of households (consumer units) (000)	4	127,006	(2)
Total number of air party trips by U.S. residents (m)	5	71.4	(3)
Percent business trips	6	27.9%	(4)
U.S. Air Passenger Trips			
Domestic			
Enplanements (m)	7	669	(5)
Enplanements per O-D one-way trip	8	1.334	(6)
Percent enplanements by foreign visitors	9	7.4%	(7)
Passenger round trips by U.S. residents (m)	10	232	(8)
Average air party size	11	1.49	(7)
Air party trips by U.S. residents (m)	12	155	(9)
International			
Departures by U.S. residents (m)	13	41.1	(10)
Average air party size	14	1.76	(7)
Air party trips by U.S. residents (m)	15	23	(11)
Total			
Air party trips by U.S. residents (m)	16	179	(12)
CES estimates / U.S. total		40%	(13)

- Sources:
1. Analysis of 2014 CES data
 2. U.S. Bureau of Labor Statistics, *Consumer Expenditure Survey: 2014*, Table 1202.
 3. (Line 1 + Line 3) * Line 4
 4. (((Line 1 * Line 2) + Line 3) * Line 4) / Line 5
 5. Federal Aviation Administration, *FAA Aerospace Forecast FY2016-2036*
 6. Federal Aviation Administration, *FAA Aerospace Forecast FY2015-2035*
 7. Analysis of 2014/15 air passenger surveys at OAK and SFO
 8. Line 7 * (1 – Line 9) / (2 * Line 8)
 9. Line 10 / Line 11
 10. U.S. Department of Commerce, National Trade and Tourism Office, *U.S. Citizen Traffic to Overseas Regions, Canada & Mexico, 2014*
 11. Line 13 / Line 14
 12. Line 12 + Line 15
 13. Line 5 / Line 16

The estimates of average air party sizes and the percentage of domestic enplanements by foreign visitors were obtained from an analysis of air passenger survey data for Oakland International Airport (OAK) and San Francisco International Airport (SFO) collected from May 2014 to May 2015 as described in the draft Interim Project Report. The resulting dataset combines passenger surveys from a large hub international gateway airport (SFO) and a medium hub airport (OAK) serving predominantly domestic traffic. Although the average domestic air

party sizes were very similar for both airports, the results were weighted to reflect the distribution of domestic air trips originating at large hub and medium airports. The average air party size for international trips was based in data from SFO since the great majority of international trips depart from large hub airports.

Based on the analysis shown in Table C-5, the CES data appear to account for only about 40% of all air trips made by U.S. residents. Part of this discrepancy may be due to the CES excluding some fully reimbursed business trips. Indeed, assuming that fully and partially reimbursed trips reported by CES respondents were all primarily business trips (which is almost certainly an overestimate, since some trips partly or fully paid for by others would have been for personal purposes, for example travel paid for by relatives), some 28% of the CES reported trips would have been primarily business trips. Although this is lower than the proportion of business trips found in other surveys, the difference is not great and certainly not enough to explain the magnitude of the discrepancy. Conversely, if none of the partially reimbursed trips reported by CES respondents were for business purposes that would increase the number of personal trips to about 58 million (and of course reduce the percentage of the CES reported trips that were for business even further). Based on trip purpose data from the 2014/15 OAK and SFO surveys, the total number of personal trips made by U.S. residents in 2014 was about 117 million, so the number of personal trips reported by CES respondents would have been about 50% of the total.

Therefore it appears that the CES survey is missing at least half of the air trips being made by all U.S. households and quite possibly as much as 60%. The overall air trip propensity values from the CES should be viewed with some caution, although the relative air trip propensities for different segments of the population may still be valid.

Airfare Expenses

The CES respondents stated the airfare expense for each trip. Since the reported trip expenses were intended to cover the total expenditures for all the household members on the trip, the reported airfare expense should be the airfare per person times the number of household members on the trip. Unfortunately, the survey did not ask (or at least did not record) the number of household members on each trip, so in most cases it is unclear what the airfare per person was. However, in the case of one-person households, by definition we know that only one household member went on each trip. Figure C-7 shows the distribution of reported airfare expenditures for each trip, for all households and for one-person households.

As expected, it can be seen that the airfare expense distribution reported by all households gave a higher airfare for a given percentile of the distribution than that reported by one-person households. The average airfare expense was \$565 for one-person households and \$891 for all households, a ratio of about 1.58, suggesting that the average travel party size was around 1.6 assuming that one-person households made similar trips to multi-person households and faced the same average airfares per person. This average travel party size is fairly consistent with the findings of air passenger surveys performed at airports. For example, respondents to the air passenger survey performed at San Francisco International Airport in 2014-2015 with fewer than 10 people in the air travel party had an average air travel party size of 1.56. Air travel parties of 10 or more people are generally travel groups comprised of travelers from multiple households, such as sports teams or tour groups.

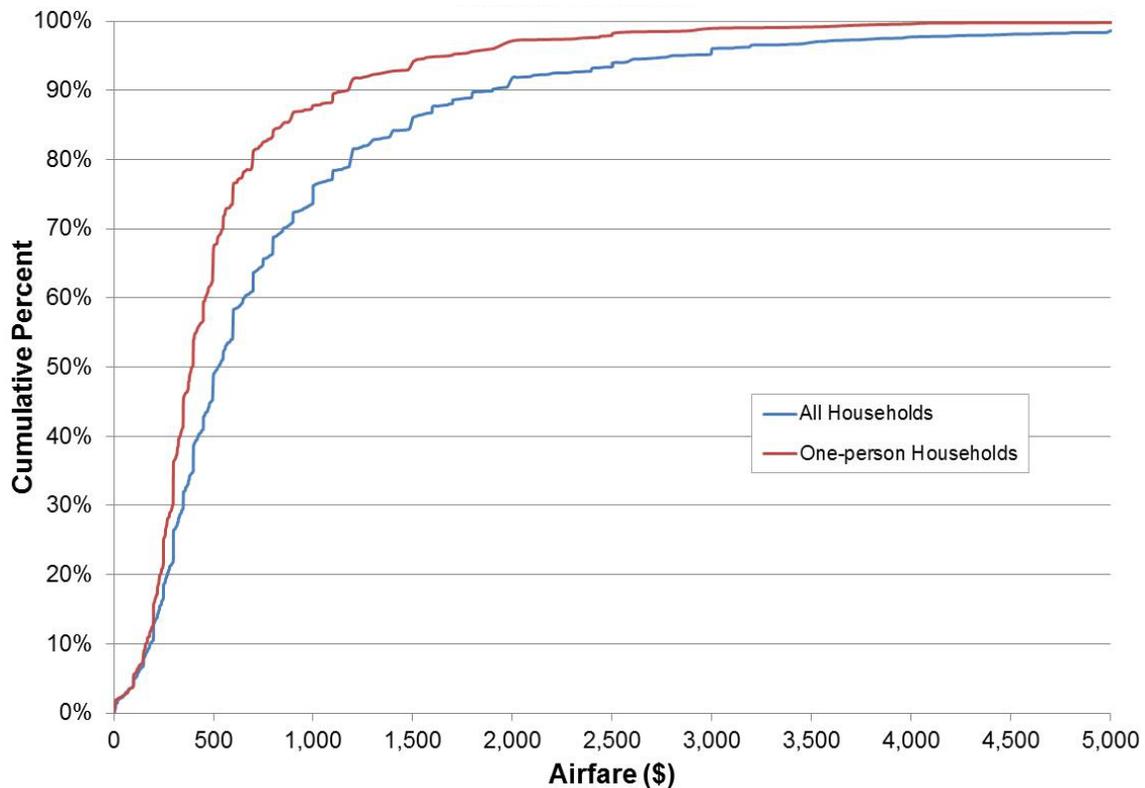


Figure C-7. Cumulative Distribution of Airfare Expense for Each Trip Reported by 2014 CES Respondents

About 10% of survey respondents did not report an airfare, although they stated that they used a commercial airline during their trip. Even if they used a frequent flier award, they should have paid various airline ticket taxes, although they may not have reported these or included them in other expense categories. It is also possible that they misstated that they used a commercial airline in that part of the survey interview and corrected this by giving a zero airfare when giving their trip expenses later in the interview. These respondents have been excluded from the distribution in Figure 2. The figure also shows a small percentage of respondents who reported a very low airfare. About 2% reported an airfare expense of \$20 or less. These could be respondents using frequent flier awards who (correctly) reported the ticket taxes as the airfare.

About 1% of respondents from one-person households reported an airfare expense of \$3,000 or more, while a similar percentage of respondents from all households reported an airfare expense of \$6,000 or more. The highest airfare expense reported by respondents from a one-person household was \$6,868, while the highest airfare expense reported by respondents from all households was \$19,247. These values, while high, are quite plausible for a business class or first class ticket, particularly to an international destination and for several people in the case of a respondent from a multi-person household.

The average airfare reported by survey respondents from one-person households of \$565 is somewhat higher than the average airfare in 2014 estimated from U.S. Department of Transportation (DOT) 10% Origin-Destination (OD) Survey and other data. The average airfare

for domestic round trips from the 10% OD Survey was \$421. Obtaining an estimate of the average airfare for international trips proved somewhat more difficult due to restrictions on access to international OD Survey data. Based on an estimate of the average airline revenue per international enplanement obtained from data in the FAA Aerospace Forecast for fiscal years 2016-2036 and an estimate of U.S. and foreign taxes and fees on international flights, the average airfare for international flights on U.S. commercial air carriers was estimated at about \$996. From the ratio of international to domestic air trips, the average airfare for all trips was estimated to be about \$507. However, these estimates include travelers using frequent flier program awards, which as noted above may have been reported as a zero fare in the CES data and excluded from the average. If the 10% of survey respondents who reported a zero airfare in fact were using a frequent flier award or other free ticket and paid (but did not report) the ticket taxes, this would reduce the average airfare expense per trip for a one-person household to \$512, which is fairly consistent with the estimated average airfare for all trips from U.S. DOT and other data. It is also quite likely that there is a difference in the average airfare paid per trip for personal and business trips, whether due to differences in the distribution of markets flown (for example a higher proportion of longer distance or international trips for personal purposes), corporate discounts, or differences in the use of discounted, business class and first-class airfares.

Analysis of 2006 and 2010 Data

In order to examine changes of air trip making and household characteristics over time, the analysis of air travel propensity undertaken for the 2014 CES data was repeated for the corresponding data for 2006 and 2010.

2006 Data

The distribution of the number of air trips reported by households that were interviewed in different numbers of quarters in the 2006 survey is shown in The maximum number of trips reported by any household reporting four quarters of data was somewhat less than in the 2014 survey. The average number of air trips for households reporting four quarters of data was also slightly lower than in the 2014 survey, as would be expected, at 1.88 compared to 1.93. As with the 2014 survey, over half (55%) of the households reporting four quarters of data and making at least one air trip in the previous 12 months reported only making one air trip in the year.

Table C-7 shows the average number of air trips per year (air trip propensity) by annual household income. Overall, those households that reported making an air trip in the previous year reported making about 1.9 trips on average, as shown in **Table C-7. Only 28% of all** households reported making at least one air trip, somewhat higher than the percentage found in the 2014 survey. As expected, the percentage of households that reported making at least one air trip in the previous year increased with income from 11% for households with an income less than \$20,000 per year to 78% for households with an income of \$200,000 to \$250,000. The percentage declined slightly for households reporting an income of \$250,000 or more. The average air trip propensity across all households was about 0.53 air trips per year, or somewhat higher than found in the 2014 survey (0.46 air trips per year).

Table C-6. The maximum number of trips reported by any household reporting four quarters of data was somewhat less than in the 2014 survey. The average number of air trips for

households reporting four quarters of data was also slightly lower than in the 2014 survey, as would be expected, at 1.88 compared to 1.93. As with the 2014 survey, over half (55%) of the households reporting four quarters of data and making at least one air trip in the previous 12 months reported only making one air trip in the year.

Table C-7 shows the average number of air trips per year (air trip propensity) by annual household income. Overall, those households that reported making an air trip in the previous year reported making about 1.9 trips on average, as shown in Table C-7. Only 28% of all households reported making at least one air trip, somewhat higher than the percentage found in the 2014 survey. As expected, the percentage of households that reported making at least one air trip in the previous year increased with income from 11% for households with an income less than \$20,000 per year to 78% for households with an income of \$200,000 to \$250,000. The percentage declined slightly for households reporting an income of \$250,000 or more. The average air trip propensity across all households was about 0.53 air trips per year, or somewhat higher than found in the 2014 survey (0.46 air trips per year).

Table C-6. Air Trips per Household by Number of Reported Quarters of Data (2006)

Air Trips	Quarters of Data					Cumulative Percent	
	1	2	3	4	Total	4 Quarters	Total
1	421	481	522	403	1,827	55.0%	67.3%
2	65	124	160	171	520	78.3%	86.5%
3	8	31	82	90	211	90.6%	94.3%
4	3	12	22	36	73	95.5%	96.9%
5	3	5	10	12	30	97.1%	98.0%
6	1	1	8	8	18	98.2%	98.7%
7	1	1	3	6	11	99.0%	99.1%
8	1	2	3	2	8	99.3%	99.4%
9		1	3	2	6	99.6%	99.6%
10	1		2	1	4	99.7%	99.8%
11			1		1	99.7%	99.8%
12			1		1	99.7%	99.9%
13			1	1	2	99.9%	99.9%
14			1	1	2	100.0%	100.0%
Total	504	658	819	733	2,714		
Total trips	633	933	1,416	1,380	4,362		
Average trips per household	1.26	1.42	1.73	1.88	1.61		

The fact that the average number of air trips per year across all households was somewhat higher than in the 2014 survey while the average number of air trips per year by households that made at least one air trip in the previous 12 months was slightly lower is explained by the higher percentage of households that reported making no air trips in the 2014 survey.

Table C-7. Air Trips per Household by Household Income (2006)

Household Income	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
Less than \$20,000	52	72	1.4	489	19.1%	89%	0.15
\$20,000 - \$39,999	91	155	1.7	552	21.5%	84%	0.28
\$40,000 - \$59,999	101	167	1.7	434	16.9%	77%	0.38
\$60,000 - \$79,999	98	177	1.8	333	13.0%	71%	0.53
\$80,000 - \$99,999	99	171	1.7	257	10.0%	61%	0.67
\$100,000 - \$124,999	79	119	1.5	174	6.8%	55%	0.68
\$125,000 - \$149,999	68	147	2.2	119	4.6%	43%	1.24
\$150,000 - \$199,999	50	128	2.6	86	3.4%	42%	1.49
\$200,000 - \$249,999	54	140	2.6	69	2.7%	22%	2.03
\$250,000 - \$299,999	26	60	2.3	34	1.3%	24%	1.76
\$300,000 or more	12	31	2.6	16	0.6%	25%	1.94
Total	730	1,367	1.9	2,563	100.0%	72%	0.533

The average number of reported air trips per year generally increased with household income, as expected, particularly when expressed in terms of all households. Households with an income less than \$20,000 per year reported making 0.15 air trips in the previous year on average, while those with an income of \$200,000 or more per year reported making 1.94 air trips in the previous year on average, or 13 times the average air trip propensity for households with an income of less than \$20,000 per year. This air trip propensity was significantly lower than the average air trip propensity for the highest income group in the 2014 survey (2.97 air trips per year).

The average number of air trips per year for households that made at least one air trip per year remained relatively constant for households with an income between \$20,000 and \$80,000 per year then declined with increasing income until \$125,000 per year, increasing thereafter until \$200,000 per year and remaining fairly constant at higher income ranges. As discussed above for the 2014 survey results, this appears to reflect the interaction between the increasing average air trip propensity with income across all households with an increasing percentage of households that made at least one air trip in the year at higher income levels.

Table C-7 also shows the percentage of households participating in the survey that were in each of the household income ranges. The largest percentage of participating households, 22%, reported household incomes between \$20,000 and \$40,000. Over 80% of the households participating in the survey (81%) reported incomes below \$100,000 and only 8% reported incomes of \$150,000 or more. These percentages are broadly consistent with the results from the 2014 survey after allowing for the overall increase in household incomes (in current dollars) between 2006 and 2014.

The distribution of the average number of air trips in the previous year by the age of the survey respondent is shown in Table C-8.

Table C-8. Air Trips per Household by Respondent Age (2006)

Respondent Age	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
18 - 24	14	18	1.29	61	2.4%	77%	0.30
25 - 29	43	81	1.88	151	5.9%	72%	0.54
30 - 34	44	84	1.91	194	7.6%	77%	0.43
35 - 39	70	129	1.84	254	9.9%	72%	0.51
40 - 44	99	188	1.90	283	11.0%	65%	0.66
45 - 49	89	193	2.17	289	11.3%	69%	0.67
50 - 54	96	176	1.83	289	11.3%	67%	0.61
55 - 59	96	188	1.96	271	10.6%	65%	0.69
60 - 64	65	111	1.71	211	8.2%	69%	0.53
65 - 69	53	97	1.83	165	6.4%	68%	0.59
70 - 74	22	47	2.14	110	4.3%	80%	0.43
75 - 79	22	30	1.36	121	4.7%	82%	0.25
80 or over	20	38	1.90	168	6.5%	88%	0.23
Total	733	1,380	1.88	2,567	100%	71%	0.538
25 - 44	256	482	1.88	882	34.4%	71%	0.55
45 - 64	346	668	1.93	1,060	41.3%	67%	0.63
65 or over	117	212	1.81	564	22.0%	79%	0.38

As with the results from the 2014 survey, there does not appear to be a large variation across the different age ranges, although households with respondents between ages 45 and 64 had a somewhat higher air trip propensity than those ages 44 or less, while households with respondents ages 65 or over had a significantly lower average air trip propensity than households with respondents in any of the younger age groups, except for those ages 18 to 24. Not surprisingly, households with respondents ages 80 or over had the lowest average air trip propensity, a little over 40% of the average air trip propensity for all survey respondents. This was somewhat higher than found in the 2014 survey.

Households with respondents ages 45 to 64 accounted for 41% of survey respondents, with households with respondents in the younger age ranges accounting for 37% of survey respondents and those with respondents in older age ranges accounting for 22%. Households with respondents in the lowest age range, from 18 to 24, had a significantly lower average air trip propensity than those with respondents in older age groups below age 75, both relative to all households reporting four quarters of data and among households that reported making at least one air trip in the previous year.

Table C-9 shows the average number of air trips in the previous year by the race/ethnicity of the survey respondents. Households with Asian respondents had the highest average air trip propensity among the categories with enough respondents for statistically significant results, followed by households with white respondents. Households with Hispanic respondents had less than half the average air trip propensity of those with white respondents, while households with black respondents had the lowest average air trip propensity, at only 35% of the average air trip propensity across all survey respondents. Because there were so few households with Native American, Pacific Islander, or multiple race respondents, the combined total for these three categories has been included in Table C-9, although the relatively small number of these

respondents reduces the statistical significance of the results. Nonetheless, households with Pacific Islander respondents had the highest average trip propensity of any of the respondent race/ethnicity categories, which does not seem unreasonable, as discussed above for the 2014 survey.

Table C-9. Air Trips per Household by Respondent Race/Ethnicity (2006)

Respondent Race/Ethnicity	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
White	576	1,142	1.98	1,867	72.6%	69%	0.61
Hispanic	59	80	1.36	283	11.0%	79%	0.28
Black	37	54	1.46	291	11.3%	87%	0.19
Asian	44	74	1.68	87	3.4%	49%	0.85
Native American	4	7	1.75	10	0.4%	60%	0.70
Pacific Islander	4	9	2.25	8	0.3%	50%	1.13
Multiple races	9	14	1.56	24	0.9%	63%	0.58
Total	733	1,380	1.88	2,570	100%	71%	0.537
NA / PI / Multiple (1)	17	30	1.76	42	1.6%	60%	0.71

Note: 1. Native American, Pacific Islander, and multiple races combined.

In contrast to the results of the 2014 survey, in which no household with a Native American respondent that reported data for four quarters reported making an air trip in the previous year, in the 2006 survey the average air trip propensity of all such households was higher than for households with a white respondent. However, these findings should be treated with caution due to the small number of such households in the survey.

The percentage of households that reported making no air trips in the previous year varied with the race/ethnicity of the respondent, with households with Asian respondents having the highest percentage reporting making one or more air trips in the previous year, followed by households with Pacific Islander respondents, although these were too few for statistically significant results. This resulted in the average number of air trips reported by households with Asian respondents reporting making one or more air trips in the previous year being somewhat less than the average number of air trips reported by households with white respondents who reported making one or more air trips in the previous year, as was found in the 2014 survey.

The minor differences in the overall average number of air trips per household across all households shown in Table C-7 to Table C-9 result from differences in the number of survey respondents who reported the number of air trips taken in the previous 12 months as well as the relevant household characteristics, and the number of all household participating in the survey that reported the relevant household characteristic.

2010 Data

The distribution of the number of air trips reported by households that were interviewed in different numbers of quarters in the 2010 survey is shown in Table C-10.

Table C-10. Air Trips per Household by Number of Reported Quarters of Data (2010)

Air Trips	Quarters of Data					Cumulative Percent	
	1	2	3	4	Total	4 Quarters	Total
1	422	484	430	356	1692	55.4%	68.4%
2	56	115	135	157	463	79.8%	87.1%
3	13	32	68	61	174	89.3%	94.1%
4	3	14	23	31	71	94.1%	97.0%
5		6	10	15	31	96.4%	98.2%
6		2	6	12	20	98.3%	99.0%
7		1	3	2	6	98.6%	99.3%
8			4	4	8	99.2%	99.6%
9			3	2	5	99.5%	99.8%
11				1	1	99.7%	99.8%
12		1			1	99.7%	99.9%
13			1		1	99.7%	99.9%
14				2	2	100.0%	100.0%
Total	494	655	683	643	2,475		
Total trips	585	927	1,175	1,227	3,914		
Average trips per household	1.18	1.42	1.72	1.91	1.58		

The maximum number of trips reported by any household reporting four quarters of data was the same as in the 2006 survey and somewhat less than in the 2014 survey. The average number of air trips for households reporting four quarters of data was slightly lower than in the 2014 survey, as would be expected, at 1.91 compared to 1.93, but slightly higher than in the 2006 survey (1.88). As with both the 2006 and 2014 surveys, over half (55%) of the households reporting four quarters of data and making at least one air trip reported only making one air trip in the year.

Table C-11 shows the average number of air trips per year (air trip propensity) by annual household income.

Table C-11. Air Trips per Household by Household Income (2010)

Household Income	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
Less than \$20,000	59	84	1.4	496	19.3%	88%	0.17
\$20,000 - \$39,999	70	100	1.4	575	22.3%	88%	0.17
\$40,000 - \$59,999	100	174	1.7	440	17.1%	77%	0.40
\$60,000 - \$79,999	73	129	1.8	335	13.0%	78%	0.39
\$80,000 - \$99,999	87	158	1.8	241	9.4%	64%	0.66
\$100,000 - \$124,999	76	140	1.8	179	6.9%	58%	0.78
\$125,000 - \$149,999	44	119	2.7	87	3.4%	49%	1.37
\$150,000 - \$199,999	44	91	2.1	88	3.4%	50%	1.03
\$200,000 - \$249,999	44	109	2.5	78	3.0%	44%	1.40
\$250,000 - \$299,999	26	71	2.7	32	1.2%	19%	2.22
\$300,000 or more	19	51	2.7	25	1.0%	24%	2.04
Total	642	1,226	1.9	2,576	100%	75%	0.476

Overall, those households that reported making an air trip in the previous 12 months reported making about 1.9 trips on average, as shown in Table C-11. Only 25% of all households reported making at least one air trip, about the same percentage found in the 2014 survey (24%) and slightly less than found in the 2006 survey (28%). As expected, the percentage of households that reported making at least one air trip in the previous 12 months increased with income from 12% for households with an income less than \$20,000 per year to 81% for households with an income of \$250,000 to \$300,000. The percentage declined slightly for households reporting an income of \$300,000 or more. The average air trip propensity across all households was about 0.48 air trips per year, slightly higher than found in the 2014 survey (0.46 air trips per year) but less than found in the 2006 survey (0.53 air trips per year).

The average number of reported air trips per year generally increased with household income, as expected, particularly when expressed in terms of all households. Households with an income less than \$20,000 per year reported making 0.17 air trips in the previous 12 months on average, while those with an income of \$250,000 or more per year reported making 2.14 air trips in the previous 12 months on average, or 13 times the average air trip propensity for households with an income of less than \$20,000 per year. This air trip propensity was significantly lower than the average air trip propensity for the highest income group in the 2014 survey (2.97 air trips per year) but somewhat higher than the average air trip propensity of households with an income of \$250,000 or more per year in the 2006 survey (1.82 air trips per year), although it should be noted that the average air trip propensity in the 2006 survey for households with incomes between \$200,000 and \$250,000 per year was higher than for households with incomes of \$250,000 or more.

The average number of air trips per year for households that made at least one air trip per year generally increased with income but remained relatively constant for households with an income between \$40,000 and \$125,000 per year then increased sharply for households with an income between \$125,000 and \$150,000 per year to the same level as households with an income of \$300,000 or more per year. It then declined for households with an income between \$150,000 and \$200,000, increasing thereafter with higher income although remaining fairly constant above an income of \$250,000 per year. It seems likely that these irregularities in the general trend are a consequence of the more limited sample size at higher income levels.

Table C-11 also shows the percentage of households participating in the survey that were in each of the household income ranges. The largest percentage of participating households, 22%, reported household incomes between \$20,000 and \$40,000. Over 80% of the households participating in the survey (81%) reported incomes below \$100,000 and only 9% reported incomes of \$150,000 or more. These percentages are broadly consistent with the results from the 2006 and 2014 survey after allowing for the overall increase in household incomes (in current dollars) between 2006 and 2014.

The distribution of the average number of air trips in the previous year by the age of the survey respondent is shown in Table C-12.

Table C-12. Air Trips per Household by Respondent Age (2010)

Respondent Age	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
18 - 24	14	23	1.64	66	2.6%	79%	0.35
25 - 29	35	78	2.23	130	5.0%	73%	0.60
30 - 34	52	84	1.62	196	7.6%	73%	0.43
35 - 39	58	100	1.72	217	8.4%	73%	0.46
40 - 44	60	114	1.90	232	9.0%	74%	0.49
45 - 49	79	152	1.92	298	11.5%	73%	0.51
50 - 54	90	174	1.93	293	11.4%	69%	0.59
55 - 59	64	111	1.73	254	9.8%	75%	0.44
60 - 64	62	146	2.35	255	9.9%	76%	0.57
65 - 69	53	99	1.87	202	7.8%	74%	0.49
70 - 74	24	60	2.50	140	5.4%	83%	0.43
75 - 79	36	62	1.72	138	5.3%	74%	0.45
80 or over	16	24	1.50	160	6.2%	90%	0.15
Total	643	1,227	1.91	2,581	100%	75%	0.476
25 - 44	205	376	1.83	775	30.0%	74%	0.49
45 - 64	295	583	1.98	1,100	42.6%	73%	0.53
65 or over	129	245	1.90	640	24.8%	80%	0.38

As with the results from the 2006 and 2014 surveys, there does not appear to be a large variation across the different age ranges, although households with respondents between ages 45 and 64 had a somewhat higher air trip propensity than those ages 44 or less, while households with respondents ages 65 or over had a significantly lower average air trip propensity than households with respondents in any of the younger age groups, except for those ages 18 to 24. In particular, not surprisingly, households with respondents ages 80 or over had the lowest average air trip propensity, about 32% of the average air trip propensity for all survey respondents. This was the same as found in the 2014 survey and somewhat lower than found in the 2006 survey.

Households with respondents age 45 to 64 accounted for 43% of survey respondents, with households with respondents in the younger age ranges accounting for 30% of survey respondents and those with respondents in older age ranges accounting for 25%. Households with respondents in the lowest age range, from 18 to 24, generally had a lower average air trip propensity than those with respondents in older age groups except for those age 80 or over, both relative to all households reporting four quarters of data and among households that reported making at least one air trip in the previous year, with the exception of households that made at least one air trip in the previous year with a respondent ages between 30 and 34.

Table C-13 shows the average number of air trips in the previous year by the race/ethnicity of the survey respondents. Households with Asian respondents had by far the highest average air trip propensity among the categories with enough respondents for statistically significant results, followed by households with white respondents. Households with Hispanic respondents had less than 60% of the average air trip propensity of those with white respondents, while households with black respondents had the lowest average air trip propensity (apart from

households with Native American respondents), at 55% of the average air trip propensity across all survey respondents. Because there were so few households with Native American, Pacific Islander, or multiple race respondents, the total for these three categories has been included in Table C-13, although the relatively small number of these respondents reduces the statistical significance of the results. Nonetheless, households with Pacific Islander respondents had the second highest average trip propensity of any of the respondent race/ethnicity categories, which does not seem unreasonable, as discussed above for the 2014 survey.

Table C-13. Air Trips per Household by Respondent Race/Ethnicity (2010)

Respondent Race/Ethnicity	Households w/ Air Trips	Air Trips	Air Trips per H/H	All Households	Percent All H/H	Percent w/ No Air Trips	Air Trips per H/H (All)
White	470	892	1.90	1,803	69.8%	74%	0.49
Hispanic	53	90	1.70	320	12.4%	83%	0.28
Black	33	73	2.21	281	10.9%	88%	0.26
Asian	72	146	2.03	130	5.0%	45%	1.12
Native American	2	2	1.00	9	0.3%	78%	0.22
Pacific Islander	3	5	1.67	7	0.3%	57%	0.71
Multiple races	10	19	1.90	32	1.2%	69%	0.59
Total	643	1,227	1.91	2,582	100%	75%	0.476
NA / PI / Multiple (1)	15	26	1.73	48	1.9%	69%	0.54

Note: 1. Native American, Pacific Islander, and multiple races combined.

As in the 2006 and 2014 surveys, the percentage of households that reported making no air trips in the previous year varied with the race/ethnicity of the respondent, with households with Asian respondents having the highest percentage reporting making one or more air trips in the previous year, followed by households with Pacific Islander respondents, although these were too few for statistically significant results. This resulted in the average number of air trips reported by households with Asian respondents that reported making one or more air trips in the previous year only being a little higher than the average number of air trips reported by households with white respondents that reported making one or more air trips in the previous year, in spite of the much higher air trip propensity across all households and in contrast to the findings of the 2006 and 2014 surveys.

Households with black respondents that reported making one or more air trips in the previous year had the highest average number of air trips of any of the race/ethnicity categories, despite having a very low average trip propensity across all households with black respondents. This appears to suggest that while a high percentage of such households reported making no air trips at all, those that did made somewhat more air trips than average across all households that reported making air trips.

Lodging, Food and Beverage Expenses

Survey respondents reported their lodging, food and beverage expenses for each trip as well as the number of nights away from home on each trip. This allows these expenses to be expressed on a per-night basis. Although lodging expenses will generally be incurred for each night of trip, food and beverage expenses are usually incurred on each day of a trip. However,

the food and beverage expenses for the first and last day of trip will typically be less than for the other days of a trip of more than one night, depending on the departure and return times. So it may be appropriate to express the food and beverage expenses on a per night basis as well.

The following analysis was based on all reported trips, irrespective of whether the survey respondents completed all five interviews (*i.e.*, reported four quarters of data). Since the unit of analysis is a single trip, it does not matter how many quarters of data each survey respondent reported.

Survey respondents to the 2014 CES reported lodging expenses for only 46% of all trips involving air travel. Presumably they stayed with family or friends for the other trips. The average lodging expense per night for those trips on which they reported lodging expenses was \$107, which appears reasonable. The reported lodging expense per night spanned a wide range, as shown in Figure C-8, with the highest reported expense per night of \$4,220. However, the reported food and beverage expense per night for this trip was also absurdly high, suggesting either than the reported expenses were spurious or that the number of nights reported for the trip was incorrect. Survey respondents reported a lodging expense per night of less than \$25 for 11% of all trips involving air travel for which lodging expenses were reported, suggesting that not all the nights away on the trip were spent in a hotel or other commercial lodging, so the reported lodging expense was for fewer nights than the number of nights away on the trip.

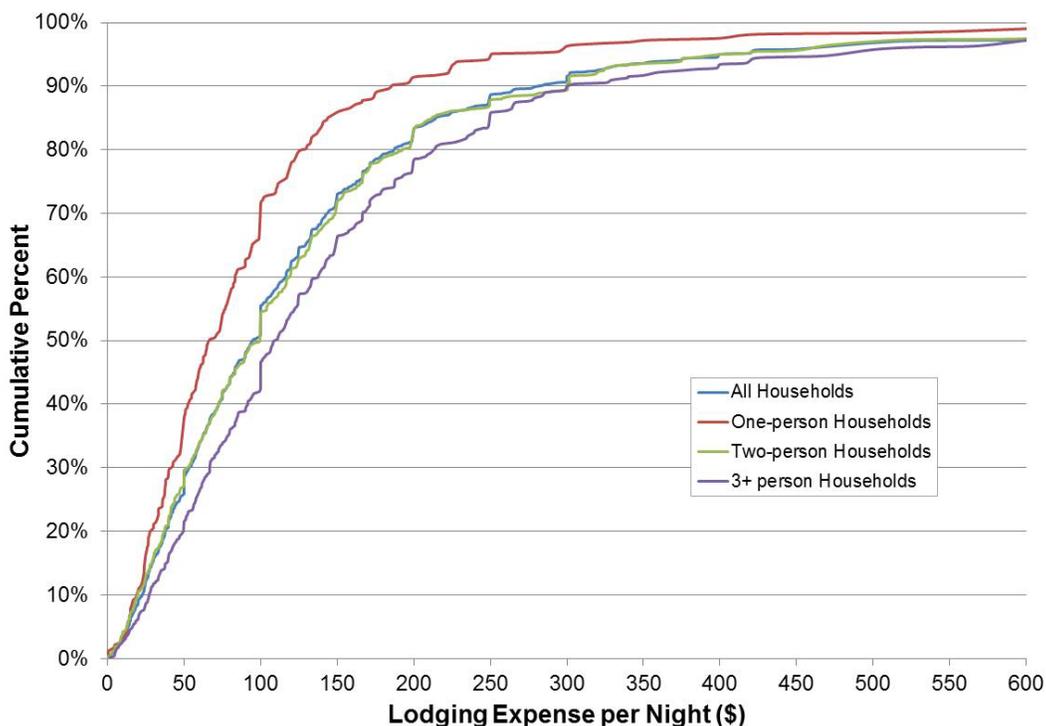


Figure C-8. Cumulative Distribution of Lodging Expense per Night for Each Trip Reported by 2014 CES Respondents

Reported lodging expenses per night were \$400 or less for 95% of the trips, which appears reasonable. Figure C-8 shows that the distribution of lodging expense per night varies

with the household size, with one-person household spending less on lodging than larger households. This may reflect differences in income or age between single-person households and two-person larger households, since generally a travel party of two adults from the same household usually only requires one room and hotel rates typically are the same whether one or two people occupy a room. Travel parties from households with three or more people spent more on lodging per night than households with two people, which appears reasonable since these travel parties may have required more than one room depending how many household members went on a trip. However, for any given trip it is not known from the CES survey data how many of the household members went on the trip. As shown in Figure C-8, the distribution of lodging expense per night is virtually the same for two-person households as for all households, although this may simply be coincidence.

Survey respondents reported food and beverage expenses for each trip under various categories. These have been combined into a single expense for food and beverage and expressed as an expense per night away on the trip. Survey respondents reported food and beverage expenses for 85% of all trips, including 98% of the trips for which lodging expenses were reported and 74% of trips for which they were not. Presumably, trips for which food and beverage expenses were not reported were spent with family or friends who provided meals. For those trips for which food and beverage expenses were reported, the average expense was about \$57 per night for trips where lodging expenses were incurred and about \$31 per night for trips where no lodging expenses were incurred, which appear reasonable.

The distributions of food and beverage expense per night for trips made by one-person households and all households are shown in Figure C-9. As with lodging expenses, the food and beverage expense per night is significantly lower for trips by one-person households than for trips by larger households. This is reasonable because food and beverage costs per night will depend on the number of household members on the trip, for any given household and destination. The wide variation in food and beverage expense per night for trips by one-person households may reflect both income and destination differences as well as differences in the amount that different households in the same income strata will spend on meals and drinks.

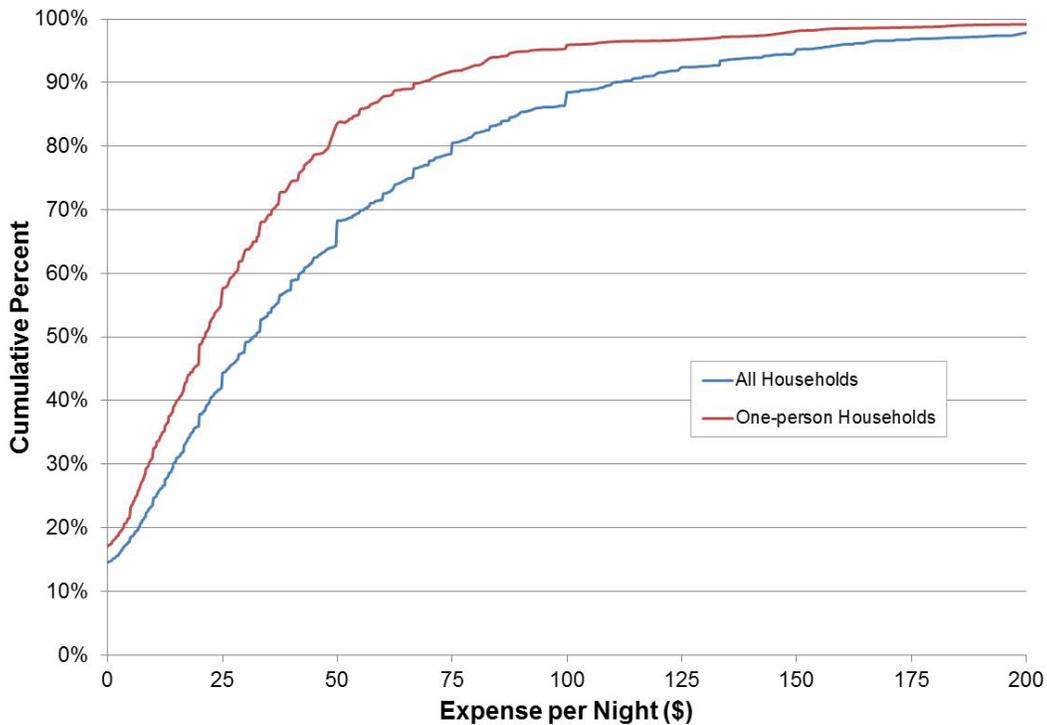


Figure C-9. Cumulative Distribution of Food and Beverage Expense per Night for Each Trip Reported by 2014 CES Respondents

The same analysis was undertaken for the 2006 and 2010 data. Figure C-10 and Figure C-11 show the cumulative probability distributions for the lodging expenses and food and beverage expenses per night reported by survey respondents for 2006 for each air trip that incurred lodging or food and beverage expenses. Figure C-12 and Figure C-13 show the corresponding probability distributions for 2010. The distributions of lodging expense for 2006 show that a household with three or more people generally spent less on lodging than a household with two people, in contrast to the findings for 2014 which showed that they spent somewhat more. It would be reasonable to expect larger households to spend more on lodging per trip than two-person households, so this finding is unexpected.

The distributions of lodging expenses for 2010 show that a household with three or more people generally spent somewhat more on lodging than a household with two people, as would be expected, although the difference is not as large as was found in the analysis of 2014 data.

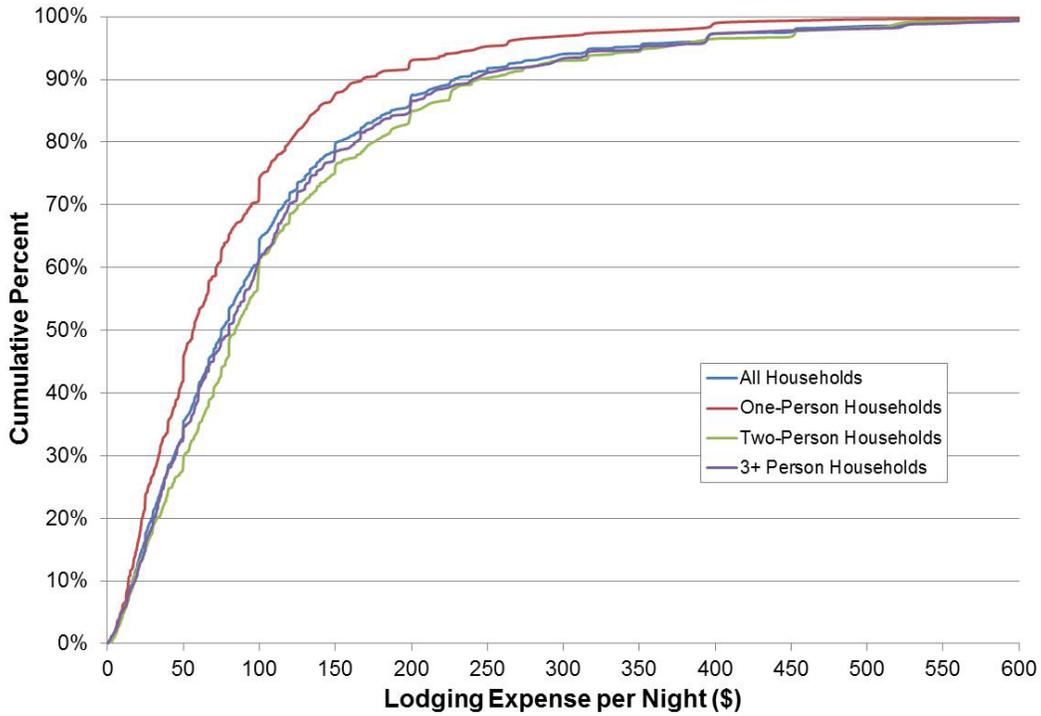


Figure C-10. Cumulative Distribution of Lodging Expense per Night for Air Trips Reported by 2006 CES Respondents

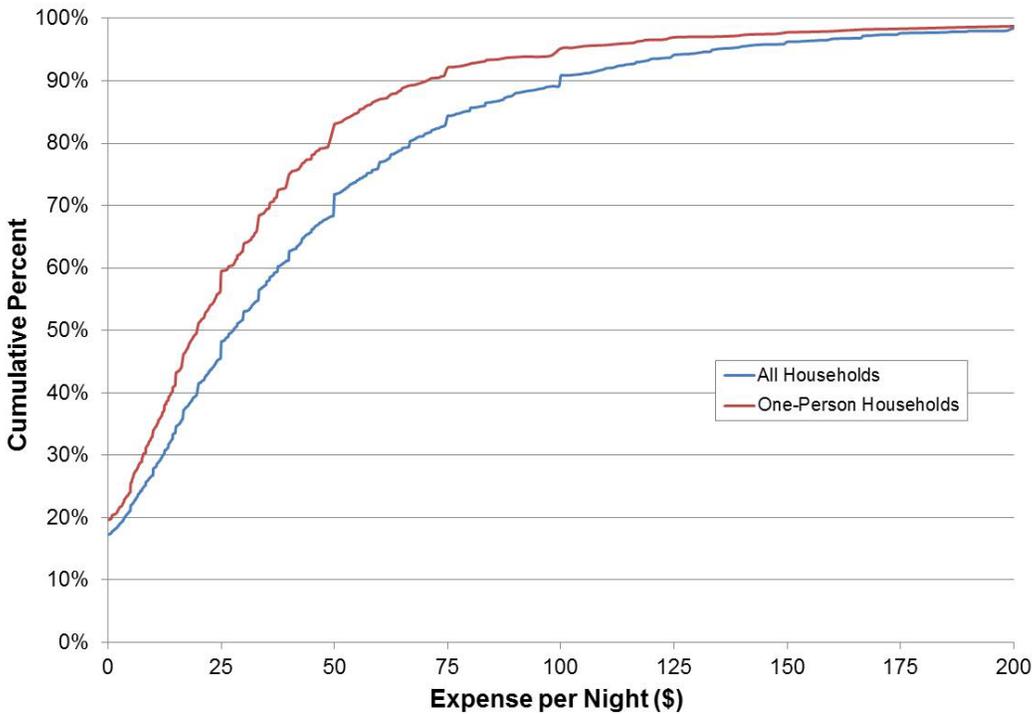


Figure C-11. Cumulative Distribution of Food and Beverage Expense per Night for Air Trips Reported by 2006 CES Respondents

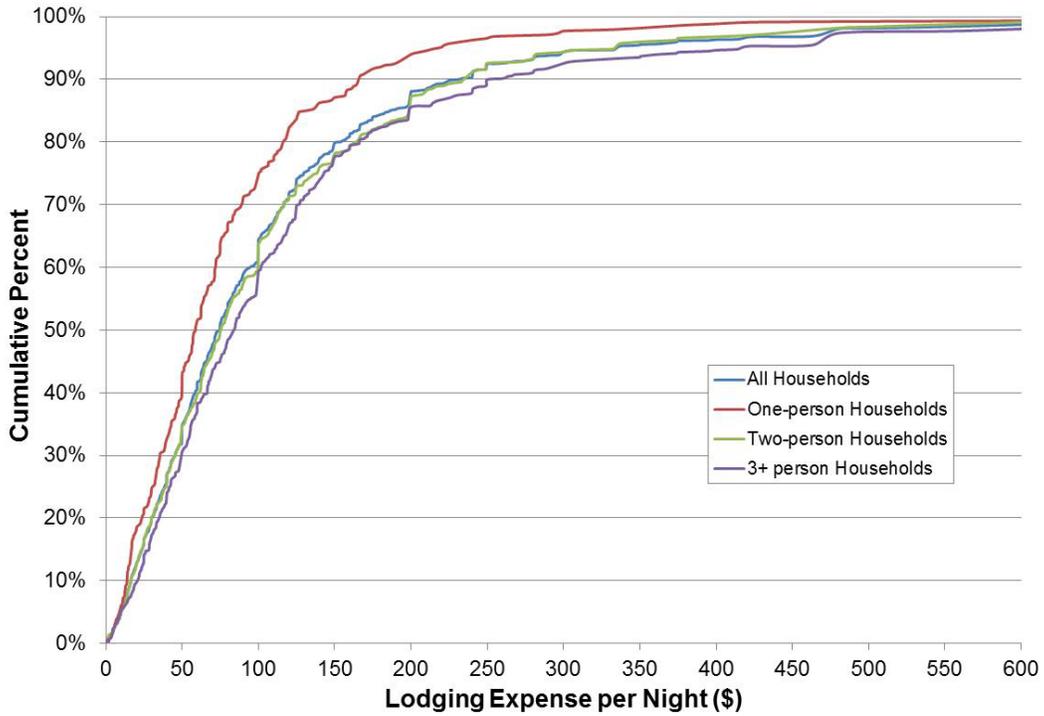


Figure C-12. Cumulative Distribution of Lodging Expense per Night for Air Trips Reported by 2010 CES Respondents

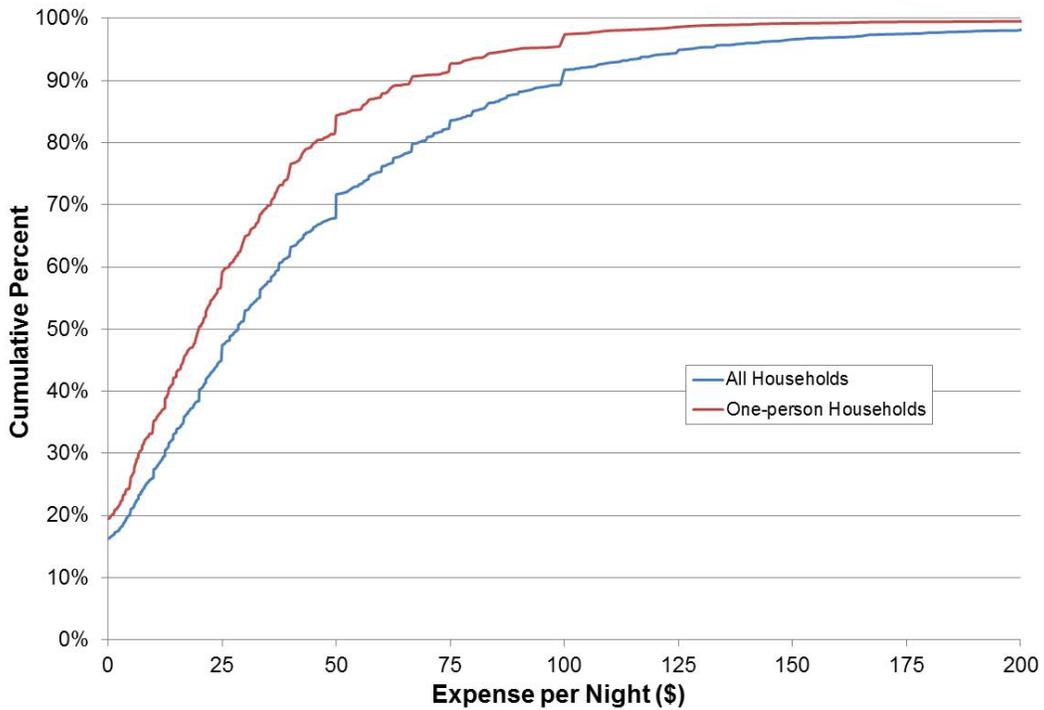


Figure C-13. Cumulative Distribution of Food and Beverage Expense per Night for Air Trips Reported by 2010 CES Respondents

The distributions of food and beverage expenses for 2006 and 2010 show that one-person households generally spent less per trip than larger households, as would be expected and as was found in the analysis of 2014 data. However, the difference between one-person households and larger households appears to have increased over the period from 2006 to 2014. In 2006, the average expenditure for food and beverage for one-person households was \$37 per night, compared to \$47 per night for all households, or about 77% of the average expenditure for all households. By 2010 the average for one-person households had declined to \$25 per night compared to \$38 per night for all households, or about 67% of the average expenditure for all households. By 2014 the average for one-person households had increased to \$34 per night compared to \$51 per night for all households, remaining at about 67% of the average expenditure for all households.

In order to examine the changes in lodging, food and beverage expenses over time, the expenses per night away on each trip were expressed in constant 2015 dollars. Figure C-14 shows the change in lodging expenses per night for all households from 2006 to 2014. Spending on lodging declined from 2006 to 2010 in constant dollars, most likely responding to the recession that began in 2007 and the relatively slow recovery. By 2014 spending on lodging had recovered to slightly higher levels than in 2006 in constant dollars. The average expenditure on lodging (for those air trips where lodging expenses were incurred) was \$105 per night in 2006, declining to \$92 per night in 2010, and recovering to \$107 per night in 2014 (all in 2015 dollars).

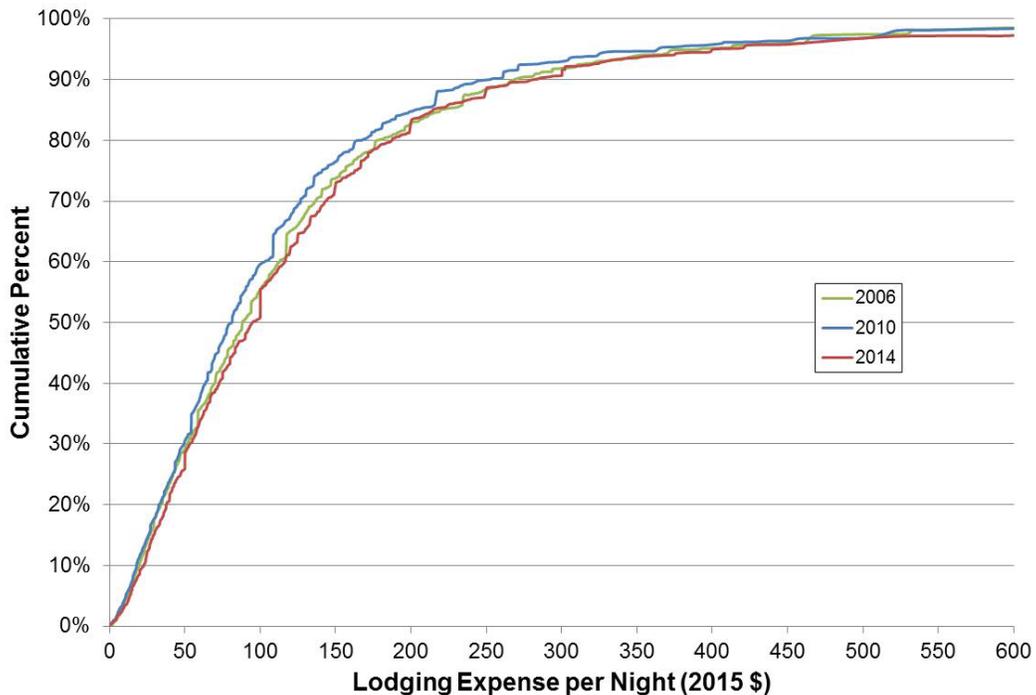


Figure C-14. Cumulative Distribution of Lodging Expense per Night for Air Trips Reported by CES Respondents 2006 to 2014 – All Households

Figure C-15 shows the change in food and beverage expenses per night for all households from 2006 to 2014. Spending on food and beverage declined from 2006 to 2010 in constant

dollars, most likely responding to the recession that began in 2007 and the relatively slow recovery, then increased somewhat by 2014, although not to the level of 2006. The average expenditure on food and beverages (for all air trips of one night or more where food and beverage expenses were incurred) was \$56 per night in 2006, declining to \$41 per night in 2010, and recovering to \$51 per night in 2014 (all in 2015 dollars). The cumulative distribution curve for the 2014 food and beverage expenses shown in Figure 2.6 appears well to the right of that for 2006 because the percentage of air trips for which no food or beverage expenses were reported declined from 17.4% in 2006 to 14.7% in 2014.

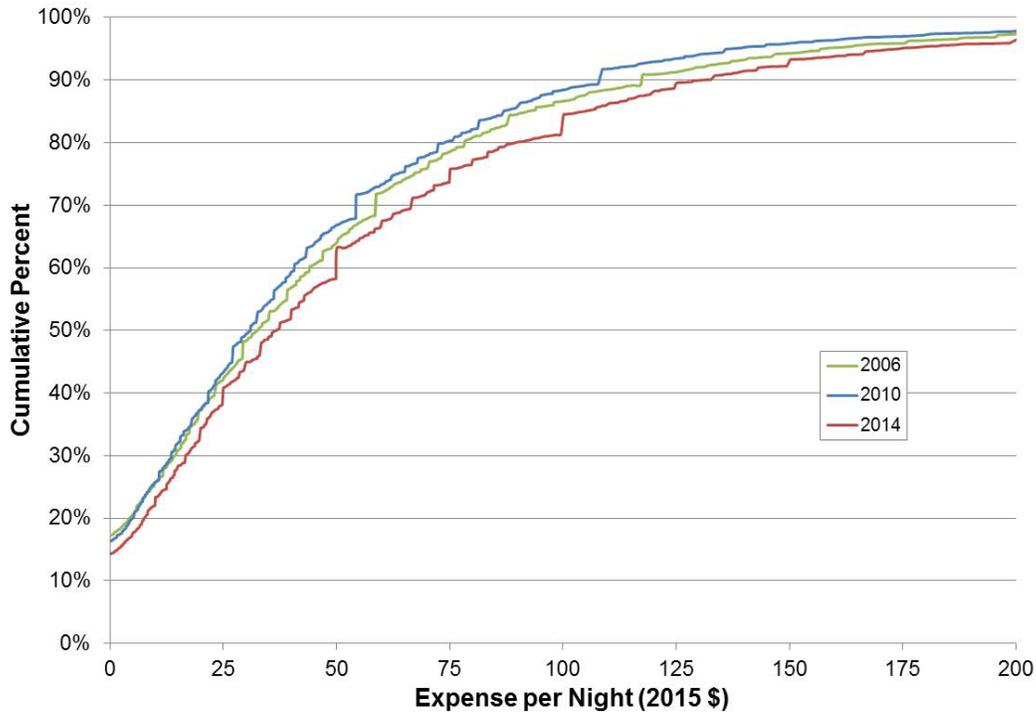


Figure C-15. Cumulative Distribution of Food and Beverage Expense per Night for Air Trips Reported by CES Respondents 2006 to 2014 – All Households

Given the increase in food and beverage expenses per night from 2010 to 2014, it appears likely that average expenditure on food and beverage in constant dollars will most likely have recovered to the 2006 level by about 2016.

Summary

Table C-14 summarizes the average number of air trips per household over all households by annual income range for the three surveys, as well as the distribution of households by income range for survey respondents reporting four quarters of data. There appears to be no obvious pattern in the changes in the average number of air trips for a given household income range, other than a progressive increase in the average number of air trips for survey respondents in households with an annual income of \$300,00 or more. Although the average number of air trips across all households declined progressively from 2006 to 2014, this

pattern does not appear for every income range, with some showing an increase or decrease from 2006 to 2010 that reversed in 2010 or even a progressive increase.

Table C-14. Air Trips per Household by Household Income – Changes from 2006 to 2014

Household Income	Air Trips per Household (All)			Percentage of Survey Households		
	2006	2010	2014	2006	2010	2014
Less than \$20,000	0.15	0.17	0.14	19.1%	19.3%	18.2%
\$20,000 - \$39,999	0.28	0.17	0.19	21.5%	22.3%	21.4%
\$40,000 - \$59,999	0.38	0.40	0.32	16.9%	17.1%	16.5%
\$60,000 - \$79,999	0.53	0.39	0.37	13.0%	13.0%	12.3%
\$80,000 - \$99,999	0.67	0.66	0.55	10.0%	9.4%	8.3%
\$100,000 - \$124,999	0.68	0.78	0.55	6.8%	6.9%	9.1%
\$125,000 - \$149,999	1.24	1.37	0.87	4.6%	3.4%	3.8%
\$150,000 - \$199,999	1.49	1.03	1.20	3.4%	3.4%	3.9%
\$200,000 - \$249,999	2.03	1.40	1.46	2.7%	3.0%	3.9%
\$250,000 - \$299,999	1.76	2.22	1.77	1.3%	1.2%	1.2%
\$300,000 or more	1.94	2.04	2.97	0.6%	1.0%	1.4%
Total	0.533	0.476	0.459	100.0%	100%	100%

Similarly, there appears to be no obvious pattern in the distribution of survey respondents across the different income ranges for each year, apart from a progressive increase in the percentage of survey respondents in households with an annual income of \$300,000 or more. Some other income ranges showed a progressive increase in the percentage of survey respondents over the three years, while the adjacent income ranges above or below them showed a progressive decline or reversal of the change from 2006 to 2010 in the percentage for 2014.

The corresponding summary data by age of the survey respondents are shown in Table C-15., where there appears to be a somewhat different pattern for the three ranges. For survey respondents ages 25 to 44, the average number of trips declined from 2006 to 2010, then remained unchanged in 2014. For survey respondents ages 45 to 64, the average number of air trips declined sharply from 2006 to 2010, then recovered slightly in 2014. For survey respondents ages 65 or over, the average number of air trips remained unchanged from 2006 to 2010, but declined in 2014.

The distribution of survey respondent ages over the three years shows the percentage of respondents in the age ranges below age 55 generally declined from 2006 to 2014, except for the age range 18 to 24, where the percentage increased. The percentage of respondents in the age range 55 to 59 declined from 2006 to 2010 but then recovered in 2014, while the percentage of respondents in age ranges of 60 or over generally increased from 2006 to 2014.

Table C-15. Air Trips per Household by Respondent Age – Changes from 2006 to 2014

Respondent Age	Air Trips per Household (All)			Percentage of Survey Households		
	2006	2010	2014	2006	2010	2014
18 - 24	0.30	0.35	0.34	2.4%	2.6%	3.1%
25 - 29	0.54	0.60	0.45	5.9%	5.0%	5.6%
30 - 34	0.43	0.43	0.57	7.6%	7.6%	7.7%
35 - 39	0.51	0.46	0.48	9.9%	8.4%	7.7%
40 - 44	0.66	0.49	0.43	11.0%	9.0%	7.7%
45 - 49	0.67	0.51	0.38	11.3%	11.5%	8.3%
50 - 54	0.61	0.59	0.52	11.3%	11.4%	10.8%
55 - 59	0.69	0.44	0.63	10.6%	9.8%	10.5%
60 - 64	0.53	0.57	0.64	8.2%	9.9%	10.3%
65 - 69	0.59	0.49	0.41	6.4%	7.8%	9.8%
70 - 74	0.43	0.43	0.34	4.3%	5.4%	6.7%
75 - 79	0.25	0.45	0.31	4.7%	5.3%	4.7%
80 or over	0.23	0.15	0.14	6.5%	6.2%	7.0%
Total	0.538	0.476	0.459	100%	100%	100%
25 - 44	0.55	0.49	0.49	34.4%	30.0%	28.8%
45 - 64	0.63	0.53	0.55	41.3%	42.6%	40.0%
65 or over	0.38	0.38	0.31	22.0%	24.8%	28.2%

Error! Not a valid bookmark self-reference. shows the changes over the three survey years in the race/ethnicity of the survey respondents.

Table C-16. Air Trips per Household by Respondent Race/Ethnicity – Changes from 2006 to 2014

Respondent Race/Ethnicity	Air Trips per Household (All)			Percentage of Survey Households		
	2006	2010	2014	2006	2010	2014
White	0.61	0.49	0.54	72.6%	69.8%	67.9%
Hispanic	0.28	0.28	0.23	11.0%	12.4%	13.3%
Black	0.19	0.26	0.15	11.3%	10.9%	11.9%
Asian	0.85	1.12	0.68	3.4%	5.0%	5.4%
Native American	0.70	0.22		0.4%	0.3%	0.3%
Pacific Islander	1.13	0.71	1.00	0.3%	0.3%	0.2%
Multiple races	0.58	0.59	0.55	0.9%	1.2%	1.0%
Total	0.537	0.476	0.459	100%	100%	100%
NA / PI / Multiple (1)	0.71	0.54	0.52	1.6%	1.9%	1.5%

Note: 1. Native American, Pacific Islander, and multiple races combined.

The percentage of households participating in the survey with white respondents declined progressively over the three surveys, while the percentage of households with a Hispanic or Asian respondent increased, although the increase from 2010 to 2014 was not a great as from 2006 to 2010. The percentage of households participating in the survey with black respondents varied, decreasing from 2006 to 2010 then increasing from 2010 to 2014 to the highest level over the three surveys. The changes in the percentages for the other race/ethnicity categories are not statistically significant due to the small number of such households in the survey.

The changes in the average number of air trips per year across all households participating in the survey for each of the race/ethnicity categories over the three surveys does not show any obvious pattern other than an apparently progressive decrease in the air trip propensity of the combined category of Native American, Pacific Islander, and multiple race respondents. However, that pattern is heavily influenced by differences among the three categories, particularly the decline in the average number of air trips per year by households with Native American respondents. Since households with white respondents account for over two-thirds of the participating households in each survey, the change in the average number of air trips per year for those households has a major effect on the total for all households. Although the average number of air trips per year for households with white respondents increased from 2010 to 2014, this was more than offset by the decline in the average number of air trips per year for households with Hispanic, Black, and Asian respondents.

The decline in the average number of air trips per year across all households from 2010 to 2014 (a decrease of about 3.6%) is somewhat unexpected in the light of the increase in total enplanements by U.S. commercial air carriers over the same period, which increased from 712 million passengers in fiscal year 2010 to 757 million passengers in fiscal year 2014 (FAA, 2016), an increase of about 6.3%. However, during the same period the number of households increased from 117.5 million to 123.9 million (Proctor, *et al.*, 2016), an increase of about 5.4%. The combined effect of the increase in the number of households and the decline in the average number of air trips per household would have given a net increase of about 1.8%, still well below the increase in air passenger enplanements.

However, it should be noted that the CES may not include all business trips, as discussed above, and the number of business trips may have grown faster from 2010 to 2014 than the number of personal trips, as the economy recovered from the 2007-2009 recession. This suggests the importance of accounting for changes in the percentage of business trips compared to personal trips when analyzing changes in air passenger traffic.

b. Air Passenger Surveys

Air passenger surveys can provide disaggregated data on the socioeconomic characteristics of air travelers as well as their air travel frequencies. A number of air passenger surveys have been identified in the research that include information on the number of air trips taken in the previous year by the survey respondents, as well as some socioeconomic characteristics of those respondents. The response-level data from these surveys allowed an analysis to be undertaken of how air travel propensity (air trips per year) varies with socioeconomic characteristics. In cases where a survey has been undertaken on a regular basis over many years using essentially the same questions, an analysis was performed to explore how the relationships between air travel propensity and socioeconomic characteristics have changed over time.

Airport Intercept Surveys

Airport intercept surveys are the most common form of air passenger surveys and are typically performed at a specific airport or group of airports over a relative short period of time, such as one or two weeks, although they may be repeated at different times of the year to capture

seasonal differences in air traveler characteristics. The research identified 10 air passenger surveys conducted at eight airports in various years from 2006 to 2015. In addition, smaller sample surveys have been undertaken on a quarterly basis at a large number of airports as part of the Airport Service Quality (ASQ) survey program run by the Airports Council International (ACI).

Of the surveys identified in the research, detailed survey response data have been obtained for recent surveys at seven of the eight airports, as well as for a number of surveys undertaken in prior years when similar surveys were undertaken at six of the airports. In addition, airport staff for the seventh airport, Boston Logan International Airport, provided survey response data for selected questions from a recent survey in place of providing complete survey response data, and ACI staff provided detailed ASQ survey response data for surveys undertaken at 28 de-identified airports in 2015.

For the analysis presented in this section of the appendix, survey data from the eight airports below have been analyzed in addition to data from the 2015 ASQ survey:

- Boston Logan International Airport (BOS)
 - 2013 survey
- Los Angeles International Airport (LAX)
 - 2015 survey
 - 2006 survey
- Metropolitan Washington Council of Governments surveys undertaken at Washington Reagan National Airport (DCA), Washington Dulles International Airport (IAD), and Baltimore-Washington International Airport (BWI)
 - 2013 survey
 - 2011 survey
- Oakland International Airport (OAK)
 - 2014/15 survey undertaken by the Port of Oakland
 - 2006 survey undertaken by the Metropolitan Transportation Commission
- San Francisco International Airport (SFO)
 - 2014/15 survey undertaken by San Francisco International Airport
 - 2006 survey undertaken by the Metropolitan Transportation Commission
- Tulsa International Airport (TUL)
 - 2016 survey

The 2013 BOS survey was undertaken over a two-week period in late April and early May. The 2015 LAX survey was undertaken in two waves: the first over a one-week period in April and the second over a one-week period in July. The 2006 LAX survey was also undertaken in two waves but over a longer period of time: the first wave from July 31 to August 27 and the second wave from October 3 to 22. The Metropolitan Washington Council of Governments (MWCOG) surveys were undertaken at each airport using effectively the same survey instrument (with wording tailored to each airport) over a three-week period in October 2013 and a two-week period in November 2011.

The 2014/15 OAK and SFO surveys were performed using the same survey instrument and methodology over a 13-month period from May 2014 to May 2015 (Corey, Canapary &

Galanis Research, 2016). The 2006 surveys at OAK and SFO (JD Franz Research, 2008) were undertaken by the San Francisco Bay Area Metropolitan Transportation Commission in cooperation with the two airports, which provided some of the funding for the survey. In addition, airport staff from both airports participated in planning and supervision of the survey. The 2006 surveys were undertaken between August 16 and October 7 at both airports, with field data collection alternating between the airports on different days and using the same survey instrument, apart from minor differences in question wording to reflect different ground transportation options at each airport.

Although both the 2014/15 and 2006 OAK and SFO surveys were only performed at the two airports, questions on survey respondents' use of the different airports serving the region in the past year addressed use of all four major airports that serve the region, including Mineta San José International Airport (SJC) and Sacramento International Airport (SMF), in addition to OAK and SFO. Although SMF is located outside the nine-county San Francisco Bay Area, it is closer to some cities in the northeast of the region than the other three airports. Therefore, the number of air trips from all four airports reported by survey respondents who were residents of the nine-county region provides a good estimate of their total air travel in the past year.

Tulsa International Airport has undertaken annual airport customer surveys for the past five years. Airport staff has provided summary data for the surveys from 2012 to 2016 and detailed survey response data for the 2016 survey. The surveys covered both arriving and departing passengers as well as meeters and well-wishers. In addition to collecting statistical data on each type of airport customer, the surveys asked questions about the customer experience at the airport and improvements they would like to see, as well as other airports in the region that they had used.

The following sub-sections present the results of the analysis of data from each of the surveys, together with a comparative analysis of the findings across each of the surveys. For those airports for which survey data was obtained for two surveys in different years, the analysis results for the most recent survey are presented first.

Boston Logan International Airport

The 2013 BOS Air Passenger Ground-Access Survey was conducted over a 14-day period from April 23 to May 6, 2013 (Steer Davies Gleave, 2014). Departing passengers were surveyed in the gate lounge area of selected flights and self-completed a survey questionnaire that was distributed to all passengers in the gate lounge area to those ages 18 or older who were not connecting between flights. Passengers were asked if they were 18 or older (where this was not apparent) and whether they were connecting between flights before being given the questionnaire to complete. One consequence of this sampling strategy is that multiple responses could be obtained from the same air travel party. The questionnaire asked how many members of the respondent's travel party had completed a questionnaire and this was used to correct for multiple responses from the same air travel party, although care is needed in making these corrections in case these answers are incorrect, particularly for larger travel parties where respondents may not be aware of which other member of the-travel party completed a survey form.

The survey asked respondents how many times in the past 12 months they had flown out of the four major airports serving the region (as stated on the survey questionnaire):

- Boston Logan Airport
- Manchester (New Hampshire)
- T.F. Green (Providence, RI)
- Bradley (Hartford/Springfield)

Respondents were asked to include the current trip in the total and provide separate totals for the number of times they had flown out of each airport primarily for business and primarily for leisure (the term used on the questionnaire). They were also asked the month and year when they last flew out of Boston Logan Airport. The term “leisure” is problematical, since many personal trips (*e.g.*, to attend a funeral or for medical treatment) would hardly be thought of as leisure. Respondents were also asked whether the trip they were taking when surveyed was primarily part of a business trip or not.

After eliminating incomplete survey responses or responses from passengers not traveling on the sampled flights or connecting between flights, the survey obtained 8,783 usable responses. In addition to asking respondents about their air trips in the previous 12 months from the four airports, the survey collected data on the household income, household size, age, gender, and employment status of the respondents, as well as the location of their primary or current residence (by zip code for U.S. residents and city and country for others).

The survey did not specifically ask how many people were in each air travel party. Rather it asked how many people in the air travel party came to the airport in the same vehicle. In most cases this would be the same number, although in the case of larger travel parties it is quite likely that members of the travel party could have come in different vehicles. There is also the case in which several members of the same air travel party (*e.g.*, business colleagues or friends traveling on the same flight together) could have come to the airport separately. This distinction should be borne in mind when interpreting the results of the survey or comparing them to those of other surveys that did not restrict the question about the air travel party size in this way.

In analyzing the survey data, an effort was made to identify any potential multiple responses from the same air travel party, based on the answers to the survey questions, although the ability to do so was limited by the data that were made available for the current study by the Massachusetts Port Authority (Massport) staff, which did not include the flight that respondents were taking, the location of their primary residence, their ground origin, or their ground access mode. However, the data did include whether they indicated that Logan Airport was at the “home” end of their air trip. Those that indicated that they were at the “home” end of their trip were assumed to be residents of the Boston metropolitan region, although these respondents would almost certainly have included a small number who lived outside the Boston metropolitan region but were starting their air round trip at Logan Airport. Therefore, potential responses from the same air travel party were defined as those that appeared in the survey data file within five records of each other with the same air travel party size, both considered either residents of the Boston region or visitors, with the same trip purpose, the same household size, the same (or similar) household income, and where the respondent ages were within ten years. Since two members of the same household might report slightly different household incomes, these were

considered similar if the reported income ranges were no more than one income category apart. Some respondents did not report all the above trip and household characteristics and these were excluded from the analysis since there was insufficient basis for identifying them as potentially from the same air travel party as some other respondent.

This methodology identified about 4% of those survey respondents who reported the number of air trips from the four airports in the previous 12 months who could possibly be from the same air travel party as another respondent in the data file. However, given the absence of corroborating information and the relatively small number of such responses, they were retained in the analysis.

As noted above, Massport staff did not provide the complete data file for the survey responses. Rather, they provided responses to selected questions addressing the issues of interest to the current project. These did not include the residential location of the respondents, although this was asked in the survey. Obviously, residents of the Boston metropolitan area are likely to make more trips per year from the four airports than visitors to the region. The Final Report on the survey (Steer Davies Gleave, 2014) provides tabulations of survey results that show the percentage of survey respondents that were residents of the Boston metropolitan area (56%) or visitors (44%). The survey tabulations also show the trip purpose split of the current trips by residency of the respondent, as shown in Table C-17.

Table C-17. Residency and Trip Purpose of BOS 2013 Survey Respondents – From Final Report on the Survey

Residency	Survey Respondents			Percentage		
	Total	Business	Non-business	Total	Business	Non-business
Resident	4,271	1,334	2,870	56.1%	45.1%	63.2%
Visitor	3,338	1,621	1,671	43.9%	54.9%	36.8%
	7,609	2,955	4,541	100%	100%	100%
Undefined	1,174			13.4%		
Total	8,783					
Residents				100%	31.7%	68.3%

It can be seen that the percentages of residents and visitors varies considerably by trip purpose. Of those resident respondents who gave the trip purpose of their current trip, 32% were traveling primarily for business. Visitor respondents were more evenly divided by trip purpose, with 49% traveling primarily for business.

The Final Report on the survey is unclear on how residents of the Boston metropolitan area were defined, but discussion with Massport staff confirmed that this was on the basis of whether the respondents indicated that Logan Airport was the “home” end of their current air trip. As noted above, these would have included some respondents who lived outside the Boston metropolitan region, as usually defined, but were commencing their air trip at Logan Airport. The Final Report on the survey discussed a response weighting system that was applied to each response to correct for multiple responses from the same air travel party, differences in sampling rate of passengers on a given surveyed flight, and differences in the number of seats on the aircraft for each surveyed flight. According to the weighting formulae given in the report, the weights for a given response would typically be considerably larger than one. However, the

tabulations shown in the report generally sum to the number of usable responses or less if there are missing data, suggesting that the weights were further adjusted to correspond to the number of usable responses.

The survey response data that were made available for the current study did not include the weighting factors for each response and included 8,805 records. This is somewhat more than the number of usable responses mentioned in the Final Report on the survey, but discussion with Massport staff confirmed that some of the responses were treated as unusable in the analysis discussed in the Final Report but additional database cleaning took place after the publication of the Final Report. Indeed, many of the records were missing responses for some of the questions. A response was considered invalid if it did not have at least one value in the data fields for the number of air trips in the past 12 months from each of the four airports and the respondent personal or household characteristics. In addition, responses that reported more than 75 business air trips or more than 50 non-business air trips in the previous 12 months for all four airports were omitted as potentially suspect (there were only six such responses). This gave 7,840 valid responses, as shown in Table C-18.

Table C-18. Residency and Trip Purpose of BOS 2013 Survey Respondents – From Data Provided for the Current Study

Residency	Survey Respondents			Percentage		
	Total	Business	Non-business	Total	Business	Non-business
Resident	4,304	1,556	2,748	60.3%	53.2%	65.2%
Visitor	2,838	1,370	1,468	39.7%	46.8%	34.8%
	7,142	2,926	4,216	100%	100%	100%
Undefined	698			6.8%		
Total	7,840					
Residents				100%	36.2%	63.8%

There are fewer total responses with both residency and trip purpose defined than given in the Final Report on the survey (shown in Table C-17), although this may be partly due to the response weighting and partly due to omitting responses that are missing data on the number of air trips in the past 12 months and respondent personal and household characteristics. It should be noted that the total count in Table C-17 includes responses that did not state the purpose of the current trip. Ignoring missing data, there were 7,348 records in the data provided by Massport staff with both residency and trip purpose.

The percentages of respondents who were Boston area residents in total and by trip purpose shown in Table C-18 are slightly higher than those shown in Table C-17, while the percentage of Boston area residents making a business trip is also slightly higher. However, it should be noted that the weighting system used in the analysis in the Final Report on the survey attempted to reflect the percentages of *air passengers*, whereas the unadjusted use of the respondent records, as shown in Table C-18, reflects the percentages of *air parties* (aside from any multiple responses from the same air travel party). Thus the differences in percentages could partly reflect differences in average air travel party size.

The following analysis uses the unadjusted survey response data and thus expresses the percentage characteristics on an *air party* basis, consistent with the analysis of the other airport air passenger surveys discussed later.

On this basis, the distribution of survey respondents by income and gender for Boston metropolitan area residents, together with their average numbers of all air trips in the previous 12 months, shown in Table C-19 was calculated.

Table C-19. Average Air Trips in Past 12 Months by Annual Household Income and Respondent Gender – Boston Area Residents

Household Income	Percent Respondents			Average Annual Air Trips		
	Total	Male	Female	Total	Male	Female
Less than \$30,000	5.4%	3.8%	7.0%	3.5	4.0	3.2
\$30,000 - \$59,999	10.5%	7.8%	13.3%	3.4	3.6	3.2
\$60,000 - \$89,999	13.1%	11.0%	15.4%	4.0	4.4	3.7
\$90,000 - \$119,999	17.1%	15.5%	18.8%	5.3	5.4	5.2
\$120,000 - \$149,000	13.5%	14.4%	12.5%	6.3	7.7	4.7
\$150,000 - \$179,999	8.3%	8.9%	7.5%	8.0	9.2	6.5
\$180,000 - \$199,999	6.5%	6.7%	6.2%	8.9	10.4	7.1
\$200,000 or more	25.7%	31.8%	19.1%	12.9	15.1	9.1
Total	100%	100%	100%	7.4	9.2	5.5
Valid responses	3,379	1,744	1,635			

The average number of air trips in the past year increased with household income, as would be expected, with the average numbers of air trips being somewhat higher for male survey respondents than female survey respondents, as found in other air passenger surveys. The overall average number of air trips per year, 7.4, is consistent with the corresponding values found in several other air passenger surveys performed around the same time, as reported elsewhere in this Appendix.

The distributions of survey responses by household income ranges show that overall just over a quarter of the survey respondents who were Boston area residents reported household incomes of \$200,000 or more, the highest range on the survey questionnaire. The income range with the next highest percentage of resident respondents was from \$90,000 to \$120,000. A higher percentage of female survey respondents than male respondents reported household incomes below \$120,000, with a corresponding lower percentage in higher income ranges, particularly for incomes above \$200,000.

The corresponding data for the average numbers of business and non-business air trips in the past year is shown in

Table C-20

Table C-20. Average Business Air Trips in Past 12 Months by Annual Household Income and Respondent Gender – Boston Area Residents

Household Income	Percent Respondents	Average Annual Air Trips
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	Total	Male	Female	Total	Male	Female
Less than \$30,000	5.4%	3.8%	7.0%	1.1	1.6	0.7
\$30,000 - \$59,999	10.5%	7.8%	13.3%	1.1	1.5	0.8
\$60,000 - \$89,999	13.1%	11.0%	15.4%	1.9	2.6	1.3
\$90,000 - \$119,999	17.1%	15.5%	18.8%	3.2	3.4	2.9
\$120,000 - \$149,000	13.5%	14.4%	12.5%	4.0	5.5	2.2
\$150,000 - \$179,999	8.3%	8.9%	7.5%	5.8	7.2	3.9
\$180,000 - \$199,999	6.5%	6.7%	6.2%	6.4	8.4	4.2
\$200,000 or more	25.7%	31.8%	19.1%	10.2	12.6	6.1
Total	100%	100%	100%	5.0	7.0	2.9
Valid responses	3,379	1,744	1,635			

Table C-21. Average Non-business Air Trips in Past 12 Months by Annual Household Income and Respondent Gender – Boston Area Residents

Household Income	Percent Respondents			Average Annual Air Trips		
	Total	Male	Female	Total	Male	Female
Less than \$30,000	5.4%	3.8%	7.0%	2.4	2.4	2.5
\$30,000 - \$59,999	10.5%	7.8%	13.3%	2.3	2.1	2.4
\$60,000 - \$89,999	13.1%	11.0%	15.4%	2.1	1.8	2.4
\$90,000 - \$119,999	17.1%	15.5%	18.8%	2.1	1.9	2.2
\$120,000 - \$149,000	13.5%	14.4%	12.5%	2.3	2.2	2.5
\$150,000 - \$179,999	8.3%	8.9%	7.5%	2.2	2.0	2.5
\$180,000 - \$199,999	6.5%	6.7%	6.2%	2.5	2.1	2.9
\$200,000 or more	25.7%	31.8%	19.1%	2.7	2.6	3.0
Total	100%	100%	100%	2.4	2.2	2.5
Valid responses	3,379	1,744	1,635			

The average number of business air trips per year shown in

Table C-20 increases steadily with household income, as expected, although there is a significant increase from the average number of trips for the income range from \$180,000 to \$200,000 to the average number of trips for the top range of \$200,000 or more, particularly for male survey respondents. The increase in the average number of non-business air trips with household income shown in Table C-21 is much less pronounced, with some fluctuation, at least for incomes below \$200,000 for male respondents and \$180,000 for female respondents. The average number of trips for the top income range of \$200,000 or more shows a significant increase over the average number of trips for the income ranges below \$180,000. The average number of non-business air trips declines with income from respondents with incomes below \$30,000 to those in the income range from \$60,000 to \$90,000 for male respondents and \$90,000 to \$120,000 for female respondents, and generally increases with income thereafter. It is also noteworthy that the average number of non-business air trips per year is somewhat higher for female respondents than male respondents in all income ranges.

It should be noted that these results for the BOS survey are fundamentally different from those for other air passenger surveys that express the change in the average number of all trips (*i.e.*, both purposes combined) with income or other respondent characteristics depending on the purpose of the trip on which the respondents were surveyed.

Table C-20 and Table C-21 show the average number of either business trips or non-business trips for all survey respondents. It can be seen from the two tables that combining trips for both purposes would show a progressive increase in the average number of trips with income, as shown in Table C-19, due mainly to the more pronounced increase in the number of business trips with income.

The distribution of survey respondents by age range and gender for Boston metropolitan area residents, together with their average numbers of all air trips in the previous 12 months is shown in Table C-22.

Table C-22. Average Air Trips in Past 12 Months by Respondent Age Range and Gender – Boston Area Residents

Respondent Age	Percent Respondents			Average Annual Air Trips		
	Total	Male	Female	Total	Male	Female
18 - 24	8.1%	6.7%	9.6%	3.5	3.5	3.5
25 - 34	22.7%	20.8%	24.7%	6.1	7.0	5.3
35 - 44	18.5%	19.5%	17.5%	8.3	10.2	6.1
45 - 54	18.8%	20.4%	17.1%	9.5	12.1	6.4
55 - 64	18.7%	19.4%	18.1%	8.2	10.9	5.2
65 - 74	10.5%	10.5%	10.6%	5.1	6.9	3.4
75 or older	2.6%	2.8%	2.4%	2.7	2.8	2.7
Total	100%	100%	100%	7.1	9.1	5.2
Valid responses	3,926	1,979	1,947			

The differences in the total number of average annual trips overall and for each respondent gender between Table C-22 and Table C-19 are due to the differences in the respondents who failed to report their household income or age (or both). Since more respondents reported their age than their household income, this suggests that those who did not report their income tended to make fewer air trips than those who did and therefore may have had lower incomes on average. Respondents who reported their age and gender were almost equally divided between male and female respondents.

The distribution of survey responses by age range shows that the age range with the highest percentage of respondents was from 25 to 34, followed by the age ranges from 45 to 54 for male respondents and overall, and from 55 to 64 for female respondents. Female respondents were younger than male respondents, with 34% of female respondents age 34 or less, compared to 27% for male respondents.

The average numbers of air trips per year increased with age until the age range of 45 to 54, then declined with age thereafter, in total and for both male and female survey respondents. Male survey respondents had a higher number average number of air trips per year than female respondents for all age ranges except 18 to 24, where the average numbers of trips were effectively identical. For respondents aged 75 or older the average number of air trips per year for female respondents was only a tenth of a trip less than for male respondents.

The fact that survey respondents reported the number of air trips they had made in the previous 12 months from the four regional airports separately for business and non-business purposes allows additional analysis of the relative frequency of both types of trips. The cumulative distributions of business and non-business trips from the four airports by Boston area residents in the previous 12 months are shown in Figure C-16.

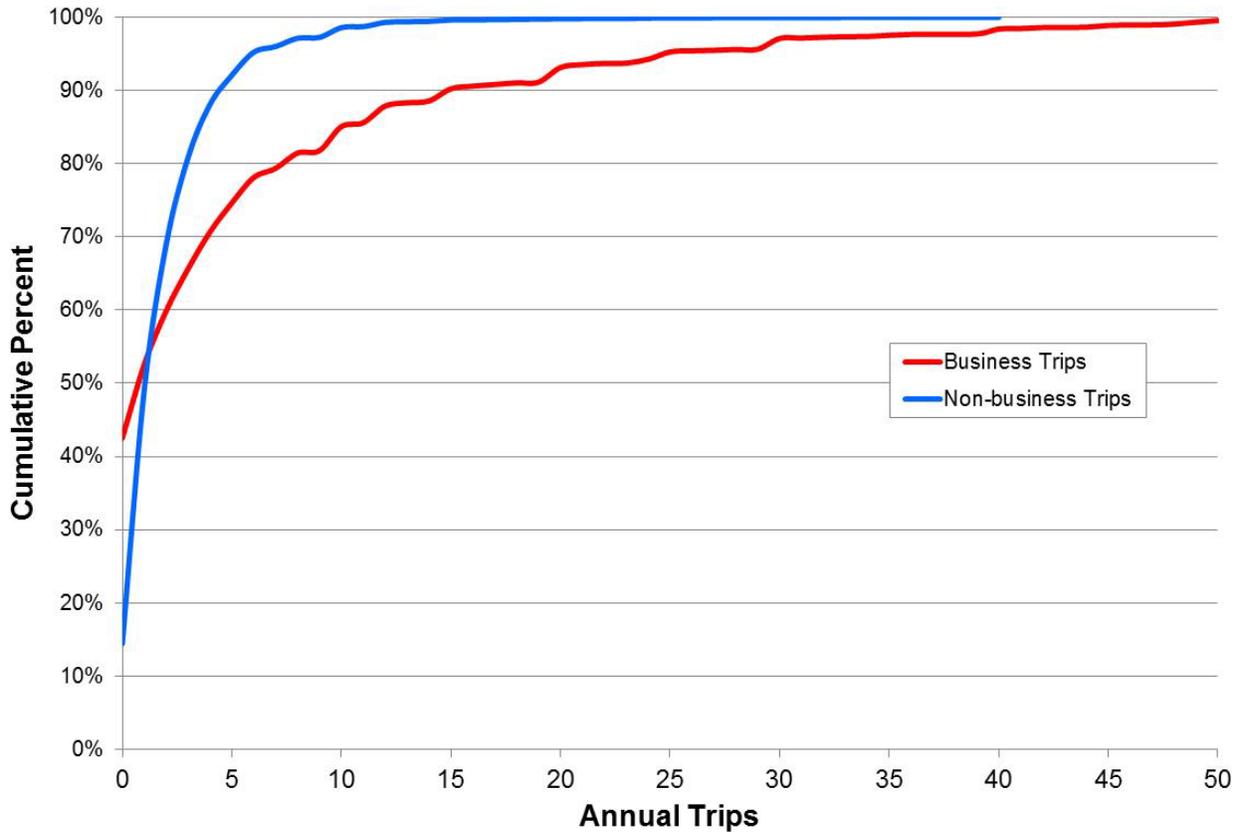


Figure C-16. Cumulative Distribution of Air Trips per Year – Boston Area Residents

Some 46% of respondents reported making no business air trips in the previous year, which seems plausible, while 14% of respondents reported making no non-business trips (but at least one business trip), which is plausible but surprisingly high, particularly since half of the respondents who reported making no non-business trips reported making five or more business trips. The number of respondents who reported making a given combination of business and non-business air trips in the previous year is shown in Table C-23.

A fairly high proportion of respondents who reported making at least one business trip reported only one such trip in the previous 12 months (21% of those reporting making at least one business trip) while a much higher proportion of respondents who reported making at least one non-business trip reported making only one such trip in the previous 12 months (40% of those reporting making at least one non-business trip). However, these percentages may be slightly inflated because respondents who did not report any business trips in the previous 12 months but stated that their current trip was for business were assumed to have made one

business trip (respondents were instructed to count their current trip in the number of reported trips in the last 12 months) and similarly for non-business trips. It could be expected that respondents who made more business trips might also tend to have made more non-business trips, but this does not appear to be the case, or at least any such effect is fairly weak.

Table C-23. Respondents Making Business and Non-business Air Trips in Past 12 Months – Boston Area Residents

Non-business Trips	Business Trips						Total	Percent
	0	1	2	3	4	5 or more		
0		133	76	54	49	314	626	14.4%
1	896	151	98	87	59	209	1,500	34.6%
2	408	81	88	39	33	212	861	19.9%
3	279	53	27	22	14	120	515	11.9%
4	153	39	19	14	14	77	316	7.3%
5 or more	247	42	32	19	14	162	516	11.9%
Total	1,983	499	340	235	183	1,094	4,334	100%
Percent	45.8%	11.5%	7.8%	5.4%	4.2%	25.2%	100%	

Los Angeles International Airport

The three most recent air passenger surveys performed at LAX were undertaken in 2006, 2011, and 2015. However, the survey questions for the 2011 survey did not ask about the number of air trips that respondents had made in the previous 12 months, so that survey cannot be used to analyze air travel propensity. The following analysis therefore addresses the 2015 and 2006 surveys.

2015 Survey

The LAX 2015 Air Passenger Survey was undertaken in two waves: the first over a one-week period from April 13 to 19, 2015 and the second over a one-week period from July 13 to 19, 2015 (Unison Consulting, 2016). The survey asked respondents how many trips they had made from LAX in the previous 12 months, including their current trip. However, the Southern California region is served by five other airports with significant levels of airline service, although LAX accounts for the majority of all air passenger activity at the region’s airports. In 2015, LAX handled almost 77% of the region’s air passengers. Although most residents of the region could be expected to make at least some of their air trips from other airports, those living closer to LAX than any of the other airports are likely to make most, if not all, of their trips from LAX and thus their reported trips from LAX in the previous 12 months provides the best indication of their overall air travel propensity.

An area surrounding LAX from Manhattan Beach in the south, to the Interstate 110 freeway to the east, Beverly Hills to the north, and Malibu to the west was defined in terms of the relevant zip code areas and termed the “West Side,” as shown in Figure C-17. For each of these zip codes, LAX is closer, easier to access, and has more extensive air service than any of the other commercial service airports. Furthermore, the expansion of low-cost airline service at LAX following the introduction of service by Virgin America in 2007 has meant that fares at

LAX are highly competitive with those at other airports. Therefore the residents of these zip codes would have little reason to use any of the other airports.

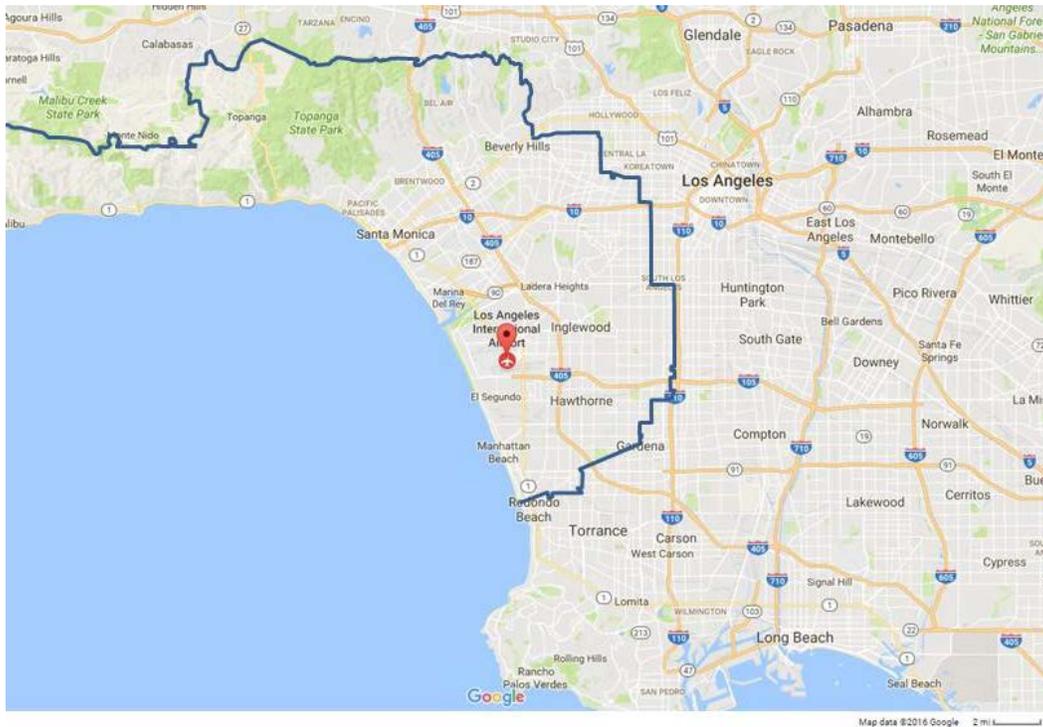


Figure C-17. Los Angeles West Side Area

The survey did not record the actual number of air trips from LAX in the previous 12 months for each respondent, but rather provided respondents with ranges of annual air trips, with the highest range being more than 12 trips. It was assumed that the actual number of trips for each respondent was the mid-point of each range, except for the highest range. Since many respondents could probably not recall the actual number of trips they made anyway, particularly for those who made more than five or six trips, any error introduced by this assumption is likely to be fairly minor. However, in the case of those reporting more than 12 trips, it was necessary to make an assumption about the average number of trips made by these respondents.

A cumulative distribution of the responses to this question was prepared for respondents resident in Los Angeles County and the West Side area, as shown in Figure C-18, assuming that the number of trips made by any respondent in the previous 12 months did not exceed 28. Although data from other air passenger surveys suggest that there is a very small percentage of air travelers who make more air trips per year than this (or at least report that they do), this upper limit seemed to result in the best fit to the cumulative distribution. As can be seen from Figure C-18 and as expected, the cumulative distribution of annual air trips from LAX for residents of Los Angeles County as a whole showed fewer trips for a given cumulative percentage than for residents of the West Side area, although the difference is not large, consistent with the dominant role of LAX in the region. The distribution for West Side residents gave an average of 20 trips for those making more than 12 trips.

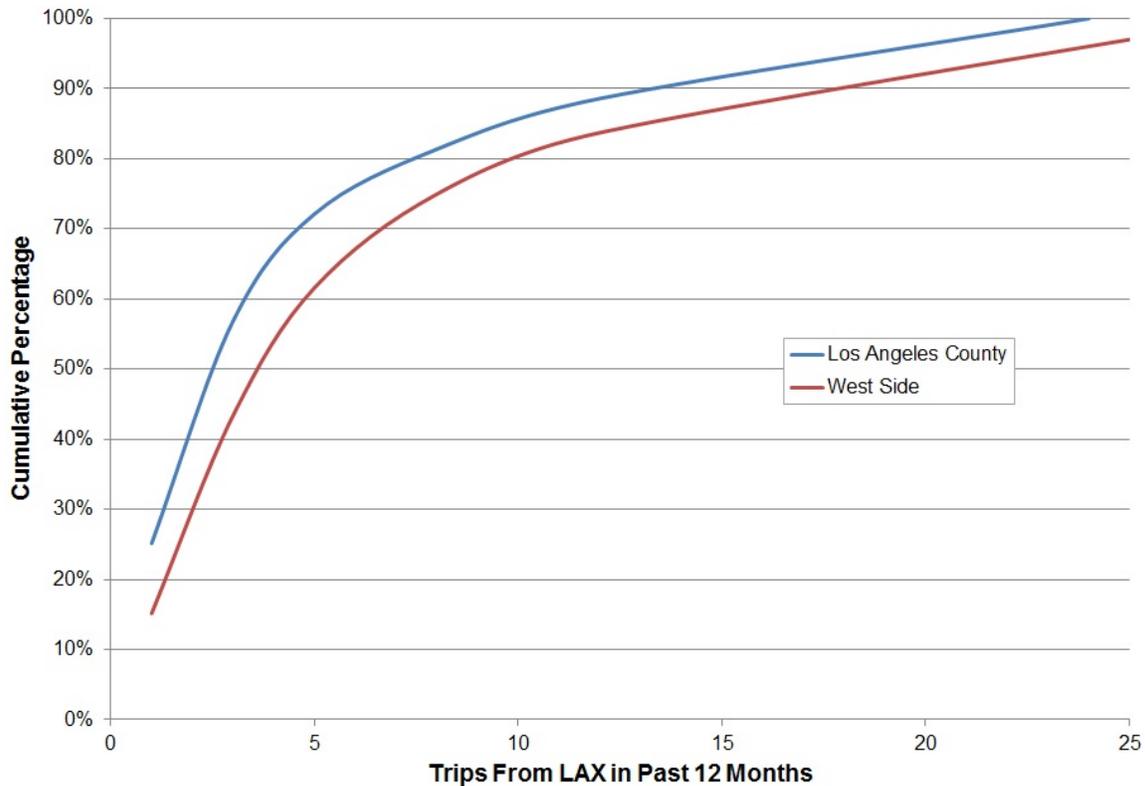


Figure C-18. Cumulative Distribution of Air Trips from LAX in Past 12 Months by Los Angeles County and West Side Residents – 2015 Survey

Survey respondents were asked to provide their annual household income in terms of seven ranges, the highest of which was \$250,000 and over. Residents of the West Side area had somewhat higher incomes than those of Los Angeles County overall, with about 12% of West Side residents reporting incomes of \$250,000 and over, compared to only about 8% of Los Angeles County residents in total. This could partly explain the higher use of LAX by West Side residents compared to that of Los Angeles County residents in total, although West Side residents had a higher use of LAX within each income range, as shown in Table C-24.

It can be seen that West Side residents generally had about one more trip per year from LAX than Los Angeles County residents overall, although those with incomes between \$20,000 and \$49,999 made slightly fewer trips from LAX than other Los Angeles County residents. Although West Side residents generally reported higher annual household incomes than Los Angeles County residents overall, curiously slightly fewer West Side residents reported annual household incomes between \$200,000 and \$249,999 than other Los Angeles County residents. However, this was more than offset by those reporting an annual household income of \$250,000 or more, giving a higher percentage of West Side residents reporting an annual household income of \$200,000 or more than other Los Angeles County residents.

Table C-24. Average Air Trips from LAX in Past 12 Months by Annual Household Income – 2015 Survey

Household Income	West Side Residents		Los Angeles County Residents	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$20,000	7.9%	4.29	9.2%	2.89
\$20,000 - \$49,999	16.5%	3.80	19.5%	3.89
\$50,000 - \$99,999	24.6%	7.08	28.9%	5.32
\$100,000 - \$149,999	19.8%	7.52	17.3%	6.47
\$150,000 - \$199,999	14.6%	7.49	11.5%	6.99
\$200,000 - \$249,999	5.0%	10.06	6.1%	8.90
\$250,000 and over	11.7%	10.41	7.6%	9.85
Total	100%	6.79 (1)	100%	5.42 (1)
Valid responses	480		1,667	

Note: 1) Average annual trips include respondents who did not indicate their household income.

As expected, the average number of trips per year from LAX increases with annual household income, although the rate for West Side residents is slightly lower for those with incomes between \$20,000 and \$49,999 than for those with incomes under \$20,000 and there is very little difference between those with incomes between \$100,000 and \$149,000 and those with incomes between \$150,000 and \$199,999.

The corresponding average annual trips from LAX by age range of the survey respondents are shown in Table C-25. In the case of multi-person air travel parties, this is the age of the survey respondent. Others in the air travel party could have different ages (and would in the case of families traveling with children). West Side residents responding to the survey were somewhat younger than respondents from Los Angeles County overall.

Table C-25. Average Air Trips from LAX in Past 12 Months by Respondent Age – 2015 Survey

Respondent Age	West Side Residents		Los Angeles County Residents	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	14.0%	5.66	12.7%	4.39
25 - 34	29.4%	7.05	26.4%	5.71
35 - 44	18.5%	7.08	19.0%	5.92
45 - 54	17.4%	7.91	19.3%	5.54
55 - 64	13.3%	6.48	14.6%	5.44
65 - 74	5.1%	5.88	6.1%	4.90
75 and over	2.3%	4.06	1.8%	3.91
Total	100%	6.79 (1)	100%	5.42 (1)
Valid responses	701		2,471	

Note: 1) Average annual trips include respondents who did not indicate their age.

The average number of annual trips from LAX by West Side residents increased slightly with age until age 45 to 54 then decreased with age thereafter. Survey responses by those 65 or

over only accounted for about 7% of all survey responses by West Side residents and about 8% of all survey responses by Los Angeles County residents overall. In the case of survey responses from residents of Los Angeles County overall, the average annual trips from LAX increased with age until age 35 to 44 and decreased thereafter.

As could be expected, the age distribution of survey respondents varies within each annual household income category, as shown in Figure C-19 for West Side residents.

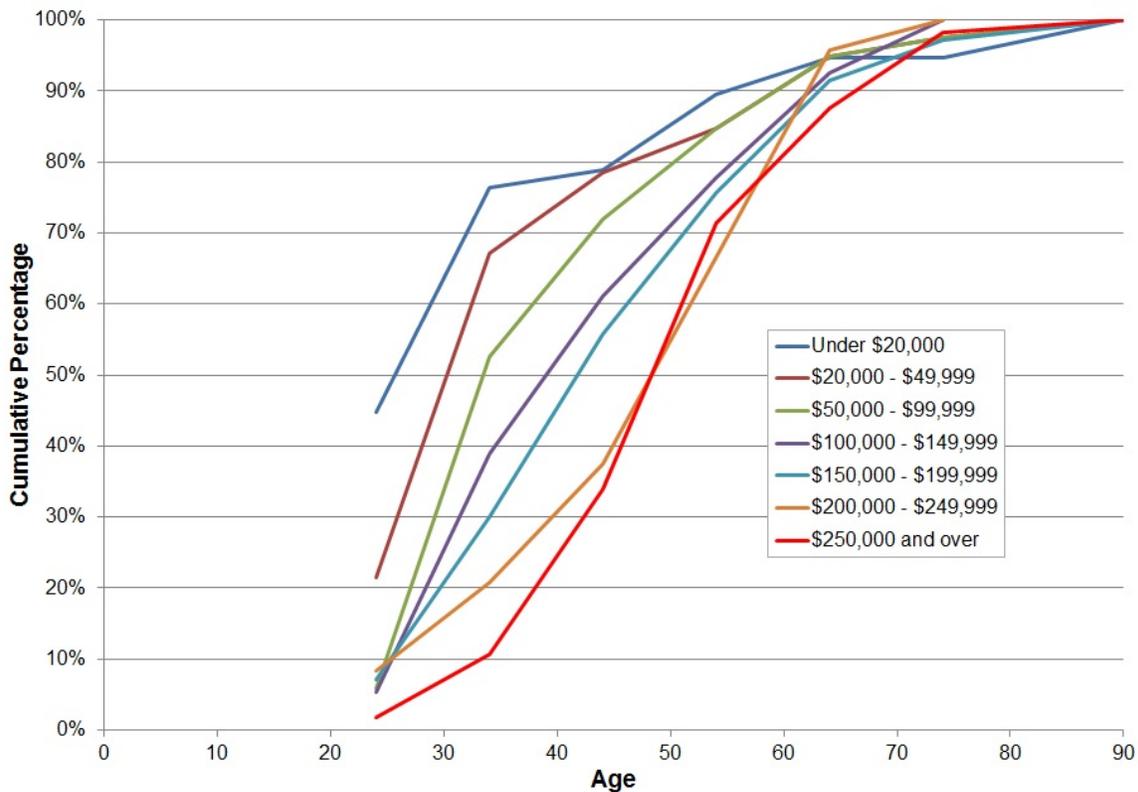


Figure C-19. Cumulative Distribution of Respondent Age by Annual Household Income (Los Angeles West Side Residents) – 2015 Survey

The median age increases with income for each category. The irregularity in the distribution curves, as well as the cases where the curves appear to cross, is due to the relatively small sample size (only 480 survey responses by West Side residents gave both annual household income and age). Even so, it can be seen that the median age clearly increases with income.

As a result, it can be expected that the average annual trips from LAX vary with both annual household income and age of the survey respondent. However, calculating average annual trips by both age range and annual household income gives irregular results, partly due to the relatively small sample size and partly due to the use of ranges for annual trips from LAX (particularly the uncertainty of the actual number of trips for those reporting more than 12 trips).

The average annual trips from LAX by gender of the survey respondent and annual household income for West Side residents are shown in Table C-26. The percentage of male survey respondents in each income category varied considerably. Overall, some 47% of the survey respondents were male. Almost two-thirds of respondents with annual household incomes between \$150,000 and \$250,000 were male, whereas almost two-thirds of respondents with annual household incomes between \$20,000 and \$50,000 were female. Respondents in the other income categories were fairly evenly split by gender.

Table C-26. Average Air Trips from LAX in Past 12 Months by Annual Household Income and Gender (Los Angeles West Side Residents) – 2015 Survey

Household Income	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
Under \$20,000	47%	3.9	4.7
\$20,000 - \$49,999	37%	3.5	4.0
\$50,000 - \$99,999	50%	6.8	7.4
\$100,000 - \$149,999	46%	8.9	6.5
\$150,000 - \$199,999	64%	7.7	7.4
\$200,000 - \$249,999	63%	11.4	7.9
\$250,000 and over	52%	10.2	10.6
Total	47%	7.1 (1)	6.5 (1)
Valid responses	478		

Note: 1) Average annual trips include respondents who did not indicate their household income.

Since no data was collected on the gender of the other members of multi-person travel parties, it is unclear whether the gender split of the survey respondents reflects the overall proportions of air travelers using LAX.

Female respondents with annual household incomes below \$100,000 reported somewhat more annual trips from LAX than male respondents in the same income categories, whereas male respondents with annual household incomes between \$100,000 and \$250,000 reported more annual trips for LAX than female respondents. Male and female respondents with annual household incomes of \$250,000 or more reported a similar number of average annual trips from LAX.

The average annual trips from LAX by gender and age of the survey respondent for West Side residents are shown in Table C-27. The percentages of male survey respondents in each age range between 25 and 64 were generally fairly close to the overall percentage of male survey respondents, whereas those under 25 and 75 and over were disproportionately female and those between 65 and 74 were disproportionately male. Female survey respondents reported fewer annual trips from LAX than male respondents in all age ranges except those under 25, where female respondents reported over 20% more trips per year from LAX than male respondents. The largest difference in reported annual trips between male and female respondents was for those in the age range between 35 and 44, where male respondents reported over 30% more trips than female respondents.

Table C-27. Average Air Trips from LAX in Past 12 Months by Respondent Age and Gender (Los Angeles West Side Residents) – 2015 Survey

Respondent Age	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
18 - 24	41%	5.0	6.1
25 - 34	47%	7.1	7.0
35 - 44	48%	8.2	6.2
45 - 54	46%	8.3	7.6
55 - 64	45%	6.7	6.3
65 - 74	58%	6.1	5.6
75 and over	31%	4.7	3.8
Total	47%	7.1 (1)	6.5 (1)
Valid responses	698		

Note: 1) Average annual trips include respondents who did not indicate their age range.

Although the survey questions provide no information on the trip purpose of the previous trips taken in the past year, differences in the number of trips per year between respondents making a business trip and those making a personal trip may be informative. Travelers making a business trip when they were surveyed are likely to have made other business trips in the previous year, whereas many of those making a personal trip may not have made any business trips in the previous year. The survey question on the main purpose of the air trip being undertaken when the respondent was surveyed gave four options: business related, pleasure/personal reasons, business and pleasure/personal, and “other.” Those stating “other” were asked to provide a short description. In some cases, the trip purpose code for these responses was recoded to business related or pleasure/personal reasons where appropriate. The majority of the survey responses by residents of the West Side give their trip purpose as either business related (28%) or pleasure/personal reasons (63%). Only 9% of survey responses by West Side residents gave their trip purpose as “business and pleasure/personal” and less than 1% remained as “other” after recoding.

For the purpose of this analysis, survey responses of “business related” and “business and pleasure/personal” were combined and termed “business.” This assumed that trips that combine business and pleasure or personal activities are primarily undertaken for business, with the pleasure or personal activities added on once the decision has been made to take the business trip. Survey responses of “pleasure/personal reasons” and the remaining “other” purposes were combined and termed personal. This gave a business trip purpose for 37% of the respondents with a personal trip purpose for the remaining 63%.

The average number of annual trips from LAX by trip purpose and annual household income is shown in Table C-28. The average annual trips from LAX were higher for survey respondents making a business trip than for those making a personal trip in all household income categories except those reporting an annual household income under \$20,000. The higher number of average annual trips for those making personal trips and reporting an income under \$20,000 may reflect travel by students, who would have relatively low incomes, are likely to

make a larger number of air trips than others with a similar income, and would make few, if any, business trips.

Table C-28. Average Air Trips from LAX in Past 12 Months by Household Income and Trip Purpose (Los Angeles West Side Residents) – 2015 Survey

Household Income	Percent Business Trips	Main Trip Purpose	
		Business	Personal
Under \$20,000	26%	2.6	4.9
\$20,000 - \$49,999	20%	5.3	3.4
\$50,000 - \$99,999	45%	7.7	6.6
\$100,000 - \$149,999	41%	9.7	6.0
\$150,000 - \$199,999	47%	9.7	5.5
\$200,000 - \$249,999	46%	10.2	10.0
\$250,000 and over	55%	11.7	8.8
Total	37%	8.9 (1)	5.6 (1)
Valid responses	480		

Note: 1) Average annual trips include respondents who did not indicate their household income.

The increase in the average annual trips with household income by those making a business trip is as expected. In contrast, the decline the average annual trips by those making a personal trip with incomes between \$100,000 and \$200,000 and those with a household income of \$250,000 or more is counter-intuitive. The fact that the average number of annual trips by those with incomes between \$200,000 and \$250,000 who were making a personal trip is 10.0 while that of those making a business trip is 10.2 suggests that both groups included a significant number of respondents reporting more than 12 trips. Based on the results for other income categories, it is likely that those in this category making a personal trip made fewer annual trips on average than those making a business trip. However, because this is an open-ended category the same number of annual trips was assumed for those in both groups, which would have resulted in an under-estimate of the average annual trips by those making a business trip and an over-estimate of the average annual trips by those making a personal trip. This could also explain some of the counter-intuitive differences in average annual trips in other income categories.

The average number of annual trips from LAX by trip purpose and respondent age group is shown in Table C-29. As expected, the average annual trips by those making a business trip is higher than for those making a personal trip for all age groups except those 75 and over. There were only three respondents age 75 or over who reported making a business trip, so the average number of annual trips for this group is unreliable. The average annual trips by those making a business trip generally increases with age up to age 45 to 54 then declines. This most likely reflects increasing seniority and household income with age, followed by a declining participation in the workforce resulting in fewer business trips. In contrast, there is very little difference in the average annual trips by age for those making a personal trip before age 65, with a small decline thereafter, most likely due to a declining participation in the workforce, indicated by the drop in the percentage of business trips from age 55 and particularly by those age 75 and over.

Table C-29. Average Air Trips from LAX in Past 12 Months by Respondent Age and Trip Purpose (Los Angeles West Side Residents) – 2015 Survey

Respondent Age	Percent Business Trips	Main Trip Purpose	
		Business	Personal
18 - 24	18%	6.8	5.4
25 - 34	38%	9.3	5.7
35 - 44	46%	8.7	5.7
45 - 54	46%	10.5	5.7
55 - 64	37%	7.8	5.7
65 - 74	36%	7.4	5.0
75 and over	19%	2.7	4.4
Total	37%	8.9 (1)	5.6 (1)
Valid responses	701		

Note: 1) Average annual trips include respondents who did not indicate their age range.

2006 Survey

The 2006 LAX Air Passenger Survey was also undertaken in two waves but over a longer period of time than the 2015 survey: the first wave from July 31 to August 27, 2006 and the second wave from October 3 to 22, 2006 (APMG, 2007). The survey not only asked how many air trips respondents had made in the previous 12 months, but how many times survey respondents had used each of the following Southern California airports:

- Los Angeles International
- John Wayne Airport (Orange County)
- Bob Hope Airport (Burbank)
- Long Beach Airport
- Ontario Airport
- Santa Barbara Airport
- Other Southern California Airport (specify)

The question only asked about total trips using each airport and did not distinguish between business and personal trips. The survey question did not explicitly identify Palm Springs International Airport or either of the two smaller airports that had limited commuter airline service, Imperial County Airport and Oxnard Airport, but air trips using these could have been reported under the “other Southern California airport” category. However, either no survey respondents volunteered this information or it was not coded, since it does not appear in the survey data file. In any case, the use of any of these three airports by someone using LAX is likely to be very limited, except for residents of eastern Riverside County around Palm Springs and in the Coachella Valley and eastern San Bernardino County (Yucca Valley and Twentynine Palms). The survey was conducted as an interview with the interviewer reading the questions, including the list of airports. It is not clear whether interviewers specifically asked about “other Southern California airports” or simply entered the response if offered, in which case it is quite unlikely that respondents would have offered this information.

The survey interviewed a total of 27,949 departing passengers, 11,183 during the peak wave (July/August) and 16,766 during the non-peak wave (October). This makes it one of the largest air passenger surveys ever undertaken by an airport.

The survey response data file was provided for use in the current project by LAWA staff. This allowed a detailed analysis that not only could examine the number of air trips per year by residents of the Southern California region, but could explore how the use of LAX varied by respondent residential location in the region.

Regional Analysis

Table C-30 shows the distributions of survey responses and the average numbers of air trips in the previous 12 months from the six regional airports combined by annual household income and gender for residents of the Southern California region. However, it should be noted that the survey was only performed at LAX, so while it covered use of all six airports by those using LAX, it would not have included Southern California residents who only used one or more of the other airports. This would tend to under-estimate the total air travel by Southern California residents.

Table C-30. Average Air Trips in Past 12 Months by Annual Household Income and Respondent Gender – Southern California Residents – 2006 Survey

Household Income	Percent Respondents			Percent Male	Average Annual Air Trips		
	Total	Male	Female		Total	Male	Female
Under \$20,000	6.8%	5.8%	7.8%	44%	3.4	3.3	3.4
\$20,000 - \$34,999	7.6%	6.4%	8.9%	44%	3.9	4.2	3.6
\$35,000 - \$49,999	14.5%	12.5%	16.7%	45%	4.0	4.2	3.8
\$50,000 - \$74,999	21.5%	19.9%	23.3%	48%	5.5	5.6	5.5
\$75,000 - \$99,999	17.7%	18.6%	16.7%	55%	6.7	6.8	6.5
\$100,000 - \$149,999	15.4%	17.9%	12.7%	60%	8.4	9.1	7.4
\$150,000 - \$174,999	7.7%	8.6%	6.8%	58%	10.9	12.0	9.5
\$175,000 - \$199,999	2.3%	2.7%	1.9%	61%	10.3	11.7	8.2
\$200,000 - \$249,999	2.5%	3.0%	2.0%	62%	15.4	16.7	13.3
\$250,000 and over	3.9%	4.5%	3.2%	60%	16.0	18.8	11.8
Total	100%	100%	100%	52%	6.88 (1)	7.73 (2)	5.96 (2)
Valid responses	8,685	4,511	4,172				
Total responses	9,648	4,952	4,663				

Notes: 1) Average annual trips include respondents who did not indicate their household income or gender.

2) Average annual trips include respondents who did not indicate their household income.

The household income range with the highest percentage of survey respondents is from \$50,000 to \$75,000 in total and for both male and female respondents. However, the next lower income range, from \$35,000 to \$50,000 only covers a range of \$15,000, whereas the higher category covers a range \$25,000. If these two categories had been divided into equal ranges of income, it appears likely that the range with the highest percentage of survey respondents would have been from \$35,000 to \$55,000, not \$55,000 to \$75,000. Female respondents had generally

lower household incomes than male respondents, with 57% of respondents having household incomes below \$75,000 compared to only 45% for male respondents.

The percentage of survey respondents in each income range who were male generally increased with household income from only 44% for respondents with household incomes below \$35,000 to between 58% and 62% for respondents with household incomes of \$100,000 or more. As expected, the average number of air trips per year generally increased with household income, with some fluctuation, for both male and female survey respondents, with male respondents reporting a higher average number of air trips per year than female respondents in all income ranges except the lowest, those with household incomes under \$20,000. Male respondents with an annual household income of \$250,000 or more, who accounted for about 4.5% of all male respondents, reported an average of almost 19 air trips per year. The average number of air trips per year for all respondents, 6.88, is marginally higher than the average number of air trips for West Side residents in the 2015 survey (6.79), while the average number for male respondents, 7.73, is significantly higher than for West Side male respondents in the 2015 survey (7.1). Conversely, the average number of air trips for all female respondents, 5.96, is somewhat lower than for West Side female respondents in the 2015 survey (6.5).

The corresponding distributions of survey responses and average numbers of air trips in the previous 12 months by respondent age range and gender are shown in Table C-31.

Table C-31. Average Air Trips in Past 12 Months by Respondent Age Range and Gender – Southern California Residents – 2006 Survey

Respondent Age	Percent Respondents			Percent Male	Average Annual Air Trips		
	Total	Male	Female		Total	Male	Female
Under 18	0.8%	0.8%	0.9%	48.7%	3.0	3.5	2.5
18 – 24	10.2%	9.2%	11.2%	47.2%	4.7	4.6	4.8
25 – 34	22.8%	21.4%	24.4%	48.9%	6.7	7.5	5.9
35 – 44	24.7%	26.2%	23.0%	55.4%	7.3	8.0	6.4
45 – 54	21.4%	22.3%	20.4%	54.4%	8.0	9.1	6.6
55 – 64	12.8%	13.0%	12.6%	52.9%	7.8	8.9	6.5
65 – 74	5.5%	5.2%	5.7%	50.0%	5.8	6.5	5.1
75 and over	1.8%	1.9%	1.8%	52.9%	3.8	4.0	3.6
Total	100%	100%	100%	52.1%	6.88 (1)	7.73 (2)	5.96 (2)
Valid responses	9,333	4,864	4,465				
Total responses	9,648	4,952	4,663				

Notes: 1) Average annual trips include respondents who did not indicate their age or gender.

2) Average annual trips include respondents who did not indicate their age.

The age range with the highest percentage of respondents is 35 to 44 for male respondents and in total and 25 to 34 for female respondents, with the percentages declining with age above and below these ranges. The age distribution for all respondents is somewhat older than found in the 2015 survey for West Side residents, with 34% under 35 compared to 43% in the 2015 survey.

The average number of air trips per year is higher for respondents in the age ranges from 35 to 64, increases with age below 35, and declines with age after 65. Female respondents below ages 25 had a slightly higher average number of air trips per year than male respondents, but a smaller average number of air trips than male respondents in all older age ranges.

The percentages of respondents who were making a business trip, together with the average numbers of air trips per year for respondents making business or personal trips, by annual household income are shown in Table C-32.

Table C-32. Average Air Trips in Past 12 Months by Annual Household Income and Trip Purpose – Southern California Residents – 2006 Survey

Household Income	Percent Business Trip	Main Trip Purpose	
		Business	Personal
Under \$20,000	9%	5.2	3.2
\$20,000 - \$34,999	18%	4.9	3.6
\$35,000 - \$49,999	27%	5.3	3.5
\$50,000 - \$74,999	31%	7.3	4.7
\$75,000 - \$99,999	37%	9.7	5.0
\$100,000 - \$149,999	38%	12.0	6.2
\$150,000 - \$174,999	42%	15.8	7.4
\$175,000 - \$199,999	40%	14.7	7.4
\$200,000 - \$249,999	53%	21.2	9.0
\$250,000 and over	50%	21.6	10.2
Total	32% (1)	10.89 (2)	5.00 (2)
Valid responses	8,685		
Total responses	9,648		

Notes: 1) Includes respondents who did not indicate their household income.

2) Average annual trips include respondents who did not indicate their household income.

The percentage of respondents who were making a business trip increased with household income up to the income range from \$150,000 to \$175,000, declined slightly in the income range from \$175,000 to \$200,000, increased significantly in the income range from \$200,000 to \$250,000, then declined somewhat in the highest income range of \$250,000 and over. The overall percentage of respondents making a business trip, 32%, was somewhat lower than found for West Side residents in the 2015 survey (37%).

The average numbers of air trips per year generally increased with income, with some fluctuation, for both respondents making a business trip or personal trip. The average number of air trips for respondents making a business trip with an income of \$250,000 and over was over four times that of respondents with an income in the range \$20,000 to \$35,000. The increase in the average number of air trips for respondents making a personal trip was proportionately less than for those making a business trip, with the average number of air trips for respondents with an income of \$250,000 and over being less than three times that of respondents with an income in the range \$20,000 to \$35,000.

The corresponding percentages of respondents making a business trip and the average numbers of air trips per year by trip purpose by respondent age range are shown in Table C-33.

Table C-33. Average Air Trips in Past 12 Months by Respondent Age Range and Trip Purpose – Southern California Residents – 2006 Survey

Respondent Age	Percent Business Trip	Main Trip Purpose	
		Business	Personal
Under 18	14%	2.6	3.1
18 - 24	20%	6.3	4.3
25 - 34	35%	9.2	5.3
35 - 44	39%	10.8	5.0
45 - 54	35%	12.8	5.4
55 - 64	27%	14.2	5.4
65 - 74	14%	12.8	4.6
75 and over	11%	4.4	3.7
Total	32% (1)	10.89 (2)	5.00 (2)
Valid responses	9,333		
Total responses	9,648		

Notes: 1) Includes respondents who did not indicate their age.
 2) Average annual trips include respondents who did not indicate their age.

The highest percentage of respondents making a business trip occurred for those ages 35 to 44, increasing with age below 35 and decreasing with age in the older age ranges. Not surprisingly, the lowest percentage of respondents making a business trip was for those ages 75 and over. The percentage of those under 18 who reported making a business trip is a little surprising, although the percentage of respondents in this age range is very small.

The average number of air trips per year for respondents making a business trip increased with age up to the age range 55 to 64 then declined with age, steeply after age 75. The average number of air trips per year by those making a personal trip was fairly consistent in the age ranges between 25 and 64, varying between 5.0 and 5.4, increasing with age below 25 and decreasing with age from 65.

Geographical Analysis

In order to compare the results from the 2006 LAX air passenger survey with those of the 2015 LAX air passenger survey, which developed separate estimates of the distributions of responses by annual household income and age range and average numbers of air trips from LAX in the previous 12 months by residents of Los Angeles County and the West Side of Los Angeles, the corresponding distributions and average number of air trips were calculated for the same geographical areas from the 2006 survey, both for air trips from LAX and from the six regional airports in total.

The distribution of the county of residence of survey respondents who identified themselves as residents of Southern California, including residents of the West Side of Los Angeles County, is shown in Table C-34. The responses shown in Table C-34 most likely

underestimate the number of respondents who were West Side residents because many respondents did not give their residence zip code, but reported their city or community of residence instead. Since a large part of the West Side area is within the City of Los Angeles it was not possible to determine whether a respondent who reported their residence in the City of Los Angeles but did not give their zip code lived in the West Side area or not. These respondents are included in the “Other Los Angeles County” total.

Table C-34. County of Residence of 2006 LAX Air Passenger Survey Respondents – Southern California Residents – 2006 Survey

County / Area	Responses	Percent
West Side Los Angeles	2,520	26.2%
Other Los Angeles	4,672	48.5%
Orange	1,078	11.2%
Riverside	240	2.5%
San Bernardino	262	2.7%
Ventura	388	4.0%
Imperial	3	0.0%
San Diego	204	2.1%
Santa Barbara	72	0.7%
Kern	69	0.7%
Outside Southern California	117	1.2%
Total	9,625	100%

Even so, respondents who were identified as residents of the West Side area accounted for 26% of all Southern California resident respondents. Residents of Los Angeles County in total accounted for 75% of all Southern California resident respondents. Orange County accounted for only 11% of all responses by Southern California residents, followed by Ventura County, which accounted for a further 4 %. Riverside and San Bernardino counties each accounted for less than 3% of all Southern California resident respondents. The three more distant counties of San Diego, Santa Barbara, and Kern, each of which has an airport with significant air service, particularly at San Diego International Airport, together accounted for less than 4% of all responses by Southern California residents. A little over 1% of all respondents who identified themselves as residents of Southern California apparently gave a residential zip code, city or community that is outside Southern California. In some cases this could be due to a misstated (or mis-recorded) zip code.

The principal conclusion from the geographical distribution of survey respondents shown in Table C-34 is that in spite of the dominant role of LAX relative to the other airports that serve the Southern California region, only about a quarter of the Southern California residents using the airport live outside Los Angeles County and almost half of those live in Orange County.

The distributions of reported annual household incomes by survey respondents who were West Side residents or residents of Los Angeles County overall, together with the average number of reported air trips during the previous 12 months both for LAX and the six airports in total for respondents in each income range, are shown in Table C-35. As expected, the average number of air trips per year from LAX is somewhat lower than from all six airports in total, although not much lower, even for Los Angeles County residents overall. While Los Angeles

County residents overall made an average of about 1.3 air trips per year from the other five airports, West Side residents made an average of about 0.8 air trips per year from the other five airports. Thus although West Side residents make the majority of their air trips from LAX, they also make some use of the other airports in the region, in contrast to the assumption in the analysis of the 2015 LAX air passenger survey discussed above.

Table C-35. Average Air Trips from LAX and All Six Regional Airports in Past 12 Months by Annual Household Income – 2006 Survey

Household Income	West Side Residents			Los Angeles County Residents		
	Percent Responses	Average Annual Trips		Percent Responses	Average Annual Trips	
		LAX	Total		LAX	Total
Under \$20,000	6.6%	3.5	3.8	6.8%	3.0	3.5
\$20,000 - \$34,999	7.5%	3.8	4.2	7.9%	3.3	4.1
\$35,000 - \$49,999	14.4%	3.7	4.1	15.4%	3.4	4.0
\$50,000 - \$74,999	22.9%	5.3	6.2	22.5%	4.5	5.6
\$75,000 - \$99,999	18.8%	6.2	7.0	17.6%	5.5	6.7
\$100,000 - \$149,999	14.5%	8.9	9.8	14.7%	7.2	8.8
\$150,000 - \$174,999	6.3%	10.3	11.2	7.1%	8.5	11.1
\$175,000 - \$199,999	2.0%	9.3	10.7	2.0%	7.1	9.3
\$200,000 - \$249,999	2.7%	12.7	14.5	2.3%	11.5	15.1
\$250,000 and over	4.3%	15.3	18.3	3.7%	14.3	18.2
Total	100%	6.65 (1)	7.46 (1)	100%	5.60 (1)	6.94 (1)
Valid responses	2,207			6,254		

Note: 1) Average annual trips include respondents who did not indicate their household income.

The distributions of annual household incomes shown in Table C-35 have higher percentages in the lower income ranges for both West Side residents and Los Angeles County residents overall than found in the analysis of the 2015 LAX air passenger survey, as would be expected, given the increase in household incomes from 2006 to 2015. However, for both surveys the household income range with the highest percentage of respondents was \$50,000 to \$100,000, which accounted for 42% of West Side residents and 40% of Los Angeles County residents in the 2006 survey, compared to 25% of West Side residents and 29% of Los Angeles County residents in the 2015 survey.

The average number of air trips per year from LAX for all West Side residents in the 2006 survey (6.65) is slightly less than found in the 2015 survey (6.79). This increase is surprisingly small, given the overall increase in passenger traffic at LAX from 2006 to 2015, which increased by 23%. The average number of air trips per year from LAX for all Los Angeles County residents decreased from 2006 to 2015, from 5.60 to 5.42. This is even more surprising since this period coincided with a considerable loss of passenger traffic at both Burbank Bob Hope Airport and Ontario International Airport.

The average numbers of air trips per year from all six airports in Table C-35 show a generally progressive increase with household income, with some minor fluctuations. The average number of trips per year for West Side residents in a given household income range are generally slightly higher than for Los Angeles County residents at the same income level. This may reflect the nature of the economic activities in the West Side area, including the presence of

the University of California at Los Angeles. The increase in the average number of air trips per year from LAX with increasing household income is more pronounced than found in the analysis of the 2015 air passenger survey, with the average annual air trips by respondents in the highest income categories in the 2006 survey being significantly greater than in 2015 survey.

The corresponding distributions of survey respondent age and the average numbers of reported air trips in the previous 12 months for each age range are shown in Table C-36.

Table C-36. Average Air Trips from LAX and All Six Regional Airports in Past 12 Months by Respondent Age – 2006 Survey

Respondent Age	West Side Residents			Los Angeles County Residents		
	Percent Responses	Average Annual Trips		Percent Responses	Average Annual Trips	
		LAX	Total		LAX	Total
Under 18	0.7%	2.50	2.63	0.7%	2.94	3.23
18 - 24	11.0%	5.10	5.69	10.4%	4.29	5.02
25 - 34	26.2%	6.55	7.35	24.0%	5.58	6.76
35 - 44	25.6%	7.32	8.28	24.8%	6.05	7.41
45 - 54	19.1%	7.22	8.20	20.6%	6.22	8.06
55 - 64	10.8%	7.13	7.66	12.4%	5.89	7.46
65 - 74	5.1%	5.45	6.48	5.2%	4.58	5.88
75 and over	1.5%	3.94	4.17	1.9%	3.35	4.06
Total	100%	6.65 (1)	7.46 (1)	100%	5.60 (1)	6.94 (1)
Valid responses	2,340			6,687		

Note: 1) Average annual trips include respondents who did not indicate their household income.

The age distributions shown in Table C-36 had a somewhat higher percentage of survey respondents in the age ranges from 35 to 54 than found in the 2015 air passenger survey, with correspondingly lower percentages in the age ranges below 35 and above 54. As found with the 2015 survey, the average number of air trips per year did not vary greatly with age, although respondents in the age ranges below 25 and above 64 had lower average numbers of annual air trips than those in the age ranges between 25 and 64, particularly those under 18 or 75 and over.

Summary

The 2006 LAX air passenger survey findings complement those of the 2015 LAX air passenger survey in two important respects. First, the survey asked respondents about their air trips in the previous 12 months from the five commercial service airports that serve the Los Angeles basin, as well as Santa Barbara Airport. Thus, the resulting average numbers of air trips per year provide a good estimate of the total annual air travel by the survey respondents. Since the 2015 LAX survey only asked about air trips from LAX in the previous 12 months, this provides a good basis for assessing the extent to which the findings of the 2015 survey underestimate the total amount of air travel by Southern California residents. Based on an analysis of the average number of annual air trips for survey respondents from the West Side area of Los Angeles County and the county overall, it appears that many residents of the West Side area make significant use of the other regional airports in addition to LAX, although not as much as residents of Los Angeles County overall.

The second contribution of the 2006 LAX survey is to provide an indication of how the average numbers of annual air trips for Southern California residents with given socioeconomic characteristics have changed over the nine years from 2006 to 2015. Based on the survey results, there appears to have been relatively little change in the overall average number of annual air trips in spite of the significant growth of air passenger traffic at LAX during this period. It also appears that 2006 survey respondents with annual household incomes of \$200,000 or more made significantly more air trips per year on average than 2015 survey respondents in the same household income range, although a much higher percentage of all survey respondents were in this income range in 2015. However, this conclusion should be treated with caution, since respondents to the 2015 survey did not record the specific number of trips that each respondent made, but recorded their responses using ranges of trips. The highest range was 12 or more trips. It was therefore necessary to assume an average number of trips for respondents reporting 12 or more trips. To the extent that survey respondents in the higher household income ranges tend to make more trips each year, using the same assumed number of air trips for all respondents reporting having made 12 or more trips in the previous year would tend to underestimate the average number of annual air trips for those in the higher income ranges.

Because the 2006 LAX air passenger survey was not only based on a much larger sample of air parties (over 27,900 responses compared to just under 13,400 for the 2015 air passenger survey) but the survey questions were much better worded from the perspective of estimating the annual number of air trips made by survey respondents, the findings of the 2006 survey are likely to be more reliable and robust than those of the 2015 survey, although the 2006 survey is more dated.

Metropolitan Washington Council of Governments

The 2013 and 2011 MWCOG Regional Air Passenger Surveys asked respondents how many flights they had made from each of the region's three commercial service airports in the past twelve months. These figures were combined to give the total number of air trips per year by residents of the Baltimore-Washington metropolitan region, covering 11 counties in Maryland, all or part of 8 counties in Virginia, two counties in West Virginia, the District of Columbia, and the cities of Baltimore and Fredericksburg, as shown in Figure C-20. Some recoding of the survey response data was necessary to identify residents of the region, since the responses were originally coded to the county of residence using the home zip code reported by survey respondents. However, some of these zip codes had errors, some responses were missing zip codes, and in some cases valid zip codes were coded to the wrong county. The home town or city was used to identify and correct these errors and omissions.

Survey respondents were also asked to state the main purpose of the air trip during which they were surveyed using six categories:

- Business related to the federal, state or local government
- Business not related to government
- Vacation
- Personal or family affairs
- Student or school related
- Other.

The first two trip purposes were classified as “Business” trips. The next three trip purposes were classified as “Personal” trips. Respondents indicating an “other” trip purpose were asked to specify the purpose. The stated purposes were reviewed and classified as either “Business” or “Personal.” Responses where the “other” purpose was not specified or not clear were counted as “Personal” trips. In a few cases respondents stated a purpose but checked one of the trip purposes other than “other.” The stated purposes were reviewed and the indicated trip purpose recoded where appropriate.



Figure C-20. Baltimore-Washington Metropolitan Region

The surveys asked respondents to indicate their total annual household income using eight categories, the highest of which was \$200,000 or more. Only 78% of respondents to the 2013 survey provided their household income, of which 27% (of those providing their household income) were in the highest category. Respondents were also asked to provide the number of

people who live in their household and their age, using six ranges, the highest of which was 65 or older.

2013 Survey

The 2013 survey was performed from October 9 to 29, 2013 (MWCOG, 2014). Detailed survey response data provided by MWCOG staff contained 23,965 responses, of which 7,444 (31%) respondents were connecting between flights. Of the 16,521 originating respondents, 14,833 (90%) provided enough information about the location of their current residence to classify them as either residents of the Baltimore-Washington region or non-residents of the region. This gave 6,701 respondents (49%) who were residents of the region of whom 6,331 (94%) reported the number of flights they had taken in the previous twelve months. The non-resident respondents included both visitors to the region and residents of areas outside the Baltimore-Washington region who had traveled to one of the three airports by ground transportation to commence their air trip.

Figure C-21 shows the cumulative distribution of reported annual household income in total and by the purpose of the trip on which the respondents were surveyed.

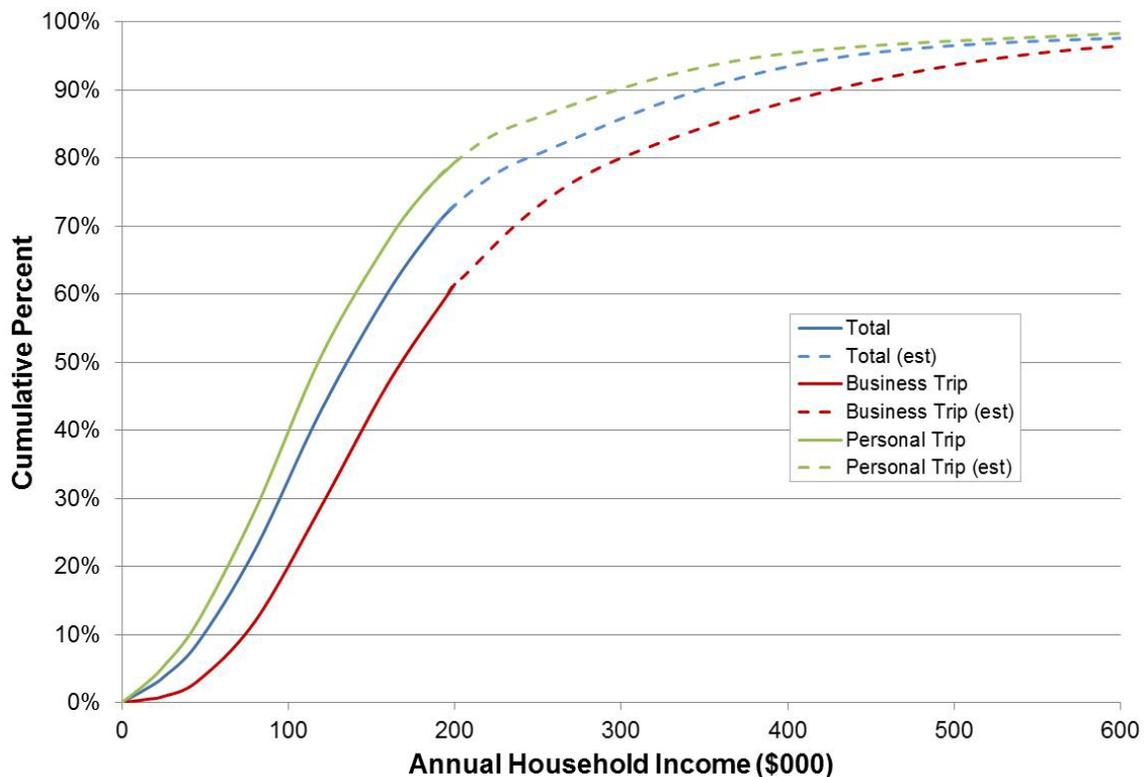


Figure C-21. Cumulative Distribution of Annual Household Income Reported by Residents of the MWCOG Region by Purpose of Surveyed Trip – 2013 Survey

Because the highest income category covered such a large proportion of survey respondents, particularly for those who were making business trips, the cumulative distribution

curve was estimated for incomes above \$200,000. This was done by taking the distribution of household incomes of residents of the Washington-Arlington-Alexandria metropolitan statistical area from the three-year American Community Survey for 2011 to 2013 and expressing the 80th and 95th percentile income as a ratio of the 60th percentile income and then applying these ratios to the 60th percentile income obtained for the survey data, together with assumed values for the 99th percentile income and making some minor adjustments to smooth the curves.

As could be expected, survey respondents making a business trip reported higher annual household incomes than those making a personal trip, with almost 40% of those making a business trip having a household income over \$200,000. Although the survey questionnaire did not specify the year for which the annual household income was requested, presumably most respondents would have reported their income for the previous calendar year.

The cumulative distribution of the number of air trips in the past twelve months from the three airports reported by residents of the metropolitan region, in total and by the purpose of the trip on which they were surveyed, is shown in Figure C-22. The minor irregularities in the curves for more than about six air trips per year is due to many survey respondents rounding the number of trips from a given airport to the nearest five or ten trips. Nonetheless, the curves are relatively smooth and give a clear indication of the frequency with which individual air travelers make a large number of air trips per year.

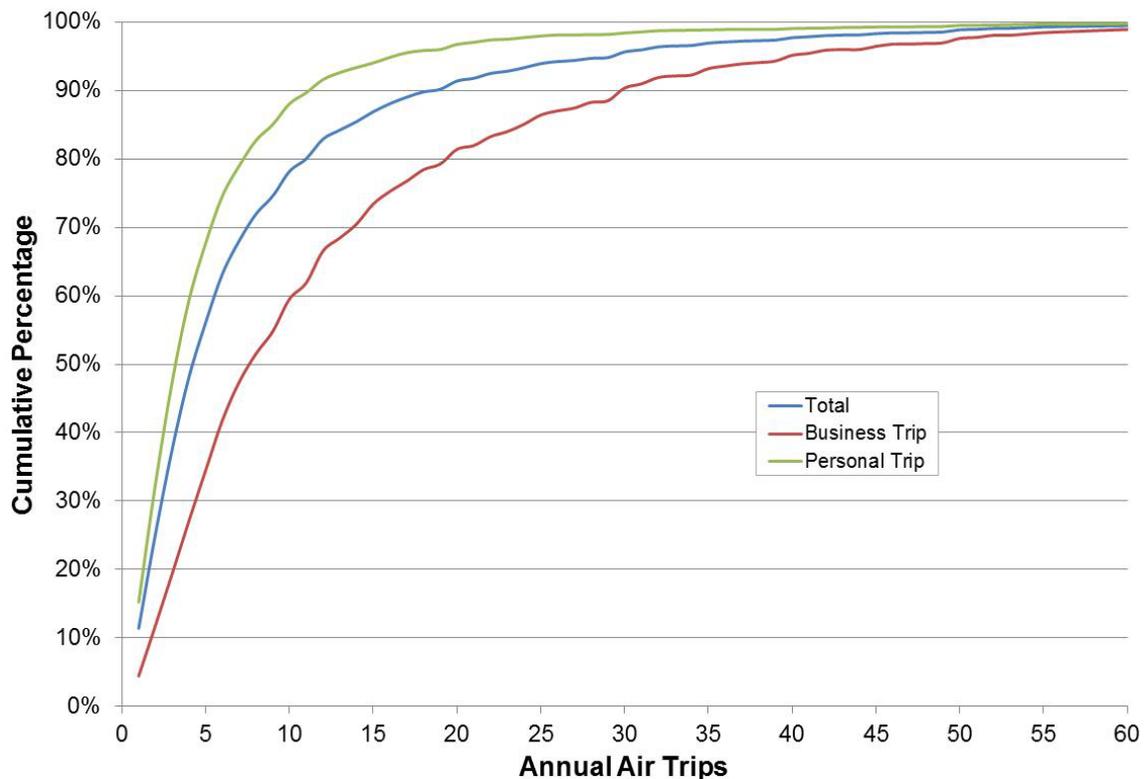


Figure C-22. Cumulative Distribution of Air Trips by Residents of the MWCOG Region in Past 12 Months by Purpose of Surveyed Trip – 2013 Survey

The average number of annual air trips for each household income category, in total and by the purpose of the trip on which they were surveyed, is shown in Table C-37. The average number of annual air trips generally increases with income, as expected, although the average annual air trips for respondents who were making a business trip showed a drop with increasing household income from \$15,000 to \$80,000. The three lowest income categories, below \$50,000 per year, only accounted for 3% of all respondents making business trips, so this pattern may be an artifact of the relatively small sample size. The average annual air trips for respondents who were making a personal trip and reported a household income under \$15,000 was higher than for those in the next income category from \$15,000 to \$25,000. An annual household income of under \$15,000 is extremely low (it is below the 2013 Federal poverty guideline for a household with two or more people), so for someone with this income level to be making over four annual air trips (let alone someone on a business trip making over six annual air trips) would be quite surprising. It is possible that many of those reporting such a low household income deliberately understated their income, misunderstood the question, or checked the wrong box on the questionnaire.

Table C-37. Average Air Trips in Past 12 Months by Residents of the MWCOCG Region by Annual Household Income and Trip Purpose – 2013 Survey

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$15,000	1.9%	4.71	0.5%	6.56	2.7%	4.56
\$15,000 - \$24,999	1.5%	3.88	0.4%	9.38	2.2%	3.25
\$25,000 - \$44,999	4.5%	4.65	2.1%	8.37	5.9%	3.89
\$45,000 - \$79,999	13.6%	5.22	8.5%	7.56	16.5%	4.46
\$80,000 - \$119,999	20.6%	6.41	17.0%	9.17	22.8%	5.26
\$120,000 - \$159,999	17.3%	8.29	18.0%	11.83	16.9%	5.77
\$160,000 - \$199,999	13.0%	9.43	14.6%	13.87	11.8%	6.44
\$200,000 and over	27.5%	12.93	38.8%	16.86	21.1%	8.81
Total	100%	8.30 (1)	100%	12.98 (2)	100%	5.77 (2)
Valid responses	5,034		1,790		3,116	

Notes: 1) Average annual trips include respondents who did not indicate their trip purpose or household income.

2) Average annual trips include respondents who did not indicate their household income.

The corresponding average number of annual air trips for respondents in each age range is shown in Across all respondents, the average number of annual air trips increases with age until the age range from 50 to 64 then declines for those age 65 and over. The same pattern is reflected by those making a business trip, although the average number of annual air trips is considerably greater except for those aged 18 or younger (who only account for 0.1% of respondents making a business trip). The average annual air trips by those making a personal trip increases with age until the age range from 25 to 34, then declines slightly in the next age range, recovers a little in the age range from 50 to 64, although still below that for the age range from 25 to 34, then declines more steeply for the age range 65 and over.

Table C-38. The largest group of respondents was in the age range from 50 to 64 and accounted for 30% of all respondents who indicated their age. Those respondents on a business

trip were somewhat younger, with the largest group in the age range from 35 to 49 which accounted for 39% of all respondents making a business trip.

Across all respondents, the average number of annual air trips increases with age until the age range from 50 to 64 then declines for those age 65 and over. The same pattern is reflected by those making a business trip, although the average number of annual air trips is considerably greater except for those aged 18 or younger (who only account for 0.1% of respondents making a business trip). The average annual air trips by those making a personal trip increases with age until the age range from 25 to 34, then declines slightly in the next age range, recovers a little in the age range from 50 to 64, although still below that for the age range from 25 to 34, then declines more steeply for the age range 65 and over.

Table C-38. Average Air Trips in Past 12 Months by Residents of the MWCOG Region by Respondent Age and Trip Purpose – 2013 Survey

Age Range	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 or younger	0.9%	3.43	0.1%	3.00	1.3%	3.36
19 - 24	6.2%	5.31	3.0%	9.32	7.9%	4.54
25 - 34	21.9%	7.93	19.5%	11.35	23.0%	6.22
35 - 49	28.8%	8.87	39.4%	12.02	23.3%	6.05
50 - 64	30.3%	9.51	31.9%	15.33	29.6%	6.15
65 and over	11.9%	6.47	6.1%	13.84	14.9%	4.87
Total	100%	8.30 (1)	100%	12.98 (2)	100%	5.77 (2)
Valid responses	6,164		2,089		3,915	

Notes: 1) Average annual trips include respondents who did not indicate their trip purpose or age range.

2) Average annual trips include respondents who did not indicate their age range.

The survey asked respondents how many people live in their household. It might be expected that for a given household income the number of annual air trips would be lower for households with more people, since the household income per person would be lower. Table C-39 shows the average number of annual air trips by household size and trip purpose, excluding respondents who reported a household size greater than 10 (there were only three), since these may be errors or shared accommodation.

The average number of annual air trips for respondents making a business trip does not appear to show a decline with increasing household size, except for households with more than six people. If anything, the average annual air trips appear to increase with household size. In contrast, the average annual air trips for respondents making a personal trip does appear to show a decreasing trend with increasing household size, although the effect is not particularly strong, except for households with more than six people.

Table C-39. Average Air Trips in Past 12 Months by Residents of the MWCOG Region by Household Size and Trip Purpose -2013 Survey

Household Size	Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
1	13.6%	12.73	20.6%	6.59
2	35.2%	13.19	41.8%	6.25
3	16.2%	12.12	15.8%	5.35
4	23.8%	13.32	12.1%	5.58
5	8.4%	14.97	6.2%	4.84
6	2.0%	15.23	2.4%	5.11
7 - 10	0.8%	10.53	1.0%	2.77
Total	100%	12.98 (1)	100%	5.77 (1)
Valid responses	1,766		3,062	

Note: 1) Average annual trips include respondents who did not indicate their household income or household size.

The average annual air trips for respondents making a personal trip by annual household income and household size is shown in Table C-40. Although the pattern is somewhat irregular, most likely due in part to the limited sample size in each cell of the table, it can be seen that the average annual air trips tend to decline with increasing household size for any given household income range. It can also be seen that the difference between one-person households and two-person households at any given income level is generally much greater than between two-person and larger households. This effect is particularly strong for higher income households where the average annual air trips for one-person households are considerably higher than the average across all households.

Table C-40. Average Air Trips in Past 12 Months by Residents of the MWCOG Region Making a Personal Trip by Annual Household Income and Household Size – 2013 Survey

Household Income	Household Size (People)			
	1	2	3 - 4	5 - 6
Under \$15,000	3.1	3.4	5.2	4.4
\$15,000 - \$24,999	3.4	3.0	3.6	3.3
\$25,000 - \$44,999	4.5	3.7	3.9	2.1
\$45,000 - \$79,999	5.3	4.2	3.4	3.4
\$80,000 - \$119,999	6.3	5.1	5.1	3.5
\$120,000 - \$159,999	8.1	6.0	4.9	3.2
\$160,000 - \$199,999	10.0	6.8	5.5	5.2
\$200,000 and over	17.3	9.2	7.6	7.4
Total (1)	6.59	6.23	5.45	4.92
Valid responses	632	1,281	857	264

Note: 1) Excludes respondents who did not indicate their household income.

Table C-41 shows the cumulative percentages of households in each income range by household size. It can be seen that the median income for one-person households is significantly lower than for multi-person households but that the distribution does not change that much for

multi-person households as the household size increases, although there is a small increase in the proportions of respondents in the two highest income categories as the household size increases.

The relatively consistent distributions for multi-person households suggests that most of the household members after the first two are children, whose presence does not add to household income, although the increase in the proportion of respondents in the higher income ranges as household size increases suggests that at least some of the larger households include more than two employed adults.

Table C-41. Annual Household Income Distribution for Residents of the MWCOG Region Making a Personal Trip by Household Size – 2013 Survey

Household Income	Household Size (People)			
	1	2	3 - 4	5 - 6
Under \$15,000	4.6%	1.5%	2.7%	3.0%
\$15,000 - \$24,999	7.8%	3.0%	5.0%	4.5%
\$25,000 - \$44,999	18.5%	7.0%	10.5%	9.5%
\$45,000 - \$79,999	50.9%	20.3%	21.9%	20.5%
\$80,000 - \$119,999	78.0%	44.6%	39.9%	41.3%
\$120,000 - \$159,999	89.2%	62.8%	59.9%	54.9%
\$160,000 - \$199,999	94.0%	76.6%	74.4%	66.3%
\$200,000 and over	100%	100%	100%	100%
Valid responses	632	1,281	857	264

2011 Survey

The 2011 survey was performed from November 2 to 17, 2011 (MWCOG, 2012). Detailed survey response data provided by MWCOG staff contained 22,519 responses, of which 5,079 (23%) respondents were connecting between flights. Of the 17,440 originating respondents, 16,338 (94%) provided enough information about the location of their current residence to classify them as either residents of the Baltimore-Washington region or non-residents of the region. This gave 8,009 respondents (49%) who were residents of the region. The non-resident respondents included both visitors to the region and residents of areas outside the Baltimore-Washington region who had traveled to one of the three airports by ground transportation to commence their air trip.

As was found with the 2013 survey, some recoding of respondent residence location was necessary to correct errors in the original coding of resident and non-resident responses and responses that were originally coded as “unknown” but in fact provided enough information to code them as residents or not. A small number of respondents reported an implausibly high number of air trips from the three airports in the previous 12 months (the highest reported number was 425 in total from all three airports, which is clearly impossible). In order to prevent these responses from unduly inflating the average number of air trips per year for any subset of the survey respondents, any reported total number of air trips from the three airports in the previous 12 months that exceeded 125 trips was set to 125 trips. Even so, it seems likely that

some of the respondents may have reported their total number of trips ever, rather than in the previous 12 months, or their entry on the questionnaire may have been incorrectly entered into the data file. It should be remembered that the questionnaires were completed by the respondents by hand, so handwritten numbers may have been misread. Unfortunately, there is no way to identify incorrect responses apart from those that are so high as to be implausible. Therefore, reported values of 125 or less were assumed to be correct in the following analysis.

The average number of annual air trips for each household income category, in total and by the purpose of the trip on which they were surveyed, is shown in Table C-42. The average number of annual air trips generally increases with income, as expected and as generally found for the 2013 survey, although the average annual air trips for respondents who were making a business trip with an annual household income under \$15,000 is implausibly high. This category only accounted for 0.5% of all respondents making business trips so this may be an artifact of the relatively small sample size. In any case, it seems unlikely that someone with an annual household income of under \$15,000 would be making any business trips at all. The average annual air trips for respondents who were making personal trips and reported a household income under \$25,000 was higher than for those in the next income category from \$25,000 to \$45,000. An annual household income of under \$15,000 is extremely low (the 2011 Federal poverty guideline for a household with two or more people was \$14,710), while an annual household income between \$15,000 and \$25,000 is still quite low, so for someone with these income levels to be making over four annual air trips would be quite surprising. It is possible that many of those reporting such a low household income deliberately understated their income, misunderstood the question, or checked the wrong box on the questionnaire.

Table C-42. Average Air Trips in Past 12 Months by Residents of the MWCOC Region by Annual Household Income and Trip Purpose – 2011 Survey

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$15,000	2.1%	5.8	0.5%	14.8	3.3%	4.8
\$15,000 - \$24,999	1.1%	4.7	0.3%	4.0	1.7%	4.8
\$25,000 - \$44,999	4.4%	4.8	2.5%	5.7	5.9%	4.6
\$45,000 - \$79,999	14.0%	6.0	9.7%	8.4	17.4%	5.0
\$80,000 - \$119,999	20.4%	7.0	18.5%	9.7	21.9%	5.2
\$120,000 - \$159,999	18.7%	8.9	21.5%	12.0	16.6%	5.7
\$160,000 - \$199,999	12.5%	9.2	13.4%	13.0	11.8%	5.9
\$200,000 and over	26.7%	14.7	33.6%	18.8	21.5%	9.6
Total	100%	9.15 (1)	100%	13.42 (2)	100%	5.94 (2)
Valid responses	6,101		2,666		3,435	

Notes: 1) Average annual trips include respondents who did not indicate their trip purpose or household income.

2) Average annual trips include respondents who did not indicate their household income.

The overall average number of air trips in the past 12 months in total and by trip purpose was somewhat higher than found in the 2013 survey. In total, the average number of annual air trips was higher than found in the 2013 survey for all household income categories except respondents with a household income between \$160,000 and \$200,000, where the difference was

not particularly large (9.2 trips compared to 9.4 trips in the 2013 survey). However, there were significant differences between the findings of the two surveys by trip purpose. For respondents making a business trip, the average number of annual air trips by those with household incomes between \$15,000 and \$45,000 was well below that found in the 2013 survey, with generally higher average numbers of annual air trips by those with higher incomes, except for respondents with household incomes between \$160,000 and \$200,000, as found for all respondents. For respondents making a personal trip, the average numbers of annual air trips for those with household incomes below \$80,000 was generally higher than found in the 2013 survey, slightly less for those with household incomes between \$80,000 and \$160,000, and lower for those with household incomes between \$160,000 and \$200,000, as found for respondents making a business trip and hence for all respondents. However, the average number of annual air trips for respondents making a personal trip with household incomes of \$200,000 and over was somewhat higher than found in the 2013 survey.

The corresponding average number of annual air trips for respondents in each age range is shown in Table C-43. The largest group of respondents was in the age range from 35 to 50 and accounted for 32% of all respondents who indicated their age. Those respondents on a business trip were somewhat younger, with the largest group in the age range from 35 to 49, which accounted for 41% of all respondents making a business trip. Generally respondents to the 2011 survey were somewhat younger than found in the 2013 survey, with a higher percentage of those under age 50 for both those making a business trip (64% compared to 62% in 2013) and those making a personal trip (60% compared to 55% in 2013).

Table C-43. Average Air Trips in Past 12 Months by Residents of the MWCOC Region by Respondent Age and Trip Purpose – 2011 Survey

Age Range	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 or younger	0.9%	3.4	0.0%	2.0	1.5%	3.4
19 - 24	5.6%	5.2	2.7%	6.1	7.9%	5.0
25 - 34	22.9%	8.8	20.1%	12.4	25.1%	6.6
35 - 49	32.2%	10.3	40.6%	13.7	25.7%	6.2
50 - 64	30.3%	10.1	31.9%	14.5	29.1%	6.4
65 and over	8.1%	6.4	4.6%	13.0	10.7%	4.3
Total	100%	9.15 (1)	100%	13.42 (2)	100%	5.94 (2)
Valid responses	7,008		3,046		3,962	

Notes: 1) Average annual trips include respondents who did not indicate their trip purpose or age range.

2) Average annual trips include respondents who did not indicate their age range.

Across all respondents, the average number of annual air trips increases with age until the age range from 35 to 49 then declines for those in older age ranges. The average numbers of annual air trips in total were somewhat higher than found in the 2013 survey for respondents in the age ranges between 25 and 64 and lower for those in the younger or older age ranges. A similar pattern is reflected by those making a business trip, although the average number of annual air trips continues to increase for those in the age range from 50 to 64 then declines for those age 65 or over. The average numbers of annual air trips for respondents making a business

trip were higher than found in the 2013 survey for those in the age ranges from 25 to 50 and lower for those in the younger and older age ranges. The average annual air trips by those making a personal trip increases with age until the age range from 25 to 34, then declines slightly in the next age range, recovers a little in the age range from 50 to 64, although still below that for the age range from 25 to 34, then declines more steeply for the age range 65 and over. This pattern follows that found in the 2013 survey, although the average numbers of annual air trips were generally higher than found in the 2013 survey, except for respondents age 65 and over, where the average number of annual air trips was somewhat lower than found in the 2013 survey.

The survey asked respondents how many people live in their household. Table C-44 shows the average number of annual air trips by household size and trip purpose, excluding respondents who reported a household size greater than ten (there were only four), since these may be errors or shared accommodation.

Table C-44. Average Air Trips in Past 12 Months by Residents of the MWCOCG Region by Household Size and Trip Purpose – 2011 Survey

Household Size	Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
1	15.9%	12.6	18.2%	6.7
2	35.4%	14.0	40.9%	6.2
3	17.5%	12.0	16.4%	6.0
4	20.8%	13.9	14.2%	5.3
5	7.6%	15.0	7.1%	4.9
6	1.9%	13.6	2.0%	4.1
7 - 10	0.9%	14.7	1.2%	5.5
Total	100%	13.42 (1)	100%	5.94 (1)
Valid responses	3,064		4,055	

Note: 1) Average annual trips include respondents who did not indicate their household size.

The average number of annual air trips for respondents making a business trip does not appear to show any clear trend with increasing household size, although respondents with households of four or more people had higher average annual air trips than the average across all households. In contrast, the average annual air trips for respondents making a personal trip show a decreasing trend with increasing household size, except for households with more than six people, which may simply reflect the relatively small sample size for these households. These general patterns are broadly consistent with the findings of the 2013 survey, although the decline in average annual air trips with household size for respondents making a personal trip is much clearer than found in the 2013 survey.

The average annual air trips for respondents making a personal trip by annual household income and household size are shown in Table C-45.

Table C-45. Average Air Trips in Past 12 Months by Residents of the MWCOG Region Making a Personal Trip by Annual Household Income and Household Size – 2011 Survey

Household Income	Household Size (People)			
	1	2	3 - 4	5 - 6
Under \$15,000	5.5	4.7	3.6	8.0
\$15,000 - \$24,999	2.5	11.0	1.8	2.8
\$25,000 - \$44,999	4.3	5.3	2.7	2.1
\$45,000 - \$79,999	5.8	4.9	4.8	3.4
\$80,000 - \$119,999	7.5	5.3	4.3	2.9
\$120,000 - \$159,999	7.0	5.7	6.0	2.9
\$160,000 - \$199,999	14.4	5.7	5.1	4.1
\$200,000 and over	13.7	9.9	8.9	7.4
Total (1)	6.69	6.21	5.66	4.73
Valid responses	611	1,346	1,018	297

Note: 1) Excludes respondents who did not indicate their household income.

Although the pattern shows some irregularities, most likely due in part to the limited sample size in each cell of the table, it can be seen that the average annual air trips tend to decline with increasing household size for any given household income range. It can also be seen that the difference between one-person households and larger households is particularly strong for households above \$160,000, where the average annual air trips for one-person households are considerably higher than the average across all households.

Table C-46 shows the cumulative percentages of households by income range and household size. It can be seen that the median income for one-person households is significantly lower than for multi-person households but that the distribution does not change that much for multi-person households as the household size increases, although there is a small increase in the proportions of respondents in multi-person households in the two highest income categories as the household size increases from 36% for two-person households to 43% for households with five or six people. Households with five or six people also have somewhat higher percentages in the income ranges below \$45,000.

Table C-46. Cumulative Distribution of Annual Household Income by Household Size for Residents of the MWCOG Region Making a Personal Trip – 2011 Survey

Household Income	Household Size (People)			
	1	2	3 - 4	5 - 6
Under \$15,000	5.9%	1.7%	2.6%	4.4%
Under \$25,000	9.0%	2.8%	3.8%	6.4%
Under \$45,000	19.0%	7.9%	8.0%	11.1%
Under \$80,000	49.8%	23.7%	20.6%	23.6%
Under \$120,000	76.6%	45.0%	41.1%	42.8%
Under \$160,000	88.4%	64.3%	58.9%	56.9%
Under \$200,000	92.6%	77.9%	72.4%	71.0%
Total	100%	100%	100%	100%
Valid responses	611	1,346	1,018	297

The relatively consistent distributions for multi-person households suggests that most of the household members after the first two are children, whose presence does not add to household income, although the increase in the proportion of respondents in the higher income ranges as household size increases suggests that at least some of the larger households include more than two employed adults. Alternatively, the results could suggest that higher income households are more likely to have more than two children.

Summary

The findings of the 2011 MWCOG air passenger survey are broadly consistent with those of the 2013 survey, although the average numbers of air trips in the previous 12 months reported by survey respondents who were residents of the MWCOG region were somewhat higher than found in the 2013 survey. Given the small increase in total passenger traffic at the three airports from 2011 to 2013, the decline in the average numbers of annual air trips from 2011 to 2013 found in the surveys suggests that the growth in passengers at the three airports may have been due to an increase in the proportion of visitors to the region or connecting passengers and in fact this is supported by the findings of the two surveys. The proportion of survey respondents who were connecting passengers increased from 23% in the 2011 survey to 31% in the 2013 survey, while the proportion of survey respondents with ground origins in the MWCOG region who were residents of the region declined from 53% in 2011 to 49% in 2013.

The average numbers of annual air trips generally increased with annual household income as would be expected, although there were some differences in the relative values found in the two surveys for each income range, after allowing for the overall decline in average annual trips from 2011 to 2013, with the average values for some income ranges for each trip purpose increasing from 2011 to 2013 despite the overall decline.

The variation in the average numbers of annual air trips with survey respondent age was generally consistent between the two surveys, although the percentages of survey respondents in the age ranges 50 and over increased from the 2011 to the 2013 survey. The average numbers of annual air trips also increased from the 2011 to the 2013 survey for respondents age 50 or over who were making a business trip and for respondents age 65 and over who were making a personal trip, despite the overall decline.

The effect of household size on the average number of air trips per year was generally consistent between the two surveys although the overall values increased from 2011 to 2013 for households with two persons and five or six persons, and declined for single-person households and those with three or four persons, suggesting that the change in average annual air trips from 2011 to 2013 varied across households of different sizes. The results from both surveys show that the average number of annual air trips generally declines with increasing household size for survey respondents in a given household income range, with a significant drop from single-person to two-person households with incomes of \$160,000 and over. This decline is much less pronounced in the 2011 survey for respondents with incomes below \$160,000.

The two surveys also show a change in the household composition from 2011 to 2013, as shown in Table C-47 with an increase in the percentage of two-person households and a decline in the percentage of other households, although the change for single-person households for total

trips was only 0.1%. These changes in household composition, combined with the differences in average annual air trips for households of different sizes, could account for some of the differences in the overall average number of annual air trips.

Table C-47. Change in Distribution of Household Size for Residents of the MWCOG Region

Household Size	Total Trips		Personal Trips	
	2011 Survey	2013 Survey	2011 Survey	2013 Survey
1	17.1%	17.0%	18.2%	19.2%
2	38.5%	40.4%	40.9%	43.2%
3 - 4	33.8%	32.5%	30.6%	28.2%
5 - 6	9.5%	9.2%	9.1%	8.3%
7 - 10	1.1%	1.0%	1.2%	1.0%
	100%	100%	100%	100%

San Francisco Bay Area

Both the 2014/15 and 2006 OAK/SFO air passenger surveys asked respondents how many flights they had made in the past twelve months from each of the San Francisco Bay Area’s primary three commercial service airports (OAK, SFO and Mineta San José International Airport), as well as Sacramento International Airport, which attracts some trips from the eastern part of the region. These figures were combined to give the total number of air trips per year by residents of the nine-county Bay Area shown in Figure C-23.

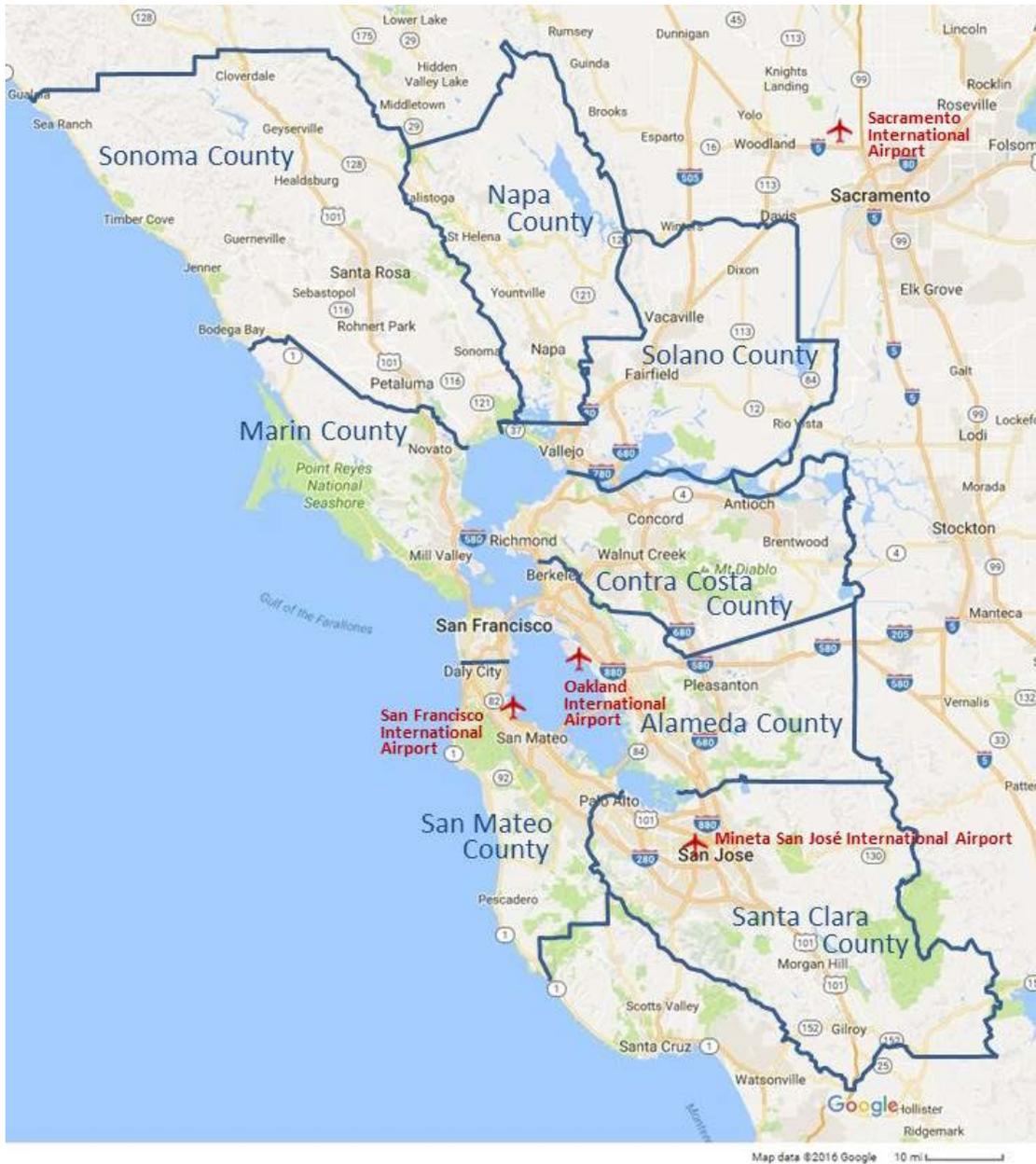


Figure C-23. San Francisco Bay Area

Respondents were asked to provide their city of residence and zip code (or state if they did not know their zip code). These responses were used to code the residence of each respondent into geographic zones and identify residents of the nine-county Bay Area. This resulted in 11,470 survey responses to the 2014/15 survey by residents of the region, of whom 11,470 (99.7%) reported the number of flights they had taken in the previous twelve months from each of the four airports. There were 3,130 survey responses to the 2006 survey by residents of the region, of whom 3,126 (99.9%) reported the number of flights they had taken in the previous twelve months from each of the four airports.

Survey respondents were asked to state the main purpose of the air trip during which they were surveyed. The 2014/15 survey used seven categories:

- Convention or conference
- Other business trip
- Visit friends or relatives
- Vacation
- School
- Personal or family emergency
- Some other purpose.

The 2006 survey included an additional category “Wedding or funeral.” Presumably respondents to the 2014/15 survey would have reported the purpose of such trips as either “visit friends or relatives,” “personal or family emergency” (in the case of funerals), or “some other purpose.”

The first two trip purposes were classified as “Business” trips. The other designated trip purposes were classified as “Personal” trips. Respondents to both surveys indicating “some other” trip purpose were asked to specify the purpose, but in the case of the 2014/15 survey this information was either not recorded or not included in the data file provided. However, since the second category was broadly defined as “other business trip,” it was assumed that those selecting the last category were making personal trips. In the 2006 survey the specified trip purposes were subsequently coded to one of the specified categories or a set of additional categories that were defined to cover trip purposes that did not fit the specified categories (*e.g.*, military travel). The reported trip purposes were then further classified as either business or personal.

Both surveys asked respondents to indicate their total annual household income using eight categories, the highest of which was \$300,000 or more. Only 71% of respondents to the 2014/15 survey provided their household income, of which 11% (of those providing their household income) were in the highest category and 24% reported having annual incomes of \$200,000 or more. However, respondents to the 2014/15 survey were not asked to provide the number of people who live in their household. They were asked their age using seven ranges, the highest of which was 65 or older. In contrast, respondents to the 2006 survey were asked how many adults and children lived in their household but were not asked their age. The gender of the survey respondent was recorded in both surveys.

The following sections present the findings of the survey separately for Bay Area resident respondents who were surveyed at OAK and SFO. Overall, 43% of Bay Area resident survey respondents to the 2014/15 survey reported air trips during the past year at both airports. Perhaps not surprisingly, this differed greatly between the two airports, with only 30% of the survey respondents at SFO reporting trips at OAK in the past year, whereas 62% of the survey respondents at OAK reported having also made trips from SFO in the past year. Presenting separate results for each airport allows the analysis to explore whether air passengers using each airport differ in their overall air travel propensity or other characteristics.

Oakland International Airport

2014/15 Survey

The 2014/15 OAK air passenger survey was undertaken over a 13-month period from May 6, 2014 to May 11, 2015 and obtained 9,340 responses, all originating passengers, of which the respondent residential location could be identified for 8,886 (95%). Of these 4,702 (53%) were residents of the nine county San Francisco Bay Area.

Figure C-24 shows the cumulative distribution of reported annual household income of Bay Area resident survey respondents at OAK in total and by the purpose of the trip on which the respondents were surveyed.

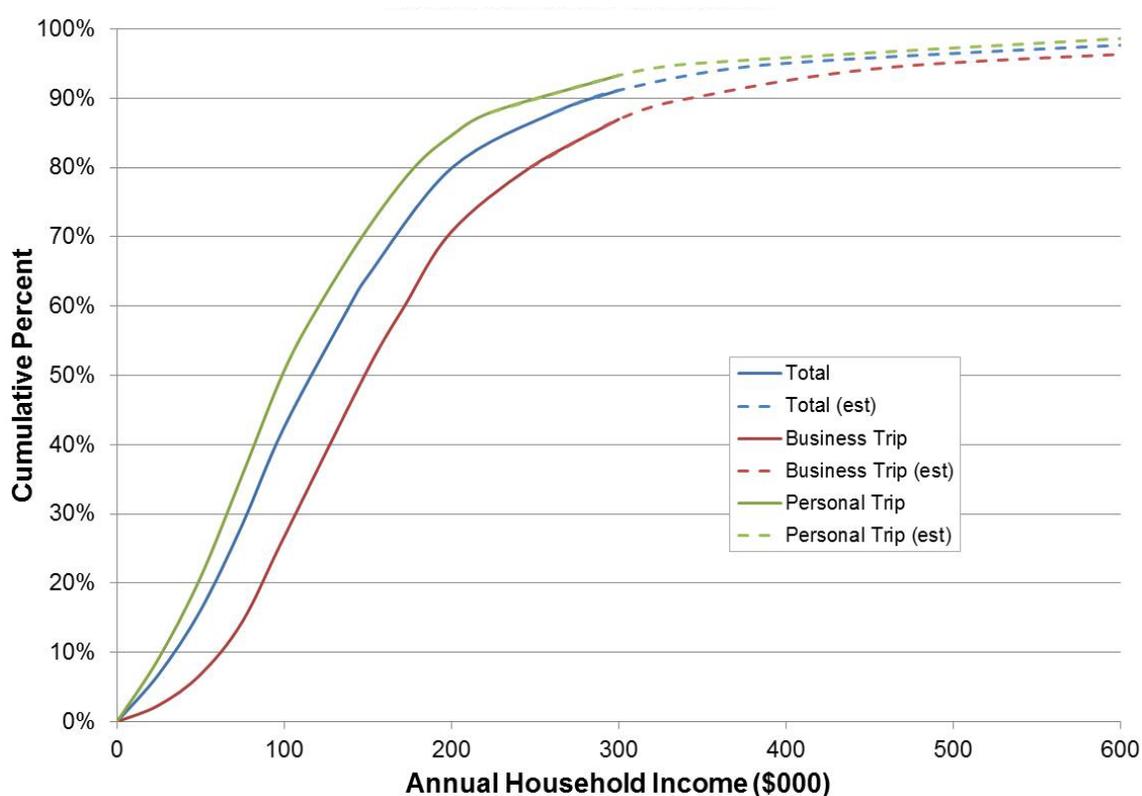


Figure C-24. Cumulative Distribution of Annual Household Income Reported by Bay Area Residents at Oakland International Airport by Purpose of Surveyed Trip – 2014/15 Survey

Because the highest income category covered a significant proportion of survey respondents, particularly for those who were making business trips, the cumulative distribution curve was estimated for incomes above \$300,000. This was done by taking the distribution of household incomes of residents of the San José-San Francisco-Oakland combined statistical area from the one-year American Community Survey for 2014 and expressing the 80th and 95th percentile income as a ratio of the 60th percentile income and then applying these ratios to the 60th percentile income obtained for the survey data, together with assumed values for the 99th percentile income and making some minor adjustments to smooth the curves.

As could be expected, survey respondents making a business trip reported higher annual household incomes than those making a personal trip, with almost 30% of those making a business trip having a household income over \$200,000. Although the survey questionnaire did not specify the year for which the annual household income was requested, presumably most respondents would have reported their income for the previous calendar year.

The cumulative distribution of the number of air trips in the past twelve months from all four airports reported by Bay Area residents, in total and by the purpose of the trip on which they were surveyed, is shown in Figure C-25.

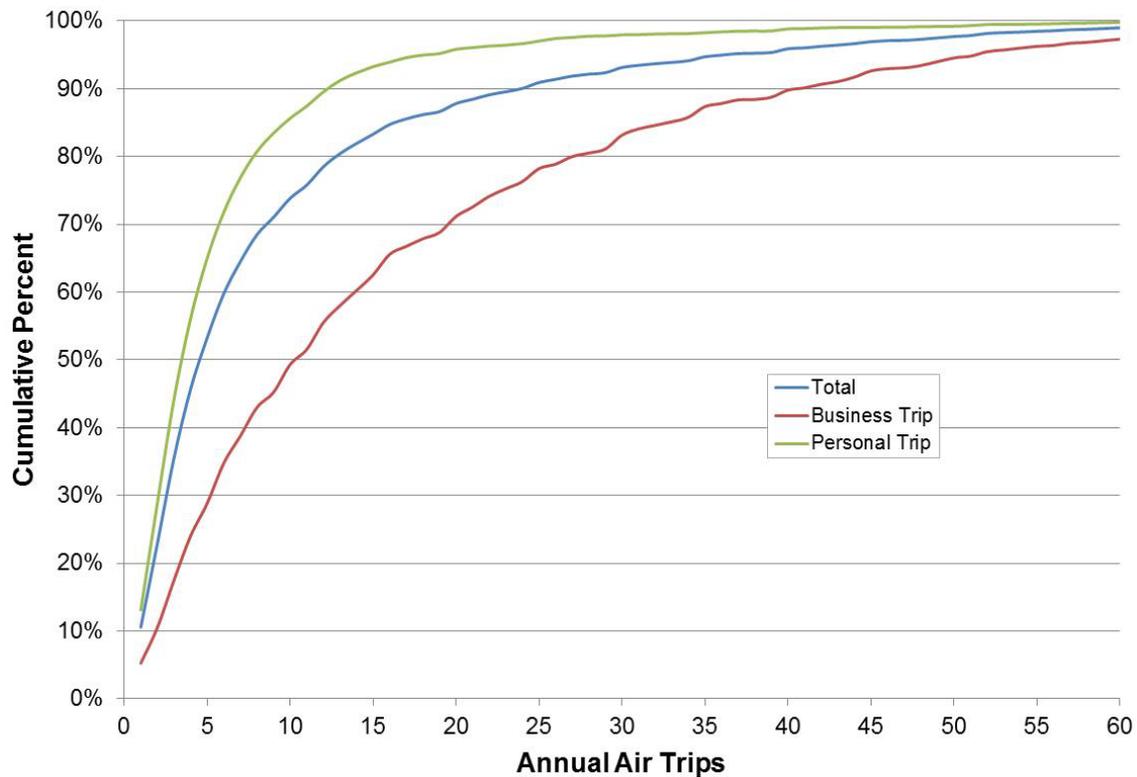


Figure C-25. Cumulative Distribution of Total Air Trips in Past 12 Months by Bay Area Residents at Oakland International Airport by Purpose of Surveyed Trip – 2014/15 Survey

The minor irregularities in the curves for more than about six air trips per year is due to many survey respondents rounding the number of trips from a given airport to the nearest five or ten trips. Nonetheless, the curves are relatively smooth and give a clear indication of the frequency with which individual air travelers make a large number of air trips per year.

The median number of air trips reported by Bay Area residents making a business trip was 10 trips while the median number of trips for those making a personal trip was only 3 trips. Although the survey did not ask how many of the air trips in the past year were for business, it can be expected that respondents making a business trip were likely to have made numerous other business trips in the past year while those making a personal trip may well not have made any business trips in the past year (although of course many did).

The average number of annual air trips for each household income category, in total and by the purpose of the trip on which they were surveyed, is shown in Table C-48.

Table C-48. Average Air Trips in Past 12 Months by Bay Area Residents at Oakland International Airport by Annual Household Income and Trip Purpose – 2014/15 Survey

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$25,000	6.9%	4.11	2.4%	4.56	9.1%	4.05
\$25,000 - \$49,999	9.2%	4.63	4.5%	4.90	11.7%	4.58
\$50,000 - \$74,999	12.4%	5.84	7.6%	7.29	14.8%	5.46
\$75,000 - \$99,999	14.1%	7.17	12.2%	11.99	15.1%	5.17
\$100,000 - \$149,999	21.7%	9.47	24.2%	14.31	20.4%	6.52
\$150,000 - \$199,999	15.6%	12.50	19.9%	19.64	13.4%	7.05
\$200,000 - \$299,999	11.3%	14.92	16.3%	20.70	8.7%	9.39
\$300,000 and over	8.9%	20.41	13.0%	30.03	6.7%	10.86
Total	100%	9.81 (1)	100%	17.07 (1)	100%	6.32 (1)
Valid responses	3,309		1,123		2,186	

Notes: 1) Average annual trips include respondents who did not indicate their household income.

The average number of annual air trips generally increased with income, as expected, although the average annual air trips for respondents who were making a personal trip showed a small drop with increasing household income from \$50,000 to \$100,000. The average annual air trips for respondents who reported a household income under \$25,000 are surprisingly high and not much less than for those in the next income category from \$25,000 to \$50,000. An annual household income of under \$25,000 is very low for the Bay Area, so for someone with this income level to be making over four annual air trips would be quite surprising. It is possible that some of those reporting such a low household income deliberately understated their income or misunderstood the question. It is also possible that many of those reporting an income below \$25,000 were students who reported just their own income.

The corresponding average number of annual air trips for respondents in each age range is shown in Table C-49. The largest group of respondents was in the age range from 45 to 54 and accounted for 20% of all respondents who indicated their age. Those respondents on a personal trip were somewhat younger, with the largest group in the age range from 25 to 34 which accounted for 21% of all respondents making a personal trip, although not surprisingly a higher percentage of those on a personal trip than those on a business trip were age 65 or over.

Across all respondents, the average number of annual air trips increased with age until the age range from 45 to 54 then declined with age over the last two age ranges. A similar pattern is reflected by those making a business trip, although the average number of annual air trips continued to increase to the age range from 55 to 64 and was considerably greater in each age range. The average number of annual air trips by those making a personal trip increased with age until the age range from 25 to 34, then declined in the next age range, increased again to reach its largest value in the age range from 45 to 54, then declined with age over the last two age ranges.

Table C-49. Average Air Trips in Past 12 Months by Bay Area Residents at Oakland International Airport by Respondent Age and Trip Purpose – 2014/15 Survey

Age Range	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	10.7%	4.86	2.6%	6.10	14.5%	4.75
25 - 34	19.4%	8.67	15.7%	13.28	21.1%	7.03
35 - 44	18.4%	11.43	24.9%	18.04	15.3%	6.31
45 - 54	20.4%	12.44	28.7%	18.74	16.4%	7.16
55 - 64	19.8%	10.97	22.0%	19.09	18.8%	6.43
65 or over	11.4%	6.95	6.0%	14.18	13.9%	5.45
Total	100%	9.81 (1)	100%	17.07 (1)	100%	6.32 (1)
Valid responses	4,558		1,472		3,086	

Notes: 1) Average annual trips include respondents who did not indicate their age range.

The average number of annual air trips for each household income category by respondent gender is shown in Table C-50, together with the percentage of respondents in each income category who were male. It should be noted that the survey recorded the gender of the survey respondent, not of other members of the air travel party (if any).

Table C-50. Average Air Trips in Past 12 Months by Bay Area Residents at Oakland International Airport by Annual Household Income and Gender – 2014/15 Survey

Household Income	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
Under \$25,000	37.0%	4.25	4.03
\$25,000 - \$49,999	36.6%	4.61	4.65
\$50,000 - \$74,999	41.4%	5.62	6.01
\$75,000 - \$99,999	46.4%	8.41	6.10
\$100,000 - \$149,999	53.2%	10.36	8.46
\$150,000 - \$199,999	54.0%	15.97	8.43
\$200,000 - \$299,999	59.4%	16.91	12.01
\$300,000 and over	58.4%	24.87	14.16
Total	48.4% (1)	11.90 (1)	7.85 (1)
Valid responses	3,307		

Note: 1) Percentage of male respondents and average annual trips include respondents who did not indicate their household income.

The percentage of survey respondents in each income category who were male generally increased with income, with some minor fluctuation which may be due to sample size effects. Overall, there were slightly fewer male survey respondents than female. The average number of annual air trips by male survey respondents was higher than those by female survey respondents for most household income categories except for the two income categories between \$25,000 and \$75,000, although the difference in average annual air trips between male and female survey respondents for the income categories below \$75,000 was not large. In contrast, the difference in

average annual air trips between male and female survey respondents was much greater for household income categories above \$150,000 and particularly for the highest income category.

The corresponding average number of annual air trips and percentage of survey respondents who were male for respondents in each age range is shown in Table C-51.

Table C-51. Average Air Trips in Past 12 Months by Bay Area Residents at Oakland International Airport by Respondent Age and Gender – 2014/15 Survey

Respondent Age	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
18 - 24	44.9%	4.73	4.97
25 - 34	45.6%	9.70	7.81
35 - 44	51.4%	14.16	8.55
45 - 54	54.0%	15.10	9.32
55 - 64	48.3%	13.59	8.54
65 or over	42.6%	8.52	5.78
Total	48.4% (1)	11.90 (1)	7.85 (1)
Valid responses	4,555		

Note: 1) Percentage of male respondents and average annual trips include respondents who did not indicate their age range.

The percentage of male survey respondents increased with age until the age range from 45 to 54, for which 54% of the survey respondents were male, then declined with age. The age range of 65 or over had the lowest percentage of male survey respondents, at 43%. The average number of annual air trips increase with age for both male and female survey respondents until the age range from 45 to 54, then declined with age. The average number of annual air trips was higher for male respondents than female respondents in all age ranges except from 18 to 24. The difference in the average annual air trips between male and female respondents was greatest in the age ranges between 35 and 64, for which the difference varied between 5.1 and 5.8 trips per year. This most likely reflects the higher number of business trips made by male survey respondents in these age ranges.

2006 Survey

The 2006 OAK air passenger survey was undertaken in two waves over the period from August 17 to October 1, 2006 and obtained 3,587 responses, of which 1,545 (43%) were residents of the nine county San Francisco Bay Area. The first wave was undertaken from August 17 to September 4, with the second wave undertaken from September 25 to October 1.

The average number of annual air trips for each household income category, in total and by the purpose of the trip on which they were surveyed, is shown in Table C-52.

Table C-52. Average Air Trips in Past 12 Months by Bay Area Residents at Oakland International Airport by Annual Household Income and Trip Purpose – 2006 Survey

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$25,000	7.7%	5.0	1.3%	9.6	10.5%	4.8
\$25,000 - \$49,999	11.3%	6.0	5.0%	10.9	14.3%	5.2
\$50,000 - \$74,999	15.9%	8.4	13.1%	14.9	17.3%	6.1
\$75,000 - \$99,999	17.5%	7.1	15.0%	10.5	18.8%	5.9
\$100,000 - \$149,999	20.1%	11.6	23.9%	18.7	18.2%	7.2
\$150,000 - \$199,999	15.6%	15.7	22.6%	20.6	12.3%	11.5
\$200,000 - \$299,999	6.7%	23.3	11.5%	31.0	4.4%	13.6
\$300,000 and over	5.2%	18.2	7.6%	27.1	4.1%	10.4
Total	100%	10.99 (1)	100%	18.58 (1)	100%	7.34 (1)
Valid responses	1,186		381		802	

Notes: 1) Average annual trips include respondents who did not indicate their household income.

The average number of annual air trips generally increased with income, as expected, although the average annual air trips for respondents who were making either business or personal trips showed a small drop with increasing household income from \$50,000 to \$100,000, as was observed for respondents making personal trips in the 2014/15 air passenger survey. The average annual air trips for respondents who reported a household income under \$25,000 are surprisingly high and not much less than for those in the next income category from \$25,000 to \$50,000, as was also observed for the 2014/15 air passenger survey. An annual household income of under \$25,000 is very low for the Bay Area, even in 2006, so for someone with this income level to be making over four annual air trips would be quite surprising. As noted in the discussion of the 2014/15 survey above, it is possible that some of those reporting such a low household income deliberately understated their income or misunderstood the question. It is also possible that many of those reporting an income below \$25,000 were students who reported just their own income.

The average number of annual air trips reported by respondents with an annual household income of \$300,000 or more was somewhat lower than reported by respondents with an annual household income of \$200,000 to \$300,000, in contrast to the findings of the 2014/15 air passenger survey. It is unclear why the average number of air trips by those in the highest income category would be lower than for those in the next lower income category. This does not appear to be solely a sample size issue, since over 5% of survey respondents (or over 60 respondents) were in the highest income category.

The average numbers of annual air trips reported by survey respondents overall and for those making either a business or personal trip were somewhat higher than reported in the 2014/15 survey, although the average numbers of air trips by those in the highest income category were slightly lower than reported in the 2014/15 survey.

In order to better understand the differences in average numbers of annual air trips by household income, a more detailed analysis was made of the differences in the distribution of reported annual air trips by trip purpose and household income. Figure C-26 shows the

cumulative distribution of the reported annual air trips by the purpose of the trip in which the respondent was surveyed. It can be seen that survey respondents making a business trip tended to report having made more air trips in the previous 12 months than those making a personal trip, as could be expected. Since the survey only asked the total number of air trips made in the past 12 months, these totals included a combination of business and personal trips for those respondents who made at least one business trip in the previous year.

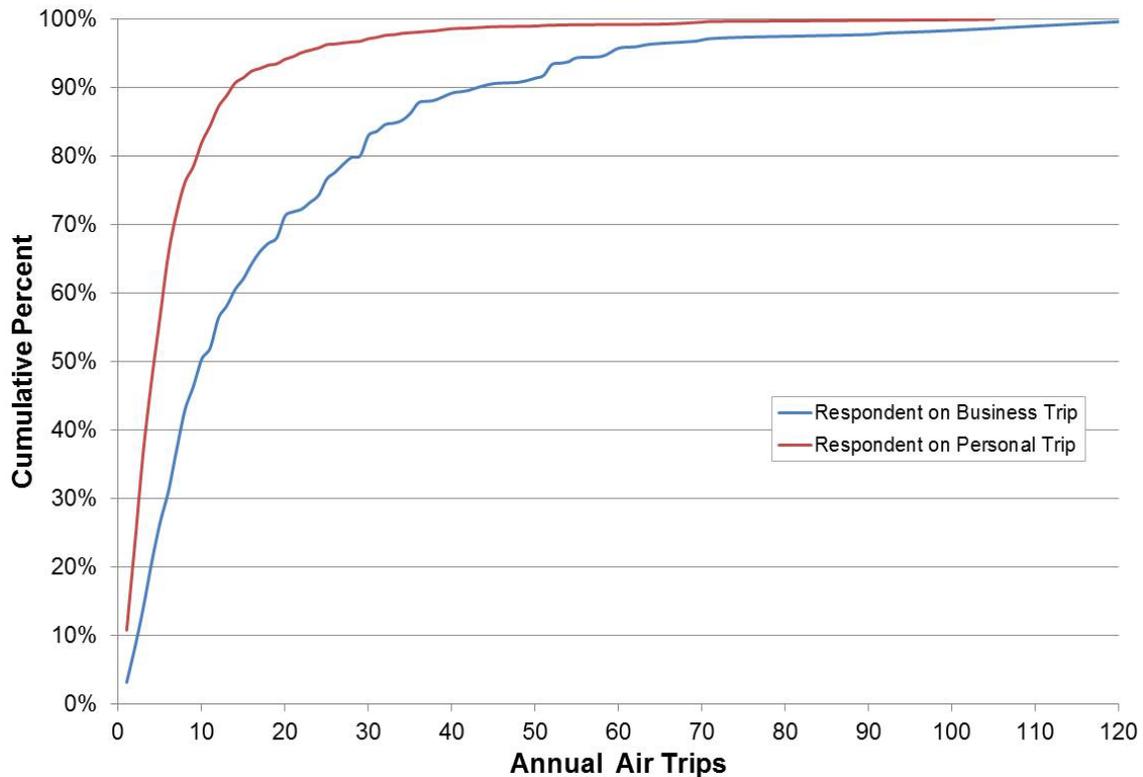


Figure C-26. Cumulative Distribution of Total Air Trips in the Past 12 Months Reported by Bay Area Residents in the 2006 Oakland International Airport Survey

The percentage of respondents who reported making more than 12 air trips in the past year is striking, particularly for those making a business trip, almost 45% of whom reported making more than 12 trips in the past year. In contrast, only 13% of those making a personal trip reported making more than 12 air trips in the past year. Clearly these two distributions reflect the combination of two different underlying distributions for the number of personal air trips and the number of business air trips by those who made at least one business air trip. It is possible that the distribution of the number of personal air trips differed between survey respondents who made at least one business air trip and those who only made personal air trips.

As shown in Figure C-26, some 4% of those making a business trip when surveyed reported making more than 60 air trips in the previous year, or more than five per month. In contrast, less than 1% of those making a personal trip reported making more than 60 air trips in the previous year. Although this level of air travel is not physically impossible, it seems rather

unlikely and in fact a few responses exceeded 100 air trips in the previous year. These were recoded to 100 to prevent them from unduly distorting the average number of air trips.

The average number of reported air trips in the past year by survey respondents who were making a business trip in four ranges of total reported trips for each household income range is shown in Table C-53. It can be seen that with the exception of the five respondents reporting a household income under \$25,000, the average number of annual air trips for those making 12 air trips or less increases progressively with income. However, this is not the case for those reporting a larger number of trips in the previous 12 months. For those reporting 13 to 36 air trips in the previous 12 months there appears to be a slight overall increase with income, although the variation between income categories is larger than this increase. For those reporting more than 36 air trips in the previous 12 months, there appears to be no obvious correlation with income, although the small sample size in each income range makes this conclusion somewhat uncertain. Survey respondents reporting more than 12 air trips are concentrated in the income ranges above \$100,000, which seems reasonable, since those making such a large number of air trips are likely to be in fairly senior positions and most of those air trips were almost certainly made for business purposes.

Table C-53. Average Air Trips in Past 12 Months by Bay Area Residents on a Business Trip at Oakland International Airport by Annual Household Income and Total Trips – 2006 Survey

Household Income	Total Trip in Past 12 Months				
	1-12	13-36	37-60	61 or more	60 or less
Under \$25,000	5.50	26.0			9.60
\$25,000 - \$49,999	4.79	16.7	45.0		10.89
\$50,000 - \$74,999	4.95	21.5	52.0	106.3	9.06
\$75,000 - \$99,999	5.79	23.8	43.0		10.54
\$100,000 - \$149,999	6.42	21.8	50.5	103.0	13.84
\$150,000 - \$199,999	6.92	22.7	50.4	67.5	18.27
\$200,000 - \$299,999	8.70	23.5	49.8	104.7	25.63
\$300,000 and over	9.55	25.5	46.0	125.0	23.61
Total (1)	6.09	22.8	49.6	95.7	15.21
Survey Responses					
Under \$25,000	4	1			5
\$25,000 - \$49,999	14	3	2		19
\$50,000 - \$74,999	39	6	2	3	47
\$75,000 - \$99,999	43	13	1		57
\$100,000 - \$149,999	52	30	4	5	86
\$150,000 - \$199,999	37	37	8	4	82
\$200,000 - \$299,999	10	22	9	3	41
\$300,000 and over	11	11	6	1	28
Don't know/Refused	73	35	8	5	116
Total	283	158	40	21	481
Percent Responses	56.4%	31.5%	8.0%	4.2%	95.8%

Notes: 1) Average annual trips include respondents who did not indicate their household income.

The fact that there does not appear to be an obvious correlation between the average number of air trips and household income for those making more than 36 air trips in the previous 12 months, and only a weak correlation for those making between 13 and 36 air trips, also seems reasonable, since it is the occupation and position in the organization that is likely to result in the need to make large numbers of business air trips, rather than the household income *per se*.

Table C-53 also makes clear why the average numbers of annual air trips can be somewhat erratic across adjacent income categories. Although the number of survey respondents making more than 36 air trips per year is very small in each income category, the large number of air trips involved has a disproportionate effect on the overall average number of air trips per year for each income category. A change of only one or two survey respondents in a given income category reporting a large number of trips, or the difference between a respondent reporting making 25 trips or 50 trips can have a significant impact on the overall average number of trips for that income category.

The decline in the relative number of survey respondents with a household income of \$300,000 or more reporting making more than 12 air trips in the previous 12 months compared to those in the income range from \$200,000 to \$300,000 explains the decline in the average number of air trips across all respondents in these two income categories who reported making up to 60 air trips. Whether this apparent decline in the proportion of survey respondents making a larger number of annual air trips is simply an artifact of the smaller sample size or reflects an underlying systemic difference in the composition of the survey respondents in the two income categories is unclear.

The corresponding data for survey respondents who were making a personal trip are shown in The average number of air trips in the previous 12 months for respondents who reported making up to 60 air trips shows the same decline between respondents in the household income range from \$200,000 to \$300,000 and those with incomes of \$300,000 or more observed for those making a business trip and for the same reason, a decline in the proportion of respondents reporting having made more than 36 air trips in the previous 12 months. The average numbers of annual air trips for respondents who reported making 12 or fewer air trips in the previous 12 months shows a general increase with household income but greater variation between adjacent income categories, with a decline in the average number of annual air trips from that in the next lower income range for respondents with household incomes between \$50,000 and \$75,000 and between \$200,000 and \$300,000. These apparent declines could simply be a result of statistical variation in the number of respondents reporting a given number of air trips in the previous 12 months. Although the number of respondents in each income range is relatively large (greater than a hundred for income ranges between \$25,000 and \$150,000), the number reporting having made more than six trips is fairly small (12 or less for those reporting having made seven trips and seven or less for those reporting having made 12 trips). Thus there is likely to be considerable variability in the proportion of respondents reporting a given number of trips and hence in the average.

Table C-54. The general pattern is similar to that for respondents on business trips, with many fewer respondents reporting having made more than 12 air trips in the previous 12 months, as could be expected and shown in Figure C-26.

The average number of air trips in the previous 12 months for respondents who reported making up to 60 air trips shows the same decline between respondents in the household income range from \$200,000 to \$300,000 and those with incomes of \$300,000 or more observed for those making a business trip and for the same reason, a decline in the proportion of respondents reporting having made more than 36 air trips in the previous 12 months. The average numbers of annual air trips for respondents who reported making 12 or fewer air trips in the previous 12 months shows a general increase with household income but greater variation between adjacent income categories, with a decline in the average number of annual air trips from that in the next lower income range for respondents with household incomes between \$50,000 and \$75,000 and between \$200,000 and \$300,000. These apparent declines could simply be a result of statistical variation in the number of respondents reporting a given number of air trips in the previous 12 months. Although the number of respondents in each income range is relatively large (greater than a hundred for income ranges between \$25,000 and \$150,000), the number reporting having made more than six trips is fairly small (12 or less for those reporting having made seven trips and seven or less for those reporting having made 12 trips). Thus there is likely to be considerable variability in the proportion of respondents reporting a given number of trips and hence in the average.

Table C-54. Average Air Trips in Past 12 Months by Bay Area Residents on a Personal Trip at Oakland International Airport by Annual Household Income and Total Trips – 2006 Survey

Household Income	Total Trip in Past 12 Months				
	1-12	13-36	37-60	61 or more	60 or less
Under \$25,000	4.18	18.0			4.83
\$25,000 - \$49,999	4.51	20.0			5.18
\$50,000 - \$74,999	4.22	17.3	42.5	70.0	5.63
\$75,000 - \$99,999	4.51	16.6			5.87
\$100,000 - \$149,999	4.93	20.7	50.5		7.17
\$150,000 - \$199,999	5.04	21.6	40.0	77.8	8.72
\$200,000 - \$299,999	4.88	20.6	47.3	105.0	10.94
\$300,000 and over	6.38	23.3	38.0		10.42
Total (1)	4.73	19.5	43.9	80.0	6.77
Survey Responses					
Under \$25,000	80	4			84
\$25,000 - \$49,999	110	5			115
\$50,000 - \$74,999	127	9	2	1	138
\$75,000 - \$99,999	134	17			151
\$100,000 - \$149,999	129	15	2		146
\$150,000 - \$199,999	75	19	1	4	95
\$200,000 - \$299,999	26	5	3	1	34
\$300,000 and over	26	6	1		33
Don't know/Refused	197	33	2	2	232
Total	904	113	11	8	1,028
Percent Responses	87.3%	10.9%	1.1%	0.8%	99.2%

Notes: 1) Average annual trips include respondents who did not indicate their household income.

The average number of annual air trips for each household income category by respondent gender is shown in Table C-55, together with the percentage of respondents in each income category who were male. It should be noted that the survey recorded the gender of the survey respondent, not of other members of the air travel party (if any).

The percentage of survey respondents in each income category who were male generally increased with income, with some minor fluctuation which may be due to sample size effects. Overall, there were almost equal percentages of male and female survey respondents, in contrast to the findings of the 2014/15 survey, which had a slightly lower percentage of male respondents. The average number of annual air trips by male survey respondents was higher than those by female survey respondents for all household income categories except for the lowest income category of under \$25,000, although the difference in average annual air trips between male and female survey respondents varied widely across the income categories. By far the largest difference in average annual air trips between male and female survey respondents was for respondents with an annual household income above \$300,000. Overall, the average number of annual air trips by both male and female survey respondents was somewhat higher than found in the 2014/15 survey, consistent with the findings for the average numbers of annual air trips by trip purpose.

The percentage of male survey respondents in the different household income categories was generally slightly higher than found in the 2014/15 survey, particularly for the lowest and highest income categories, with the exception of survey respondents with household incomes between \$100,000 and \$150,000 and between \$200,000 and \$250,000, where the percentage of male respondents was slightly lower than found in the 2014/15 survey.

Table C-55. Average Air Trips in Past 12 Months by Bay Area Residents at Oakland International Airport by Annual Household Income and Gender – 2006 Survey

Household Income	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
Under \$25,000	47.3%	3.8	6.1
\$25,000 - \$49,999	39.6%	6.5	5.7
\$50,000 - \$74,999	42.9%	10.2	7.1
\$75,000 - \$99,999	48.6%	7.6	6.7
\$100,000 - \$149,999	52.1%	13.7	9.4
\$150,000 - \$199,999	62.2%	16.8	14.0
\$200,000 - \$299,999	57.0%	25.6	20.2
\$300,000 and over	69.4%	21.6	10.6
Total	49.7% (1)	13.36 (1)	8.65 (1)
Valid responses	1,186		

Note: 1) Percentage of male respondents and average annual trips include respondents who did not indicate their household income.

Summary

The findings of the 2006 OAK air passenger survey are broadly consistent with those found in the 2014/15 air passenger survey, although the overall average numbers of annual air

trips were somewhat higher in the 2006 survey than in the subsequent survey some eight years later. There are some differences across the different household income categories, particularly much higher average numbers of annual air trips in 2006 reported by respondents with household incomes below \$75,000, especially by those making a business trip.

San Francisco International Airport

2014/15 Survey

The 2014/15 SFO air passenger survey was undertaken over a 13-month period from May 6, 2014 to May 11, 2015 and obtained 17,781 responses from originating passengers, of which the respondent residential location could be identified for 16,806 (95%). Of these 6,797 (40%) were residents of the nine county San Francisco Bay Area. Not surprisingly, the percentage of resident responses is significantly lower than for OAK, reflecting the large number of trips by visitors to San Francisco, most of which use SFO.

Figure C-27 shows the cumulative distribution of reported annual household income of Bay Area resident survey respondents at SFO in total and by the purpose of the trip on which the respondents were surveyed. As with the similar figure above for OAK, the cumulative distribution curve was estimated for incomes above \$300,000 in the same way.

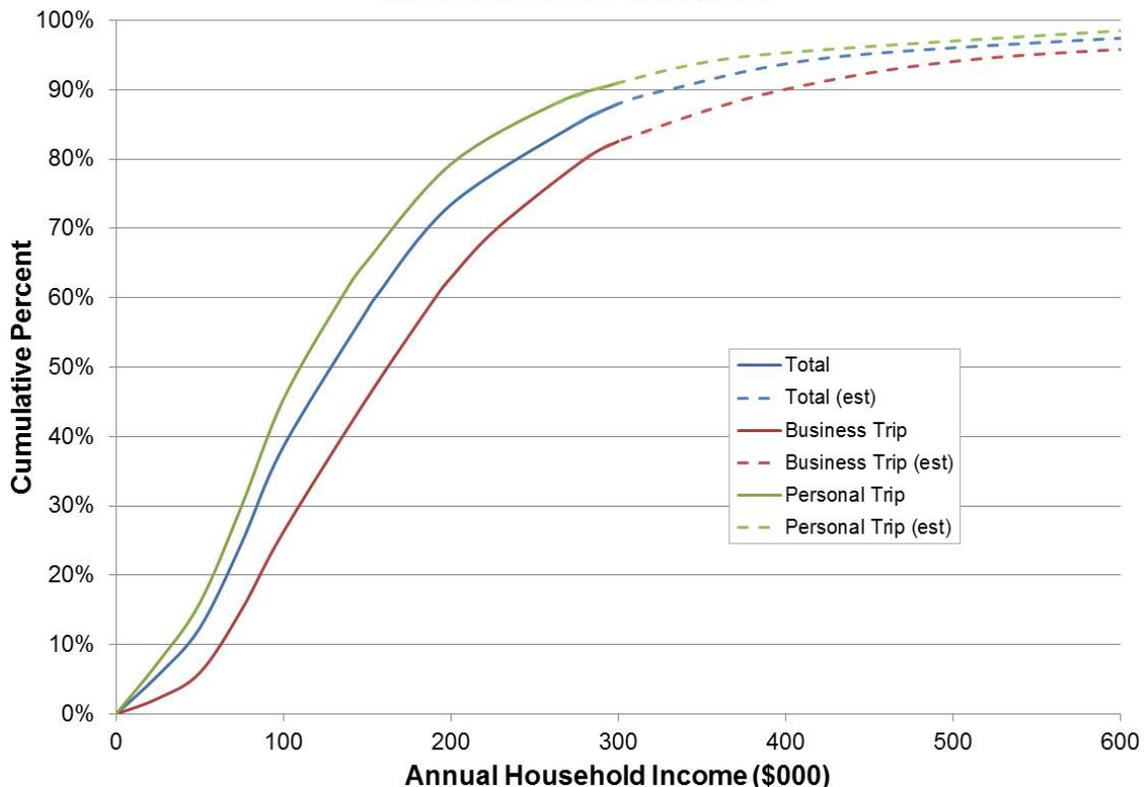


Figure C-27. Cumulative Distribution of Annual Household Income Reported by Bay Area Residents at San Francisco International Airport in 2014/15 Survey by Purpose of Surveyed Trip

As could be expected, survey respondents making a business trip reported higher annual household incomes than those making a personal trip, with about 37% of those making a business trip having a household income over \$200,000. As noted above for OAK, although the survey questionnaire did not specify the year for which the annual household income was requested, presumably most respondents would have reported their income for the previous calendar year.

The cumulative distribution of the number of air trips in the past twelve months from all four airports reported by Bay Area residents, in total and by the purpose of the trip on which they were surveyed, is shown in Figure C-28. The minor irregularities in the curves for more than about six air trips per year is due to many survey respondents rounding the number of trips from a given airport to the nearest five or ten trips. Nonetheless, the curves are relatively smooth and give a clear indication of the frequency with which individual air travelers make a large number of air trips per year.

The median number of air trips reported by Bay Area residents making a business trip was between 9 and 10 trips while the median number of trips for those making a personal trip was between 3 and 4 trips. Although the survey did not ask how many of the air trips in the past year were for business, it can be expected that respondents making a business trip were likely to have made numerous other business trips in the past year while those making a personal trip may well not have made any business trips in the past year (although of course many did).

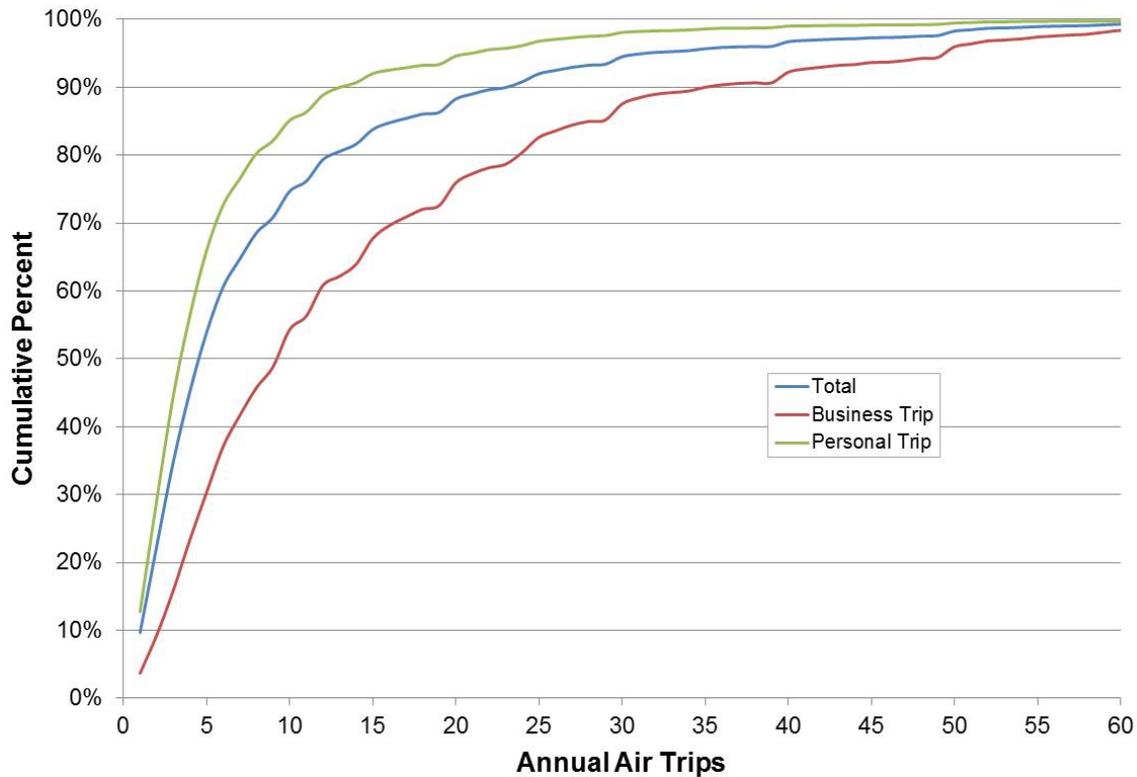


Figure C-28. Cumulative Distribution of Total Air Trips in Past 12 Months by Bay Area Residents at San Francisco International Airport in 2014/15 Survey by Purpose of Surveyed Trip

The average number of annual air trips for each household income category, in total and by the purpose of the trip on which they were surveyed, is shown in Table C-56. The average number of annual air trips generally increased with income, as expected, although the average annual air trips for respondents who were making a business trip showed a small drop with increasing household income from \$100,000 to \$200,000. The average annual air trips for respondents who reported a household income under \$25,000 are surprisingly high although somewhat less than for those in the next income category from \$25,000 to \$50,000. An annual household income of under \$25,000 is very low for the Bay Area, so for someone with this income level to be making almost four annual air trips would be quite surprising. As noted above for OAK, it is possible that some of those reporting such a low household income deliberately understated their income or misunderstood the question, or that many of those reporting an income below \$25,000 were students who reported just their own income.

Table C-56. Average Air Trips in Past 12 Months by Bay Area Residents at San Francisco International Airport by Annual Household Income and Trip Purpose – 2014/15 Survey

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$25,000	5.6%	3.87	2.3%	5.00	7.4%	3.68
\$25,000 - \$49,999	6.8%	4.73	3.7%	6.08	8.6%	4.41
\$50,000 - \$74,999	12.2%	6.03	9.1%	9.40	14.0%	4.81
\$75,000 - \$99,999	13.9%	7.36	11.3%	11.63	15.4%	5.62
\$100,000 - \$149,999	19.7%	9.75	19.3%	15.36	19.9%	6.73
\$150,000 - \$199,999	15.2%	10.52	17.4%	14.24	13.9%	7.94
\$200,000 - \$299,999	14.6%	13.95	19.7%	19.40	11.7%	8.87
\$300,000 and over	12.0%	18.13	17.4%	23.86	9.0%	11.96
Total	100%	9.51 (1)	100%	15.49 (1)	100%	6.45 (1)
Valid responses	4,852		1,733		3,119	

Notes: 1) Average annual trips include respondents who did not indicate their household income.

The corresponding average number of annual air trips for respondents in each age range is shown in **Error! Not a valid bookmark self-reference..** In contrast to the age distribution found for OAK, the largest group of respondents was in the age range from 35 to 44 and accounted for 19% of all respondents who indicated their age. Those respondents on a personal trip were somewhat younger, with the largest group in the age range from 25 to 34 which accounted for 27% of all respondents making a personal trip, although not surprisingly a higher percentage of those on a personal trip than those on a business trip were age 65 or over.

Across all respondents, the average number of annual air trips increased with age until the age range from 45 to 54 then declined with age over the last two age ranges. A similar pattern is reflected by those making a business trip, although the average number of annual air trips remained essentially the same for the age ranges between 45 and 64 and was considerably greater in each age range.

Table C-57. Average Air Trips in Past 12 Months by Bay Area Residents at San Francisco International Airport by Respondent Age and Trip Purpose – 2014/15 Survey

Age Range	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	10.9%	5.38	5.3%	10.37	13.7%	4.42
25 - 34	26.8%	9.34	25.5%	13.73	27.4%	7.27
35 - 44	19.4%	11.26	25.7%	16.31	16.1%	7.18
45 - 54	18.5%	11.65	24.2%	17.15	15.6%	7.32
55 - 64	14.5%	10.05	14.9%	17.13	14.4%	6.34
65 or over	9.9%	5.90	4.4%	12.59	12.7%	4.73
Total	100%	9.51 (1)	100%	15.49 (1)	100%	6.45 (1)
Valid responses	6,614		2,226		4,388	

Notes: 1) Average annual trips include respondents who did not indicate their age range.

The average number of annual air trips by those making a personal trip increased with age until the age range from 25 to 34, then declined in the next age range, increased again to reach its largest value in the age range from 45 to 54, then declined with age over the last two age ranges.

The average number of annual air trips for each household income category by respondent gender is shown in Table C-58, together with the percentage of respondents in each income category who were male. As noted above for OAK, the survey recorded the gender of the survey respondent, not of other members of the air travel party (if any).

Table C-58. Average Air Trips in Past 12 Months by Bay Area Residents at San Francisco International Airport by Annual Household Income and Gender – 2014/15 Survey

Household Income	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
Under \$25,000	43.7%	3.68	4.01
\$25,000 - \$49,999	44.3%	4.50	4.92
\$50,000 - \$74,999	46.5%	5.83	6.19
\$75,000 - \$99,999	50.1%	8.10	6.61
\$100,000 - \$149,999	57.3%	10.13	8.29
\$150,000 - \$199,999	55.0%	12.07	8.65
\$200,000 - \$299,999	61.2%	15.76	11.08
\$300,000 and over	66.0%	20.09	14.30
Total	54.0% (1)	10.96 (1)	7.70 (1)
Valid responses	4,848		

Note: 1) Percentage of male respondents and average annual trips include respondents who did not indicate their household income.

The percentage of survey respondents in each income category who were male generally increased with income, with some minor fluctuation which may be due to sample size effects. Overall, there were significantly more male survey respondents than female, in contrast to the

gender proportions at OAK. The average number of annual air trips by male survey respondents was higher than those by female survey respondents for all household income categories above \$75,000, although the difference in average annual air trips between male and female survey respondents for the income categories below \$75,000 was not large. In contrast, the difference in average annual air trips between male and female survey respondents increased progressively with income above \$75,000.

The corresponding average number of annual air trips and percentage of survey respondents who were male for respondents in each age range is shown in Table C-59. The percentage of male survey respondents increased with age until the age range from 35 to 44, for which 57% of the survey respondents were male, remained effectively the same for the next age range from 45 to 54 then declined slowly with age. The age range from 18 to 24 had the lowest percentage of male survey respondents, at 47%. The average number of annual air trips increased with age for male survey respondents until the age range from 45 to 54 then declined with age. The average number of annual air trips by female survey respondents increased sharply from the age range from 18 to 24 to the next age range from 25 to 34, then declined slowly with age until the age range from 45 to 54 and more steeply thereafter. The average number of annual air trips was higher for male respondents than female respondents in all age ranges, with the greatest difference in the age ranges between 35 and 64, for which the difference increased with age from 3.9 to 5.5 trips per year, most likely reflecting the higher number of business trips made by male survey respondents in these age ranges.

Table C-59. Average Air Trips in Past 12 Months by Bay Area Residents at San Francisco International Airport by Respondent Age and Gender – 2014/15 Survey

Respondent Age	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
18 - 24	47.1%	6.22	4.64
25 - 34	52.0%	9.79	8.86
35 - 44	57.3%	12.64	8.72
45 - 54	57.2%	13.88	8.67
55 - 64	55.8%	12.47	7.00
65 or over	53.1%	6.76	4.93
Total	54.0% (1)	10.96 (1)	7.70 (1)
Valid responses	6,610		

Note: 1) Percentage of male respondents and average annual trips include respondents who did not indicate their age range.

2006 Survey

The 2006 SFO air passenger survey used the same survey questions and response coding as the 2006 OAK air passenger survey. The survey was conducted in three waves over the period from August 16 to October 7, 2006 and obtained 4,628 responses, of which 1,585 (34%) were residents of the nine-county Bay Area. The first wave was undertaken from August 16 to September 4, the second wave undertaken from September 18 to September 24, and the third wave from October 2 to October 7.

The average number of annual air trips for each household income category, in total and by the purpose of the trip on which they were surveyed, is shown in In contrast with the findings of the 2006 OAK survey, the average numbers of annual air trips increased progressively with income for all survey respondents with annual household incomes over \$25,000, with the exception of survey respondents who were making a personal trip with annual household incomes between \$100,000 and \$200,000. The average numbers of annual air trips increased fairly slowly with income for both survey respondents making a business trip and those making a personal trip with annual household incomes between \$75,000 and \$200,000, then increased sharply at higher income levels, particularly for survey respondents making a business trip.

Table C-60. In spite of the slightly higher number of Bay Area resident respondents than in the 2006 OAK air passenger survey, the SFO respondents had a lower percentage that reported their annual household income (68% compared to 77% at OAK) resulting in a somewhat smaller number of survey responses for which the household income is known.

The overall average number of annual air trips by survey respondents making a business trip (17.5) was slightly less than found in the 2006 OAK air passenger survey (18.6), although the average number of annual air trips by survey respondents making a personal trip was the same in both surveys (7.3). As with the 2006 OAK survey, these average numbers of annual air trips are somewhat higher than was found in the 2014/15 SFO air passenger survey.

In contrast with the findings of the 2006 OAK survey, the average numbers of annual air trips increased progressively with income for all survey respondents with annual household incomes over \$25,000, with the exception of survey respondents who were making a personal trip with annual household incomes between \$100,000 and \$200,000. The average numbers of annual air trips increased fairly slowly with income for both survey respondents making a business trip and those making a personal trip with annual household incomes between \$75,000 and \$200,000, then increased sharply at higher income levels, particularly for survey respondents making a business trip.

Table C-60. Average Air Trips in Past 12 Months by Bay Area Residents at San Francisco International Airport by Annual Household Income and Trip Purpose – 2006 Survey

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$25,000	3.6%	5.6	0.3%	2.0	5.1%	5.8
\$25,000 - \$49,999	7.5%	4.9	3.1%	5.6	9.7%	4.8
\$50,000 - \$74,999	15.1%	6.5	10.0%	8.8	17.6%	5.9
\$75,000 - \$99,999	18.3%	8.7	15.3%	13.2	19.8%	7.0
\$100,000 - \$149,999	20.9%	10.8	24.2%	14.9	19.2%	8.2
\$150,000 - \$199,999	17.2%	10.3	19.8%	16.4	15.9%	6.5
\$200,000 - \$299,999	10.2%	18.7	16.7%	21.2	6.9%	15.6
\$300,000 and over	7.4%	26.2	10.6%	35.4	5.8%	17.9
Total	100%	10.68 (1)	100%	17.54 (1)	100%	7.34 (1)
Valid responses	1,083		359		723	

Notes: 1) Average annual trips include respondents who did not indicate their household income.

In order to better understand the differences in average numbers of annual air trips by household income, a more detailed analysis was made of the differences in the distribution of reported annual air trips by trip purpose and household income. Figure C-29 shows the cumulative distribution of the reported annual air trips by the purpose of the trip in which the respondent was surveyed. As with the results from the 2006 OAK survey, it can be seen that survey respondents making a business trip tended to report having made more air trips in the previous 12 months than those making a personal trip, as could be expected. Since the survey only asked the total number of air trips made in the past 12 months, these totals included a combination of business and personal trips for those respondents who made at least one business trip in the previous year.

The percentages of respondents who reported making more than 12 air trips in the past year is almost identical to the percentages found in the 2006 OAK survey, with 43% those making a business trip and 13% of those making a personal trip reporting that they made more than 12 air trips in the past year. Less than 4% of those making a business trip when surveyed reported making more than 60 air trips in the previous year, or more than five per month. In contrast, less than 1% of those making a personal trip reported making more than 60 air trips in the previous year. As noted in the discussion of the results from the 2006 OAK survey, although this level of air travel is not physically impossible, it seems rather unlikely.

The average number of reported air trips in the past year by survey respondents who were making a business trip in four ranges of total reported trips for each household income range is shown in The average number of annual air trips for those making 12 air trips or less appears to decline with income for respondents with household incomes between \$25,000 and \$100,000 and again for those in the highest income range. However, the effect of respondents reporting between 13 and 60 air trips in the previous 12 months causes the average number of annual air trips to increase with income except for respondents with household incomes between \$150,000 and \$200,000, primarily due to a lower average number of air trips by those reporting between 13 and 36 air trips in the previous 12 months. As with the results from the 2006 OAK survey, for those reporting 13 to 36 air trips in the previous 12 months there appears to be a slight overall increase with income, although the variation between income categories is much larger than this increase. For those reporting more than 36 air trips in the previous 12 months, there appears to be no obvious correlation with income, although the small sample size in each income range makes this conclusion somewhat uncertain. Survey respondents reporting more than 12 air trips are concentrated in the income ranges above \$100,000, which seems reasonable, since those making such a large number of air trips are likely to be in fairly senior positions and most of those air trips were almost certainly made for business purposes.

As noted for the results of the 2006 OAK survey, the fact that there does not appear to be an obvious correlation between the average number of air trips and household income for those making more than 36 air trips in the previous 12 months, and only a weak correlation for those making between 13 and 36 air trips, also seems reasonable, since it is the occupation and position in the organization that is likely to result in the need to make large numbers of business air trips, rather than the household income *per se*.

Table C-61.

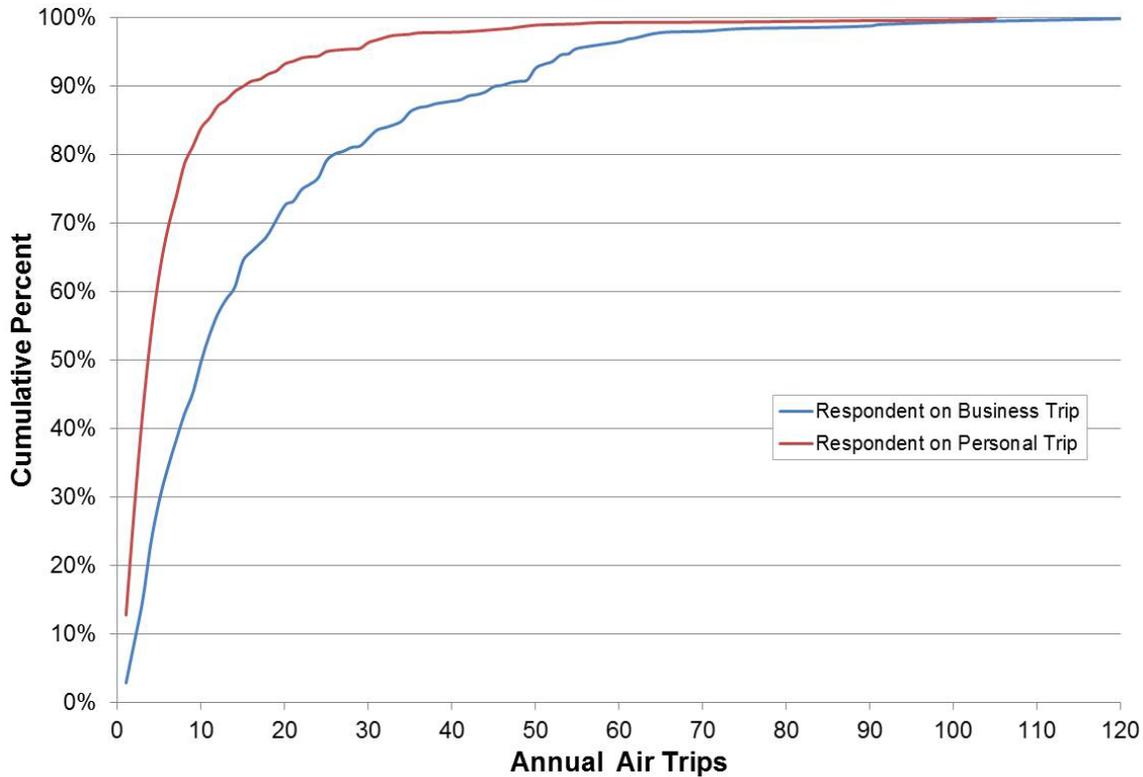


Figure C-29. Cumulative Distribution of Total Air Trips in the Past 12 Months Reported by Bay Area Residents in the 2006 San Francisco International Airport Survey

The average number of annual air trips for those making 12 air trips or less appears to decline with income for respondents with household incomes between \$25,000 and \$100,000 and again for those in the highest income range. However, the effect of respondents reporting between 13 and 60 air trips in the previous 12 months causes the average number of annual air trips to increase with income except for respondents with household incomes between \$150,000 and \$200,000, primarily due to a lower average number of air trips by those reporting between 13 and 36 air trips in the previous 12 months. As with the results from the 2006 OAK survey, for those reporting 13 to 36 air trips in the previous 12 months there appears to be a slight overall increase with income, although the variation between income categories is much larger than this increase. For those reporting more than 36 air trips in the previous 12 months, there appears to be no obvious correlation with income, although the small sample size in each income range makes this conclusion somewhat uncertain. Survey respondents reporting more than 12 air trips are concentrated in the income ranges above \$100,000, which seems reasonable, since those making such a large number of air trips are likely to be in fairly senior positions and most of those air trips were almost certainly made for business purposes.

As noted for the results of the 2006 OAK survey, the fact that there does not appear to be an obvious correlation between the average number of air trips and household income for those making more than 36 air trips in the previous 12 months, and only a weak correlation for those making between 13 and 36 air trips, also seems reasonable, since it is the occupation and position

in the organization that is likely to result in the need to make large numbers of business air trips, rather than the household income *per se*.

Table C-61. Average Air Trips in Past 12 Months by Bay Area Residents on a Business Trip at San Francisco International Airport by Annual Household Income and Total Trips – 2006 Survey

Household Income	Total Trip in Past 12 Months				
	1-12	13-36	37-60	61 or more	60 or less
Under \$25,000	2.00				2.00
\$25,000 - \$49,999	4.60	16.0			5.64
\$50,000 - \$74,999	4.34	23.3	50.0		8.78
\$75,000 - \$99,999	4.12	22.1	52.3		13.18
\$100,000 - \$149,999	6.20	23.7	50.9		14.94
\$150,000 - \$199,999	6.55	17.4	46.5	112.5	13.64
\$200,000 - \$299,999	7.26	23.2	45.6	68.3	18.75
\$300,000 and over	7.00	24.2	52.7	79.5	23.60
Total (1)	5.95	21.8	49.1	83.3	15.18
Survey Responses					
Under \$25,000	1				1
\$25,000 - \$49,999	10	1			11
\$50,000 - \$74,999	29	6	1		36
\$75,000 - \$99,999	34	17	4		55
\$100,000 - \$149,999	56	23	8		87
\$150,000 - \$199,999	40	23	6	2	69
\$200,000 - \$299,999	23	29	5	3	57
\$300,000 and over	11	13	6	8	30
Don't know/Refused	91	44	20	5	155
Total	295	156	50	18	501
Percent Responses	56.4%	31.5%	8.0%	4.2%	95.8%

Notes: 1) Average annual trips include respondents who did not indicate their household income.

The average number of annual air trips for those making 12 air trips or less appears to decline with income for respondents with household incomes between \$25,000 and \$100,000 and again for those in the highest income range. However, the effect of respondents reporting between 13 and 60 air trips in the previous 12 months causes the average number of annual air trips to increase with income except for respondents with household incomes between \$150,000 and \$200,000, primarily due to a lower average number of air trips by those reporting between 13 and 36 air trips in the previous 12 months. As with the results from the 2006 OAK survey, for those reporting 13 to 36 air trips in the previous 12 months there appears to be a slight overall increase with income, although the variation between income categories is much larger than this increase. For those reporting more than 36 air trips in the previous 12 months, there appears to be no obvious correlation with income, although the small sample size in each income range makes this conclusion somewhat uncertain. Survey respondents reporting more than 12 air trips are concentrated in the income ranges above \$100,000, which seems reasonable, since those making such a large number of air trips are likely to be in fairly senior positions and most of those air trips were almost certainly made for business purposes.

As noted for the results of the 2006 OAK survey, the fact that there does not appear to be an obvious correlation between the average number of air trips and household income for those making more than 36 air trips in the previous 12 months, and only a weak correlation for those making between 13 and 36 air trips, also seems reasonable, since it is the occupation and position in the organization that is likely to result in the need to make large numbers of business air trips, rather than the household income *per se*.

Table C-61 also makes clear why the average numbers of annual air trips can be somewhat erratic across adjacent income categories. Although the number of survey respondents making more than 36 air trips per year is very small in each income category, the large number of air trips involved has a disproportionate effect on the overall average number of air trips per year for each income category.

In contrast to the findings of the 2006 OAK survey, the increase in the relative number of survey respondents with a household income of \$300,000 or more reporting making more than 36 air trips in the previous 12 months compared to those in the income range from \$200,000 to \$300,000 explains the increase in the average number of air trips across all respondents in these two income categories who reported making up to 60 air trips. Whether this apparent increase in the proportion of survey respondents making a relatively large number of annual air trips is simply an artifact of the smaller sample size or reflects an underlying systemic difference in the composition of the survey respondents in the two income categories is unclear. However, it is worth noting that there was an even greater relative increase in the number of survey respondents reporting more than 60 air trips in the previous 12 months in these two income categories.

The corresponding data for survey respondents who were making a personal trip is shown in Table C-62. The general pattern is similar to that for respondents on business trips, with many fewer respondents reporting having made more than 12 air trips in the previous 12 months, as could be expected and shown in Figure C-29.

The average number of air trips in the previous 12 months for respondents who reported making up to 60 air trips shows an apparent decline for respondents in the household income ranges from \$25,000 to \$50,000 and from \$150,000 to \$200,000 compared to those in the next lower income range. However, in both cases, the average numbers of air trips for respondents who reported making 12 or fewer air trips in the previous 12 months shows an increase, and in the case of respondents with incomes between \$25,000 and \$50,000 there was even an increase for those who reported making between 13 and 36 air trips in the previous 12 months. In the latter case, the decline in the overall average number of air trips was due to a drop in the proportion of respondents who reported making the higher number of trips rather than the average number of trips. This further illustrates how the overall average number of air trips for respondents in any particular income range (or any other subset of respondents for that matter) can be strongly influenced by the relatively small number of respondents making a large number of air trips, which because of the limited sample size is subject to a high degree of variability.

Table C-62. Average Air Trips in Past 12 Months by Bay Area Residents on a Personal Trip at San Francisco International Airport by Annual Household Income and Total Trips – 2006 Survey

Household Income	Total Trip in Past 12 Months				
	1-12	13-36	37-60	61 or more	60 or less
Under \$25,000	3.39	18.2			5.78
\$25,000 - \$49,999	3.52	20.8			4.76
\$50,000 - \$74,999	3.79	23.4	50.0		5.85
\$75,000 - \$99,999	4.49	22.4	48.3		7.03
\$100,000 - \$149,999	4.22	21.2	45.0	82.0	7.64
\$150,000 - \$199,999	4.93	18.1	45.0		6.54
\$200,000 - \$299,999	5.27	20.3	51.0	105.0	11.90
\$300,000 and over	6.64	22.9	53.0	90.0	14.25
Total (1)	4.28	21.2	48.6	94.7	6.76
Survey Responses					
Under \$25,000	31	6			37
\$25,000 - \$49,999	65	5			70
\$50,000 - \$74,999	115	11	1		127
\$75,000 - \$99,999	127	13	3		143
\$100,000 - \$149,999	113	23	2	1	138
\$150,000 - \$199,999	103	11	1		115
\$200,000 - \$299,999	33	12	3	2	48
\$300,000 and over	25	13	2	2	40
Don't know/Refused	314	19	4	2	337
Total	926	113	16	7	1,055
Percent Responses	56.4%	31.5%	8.0%	4.2%	95.8%

Notes: 1) Average annual trips include respondents who did not indicate their household income.

The average number of annual air trips for each household income category by respondent gender is shown in Table C-63 together with the percentage of respondents in each income category who were male.

Table C-63. Average Air Trips in Past 12 Months by Bay Area Residents at San Francisco International Airport by Annual Household Income and Gender – 2006 Survey

Household Income	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
Under \$25,000	43.6%	5.1	5.9
\$25,000 - \$49,999	39.5%	5.5	4.5
\$50,000 - \$74,999	44.8%	5.4	7.4
\$75,000 - \$99,999	47.0%	10.4	7.3
\$100,000 - \$149,999	55.3%	11.6	9.7
\$150,000 - \$199,999	59.1%	11.6	8.5
\$200,000 - \$299,999	60.9%	19.7	17.2
\$300,000 and over	65.0%	25.9	26.7
Total	51.6% (1)	12.39 (1)	8.84 (1)
Valid responses	1,083		

Note: 1) Percentage of male respondents and average annual trips include respondents who did not indicate their household income.

The percentage of survey respondents in each income category who were male increased with income for all survey respondents with annual household incomes over \$25,000. Overall, there were slightly more male survey respondents than female, consistent with the findings of the 2014/15 survey, which had an even higher overall percentage of male respondents. The average number of annual air trips by male survey respondents was generally higher than those by female survey respondents for all household income categories except for the lowest income category of under \$25,000, those with household incomes between \$50,000 and \$75,000, and those with household incomes of \$300,000 and over. In contrast to the findings of the 2006 OAK survey, there was little difference in the average number of annual air trips for male and female survey respondents. By far the largest difference in average annual air trips reported by male and female survey respondents with an annual household income of \$300,000 and over.

The percentage of male survey respondents in the different household income categories was generally slightly lower than found in the 2014/15 survey, with the exception of survey respondents with household incomes between \$150,000 and \$200,000, where the percentage of male respondents was somewhat higher than found in the 2014/15 survey.

Summary

The survey results for the 2006 SFO air passenger survey are broadly similar to the findings of the 2006 OAK air passenger survey and share a similar relationship to the results of the 2014/15 air passenger surveys at both airports. In spite of the large difference in enplaned passengers between OAK and SFO, the sampling approach for the two surveys resulted in slightly fewer survey respondents at SFO who were Bay Area residents and reported their annual household income.

Respondents to the 2006 SFO survey who were making a business trip and reported an annual household income of \$300,000 or more had a higher average number of annual air trips (35.4) than the corresponding respondents to the 2006 OAK survey (27.1), as did those making a

personal trip (17.9 at SFO compared to 10.4 at OAK), although in both cases the average numbers of annual air trips for OAK may be underestimated, since the figures are lower than those for the next lower household income range.

However, as discussed above, these differences are heavily influenced by the small number of respondents who reported making a large number of trips, which have a disproportionate influence on the overall average number of air trips and are subject to considerable variability due to the limited sample size.

Tulsa International Airport

The summary data for the 2013 to 2016 TUL surveys provided by airport staff gave the topline responses to each question but contained no cross-tabulations. The summary data for the 2012 survey provided only the age distribution for the survey respondents and the percentage of survey respondents from each state and foreign countries.

The number of respondents for each survey and the percentages of each type of customer from 2013 to 2016 are shown in Table C-64. The survey sample sizes are relatively small compared to air passenger surveys performed at larger airports. It can be seen that the percentages of meeters/well-wishers varied from year to year, with roughly equal proportions of departing and arriving passengers, with a little over 100 of each type of air passenger surveyed in each year.

Table C-64. Sample Size and Composition of Tulsa International Airport Customer Survey Respondents

Customer Type	2013	2014	2015	2016
Departing passenger	40%	51%	47%	40%
Arriving passenger	41%	49%	47%	40%
Meeter/well-wisher	19%		5%	20%
	100%	100%	100%	100%
Survey sample size	261	204	213	252

The trip purposes of each type of air passenger are shown in Table C-65.. The proportion of respondents making business and personal trips varies considerably from year and also differs between departing and arriving passengers in a given year. This could reflect the relatively small size of the sample, as well as the timing of the surveys. Nonetheless, for the three most recent surveys the percentage of respondents making business trips was higher than for those making personal trips, in contrast to the survey results for 2013. It is unclear what may have caused the change from 2013 to subsequent years.

It should be noted that the survey did not ask how many people were in each travel party, so the percentages shown in Table C-65 (and subsequent tables) are of *air parties*, not total air passengers. Since the average air travel party size of those making business trips is usually considerably lower than those making personal trips, the percentages of *air passengers* making a business trip would be lower than shown in the table.

Table C-65. Trip Purpose of Tulsa International Airport Air Passenger Respondents

Trip Purpose	2013	2014	2015	2016
Departing passengers				
Business	42%	65%	55%	65%
Personal	58%	35%	45%	35%
	100%	100%	100%	100%
Arriving passengers				
Business	32%	51%	61%	53%
Personal	68%	49%	39%	47%
	100%	100%	100%	100%

The gender and age of survey respondents was asked in all four surveys and the household income was asked in the two most recent surveys, as shown in Table C-66.

Gender and age was asked of all survey respondents in 2013 but only of air passenger respondents in 2015 and 2016 (all survey respondents in 2014 were air passengers). Household income was only asked of air passenger respondents.

The respondents to the 2013 survey had a significantly higher proportion of female respondents than the later surveys. This could reflect the inclusion of meeters and well-wishers, suggesting that the majority of these were women. Even so, the percentage of male air passenger respondents would still have been still significantly less than in subsequent years.

Different age ranges were used in the 2013 and 2014 surveys from those in the 2015 and 2016 surveys. However, the ranges are similar enough to allow comparison across the four years. Respondents to the 2013 survey were generally older than those in the 2014 survey, suggesting that the meters and well-wishers were typically older than the air passengers. The age profile for the last three years appears to show a progressive increase in older air passengers, with the percentage ages 40 and over increasing from 47% in 2014 to 71% in 2016.

The annual household income profiles do not show a significant change from the 2015 to the 2016 survey, allowing for the fairly small sample size. Not surprisingly, the survey respondents had fairly high incomes, with over half the respondents having incomes of \$100,000 or more and about a third having incomes of \$150,000 or more. Only about 12 or 13% had incomes below \$50,000, a far lower percentage than the U.S. population in total.

Table C-66. Distribution of Tulsa International Airport Air Passenger Respondent Characteristics

Characteristics	2013 (1)	2014	2015	2016
Gender				
Male	39%	58%	64%	59%
Female	61%	42%	36%	41%
	100%	100%	100%	100%
Age				
18 - 28	17%	24%		
29 - 39	26%	29%		
40 - 50	30%	27%		
51 - 61	16%	14%		
62 or more	11%	6%		
18 - 19			2%	2%
20 - 29			19%	11%
30 - 39			15%	17%
40 - 49			26%	20%
50 - 59			23%	28%
60 or more			15%	23%
	100%	100%	100%	100%
Household Income				
Less than \$25,000			5%	3%
\$25,000 - 49,999			7%	10%
\$50,000 - 74,999			14%	16%
\$75,000 - 99,999			20%	16%
\$100,000 - 149,999			20%	25%
\$150,000 or more			34%	31%
	100%	100%	100%	100%

Note: 1. All survey respondents

The surveys did not ask how many air trips the air passenger survey respondents had made in the past year, so it is not possible to analyze the air travel propensity of the respondents.

2016 Customer Survey

A more detailed analysis of the 2016 survey response data was undertaken to determine how air passenger characteristics varied by trip purpose. The ability to examine combinations of characteristics (such as household income by age or gender) was constrained by the size of survey sample. The 2016 survey was undertaken on ten days between Monday, April 4 and Monday, May 9, 2016. The number of survey responses per day varied between five and 52.

The age profile of the survey respondents is significantly different for respondents who were making a business trip and those making a personal trip. Of those making a business trip, 80% were between the ages of 30 and 59, with only 6% below the age of 30 and over a third (36%) in the age range from 50 to 59. In contrast, 23% of those making a personal trip were below the age of 30, with 33% age 60 or more.

Table C-67 shows the profile of the air passenger respondents by trip purpose. A much higher percentage of respondents on a business trip were male, while a higher percentage of those on a personal trip were female. While the higher percentage of business travelers being male is not surprising, the higher percentage of those who were making a personal trip being female is surprising. Although other air passenger surveys have also found a somewhat higher percentage of respondents making personal trips to be female, the difference has not been as great as suggested by the TUL survey.

The age profile of the survey respondents is significantly different for respondents who were making a business trip and those making a personal trip. Of those making a business trip, 80% were between the ages of 30 and 59, with only 6% below the age of 30 and over a third (36%) in the age range from 50 to 59. In contrast, 23% of those making a personal trip were below the age of 30, with 33% age 60 or more.

Table C-67. Distribution of Tulsa International Airport 2016 Survey Air Passenger Respondent Characteristics

Characteristics	Business Trip	Personal Trip
Gender		
Male	79%	29%
Female	21%	71%
	100%	100%
Age		
18 - 19		4%
20 - 29	6%	19%
30 - 39	20%	14%
40 - 49	24%	15%
50 - 59	36%	16%
60 or more	15%	33%
	100%	100%
Household Income		
Less than \$25,000		7%
\$25,000 - 49,999	5%	18%
\$50,000 - 74,999	10%	25%
\$75,000 - 99,999	15%	18%
\$100,000 - 149,999	28%	21%
\$150,000 or more	43%	12%
	100%	100%
Educational attainment		
Some high school		1%
High school graduate	3%	9%
Trade/tech/vocational	4%	6%
Some college credit	15%	12%
Associate's degree	10%	12%
Bachelor's degree	45%	41%
Post-graduate degree	22%	19%
	100%	100%

As might be expected, survey respondents who were making business trips had significantly higher annual household incomes than those who were making personal trips, with 43% having incomes of \$150,000 or more compared to only 12% for those making personal trips. Survey respondents who were making personal trips had household incomes more evenly distributed between \$25,000 and \$150,000, with the largest percentage (25%) having incomes between \$50,000 and \$75,000. No survey respondents who were making a business trip reported a household income below \$25,000, while only 7% of those making a personal trip reported an income below \$25,000.

The 2016 survey was the first one to ask respondents about the highest level of education they had attained, as shown in Table 2.46. Not surprisingly, survey respondents who were making business trips had a fairly high level of education with two-thirds having a Bachelor's or post-graduate or professional degree and over 90% having some college education. However, survey respondents who were making personal trips also had a fairly high level of education, with 60% having a Bachelor's, or post-graduate or professional degree and a further 24% having some college education.

Summary

In summary, the results of the TUL customer surveys provide a useful indication of the profile of air travelers using a smaller airport, although the small sample size both limits the ability to explore how the respondent characteristics vary with more than one variable and may have introduced a fair amount of error in the results. The data from the annual surveys over the past four years appear to suggest that the air passenger population is experiencing an increasing percentage of older travelers.

ACI Airport Service Quality Surveys

For many years the Airports Council International has maintained a program of customer satisfaction surveys, now named the Airport Service Quality (ASQ) Survey, in which many of its member airports participate (<http://www.aci.aero/Airport-Service-Quality/ASQ-Home>). These surveys are generally undertaken four times per year using a standardized survey questionnaire with a minimum of 350 respondents for each survey. As of 2015, 28 U.S. airports participated in this program.

The ASQ survey asks respondents to rate 30 aspects of their airport experience at the airport where they were surveyed. These aspects include access, check-in, passport/identification inspection, security, wayfinding, airport facilities, and the airport environment. In addition, the ASQ survey includes the following questions about the current air trip being taken by respondents and traveler characteristics:

- Airline, flight number, departure date and time, destination on flight
- Whether originating or connecting from another flight
- Main reason for trip (business, leisure, or other)
- Section of aircraft traveling in (first class, business/upper class, economy/tourist)
- Number of return air trips made in the past 12 months, including the current trip
- Nationality/country of citizenship

- Country of residence and postal/zip code
- Gender and age group (eight age ranges)

The survey does not ask respondents who are connecting between flights where they started their trips, nor whether their destination on the flights they are about to board is their final destination (although in some cases this can be inferred from the respondents' postal codes). The survey also does not ask about respondents' income levels, although it may be possible to approximate these income levels from the respondents' postal codes. From the perspective of the current project, the most relevant information collected by the survey is the number of air trips made in the past 12 months, and how this varies by age group, gender, nationality, and region (based on the residential postal area).

ACI staff provided ASQ survey response data for surveys undertaken at 28 de-identified airports in 2015 for the following questions:

- Trip purpose
- Number of return air trips made in the past 12 months
- Nationality
- Country of residence
- Postal code
- Gender
- Age

The dataset comprised 68,484 survey responses, of which 58,448 were by U.S. residents. Initial analysis of the data for U.S. residents was undertaken to explore how the number of air trips in the past 12 months varied by trip purpose, age, and gender. The number of air trips was reported by survey respondents in five ranges: 1-2, 3-5, 5-10, 11-20, and 21 or more. The number of respondents by trip purpose and the proportion that reported making air trips in each range is shown in Table C-68.

Table C-68. Distribution of Air Trips per Year by Trip Purpose – 2015 ASQ Survey

Trip Purpose	Survey Responses	Percent	Air Trips in Past 12 Months					Total
			1-2	3-5	6-10	11-20	21+	
Business	21,105	36.1%	17%	26%	21%	17%	20%	100%
Leisure	30,893	52.9%	41%	36%	15%	5%	3%	100%
Other	6,450	11.0%	44%	35%	14%	4%	3%	100%
Total	58,448	100%	33%	32%	17%	9%	9%	100%
Average Trips								
Business			1.6	4.0	7.8	15.0	38	12.9
Leisure			1.6	3.8	7.5	14.3	33	4.8
Other			1.6	3.8	7.5	14.3	33	4.6
Total								7.7

The cumulative distribution of the number of air trips in the past 12 months by the trip purpose of the current trip in which the respondent was surveyed is shown in Figure C-30. It can

be seen that the distribution is almost identical for leisure trips and other non-business trips, but significantly different for business trips. It should be noted that these trip frequency distributions are based on the purpose of the current trip, and do not show the number of trips by each purpose in the past 12 months. However, it is reasonable that those survey respondents who were making a business trip would be more likely to have made more air trips in the past 12 months (many of which would most likely have been for business) than those survey respondents who were making a non-business trip (and may not have made any business trips in the past 12 months).

The average number of air trips for each trip frequency range shown in Table C-68 in general differs from the mid-point of the range, reflecting the curvature of the cumulative distributions shown in Figure C-30. These values were obtained from an analysis of the frequency distribution of air trip in the past 12 months by San Francisco Bay Area residents in the 2014/15 air passenger survey undertaken at San Francisco International Airport, in which respondents reported the actual number of trips they had made.

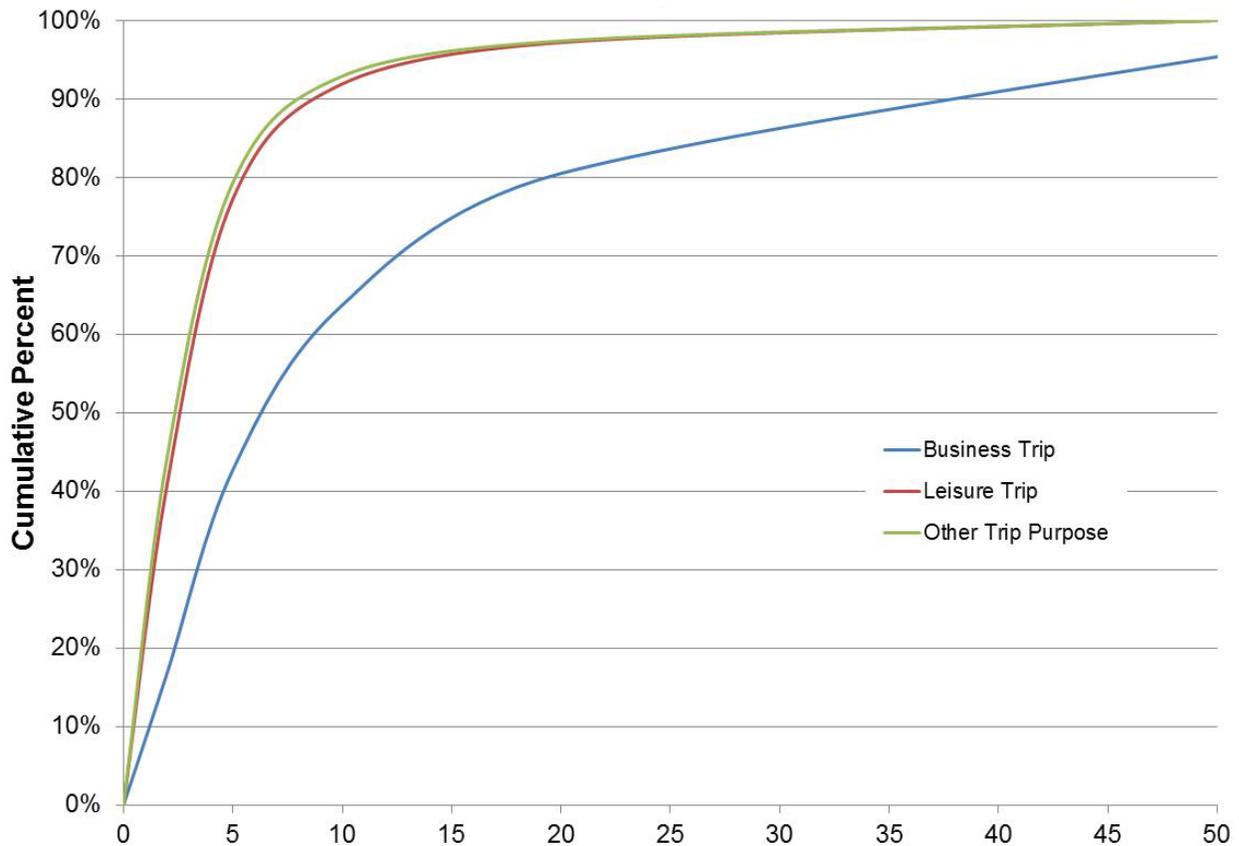


Figure C-30. Cumulative Distribution of Air Trips in Past 12 Months by 2015 ASQ Survey Respondents by Trip Purpose

The average number of trips for each trip purpose and in total shown in the rightmost column of Table C-68 is based on the percentages of respondents reporting the number of air trips in the past 12 months in each range and the assumed average number of trips for that range. Overall, survey respondents reported making about 7.7 air trips per year on average. Those

making a business trip reported making a larger number of air trips per year, about 12.9 on average, while those making a leisure trip reported making about 4.8 air trips per year on average, and those making a trip for other non-business purposes reported making a slightly lower number of air trips per year, about 4.6 on average.

Given the clear difference in air travel frequency between those making a business trip and those making a leisure or other trip, an analysis of how the reported number of air trips in the past year varied with age and gender was performed separately for those respondent making a business trip and those making a personal (leisure or other purpose) trip.

Table C-69 shows the number of respondents by age range for those making business and personal trips and the proportion that reported making air trips in each trip frequency range, as well as the average number of air trips in the past year using the assumed average number of trips for each trip frequency range shown in Table C-68. The average number of trips per year increases with age until the age range 55 to 64 in the case of those making a business trip and age range 45 to 54 for personal trips. The average number of trips per year then declines with age. For those making personal trips, the average number of trips per year by those in the highest age range of 76 and over is the lowest of any age range, at 3.4 trips per year on average, although only 3% of those making personal trips are in this age range. Even so, this is still a respectable number of trips per year for someone in this age range.

Table C-69. Distribution of Air Trips per Year by Age – 2015 ASQ Survey

Age Range	Survey Responses	Percent	Air Trips in Past 12 Months						
			1-2	3-5	6-10	11-20	21+	Total	Average
Business Trip									
16-21	340	1.6%	38%	37%	17%	4%	4%	100%	5.5
22-25	1,106	5.3%	27%	33%	20%	12%	9%	100%	8.3
26-34	3,540	17.0%	21%	27%	21%	16%	15%	100%	11.0
35-44	4,521	21.7%	17%	26%	21%	16%	20%	100%	12.9
45-54	5,587	26.8%	14%	24%	21%	18%	23%	100%	14.3
55-64	4,491	21.6%	13%	24%	21%	18%	24%	100%	14.5
65-74	1,142	5.5%	15%	26%	23%	19%	17%	100%	12.5
76 and over	100	0.5%	23%	31%	18%	16%	11%	100%	9.7
Total	20,827	100%							12.9
Personal Trips									
16-21	2,675	7.3%	47%	36%	12%	4%	1%	100%	4.0
22-25	2,893	7.9%	43%	37%	14%	5%	2%	100%	4.3
26-34	5,279	14.4%	38%	36%	16%	7%	3%	100%	5.1
35-44	4,246	11.5%	43%	34%	14%	6%	4%	100%	5.0
45-54	6,146	16.7%	41%	35%	14%	6%	4%	100%	5.2
55-64	8,431	22.9%	40%	36%	16%	5%	3%	100%	5.0
65-74	6,029	16.4%	41%	39%	14%	4%	2%	100%	4.4
76 and over	1,079	2.9%	55%	34%	8%	1%	1%	100%	3.4
Total	36,778	100%							4.8

Table C-70 shows the number of respondents by gender for those making business and personal trips and the proportion that reported making air trips in each trip frequency range, as

well as the average number of air trips in the past year using the assumed average number of trips for each trip frequency range shown in Table C-68.

As might be expected, a higher proportion of those making business trips (64%) were male and male business travelers has a somewhat higher average number of air trips in the past year than female respondents making a business trip. Interestingly, 62% of those making personal trips were female, although male respondents making personal trips had a somewhat higher average number of air trips in the past year than female respondents making a personal trip. This most likely reflects the fact that male respondents making a personal trip may have made a larger number of business trips in the past year on average than female respondents making a personal trip.

Table C-70. Distribution of Air Trips per Year by Gender – 2015 ASQ Survey

Gender	Survey Responses	Percent	Air Trips in Past 12 Months						
			1-2	3-5	6-10	11-20	21+	Total	Average
Business Trip									
Male	13,305	64.4%	15%	24%	21%	18%	23%	100%	14.1
Female	7,360	35.6%	21%	29%	21%	14%	14%	100%	10.6
Total	20,665	100%							12.9
Personal Trips									
Male	14,007	38.5%	47%	36%	12%	4%	1%	100%	5.4
Female	22,348	61.5%	55%	34%	8%	1%	1%	100%	4.4
Total	36,355	100%							4.8

It can be seen from the foregoing tables that air travel propensity, expressed as the average number of air trips per year per survey respondent, varies with trip purpose, age and gender in fairly predictable ways. However, the high proportion of female respondents among those making a personal trip is somewhat unexpected. *A priori*, one would have expected air travelers making a personal trip to be fairly evenly divided between men and women.

Survey of International Air Travelers

The Survey of International Air Travelers (SIAT) is undertaken annually by the National Travel & Tourism Office (NTTO) (formerly the Office of Travel & Tourism Industries) of the U.S. Department of Commerce. This survey provides a large sample of both outbound U.S. residents and inbound foreign visitors traveling between the U.S. and overseas countries (i.e., excluding Canada and, until recently, Mexico). The survey collects detailed trip purpose information and the number of air trips to/from the U.S. by the respondent in the prior 12 months (and until 2012 the prior five years), as well as a range of socioeconomic data. The major value of this survey lies in the fact that it has been performed using a consistent survey instrument every year since 1983, with some changes from 2012 on, discussed below. Therefore, it provides a unique resource to study how international air travel propensity and air traveler characteristics have changed over time.

The NTTO has provided data for relevant variables from the 2005, 2010, and 2015 surveys for U.S. residents. The 2015 data provided responses from 42,305 survey respondents

who were U.S. residents, of whom about 63% answered the question of how many international round trips they had made by air from the U.S. in the past 12 months, including the trip they were on. Survey respondents were also asked the main purpose of their trip as well as any other purposes of the trip, using fourteen categories:

- Visit customer
- Visit supplier
- Sales/marketing
- Internal company meeting
- Convention
- Conference
- Trade show
- Government/military
- Education
- Health treatment
- Vacation/holiday
- Religion/pilgrimage
- Visit friends/relatives
- Other (specify)

Based on the specified other trip purpose, the NTTO survey contractor classified “other” purposes as business/professional or other purposes. For the current analysis, the first eight categories together with business/professional “other” purposes were classified as “business” trips, while the remaining categories were classified as “personal” trips. Some respondents did not provide a main trip purpose but did indicate other trip purposes. If those trip purposes included any business purposes using the classification adopted for the main trip purpose, those responses were classified as a “business” trip. Otherwise they were classified as a “personal” trip. On this basis, 97% of respondents to the 2015 survey provided a trip purpose, of which 15% were classified as making a business trip.

A number of changes were made to the SIAT survey instrument for the 2012 and subsequent surveys. The principal change that affects the analysis presented in this appendix is that prior to 2012 respondents reported their annual household income by selecting from 11 income ranges, the highest of which was \$200,000 or more, whereas from 2012 respondents reported their actual annual household income. This has two implications for the analysis. The first is that for surveys before 2012 it prevents any analysis of how the number of international air trips varies with income for high-income households with an annual income above \$200,000. In the 2015 survey, 18.6% of survey respondents who reported an annual household income of \$10,000 or more reported a household income of \$200,000 or more, with 2.4% of respondents reporting a household income of \$500,000 or more.

The second implication is that the analysis of the 2015 survey data excluded respondents who reported an annual household income below \$10,000, since it was felt that these respondents included an unknown number who misreported their household income, as discussed in more detail below. However, in the survey data prior to 2012 the lowest household income range was under \$20,000 so it is not possible to exclude respondents who would have reported an annual household income of less than \$10,000 had this been an option. Therefore all respondents were

included in the analysis. In the 2015 survey, about 3% of those reporting a household income reported an income below \$10,000, while about 2.4% reported an income between \$10,000 and \$19,999. Thus it appears that a high proportion of survey respondents reporting a household income below \$20,000 may have misreported their income.

Another major change in the survey instrument in 2012 was to add questions on Hispanic ethnicity and race. Prior to 2012, the survey did not ask respondents about their ethnicity or race, preventing any analysis of these respondent characteristics from the 2005 and 2010 survey data.

Analysis of 2015 SIAT Data

The cumulative distribution of the number of reported international air trips by respondents to the 2015 survey in total and by the purpose of the surveyed trip is shown in Figure C-31. The irregularity in the curves above about six annual trips appears due to many respondents rounding the number of trips to the nearest five or ten trips, or to six trips (one every two months) or 12 trips (one per month). As could be expected, survey respondents on business trips reported more annual trips than those on personal trips. About 12% of respondents on a business trip reported making ten or more international air trips in the past year, while about 5% of respondents on personal trips reported making six or more international air trips in the past year. It is of course likely that some of the trips in the past year reported by those on a personal trip were for business.

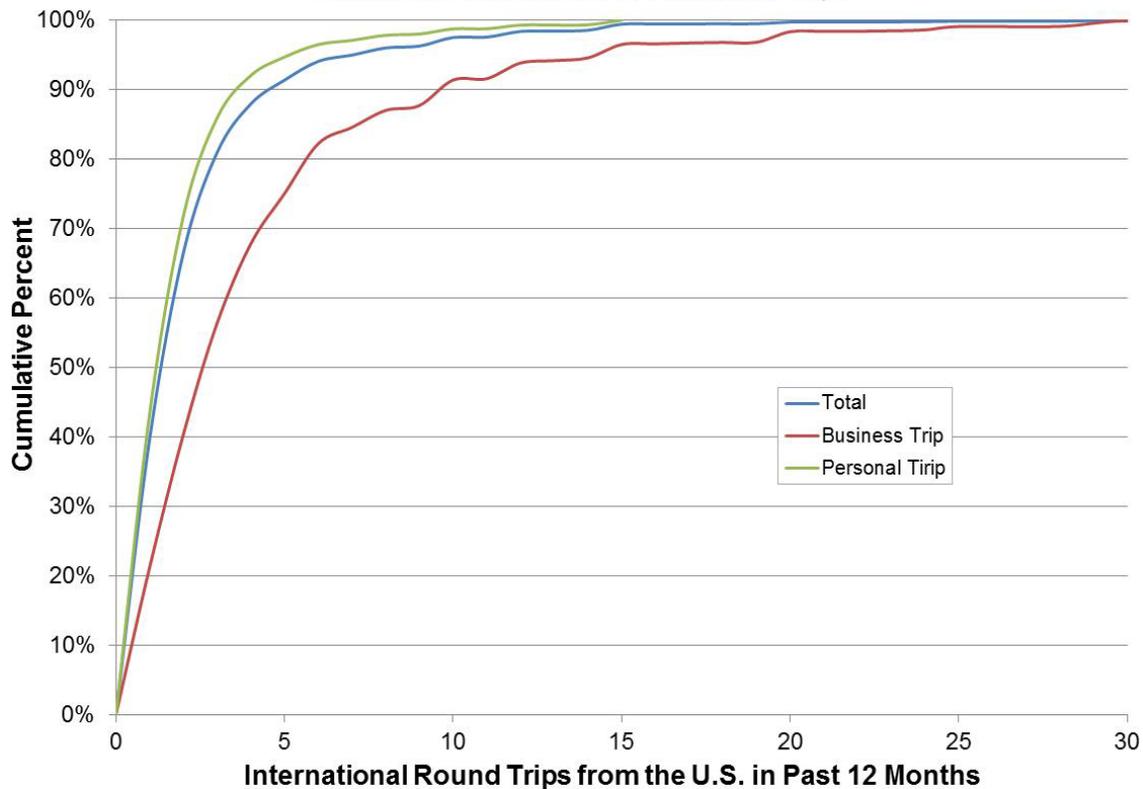


Figure C-31. Cumulative Distribution of International Air Trips by U.S. Residents in Past 12 Months (2015 SIAT)

At the other end of the distribution, 21% of those on a business trip and 43% of those on a personal trip reported only one trip in the past year. In other words, this was the first international air trip they had made in the past year. Of those on a business trip, 5% stated that this was the first international air trip they had ever taken from the U.S., while 8% of those on a personal trip stated that this was the first international air trip they had ever taken.

The following analysis explores how international air travel propensity (in terms of international air trips per year) varies with socioeconomic factors, including household income, age, gender, and ethnicity/race.

In interpreting the results presented in the following tables, caution should be exercised in drawing conclusions from relatively small differences in percentages or air travel propensity that may in fact be due to the limited number of responses that generated the values for the relevant cells of the table. All percentages shown in the tables have been expressed to one decimal place for consistency, although the decimal place may not be statistically significant. Similarly, average annual trips have been shown to two decimal places, whether or not the second decimal place is statistically significant.

Household Income

Survey respondents stated their annual household income in a free text box on the survey questionnaire, although only 57% of respondents answered this question. The NTTO contractor responsible for the survey then organized the household incomes into ranges for tabulation purposes. However, in order to allow the research team to analyze the household income distribution, the survey contractor provided the individual responses. Examination of these data revealed some implausibly low values under \$10,000 per year, with some under \$1,000 per year. About 1.2% of respondents who reported their income gave an annual income of \$750 or less, while a further 1.8% of respondents who reported their income gave an annual income between \$751 and \$9,999. It seems quite unlikely that anyone with such a low household income would be making an international air trip.

It is of course possible that some respondents gave deliberately spurious answers or misunderstood the question. However, it is also possible that some respondents gave their household income in thousands of dollars, or gave a monthly or weekly income. A comparison of the distribution of reported incomes of \$750 or less with the distribution of reported incomes above \$10,000 suggests that many of those who reported an income of \$750 or less could well have been expressing their annual income in thousands. An explanation for those reporting an income between \$750 and \$10,000 is less clear. Some of these respondents could have been reporting their monthly income while others could have been reporting their weekly income. It is not possible to tell from the survey responses which respondents did which. There is also an issue of potential overlap between respondents who correctly reported a household income between \$10,000 and \$20,000 and much higher income respondents who reported a monthly income in this range. However, it is assumed that the majority of survey responses in this range correctly report their household income. Because of the uncertainty in how to interpret reported annual household incomes below \$10,000, these responses have been excluded from the following analysis. This resulted in omitting about 3% of those reporting an annual household income.

The cumulative distribution of the reported annual household income in total and by the purpose of the surveyed trip is shown in Figure C-32. As with the cumulative distributions for the reported annual international air trips, the steps in the curves show the occurrence of large numbers of respondents who appear to have approximated their income to round numbers, in this case to the nearest \$50,000 or \$100,000. As could be expected, the figure shows that those on business trips reported higher incomes than those on personal trips. About 12% of those on business trips and about 6% of those on personal trips reported an annual household income of \$300,000 or more. Due to the small proportion of survey respondents on business trips, the cumulative distribution curve for those on personal trips is fairly close to that for total trips.

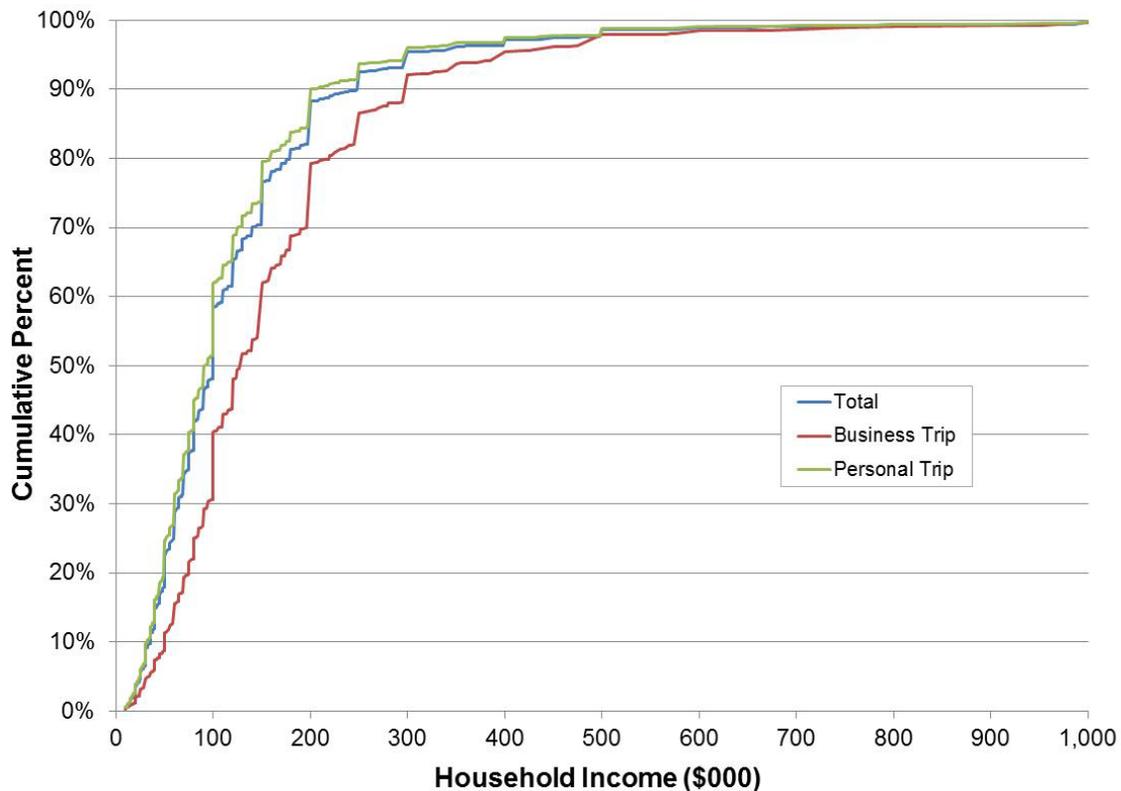


Figure C-32. Cumulative Distribution of Annual Household Income by U.S. Residents on International Air Trips by Trip Purpose (2015 SIAT)

Using the same annual household income categories as those used in the tabulations prepared by the NTTU survey contractor, but omitting survey respondents reporting household incomes below \$10,000, the average number of international air trips per year by household income category are shown in Table C-71 in total and by the purpose of the surveyed trip, together with the percentage of the survey responses in each income category.

As expected the average number of international air trips per year generally increases with household income, although there are some apparent decreases in average air trips with increasing income across income categories, particularly for survey respondents making a personal trip. Although the sample size is quite large (over 14,600 for those making a personal trip) the large number of household income categories reduces the number of survey responses in

each cell, while the high proportion of survey respondents who reported only one international air trip in the past year means that the average number of air trips is heavily influenced by the relatively few respondents who made a large number of air trips. Thus some variability in the pattern is not surprising.

Table C-71. Average International Air Trips in Past 12 Months by U.S. Residents by Annual Household Income and Trip Purpose (2015 SIAT)

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
\$10,000 - \$19,999	2.2%	2.04	1.1%	2.58	2.5%	1.99
\$20,000 - \$39,999	8.8%	2.06	4.6%	2.55	9.7%	1.99
\$40,000 - \$59,999	12.3%	2.15	6.4%	3.23	13.5%	2.03
\$60,000 - \$79,999	12.7%	2.37	9.2%	3.74	13.5%	2.16
\$80,000 - \$99,999	10.4%	2.48	8.7%	4.36	10.8%	2.13
\$100,000 - \$119,999	13.7%	2.73	13.2%	4.37	13.9%	2.37
\$120,000 - \$139,999	7.6%	2.83	8.8%	4.50	7.3%	2.37
\$140,000 - \$159,999	8.3%	3.17	10.2%	5.43	7.9%	2.48
\$160,000 - \$179,999	3.1%	3.10	4.6%	4.68	2.8%	2.51
\$180,000 - \$199,999	2.3%	3.25	3.5%	5.05	2.0%	2.52
\$200,000 - \$219,999	6.8%	3.58	9.4%	6.01	6.2%	2.74
\$220,000 - \$239,999	1.0%	3.73	1.6%	5.42	0.8%	2.88
\$240,000 - \$259,999	3.1%	3.93	5.3%	5.84	2.6%	3.04
\$260,000 - \$279,000	0.5%	3.40	1.1%	4.27	0.3%	2.73
\$280,000 - \$299,999	0.3%	4.60	0.5%	7.29	0.2%	3.00
\$300,000 - \$349,999	2.6%	4.24	4.7%	6.87	2.2%	2.95
\$350,000 - \$399,999	0.8%	4.24	1.4%	6.36	0.6%	3.22
\$400,000 - \$499,999	1.2%	4.45	2.3%	5.85	1.0%	3.71
\$500,000 - \$599,999	1.1%	4.67	1.6%	7.45	1.0%	3.66
\$600,000 and over	1.3%	4.37	1.8%	6.07	1.1%	3.79
Total	100%	2.67 (1)	100%	4.62 (1)	100%	2.27 (1)
Valid responses	18,274		3,366		14,657	

Note: 1) Average annual trips include respondents who did not indicate their household income or reported household incomes below \$10,000.

Also as expected, for any given income category those survey respondents who were making a business trip had a higher average number of international air trips in the past year than those making a personal trip. The fact that the average number of air trips for those making a business trip who reported an annual household income of \$10,000 to \$20,000 was slightly higher than for those reporting a household income of \$20,000 to \$40,000 suggests that the survey respondents in the lower category may have included a number of respondents who gave their monthly income or otherwise misreported their income and should have been counted in a higher category.

Although the data in Table C-71 show that international air travel propensity (average annual air trips) tends to increase with household income, as would be expected, the effect is not particularly strong. Those in the highest income category only make just over twice the number of international air trips per year as those in the lowest income category (somewhat over twice

for those making a business trip and just under twice for those making a personal trip), although their income is more than 30 times greater. Even so, the average number of international air trips per year for those in the higher income categories is remarkably high. For survey respondents making a personal trip with a household income of \$200,000 or more the average number of international air trips per year ranged from 2.73 to 3.79 across the income categories. For those survey respondents making a business trip with a household income of \$200,000 or more the average number of international air trips per year ranged from 4.27 to 7.45 across the income categories, with the average for all categories except one above 5.4. Given that a significant number of survey respondents only made one trip, this implies that there were a large number of survey respondents in each category who made many international air trips in the year.

The average number of international air trips shown in Table C-71 includes individual trips reported by those who were making their first international air trip. The percentage of survey respondents who were making their first international air trip varied by income category, as shown in Table C-72.

Table C-72. Percentage of First International Air Trip by U.S. Residents by Annual Household Income and Trip Purpose (2015 SIAT)

Household Income	Total		Business Trip		Personal Trip	
	Percent First Trip	Average Annual Trips (Not First)	Percent First Trip	Average Annual Trips (Not First)	Percent First Trip	Average Annual Trips (Not First)
\$10,000 - \$19,999	13.4%	2.21	13.2%	2.82	13.6%	2.15
\$20,000 - \$39,999	10.7%	2.19	11.7%	2.75	10.4%	2.11
\$40,000 - \$59,999	11.0%	2.29	11.2%	3.51	11.0%	2.15
\$60,000 - \$79,999	8.3%	2.49	7.1%	3.95	8.4%	2.26
\$80,000 - \$99,999	7.5%	2.60	4.8%	4.53	7.9%	2.23
\$100,000 - \$119,999	5.8%	2.84	4.5%	4.53	5.9%	2.46
\$120,000 - \$139,999	5.2%	2.93	3.4%	4.62	5.5%	2.45
\$140,000 - \$159,999	4.4%	3.27	3.2%	5.57	4.7%	2.55
\$160,000 - \$179,999	4.5%	3.20	5.2%	4.88	4.4%	2.58
\$180,000 - \$199,999	3.8%	3.34	1.7%	5.12	4.7%	2.59
\$200,000 - \$219,999	3.0%	3.66	1.6%	6.09	3.5%	2.80
\$220,000 - \$239,999	2.3%	3.79	1.8%	5.50	2.6%	2.93
\$240,000 - \$259,999	1.2%	3.96	1.1%	5.90	1.3%	3.07
\$260,000 - \$279,000	1.2%	3.42	0%	4.27	2.1%	2.77
\$280,000 - \$299,999	0%	4.60	0%	7.29	0%	3.00
\$300,000 - \$349,999	2.3%	4.31	1.3%	6.94	2.8%	3.01
\$350,000 - \$399,999	2.1%	4.31	2.1%	6.48	2.1%	3.27
\$400,000 - \$499,999	2.2%	4.53	1.3%	5.91	2.7%	3.79
\$500,000 - \$599,999	1.9%	4.74	0%	7.45	2.6%	3.73
\$600,000 and over	3.5%	4.50	1.7%	6.15	4.2%	3.91
Total (1)	7.8%	2.81	5.1%	4.82	8.2%	2.39
Total responses (2)	28,484		4,732		23,284	

Notes: 1) Percent of first trips and average annual trips include respondents who did not indicate their household income or reported household incomes below \$10,000.

2) Survey respondents who reported their number of international air trips in the past 12 months.

As could be expected, the percentage of survey respondents making their first international air trip declined with increasing income and was lower for those making a business trip than for those making a personal trip. Above an annual household income of \$200,000 the percentage appears fairly stable, although with considerable fluctuation across income categories, possibly due to the smaller sample size in each category. Surprisingly, the percentage of survey respondents in the highest income category making a personal trip that was their first international air trip is notably higher than for those in other income categories between \$200,000 and \$600,000. Table C-72 also shows the effect on the average number of international air trips per year of excluding those making their first international air trip. Naturally, this gave a higher number of average international trips per year in each income category for each trip purpose, although the increase is somewhat lower for those making a business trip with an income above \$60,000, reflecting the lower percentage of respondents who were making their first international air trip.

The table also suggests that the percentage of survey respondents with incomes between \$20,000 and \$60,000 who were making their first international air trip was slightly higher for those making a business trip than those making a personal trip. This could reflect more junior (and therefore lower income) personnel making their first overseas business trip, although the differences could also be influenced by the relatively small number of survey respondents in these income ranges who were making business trips.

Other Socioeconomic Factors

The average number of international air trips per year varies somewhat with age for those making a business trip, with the highest average number of trips being made by survey respondents in the age range from 55 to 59. The average number of international air trips per year for survey respondents making a business trip increases strongly with age range from those 18 to 24 to those 40 to 44, then remains fairly constant to age range 60 to 64. After age 65, the average number of international air trips per year shows a declining trend with age. There was only one survey respondent aged over 85 who was making a business trip, although he reported making 25 trips in the past year. However, this clearly is not a representative level of international air trips for someone of that age.

Table C-73 shows the percentage of survey respondents in each age range and their average number of international air trips per year by the purpose of the surveyed trip. It can be seen from the table that those making a business trip are somewhat older than those making a personal trip. Indeed, the age range with the largest percentage of survey respondents making a personal trip is from 18 to 24, while the age range from 25 to 29 has the next largest percentage of those making a personal trip. In contrast, the age range with the largest percentage of survey respondents making a business trip is from 50 to 54. Not surprisingly, a relatively small percentage of survey respondents making a business trip (6%) were age 65 or over, while a much larger percentage (14%) of those making a personal trip were age 65 or over.

The average number of international air trips per year varies somewhat with age for those making a business trip, with the highest average number of trips being made by survey respondents in the age range from 55 to 59. The average number of international air trips per year for survey respondents making a business trip increases strongly with age range from those

18 to 24 to those 40 to 44, then remains fairly constant to age range 60 to 64. After age 65, the average number of international air trips per year shows a declining trend with age. There was only one survey respondent aged over 85 who was making a business trip, although he reported making 25 trips in the past year. However, this clearly is not a representative level of international air trips for someone of that age.

Table C-73. Average International Air Trips in Past 12 Months by U.S. Residents by Age Range and Trip Purpose (2015 SIAT)

Age Range	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	12.6%	1.99	5.0%	2.50	14.0%	1.95
25 - 29	11.1%	2.31	8.8%	3.34	11.5%	2.16
30 - 34	9.9%	2.60	10.6%	4.08	9.8%	2.28
35 - 39	8.5%	2.88	11.5%	4.41	7.8%	2.43
40 - 44	9.1%	3.10	13.3%	5.21	8.2%	2.40
45 - 49	9.4%	3.06	13.3%	5.15	8.6%	2.38
50 - 54	10.5%	3.16	14.5%	5.30	9.7%	2.51
55 - 59	8.4%	3.08	10.2%	5.43	8.0%	2.46
60 - 64	7.9%	2.73	7.1%	5.06	8.1%	2.31
65 - 69	6.5%	2.39	3.3%	3.92	7.3%	2.23
70 - 74	3.8%	2.33	1.7%	3.53	4.2%	2.23
75 - 79	1.7%	2.17	0.5%	3.73	1.9%	2.10
80 - 84	0.5%	2.09	0.1%	2.67	0.6%	2.06
85+	0.1%	2.61	0.0%		0.2%	2.03
Total	100%	2.67 (1)	100%	4.62 (1)	100%	2.27 (1)
Valid responses	27,508		4,617		22,441	

Note: 1) Average annual trips include respondents who did not indicate their age range.

The average number of international air trips per year by survey respondents making a personal trip did not vary much with age, although it increased slightly with age from age range 18 to 24 to age range 35 to 39, then varied between an average of 2.43 air trips per year and 2.51 air trips per year until age range 55 to 59 before declining with age thereafter. Perhaps not surprisingly, survey respondents in the age range from 18 to 24 had the lowest average number of international air trips per year, at 1.95 trips, although those aged 85 or over had only a slightly higher average number of international air trips per year, at 2.03 trips, followed by those in the age range from 80 to 84, at 2.06 trips.

There were significant differences between male and female survey respondents, as shown in Table C-74. It should be noted that the survey asked respondents their gender, not that of other member of their travel party. Slightly more women than men responded to the survey, although slightly more men than women provided their age and the number of international air trips they had taken in the previous 12 months.

A much larger percentage of female survey respondents than men are in the age ranges from 18 to 29, while the age range with the largest percentage of male survey respondents was from 50 to 54. This may well reflect a higher proportion of men among survey respondents

making a business trip, as also indicated by the increasing average number of international air trips per year with age for male survey respondents until the age range from 55 to 59, with a subsequent decline thereafter. The average number of international air trips per year for female survey respondents shows much less variability with age, varying from an average of 2.21 air trips per year to an average of 2.68 for age ranges between 25 and 74, with the average number of international air trips varying between 1.91 and 2.14 for the age ranges over age 74.

Table C-74. Average International Air Trips in Past 12 Months by U.S. Residents by Age Range and Gender (2015 SIAT)

Age Range	Male Respondents		Female Respondents	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	9.7%	1.96	15.7%	2.01
25 - 29	10.2%	2.28	12.1%	2.35
30 - 34	10.4%	2.74	9.5%	2.45
35 - 39	9.3%	3.17	7.7%	2.53
40 - 44	9.6%	3.51	8.5%	2.62
45 - 49	9.9%	3.54	8.8%	2.53
50 - 54	11.0%	3.58	9.9%	2.68
55 - 59	8.9%	3.60	7.8%	2.47
60 - 64	7.9%	3.08	7.9%	2.33
65 - 69	6.6%	2.57	6.5%	2.21
70 - 74	3.9%	2.44	3.7%	2.24
75 - 79	1.9%	2.24	1.4%	2.07
80 - 84	0.6%	2.24	0.4%	1.91
85+	0.2%	2.91	0.1%	2.14
Total	100%	2.97 (1)	100%	2.38 (1)
Valid responses	13,900		13,268	

Note: 1) Average annual trips include respondents who did not indicate their age range.

Survey respondents who were U.S. residents were asked whether they were Hispanic ethnicity or not and to indicate their race using five categories:

- American Indian/Alaska Native
- Asian
- Hawaiian/Pacific Islander
- Black
- White

Respondents were asked to indicate all races that apply. About 80% of the survey respondents answered these two questions. Since multiple responses were possible, the survey responses were recoded into the following categories:

- White
- White and other
- Hispanic (white)

- Hispanic (other)
- Asian
- Black
- American Indian/Alaska Native
- Hawaiian/Pacific Islander
- Multiple races

“Hispanic (other)” comprised any responses that selected Hispanic and gave a race other than white, even if the respondents also selected white. Any non-Hispanic respondent selecting more than one race was classified either as “White and other” (if one of the selected races was white) or as “Multiple races.” Any respondent who selected “Hispanic” but gave no specific race was assumed to be “Hispanic (white).”

Table C-75 shows the percentage of survey respondents who reported the number of international air trips they had taken in the past year in each ethnicity/race category, together with the average number of international air trips per year, the percentage for whom the surveyed trip was their first international air trip ever, and the percentage who were making a business trip. By far the largest percentage of respondents was non-Hispanic white at about 62%, followed by Asian at about 18%. White Hispanic respondents accounted for the third largest percentage at about 12%, with black respondents accounting for about 5% of respondents. All other ethnicity/race categories accounted for less than 2% each.

Table C-75. Average International Air Trips in Past 12 Months by U.S. Residents and Trip Purpose by Ethnicity/Race (2015 SIAT)

Ethnicity/Race	Percent Responses (1)	Average Annual Trips	Percent First Trip	Percent Business Trip (2)
White	61.6%	2.58	7.3%	18.0%
White and other	1.8%	2.84	6.3%	14.0%
Hispanic (white)	11.8%	3.22	7.8%	14.1%
Hispanic (other)	1.4%	2.76	14.3%	13.2%
Asian	17.7%	2.62	6.5%	17.1%
Black	4.6%	2.72	11.3%	12.8%
American Indian/Alaska Native	0.5%	2.59	13.3%	16.8%
Hawaiian/Pacific Islander	0.4%	2.85	6.2%	10.8%
Multiple races	0.2%	1.91	7.4%	11.3%
Total	100%	2.67	7.5%	17.0%
Valid responses	25,173			24,789

Notes: 1) Excludes respondents who did not indicate the number of international air trips in past 12 months.

2) Excludes respondents who did not indicate the number of international air trips in past 12 months or their trip purpose.

White Hispanic respondents had the highest average number of international air trips in the past year at 3.22 trips. This may well reflect frequent visits to family or friends in Latin America, as well as the relative proximity of (and hence lower airfares to) Mexico and Central America, which account for over 24% of all international air trips by U.S. residents. All other

ethnicity/race categories had a similar level of average international air trips per year, varying between 2.58 and 2.85 trips, with the exception of respondents in the “multiple races” category, who reported an average of 1.91 international air trips per year. However, this category only accounted for 0.2% of all responses, so the lower average number of international air trips could be influenced by the relatively small sample size.

The percentage of survey respondents who were making their first international air trip varied widely by ethnicity/race, with Hawaiian/Pacific Islanders having the lowest percentage, followed by non-Hispanic respondents who classified themselves as a combination of white and other races. These respondents also reported a relative high average number of international air trips in the past year (2.85 and 2.85 trips, respectively), both of which could reflect frequent visits to family and friends overseas, particularly for Pacific Islanders.

The percentage of survey respondents who were making a business trip showed less variation with the ethnicity/race of survey respondents, although white respondents had the highest percentage, followed by Asian respondents and American Indian/Alaska Native respondents. Hawaiian/Pacific Islander survey respondents had the lowest percentage of business trips, with black survey respondents having the second lowest percentage. This may reflect a combination of visits to family or friends overseas and differences in occupation.

These aspects could be explored further in future research.

Analysis of 2010 SIAT Data

The average numbers of international air trips per year by household income category reported by respondents to the 2010 survey are shown in poses in each income category. As expected the average number of international air trips per year increases with annual household income. Also as expected, for any given income category those survey respondents who were making a business trip had a higher average number of international air trips in the past year than those making a personal trip.

As noted in the analysis of the 2015 survey, although the data in Table C-76 show that international air travel propensity (average annual air trips) tends to increase with household income, as would be expected, the effect is not particularly strong. Those in the highest income range only make a little over twice the number of international air trips per year as those in the income range from \$20,000 to \$40,000 (slightly more for those making a business trip and well under twice for those making a personal trip), although their income is more than ten times greater. Even so, the average number of international air trips per year for those in the higher income categories is remarkably high. For survey respondents making a personal trip with a household income of \$200,000 or more the average number of international air trips per year was about 2.7. For those survey respondents making a business trip with a household income of \$200,000 or more the average number of international air trips per year was more than twice that at about 5.6. Given that a significant number of survey respondents only made one trip, this implies that there were a large number of survey respondents in each category who made many international air trips in the year.

Table C-76 in total and by the purpose of the surveyed trip, together with the percentage of the survey responses in each income category. As expected the average number of international air trips per year increases with annual household income. Also as expected, for any given income category those survey respondents who were making a business trip had a higher average number of international air trips in the past year than those making a personal trip.

As noted in the analysis of the 2015 survey, although the data in Table C-76 show that international air travel propensity (average annual air trips) tends to increase with household income, as would be expected, the effect is not particularly strong. Those in the highest income range only make a little over twice the number of international air trips per year as those in the income range from \$20,000 to \$40,000 (slightly more for those making a business trip and well under twice for those making a personal trip), although their income is more than ten times greater. Even so, the average number of international air trips per year for those in the higher income categories is remarkably high. For survey respondents making a personal trip with a household income of \$200,000 or more the average number of international air trips per year was about 2.7. For those survey respondents making a business trip with a household income of \$200,000 or more the average number of international air trips per year was more than twice that at about 5.6. Given that a significant number of survey respondents only made one trip, this implies that there were a large number of survey respondents in each category who made many international air trips in the year.

Table C-76. Average International Air Trips in Past 12 Months by U.S. Residents by Annual Household Income and Trip Purpose (2010 SIAT)

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$20,000	5.8%	1.62	2.2%	2.28	7.0%	1.56
\$20,000 - \$39,999	8.3%	1.74	3.8%	2.43	9.7%	1.66
\$40,000 - \$59,999	11.3%	1.92	6.4%	2.97	12.9%	1.75
\$60,000 - \$79,999	11.9%	2.01	7.7%	3.13	13.3%	1.80
\$80,000 - \$99,999	11.5%	2.16	10.1%	3.35	11.9%	1.85
\$100,000 - \$119,999	11.7%	2.35	11.6%	3.88	11.8%	1.88
\$120,000 - \$139,999	7.7%	2.61	9.4%	3.92	7.2%	2.07
\$140,000 - \$159,999	6.0%	2.82	8.2%	4.34	5.3%	2.08
\$160,000 - \$179,999	4.2%	2.95	6.2%	4.39	3.5%	2.15
\$180,000 - \$199,999	3.4%	3.12	4.8%	4.69	3.0%	2.30
\$200,000 or more	18.1%	3.85	29.5%	5.63	14.5%	2.70
Total	100%	2.45 (1)	100%	4.18 (1)	100%	1.94 (1)
Valid responses	22,980		5,518		17,403	

Note: 1) Average annual trips include respondents who did not indicate their household income.

The average numbers of international air trips shown in Table C-76 include individual trips reported by those who were making their first international air trip.

Table C-77. Percentage of First International Air Trip by U.S. Residents by Annual Household Income and Trip Purpose (2010 SIAT)

Household Income	Total		Business Trip		Personal Trip	
	Percent First Trip	Average Annual Trips (Not First)	Percent First Trip	Average Annual Trips (Not First)	Percent First Trip	Average Annual Trips (Not First)
Under \$20,000	15.3%	1.74	15.4%	2.38	15.8%	1.67
\$20,000 - \$39,999	11.4%	1.83	10.5%	2.49	12.4%	1.75
\$40,000 - \$59,999	9.6%	2.02	8.3%	3.05	10.5%	1.84
\$60,000 - \$79,999	6.7%	2.08	6.5%	3.29	6.6%	1.86
\$80,000 - \$99,999	7.2%	2.25	6.3%	3.47	7.7%	1.92
\$100,000 - \$119,999	5.0%	2.42	4.8%	4.00	5.4%	1.93
\$120,000 - \$139,999	4.6%	2.69	4.1%	4.03	5.1%	2.13
\$140,000 - \$159,999	4.8%	2.91	3.7%	4.45	5.5%	2.14
\$160,000 - \$179,999	3.2%	3.02	2.5%	4.48	3.6%	2.19
\$180,000 - \$199,999	2.3%	3.17	1.8%	4.76	2.5%	2.33
\$200,000 or more	2.4%	3.92	1.9%	5.70	3.1%	2.76
Total (1)	6.6%	2.55	5.5%	4.29	7.5%	2.02
Total responses (2)	26,521		6,079		20,356	

Notes: 1) Percent of first trips and average annual trips include respondents who did not indicate their household income.
2) Survey respondents who reported their number of international air trips in the past 12 months.

The percentage of survey respondents who were making their first international air trip varied by income category, as shown in Table C-77. As could be expected, the percentage of survey respondents making their first international air trip generally declined with increasing income and was lower for those making a business trip than for those making a personal trip. Surprisingly, the percentage of survey respondents from households with incomes of \$200,000 or more making their first international air trip was notably higher than for those from households in the preceding income range of \$180,000 to \$200,000.

Table C-77 also shows the effect on the average number of international air trips per year of excluding those making their first international air trip. Naturally, this gave a higher number of average international trips per year in each income category for each trip purpose, with the increase tending to decline with household income for respondents making a personal trip although not showing any obvious trend with respect to income for respondents making a business trip, in contrast to the pattern found in the 2005 survey. The table also shows that the percentage of survey respondents with incomes below \$20,000 who were making their first international air trip was significantly higher for those with higher incomes, as might be expected.

Table C-78 shows the percentage of survey respondents in each age range and their average number of international air trips per year by the purpose of the surveyed trip. It can be seen from the table that those making a business trip have a much higher proportion between age 30 and 60 than those making a personal trip, with a much lower proportion in the age ranges below 30. Not surprisingly, a relatively small percentage of survey respondents making a business trip (5%) were age 65 or over, while a much larger percentage (13%) of those making a personal trip were age 65 or over.

Table C-78. Average International Air Trips in Past 12 Months by U.S. Residents by Age Range and Trip Purpose (2010 SIAT)

Age Range	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	9.7%	1.66	3.2%	2.44	11.5%	1.60
25 - 29	9.6%	2.03	7.2%	3.18	10.3%	1.82
30 - 34	9.2%	2.42	9.8%	3.95	9.0%	1.96
35 - 39	9.2%	2.69	11.0%	4.56	8.8%	2.05
40 - 44	10.8%	2.73	14.5%	4.35	9.8%	2.07
45 - 49	10.8%	2.89	14.1%	4.77	9.9%	2.16
50 - 54	11.0%	2.95	15.7%	4.67	9.7%	2.21
55 - 59	9.6%	2.77	12.0%	4.60	8.8%	2.11
60 - 64	8.6%	2.36	7.1%	4.02	9.0%	2.01
65 - 69	5.9%	2.35	3.1%	5.34	6.6%	1.97
70 - 74	3.3%	2.23	1.6%	4.33	3.8%	2.01
75 - 79	1.4%	1.87	0.4%	3.58	1.7%	1.75
80 - 84	0.7%	1.75	0.2%	2.00	0.8%	1.73
85+	0.2%	1.89	0.1%	1.67	0.2%	1.92
Total	100%	2.45 (1)	100%	4.18 (1)	100%	1.94 (1)
Valid responses	12,925		2,752		10,127	

Note: 1) Average annual trips include respondents who did not indicate their age range.

The average number of international air trips per year varies somewhat with age for those making a business trip, with the highest average number of trips being made by survey respondents in the age range from 45 to 49. The average number of international air trips per year for survey respondents making a business trip increases strongly with age range from those 18 to 24 to those 35 to 39, then fluctuates between 4.0 and 5.3 air trips per year to age range 65 to 69. After age 70, the average number of international air trips per year declines steadily with increasing age.

The average number of international air trips per year by survey respondents making a personal trip did not vary as much with age, although it increased with age from age range 18 to 24 to age range 50 to 54, then generally declined with age until age range 80 to 84. The average number of air trips per year increased somewhat for those aged 85 or over, although this a result of one respondent who reported making ten trips in the previous year.

There were significant differences between male and female survey respondents, as shown in Table C-79. As noted for the 2015 survey, the survey asked respondents their gender, not that of other member of their travel party. Somewhat fewer women than men responded to the survey, in contrast to the 2015 survey, although a slightly higher percentage of men (39%) than women (38%) provided their age and the number of international air trips they had taken in the previous 12 months. However, this was a much lower proportion in both cases than found in the 2005 survey, as discussed below. It is not clear why so many survey respondents failed to provide their age or the number of international air trips they had taken in the previous 12 months.

Table C-79. Average International Air Trips in Past 12 Months by U.S. Residents by Age Range and Gender (2010 SIAT)

Age Range	Male Respondents		Female Respondents	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	7.5%	1.66	12.8%	1.65
25 - 29	8.5%	2.16	11.2%	1.94
30 - 34	8.3%	2.82	10.2%	2.02
35 - 39	9.9%	3.12	8.6%	2.19
40 - 44	11.8%	3.07	9.5%	2.22
45 - 49	11.6%	3.38	9.8%	2.20
50 - 54	11.9%	3.46	9.9%	2.24
55 - 59	10.0%	3.29	9.1%	2.14
60 - 64	8.7%	2.70	8.4%	1.98
65 - 69	5.9%	2.73	5.5%	1.89
70 - 74	3.4%	2.21	3.0%	1.98
75 - 79	1.5%	1.85	1.1%	1.80
80 - 84	0.7%	1.76	0.5%	1.37
85+	0.2%	2.38	0.2%	1.30
Total	100%	2.83 (1)	100%	2.02 (1)
Valid responses	6,828		5,613	

Note: 1) Average annual trips include respondents who did not indicate their age range.

A much larger percentage of female survey respondents than men are in the age ranges from 18 to 34, while the age range with the largest percentage of male survey respondents was from 50 to 54. This may well reflect a higher proportion of men among survey respondents making a business trip, as also indicated by the increasing average number of international air trips per year with age for male survey respondents until that age range, with a decline thereafter. The average number of international air trips per year for female survey respondents shows much less variability with age than for male respondents, varying between 1.89 and 2.24 air trips per year for age ranges between 25 and 74, then declining from 1.80 to 1.30 for the age ranges from 75 to 85 and over. For both male and female survey respondents the average number of international air trips per year for survey respondents age 18 to 24 was the lowest of all the age ranges, except for female survey respondents age 85 or over.

Analysis of 2005 SIAT Data

The average numbers of international air trips per year reported by respondents to the 2005 survey by household income category are shown in Table C-80 in total and by the purpose of the surveyed trip, together with the percentage of the survey responses in each income category.

As expected the average number of international air trips per year generally increases with annual household income, although there is an apparent decrease in average air trips by respondents making a business trip with a household income in the range from \$180,000 to \$200,000 compared to respondents in the preceding income range from \$160,000 to \$180,000. However, given the general trend in the increase in average air trips with increasing income in

the preceding income ranges below \$160,000, it may be that the average number of air trips for the income range from \$160,000 to \$180,000 is over-stated.

Table C-80. Average International Air Trips in Past 12 Months by U.S. Residents by Annual Household Income and Trip Purpose (2005 SIAT)

Household Income	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
Under \$20,000	3.7%	1.73	1.0%	2.66	4.9%	1.65
\$20,000 - \$39,999	7.4%	1.75	2.6%	2.33	9.5%	1.68
\$40,000 - \$59,999	11.4%	2.02	5.4%	3.34	14.1%	1.79
\$60,000 - \$79,999	12.3%	2.21	8.2%	3.60	14.1%	1.85
\$80,000 - \$99,999	11.8%	2.49	10.1%	4.00	12.6%	1.96
\$100,000 - \$119,999	11.6%	2.70	12.2%	4.08	11.4%	2.05
\$120,000 - \$139,999	8.2%	3.24	10.5%	4.93	7.2%	2.15
\$140,000 - \$159,999	6.4%	3.39	8.9%	4.96	5.3%	2.22
\$160,000 - \$179,999	4.3%	3.80	5.8%	5.80	3.6%	2.37
\$180,000 - \$199,999	3.3%	3.85	4.9%	5.37	2.5%	2.55
\$200,000 or more	19.6%	4.52	30.4%	6.31	14.9%	2.91
Total	100%	2.90 (1)	100%	4.87 (1)	100%	2.06 (1)
Valid responses	21,584		6,591		14,938	

Note: 1) Average annual trips include respondents who did not indicate their household income.

As was noted in the Interim Project Report, the high proportion of survey respondents who reported only one international air trip in the past year means that the average number of air trips is heavily influenced by the relatively few respondents who made a large number of air trips. Thus, some variability in the pattern is not surprising.

Also as expected, for any given income category those survey respondents who were making a business trip had a higher average number of international air trips in the past year than those making a personal trip. The fact that the average number of air trips for those making a business trip who reported an annual household income below \$20,000 was somewhat higher than for those reporting a household income of \$20,000 to \$40,000 suggests that the survey respondents in the lower category may have included a number of respondents who gave their monthly income or otherwise misreported their income and should have been counted in a higher category.

As noted in the analysis of the 2005 and 2015 surveys, although the data in Table C-80 show that international air travel propensity (average annual air trips) tends to increase with household income, as would be expected, the effect is not particularly strong. Those in the highest income range only make a little over two and half times the number of international air trips per year as those in the income range from \$20,000 to \$40,000 (slightly more for those making a business trip and well under twice for those making a personal trip), although their income is more than ten times greater. Even so, the average number of international air trips per year for those in the higher income categories is remarkably high. For survey respondents making a personal trip with a household income of \$200,000 or more the average number of international air trips per year was about 2.9. For those survey respondents making a business

trip with a household income of \$200,000 or more the average number of international air trips per year was more than twice that at about 6.3. Given that a significant number of survey respondents only made one trip, this implies that there were a large number of survey respondents in each category who made many international air trips in the year.

The average numbers of international air trips shown in Table C-80 include individual trips reported by those who were making their first international air trip. The percentage of survey respondents who were making their first international air trip varied by income category, as shown in Table C-81. As could be expected, the percentage of survey respondents making their first international air trip generally declined with increasing income and was generally lower for those making a business trip than for those making a personal trip, except for respondents with household incomes below \$20,000. Surprisingly, the percentage of survey respondents from households in the income range from \$180,000 to \$200,000 making their first international air trip was notably higher than for those from households in the income ranges above and below this range.

The table also suggests that the percentage of survey respondents with incomes below \$20,000 who were making their first international air trip was slightly higher for those making a business trip than those making a personal trip. This could reflect more junior (and therefore lower income) personnel making their first overseas business trip, although the differences could also be influenced by the relatively small number of survey respondents in this income range who were making business trips.

Table C-81 also shows the effect on the average number of international air trips per year of excluding those making their first international air trip. Naturally, this gave a higher number of average international trips per year in each income category for each trip purpose, with the increase generally declining with household income until the household income range of \$160,000 to \$180,000 for respondents making a business trip and \$140,000 to \$160,000 for those making a personal trip. Above these ranges the increase varied with no apparent pattern. The increase was generally greater for respondents making a business trip, reflecting the higher numbers of international air trips in the previous year reported by those making a business trip.

The table also suggests that the percentage of survey respondents with incomes below \$20,000 who were making their first international air trip was slightly higher for those making a business trip than those making a personal trip. This could reflect more junior (and therefore lower income) personnel making their first overseas business trip, although the differences could also be influenced by the relatively small number of survey respondents in this income range who were making business trips.

Table C-81. Percentage of First International Air Trip by U.S. Residents by Annual Household Income and Trip Purpose (2005 SIAT)

Household Income	Total		Business Trip		Personal Trip	
	Percent First Trip	Average Annual Trips (Not First)	Percent First Trip	Average Annual Trips (Not First)	Percent First Trip	Average Annual Trips (Not First)
Under \$20,000	12.3%	1.83	12.5%	2.89	12.3%	1.74
\$20,000 - \$39,999	10.9%	1.84	9.9%	2.48	11.0%	1.76
\$40,000 - \$59,999	8.1%	2.11	6.4%	3.50	8.4%	1.86
\$60,000 - \$79,999	6.5%	2.29	3.5%	3.70	7.2%	1.91
\$80,000 - \$99,999	5.9%	2.59	4.2%	4.13	6.5%	2.03
\$100,000 - \$119,999	5.4%	2.80	3.0%	4.18	6.5%	2.12
\$120,000 - \$139,999	3.6%	3.32	1.9%	5.01	4.7%	2.21
\$140,000 - \$159,999	3.1%	3.47	1.7%	5.03	4.1%	2.27
\$160,000 - \$179,999	2.7%	3.87	0.8%	5.84	4.1%	2.43
\$180,000 - \$199,999	3.4%	3.95	1.9%	5.46	4.8%	2.63
\$200,000 or more	1.4%	4.57	0.8%	6.35	2.0%	2.95
Total (1)	5.5%	3.01	2.6%	4.97	6.7%	2.14
Total responses (2)	24,027		7,162		16,801	

Notes: 1) Percent of first trips and average annual trips include respondents who did not indicate their household income.
 2) Survey respondents who reported their number of international air trips in the past 12 months.

Table C-82 shows the percentage of survey respondents in each age range and their average number of international air trips per year by the purpose of the surveyed trip. It can be seen from the table that those making a business trip have a much higher proportion between age 35 and 60 than those making a personal trip, with a much lower proportion in the age ranges below 35. Not surprisingly, a relatively small percentage of survey respondents making a business trip (4%) were age 65 or over, while a much larger percentage (12%) or those making a personal trip were age 65 or over.

The average number of international air trips per year varies somewhat with age for those making a business trip, with the highest average number of trips being made by survey respondents in the age range from 45 to 49. The average number of international air trips per year for survey respondents making a business trip increases strongly with age range from those 18 to 24 to those 40 to 44, then remains fairly constant to age range 55 to 59. After age 60, the average number of international air trips per year drops and remains fairly constant to age 70 then generally shows a declining trend with age with quite a bit of fluctuation due to the limited number of respondents making a business trip in these age ranges. There were only two survey respondents who were making a business trip and gave their age as 85 or over.

The average number of international air trips per year by survey respondents making a personal trip did not vary much with age, although it increased slightly with age from age range 18 to 24 to age range 35 to 39, then varied between an average of 2.13 air trips per year and 2.28 air trips per year until age range 60 to 64 before declining with age thereafter.

Table C-82. Average International Air Trips in Past 12 Months by U.S. Residents by Age Range and Trip Purpose (2005 SIAT)

Age Range	Total		Business Trip		Personal Trip	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	6.7%	1.72	1.5%	2.62	9.0%	1.66
25 - 29	8.1%	2.17	4.8%	3.59	9.5%	1.86
30 - 34	9.6%	2.72	8.9%	4.41	9.9%	2.06
35 - 39	10.8%	3.08	13.0%	4.63	9.8%	2.19
40 - 44	12.5%	3.31	16.3%	5.05	10.8%	2.17
45 - 49	12.5%	3.59	17.4%	5.53	10.3%	2.18
50 - 54	12.2%	3.35	15.5%	5.07	10.8%	2.28
55 - 59	10.6%	3.17	12.2%	5.11	9.9%	2.13
60 - 64	7.4%	2.84	6.2%	4.85	7.9%	2.16
65 - 69	4.9%	2.50	2.7%	4.86	5.9%	2.03
70 - 74	2.8%	2.17	0.9%	3.98	3.6%	1.96
75 - 79	1.4%	2.04	0.4%	4.42	1.9%	1.84
80 - 84	0.4%	1.92	0.1%	3.40	0.6%	1.85
85+	0.1%	2.53	0.0%	4.00	0.1%	2.33
Total	100%	2.90 (1)	100%	4.87 (1)	100%	2.06 (1)
Valid responses	22,972		6,930		15,986	

Note: 1) Average annual trips include respondents who did not indicate their age range.

Perhaps not surprisingly, survey respondents in the age range from 18 to 24 had the lowest average number of international air trips per year, at 1.66 trips. Those aged 85 or over had the highest average number of international air trips per year, at 2.33 trips, although there were only 15 such respondents in the survey who gave their trip purpose and the number of international air trips in the previous 12 months.

There were significant differences between male and female survey respondents, as shown in Table C-83. It should be noted that the survey asked respondents their gender, not that of other member of their travel party. Significantly fewer women than men responded to the survey, in contrast to the 2015 survey, although a slightly higher percentage of men (86%) than women (82%) provided their age and the number of international air trips they had taken in the previous 12 months.

A much larger percentage of female survey respondents than men are in the age ranges from 18 to 34, while the age range with the largest percentage of male survey respondents was from 45 to 49. This may well reflect a higher proportion of men among survey respondents making a business trip, as also indicated by the increasing average number of international air trips per year with age for male survey respondents until that age range, with a decline thereafter. The average number of international air trips per year for female survey respondents shows much less variability with age than for male respondents, varying from an average of 2.06 air trips per year to an average of 2.54 for age ranges between 25 and 64, with the average number of international air trips varying declining from 1.97 to 1.68 for the age ranges between 65 and 84. There were only four female survey respondents who gave their age as 85 or over and reported the number of international air trips they had taken in the previous 12 months (the current trip was the first in each case).

Table C-83. Average International Air Trips in Past 12 Months by U.S. Residents by Age Range and Gender (2005 SIAT)

Age Range	Male Respondents		Female Respondents	
	Percent Responses	Average Annual Trips	Percent Responses	Average Annual Trips
18 - 24	4.9%	1.82	9.7%	1.65
25 - 29	6.7%	2.27	10.2%	2.06
30 - 34	9.2%	3.04	10.3%	2.27
35 - 39	11.0%	3.42	10.3%	2.54
40 - 44	13.4%	3.75	11.1%	2.46
45 - 49	13.5%	4.20	10.9%	2.39
50 - 54	12.7%	3.90	11.5%	2.45
55 - 59	10.8%	3.69	10.2%	2.32
60 - 64	7.6%	3.26	7.0%	2.16
65 - 69	5.1%	2.83	4.6%	1.97
70 - 74	2.9%	2.34	2.5%	1.87
75 - 79	1.6%	2.11	1.2%	1.90
80 - 84	0.4%	2.08	0.4%	1.68
85+	0.1%	3.00	0.0%	1.00
Total	100%	3.36 (1)	100%	2.23 (1)
Valid responses	13,874		8,812	

Note: 1) Average annual trips include respondents who did not indicate their age range.

Summary of Survey Analysis Findings

The surveys for the three years over a ten-year period showed broadly similar patterns in each year, as shown in Table C-84. The overall average number of international air trips per year declined from 2005 to 2010, then recovered by 2015 to a level somewhat below that in 2005. Although the decline from 2005 to 2010 and the recovery from 2010 to 2015 occurred in all household income ranges, the change from 2005 to 2015 differed between the income ranges, with the average number of air trips increasing from 2005 to 2015 for survey respondents from households with incomes below \$120,000 per year (apart from a small decrease for respondents from households with incomes between \$80,000 and \$100,000 per year), but decreasing significantly for respondents from households with incomes above \$120,000 per year.

Of course, the reported household incomes are expressed in current dollars and the same income ranges were used for each of the surveys. Therefore, if expressed in constant dollars, the income ranges would change over time. Nonetheless, the distribution of survey responses by household income shown in Table C-84 does not appear to have changed significantly between the three surveys. The percentage of respondents reporting annual household incomes under \$20,000 in the 2015 survey excluded those reporting incomes under \$10,000, as discussed above, so it is to be expected that this percentage would be lower than for 2005 and 2010 (and the percentages for other income ranges correspondingly higher, although the effect in each income range would be relatively small). The percentage of survey respondents who reported a

household income of \$160,000 or more declined from about 27% in 2005 to about 24% in 2015. This is somewhat surprising, given the recent trends in household income distribution in the U.S. and the increase in household incomes in current dollars that occurred from 2005 to 2015, the 2007 recession notwithstanding.

Table C-84. Average International Air Trips in Past 12 Months by U.S. Residents by Annual Household Income – Changes from 2005 to 2015

Household Income	Average Annual Trips			Percent Responses		
	2005s	2010	2015	2005s	2010	2015
Under \$20,000	1.73	1.62	2.04	3.7%	5.8%	2.2%
\$20,000 - \$39,999	1.75	1.74	2.06	7.4%	8.3%	8.8%
\$40,000 - \$59,999	2.02	1.92	2.15	11.4%	11.3%	12.3%
\$60,000 - \$79,999	2.21	2.01	2.37	12.3%	11.9%	12.7%
\$80,000 - \$99,999	2.49	2.16	2.48	11.8%	11.5%	10.4%
\$100,000 - \$119,999	2.70	2.35	2.73	11.6%	11.7%	13.7%
\$120,000 - \$139,999	3.24	2.61	2.83	8.2%	7.7%	7.6%
\$140,000 - \$159,999	3.39	2.82	3.17	6.4%	6.0%	8.3%
\$160,000 - \$179,999	3.80	2.95	3.10	4.3%	4.2%	3.1%
\$180,000 - \$199,999	3.85	3.12	3.25	3.3%	3.4%	2.3%
\$200,000 or more	4.52	3.85	3.95	19.6%	18.1%	18.6%
Total	2.90 (1)	2.45 (1)	2.67 (1)	100%	100%	100%
Valid responses				21,584	22,980	18,274

Note: 1) Average annual trips include respondents who did not indicate their household income.

The corresponding data over the three surveys for the average number of international air trips per year by the age of the survey respondent are shown in Table C-85. The data in Table C-85 show a clear trend over the three surveys, with an increasing percentage of survey respondents in the age ranges below 35 and age 60 or over, and a corresponding decline in the percentage of survey respondents in the age ranges between 35 and 59. These findings suggest that there may be a potential interaction between the age of the respondents and their annual household income that influences the average number of international air trips per year that they make.

Table C-85. Average International Air Trips in Past 12 Months by U.S. Residents by Age Range – Changes from 2005 to 2015

Age Range	Average Annual Trips			Percent Responses		
	2005s	2010	2015	2005s	2010	2015
18 - 24	1.72	1.66	1.99	6.7%	9.7%	12.6%
25 - 29	2.17	2.03	2.31	8.1%	9.6%	11.1%
30 - 34	2.72	2.42	2.60	9.6%	9.2%	9.9%
35 - 39	3.08	2.69	2.88	10.8%	9.2%	8.5%
40 - 44	3.31	2.73	3.10	12.5%	10.8%	9.1%
45 - 49	3.59	2.89	3.06	12.5%	10.8%	9.4%
50 - 54	3.35	2.95	3.16	12.2%	11.0%	10.5%
55 - 59	3.17	2.77	3.08	10.6%	9.6%	8.4%
60 - 64	2.84	2.36	2.73	7.4%	8.6%	7.9%
65 - 69	2.50	2.35	2.39	4.9%	5.9%	6.5%
70 - 74	2.17	2.23	2.33	2.8%	3.3%	3.8%
75 - 79	2.04	1.87	2.17	1.4%	1.4%	1.7%
80 - 84	1.92	1.75	2.09	0.4%	0.7%	0.5%
85+	2.53	1.89	2.61	0.1%	0.2%	0.1%
Total	2.90 (1)	2.45 (1)	2.67 (1)	100%	100%	100%
Valid responses				22,972	12,925	27,508

Note: 1) Average annual trips include respondents who did not indicate their age range.

Table C-86 shows the change in the average number of international air trips in the previous 12 months by the purpose of the current trip for the three surveys, as well as trip purpose split.

Table C-86. Average International Air Trips in Past 12 Months by U.S. Residents by Trip Purpose – Changes from 2005 to 2015

Trip Purpose	Average Annual Trips			Percent Responses		
	2005s	2010	2015	2005s	2010	2015
Business	4.87	4.18	4.62	29.9%	23.0%	15.3%
Personal	2.06	1.94	2.27	70.1%	77.0%	84.7%
Total	2.90 (1)	2.45 (1)	2.67 (1)	100%	100%	100%
Valid responses				30,701	37,670	43,997

Note: 1) Average annual trips include respondents who did not indicate their trip purpose.

The average number of air trips per year declined for both purposes from 2005 to 2010 and subsequently increased from 2010 to 2015. However, whereas the average number of air trips by respondents making a business trip in 2015 was lower than in 2005, the average number of air trips by respondents making a personal trip was higher in 2015 than in 2005. The percentage of survey respondents that were making a business trip declined steadily from 2005 to 2015. By 2015, the share of international air trips that were made for business was almost half that in 2005.

Online Surveys of Air Travelers

Online surveys of air travelers are sometimes undertaken in support of research projects or other studies and can provide a complementary perspective to data collected through intercept surveys of air passengers at airports. Although online surveys of air travelers typically collect information on air trips made by respondents, they are really a form of a household survey in that each respondent usually represents one household (or one individual within a household) and the probability of a respondent participating in the survey does not vary with the number of annual air trips made (although this information may be reported in the survey). In contrast, an intercept survey of air passengers conducted at an airport is essentially a survey of air passenger trips, not of individual travelers. Someone who makes ten air trips per year through the airport where the survey is being conducted is ten times more likely to be sampled than someone who only makes one air trip per year through that airport. On the other hand, online surveys may experience problems of self-selection bias, since the respondents to the surveys have agreed to participate (often in return for some inducement or remuneration) and are often recruited using firms that maintain e-mail lists of people who have agreed to participate in a range of surveys on many different topics. Therefore, the responses to such surveys involving air travel need to be carefully analyzed to ensure that the respondents are representative of air travelers in general.

The research has identified three such surveys, one undertaken as part of ACRP Project 03-19 *Passenger Value of Time, Benefit Cost Analysis, and Airport Capital Investment Decisions*, and two more recent surveys that were performed in late 2015 and early 2017 for Airlines for America (A4A).

ACRP Project 03-19 Survey

The Research Team for ACRP Project 03-19 performed a web-based survey in early 2013 of individuals who had made a paid domestic air trip in the prior six months. The survey respondents were recruited from a commercial firm that maintains panels of individuals willing to participate in online surveys and provided details about their most recent trip, including the trip purpose and air party size, as well as the number of air trips they had made in the previous 12 months for business and non-business (personal) purposes. The survey also collected information on various socioeconomic characteristics of the respondents, including personal and household income, gender, age, and household composition.

The distribution of the origins and destinations (O&D) of the most recent domestic air trip reported by survey respondents was compared to the overall pattern of domestic O&D travel and found to be reasonably representative of domestic air travel in general (ACRP, 2015). Although the sample size of the survey was fairly small, 1,171 respondents, the respondents were distributed throughout the U.S. Thus, the survey provides a more representative sample of national air passengers compared to surveys conducted at specific airports, which necessarily involve a large proportion (typically around half) of respondents who live in the region served by the airport. Although the survey respondents were on average older and with higher incomes than the general U.S. population, this may partly reflect the air traveler population, which other surveys have shown to be older and have a higher average income than the population in general. The proportion of the survey respondents who were female (55%) was somewhat higher than the population in general. The extent to which this reflects the domestic air traveler population is

unclear. Although many airport air passenger surveys collect data on the respondent gender, they typically only obtain one response from each air party and thus only report the gender of the person completing the survey or answering the survey questions on behalf of the party. In the case of a family or couple traveling together, it is possible that a male member of the party would be more likely to respond to the survey. Also, the comparison is complicated by the fact that men make more air trips per year on average than women, which would reduce the percentage of female respondents in airport air passenger surveys.

It should be noted that the survey respondents were restricted to adults 18 or older who had made a paid domestic air trip in the previous six months and also excluded anyone who was employed in the airline industry or in marketing or market research (since the primary purpose of the survey was to undertake stated preference choice experiments to estimate air passenger values of travel time and it was felt that survey respondents employed in those sectors might not be able to respond to the stated preference choice questions in an unbiased way). To the extent that those working in those sectors may make more air trips per year than air travelers in general, this would tend to underestimate the amount of air travel covered by the survey. The selection criteria would also have excluded anyone who made an air trip in the past year, but not in the past six months. Since the survey was conducted in two waves between February 20 and April 20, 2013, this would have excluded anyone whose most recent air trip was made in the summer of 2012. The criteria would also have excluded anyone who had made air trips in the past year but those in the past six months were either international trips or were not paid for (*e.g.* travel on a frequent flier program award). Thus the survey respondents may not be fully representative of air travelers in general and the reported number of air trips may underestimate the total amount of air travel. Nonetheless, the detailed information about the number of air trips by the survey respondents in the past year as well as their demographic and socioeconomic characteristics provides a useful opportunity to analyze how air travel propensity varies with these characteristics. In particular, the distinction in the survey between the number of business and non-business air trips in the past year is helpful in understanding how business travel differs from personal travel.

The profile of the survey respondents by age and gender is shown in Table C-87 together with the corresponding percentages for the U.S. population from the 2013 Current Population Survey (US Census Bureau, 2013a).

The age range with the highest percentage of survey respondents was 65 to 74, followed by 55 to 64. Those in the age range 65 to 74 were predominantly male, with most female respondents in the age range 55 to 64. There were relatively few respondents in the age ranges below 35 and these were predominantly female. It can be seen from Table C-87 that the survey respondents are significantly older than the U.S. population, with a much higher percentage in the age ranges from 55 to 74, a slightly lower percentage on the age range 45 to 54, and a significantly lower percentage in the age ranges below 45, particularly for male respondents. A somewhat higher percentage of the survey respondents are female than the U.S. adult population.

Table C-87. Distribution of ACRP 03-19 Survey Respondents by Age and Gender

Age	Total			Male			Female		
	Responses	Percent	U.S. Pop	Responses	Percent	U.S. Pop	Responses	Percent	U.S. Pop
18-24	47	4.0%	11.3%	6	1.1%	11.8%	41	6.4%	10.8%
25-34	102	8.7%	17.9%	17	3.2%	18.5%	85	13.3%	17.4%
35-44	123	10.5%	17.1%	49	9.2%	17.4%	74	11.6%	16.8%
45-54	205	17.5%	18.6%	91	17.1%	18.9%	114	17.9%	18.4%
55-64	308	26.3%	16.5%	138	25.9%	16.3%	170	26.6%	16.7%
65-74	342	29.2%	10.6%	205	38.5%	10.3%	137	21.5%	10.9%
75 or older	44	3.8%	8.0%	27	5.1%	6.8%	17	2.7%	9.0%
Total	1,171	100%	100%	533	100%	100%	638	100%	100%
Percent by gender				45.5%		48.3%	54.5%		51.7%

The distribution of household income of the survey respondents is shown in Table C-88, together with the distribution for all U.S. households in 2013 from the 2014 Current Population Survey (DeNavas-Walt & Proctor, 2014).

The survey respondents have significantly higher incomes than U.S. households in total, with a much smaller percentage having household incomes below \$50,000 and the percentage with household incomes of \$75,000 and higher approximately twice that of U.S. households in total. This partly reflects the higher income distribution of air travelers in general, as shown by numerous air passenger surveys. The distributions shown in Table C-88 show that male survey respondents had somewhat higher household incomes than female respondents, with 54% having household incomes of \$100,000 or more compared to only 39% of female respondents, which is also broadly consistent with the findings of past air passenger surveys.

Table C-88. Distribution of ACRP 03-19 Survey Respondents by Household Income

Household Income	Total			Male		Female	
	Responses	Percent	U.S. H/h	Responses	Percent	Responses	Percent
Under \$10,000	14	1.2%	7.4%	7	1.3%	7	1.1%
\$10,000 - 19,999	16	1.4%	11.2%	4	0.8%	12	1.9%
\$20,000 - 29,999	20	1.7%	11.1%	3	0.6%	17	2.7%
\$30,000 - 39,999	52	4.4%	9.8%	14	2.6%	38	6.0%
\$40,000 - 49,999	63	5.4%	9.0%	19	3.6%	44	6.9%
\$50,000 - 74,999	218	18.6%	17.4%	83	15.6%	135	21.2%
\$75,000 - 99,999	250	21.3%	11.7%	116	21.8%	134	21.0%
\$100,000 - 149,999	282	24.1%	12.6%	142	26.6%	140	21.9%
\$150,000 - 199,999	122	10.4%	5.1%	70	13.1%	52	8.2%
\$200,000 - 249,999	71	6.1%	1.9%	41	7.7%	30	4.7%
\$250,000 or more	63	5.4%	2.7%	34	6.4%	29	4.5%
Total	1,171	100%	100%	533	100%	638	100%

The household composition of survey respondents is shown in Table C-89 together with the corresponding composition for all U.S. households in 2013 from the 2013 Current Population Survey (US Census Bureau, 2013b), the 2011 American Community Survey and the 2012 Current Population Survey (Vespa, Lewis & Kreider, 2013).

A significantly higher percentage of all survey respondents live in two and three-adult households and a significantly lower percentage live in one-adult households than for all U.S. households. A higher percentage of female survey respondents than male respondents live in one and three-adult households, while a lower percentage live in two-adult households.

A far larger percentage of survey respondents live in households with no children under age 18 than for all U.S. households and there is little difference between male and female survey respondents. This most likely reflects the age profile of survey respondents. Of those survey respondents in households with children, male respondents were evenly divided between those living in a household with one child and those with two, whereas a higher percentage of female respondents lived in a household with only one child than those with two. Only 1% of male respondents and 2% of female respondents lived in a household with more than two children, compared to 7% for all U.S. households. This may be a reflection of income differences between survey respondents and U.S. households in general.

The significance of household composition is that not only did survey respondents have higher incomes than U.S. households in general, but with fewer children their disposable incomes per person would be even higher. On the other hand, the higher percentage of two-adult households would tend to result in higher incomes. This points out the importance of considering household composition when relating air travel propensity to household income, although this is typically not asked in air passenger surveys.

**Table C-89. Distribution of ACRP 03-19 Survey Respondents
by Household Composition**

Household Composition	Total			Male		Female	
	Responses	Percent	U.S. H/h	Responses	Percent	Responses	Percent
Adults in household							
1	215	18.4%	36.5%	63	11.8%	152	23.8%
2	789	67.4%	50.0%	400	75.0%	389	61.0%
3	110	9.4%	4.9%	44	8.3%	66	10.3%
4	46	3.9%	4.1%	23	4.3%	23	3.6%
5	8	0.7%	2.4%	2	0.4%	6	0.9%
6	3	0.3%	1.2%	1	0.2%	2	0.3%
7 or more	0		0.7%	0		0	
Total	1,171	100%	100%	533	100%	638	100%
Children in household							
0	1,010	86.3%	67.7%	462	86.7%	548	85.9%
1	82	7.0%	13.8%	33	6.2%	49	7.7%
2	61	5.2%	11.7%	33	6.2%	28	4.4%
3	16	1.4%	4.7%	4	0.8%	12	1.9%
4 or more	2	0.2%	2.1%	1	0.2%	1	0.2%
Total	1,171	100%	100%	533	100%	638	100%

The purpose of the most recent air trip taken by survey respondents is shown in Table C-90 with the six reported purposes reclassified into business and personal trips. Survey respondents provided a short text explanation of “other” purposes and these were reclassified based on the stated purpose and responses to other questions, such as the nature of the trip origin and who paid for the airfare.

Overall, 26% of the trips were taken for business purposes, of which a little less than a third (8% of all trips) were to attend a conference or similar event. Personal trips were fairly evenly split between vacations and visiting friends or relatives. However, this could be influenced by the time of year when the survey was performed. Air trips taken in the previous six months would have included visits to family at Thanksgiving or Christmas, but would not have included any trips taken the previous summer. The low percentage of trips to attend college or school (less than 1%) reflects the age profile of the survey respondents, with only 4% in the age range from 18 to 24.

Table C-90. Purpose of Most Recent Trip Taken by ACRP 03-19 Survey Respondents

Trip Purpose	Total		Male		Female	
	Responses	Percent	Responses	Percent	Responses	Percent
Business	206	17.6%	139	26.1%	67	10.5%
Attend conference	91	7.8%	43	8.1%	48	7.5%
Vacation	386	33.0%	160	30.0%	226	35.4%
Visit friends/relatives	391	33.4%	144	27.0%	247	38.7%
Attend school/college	9	0.8%	3	0.6%	6	0.9%
Other	88	7.5%	44	8.3%	44	6.9%
Total	1,171	100%	533	100%	638	100%
Business	305	26.0%	187	35.1%	118	18.5%
Personal	866	74.0%	346	64.9%	520	81.5%
Total	1,171	100%	533	100%	638	100%

The proportions of trips by different purposes are significantly different for male and female respondents. Only 19% of female respondents made a trip for business purposes, compared to 35% for male respondents, although both male and female respondents made a similar percentage of trips to attend a conference or similar event. Female respondents made slightly more trips to visit friends or relatives than for vacations, whereas the reverse was true for male respondents.

The distribution of the air travel party size is shown in Table C-91, together with the average party size by trip purpose, assuming that parties of 6 or more averaged 10 passengers based on typical air party size distributions from recent air passenger surveys at airports. A similar percentage of male and female survey respondents were traveling alone, but a slightly higher percentage of male respondents were traveling in a two-person party, while a correspondingly higher percentage of female respondents were traveling in larger parties.

Table C-91. Air Travel Party Size for Most Recent Trip Taken by ACRP 03-19 Survey Respondents by Gender

Air Travel Party	Total		Male		Female	
	Responses	Percent	Responses	Percent	Responses	Percent
1	509	43.5%	230	43.2%	279	43.7%
2	504	43.0%	240	45.0%	264	41.4%
3	71	6.1%	25	4.7%	46	7.2%
4	55	4.7%	29	5.4%	26	4.1%
5	11	0.9%	3	0.6%	8	1.3%
6 or more	21	1.8%	6	1.1%	15	2.4%
Total	1,171	100%	533	100%	638	100%
Average air party size						
Business	1.57		1.48		1.70	
Personal	2.01		2.02		2.00	
Total	1.89		1.83		1.94	

The average air party sizes are shown in Table C-91. Table C-91 reports values that are significantly higher than those typically found in air passenger surveys at airports, which generally find a higher percentage of one-person air parties, particularly for business trips. Although the average air party sizes for business and personal trips are both higher than those typically found in airport air passenger surveys, the discrepancy is larger for business trips. The difference may be due to the higher proportion of older respondents in the survey respondents, particularly male respondents, who may be more likely to take a spouse on a business trip than younger air travelers, who are more likely to be single, or with a working spouse or children.

The average number of trips in the past year reported by survey respondents is shown in Table C-92, which reports annual air trips by household income, gender, and trip purpose, together with the estimated number of air passengers in these trips. Because the proportions of business and personal trips in the past year reported by male and female survey respondents differ from the trip purpose proportions in the most recent trip, the average air party sizes for all trips and for all business trips shown in

The average air trips in the past year generally increase with increasing household income, as would be expected, and are generally larger for personal trips than for business trips. The percentages for both business and personal trips by males with household incomes between \$10,000 and \$30,000 have been combined due to the small number of male respondents with incomes in this range. Even so, the number of male survey respondents with household incomes below \$50,000 and the number of female respondents with household incomes below \$30,000 are both fairly small, so the average annual trips for respondents in these income ranges could be distorted by a few respondents who made an atypically large number of trips.

Table C-92 values are slightly smaller than the values shown in Table C-91. It was assumed that the average air party size for business and personal trips by male and female survey respondents were the same as reported for the most recent trip. On this basis, for the trips in the past year reported by the survey respondents the number of air passengers making a business air trip accounted for 41% of all air passengers trips. This percentage is considerably higher than the percentage typically found in air passenger surveys at airports, which is partly due to the larger average air party size for business trips discussed above.

The average air trips in the past year generally increase with increasing household income, as would be expected, and are generally larger for personal trips than for business trips. The percentages for both business and personal trips by males with household incomes between \$10,000 and \$30,000 have been combined due to the small number of male respondents with incomes in this range. Even so, the number of male survey respondents with household incomes below \$50,000 and the number of female respondents with household incomes below \$30,000 are both fairly small, so the average annual trips for respondents in these income ranges could be distorted by a few respondents who made an atypically large number of trips.

Table C-92. Average Air Trips in Past Year by ACRP 03-19 Survey Respondents by Household Income and Gender

Household Income	Total	Business Trips			Personal Trips		
		Total	Male	Female	Total	Male	Female
Under \$10,000	7.2	3.6	4.5	3.0	3.6	3.5	3.6
\$10,000 - 19,999	3.4	1.1	3.5	0.6	2.4	2.5	2.1
\$20,000 - 29,999	3.4	0.8		0.6	2.6		2.8
\$30,000 - 39,999	4.1	1.6	4.0	0.7	2.5	2.3	2.6
\$40,000 - 49,999	4.5	1.7	2.7	1.4	2.7	3.4	2.4
\$50,000 - 74,999	4.5	1.7	2.4	1.2	2.8	2.7	2.9
\$75,000 - 99,999	5.8	2.7	3.7	1.9	3.1	2.9	3.2
\$100,000 - 149,999	6.1	3.0	3.9	1.9	3.2	3.0	3.3
\$150,000 - 199,999	7.5	4.1	5.4	2.2	3.4	3.4	3.3
\$200,000 - 249,999	8.5	4.5	5.4	3.3	4.1	3.3	5.0
\$250,000 or more	10.2	5.7	8.1	2.9	4.5	4.5	4.4
Total	6.0	2.9	4.2	1.7	3.2	3.1	3.2
Average air party size	1.79	1.55	1.48	1.70	2.01	2.02	2.00
Air passengers	12,609	5,201	3,312	1,889	7,408	3,354	4,054
Percent business	41.3%						

As has been found with other surveys, the average number of reported air trips by survey respondents in the lowest income range (under \$10,000) is surprisingly large, and higher than the values found for most income ranges below \$200,000 and all income ranges below \$150,000 (in the case of personal trips by male respondents all income ranges below \$250,000).

The average number of business trips by female respondents is significantly lower than for male respondents, particularly for female respondents with household incomes between \$10,000 and \$40,000. However there appears to be no systematic difference in the average number of personal trips between male and female respondents. The difference for business trips does not appear to reflect differences in the proportion of female respondents who were employed. In fact almost the same proportion of male and female survey respondents (52%) reported that they were employed full-time or self-employed. So the difference is more likely to reflect the different types of employment. Female respondents who reported that they were self-employed made almost as many business trips on average (5.1 per year) as self-employed male respondents (5.3 per year), while female respondents who were employed full-time made only 2.1 business trips per year on average compared to 6.9 for male respondents employed full-time.

Summary

Analysis of the response data from the ACRP 03-19 survey suggests that the survey respondents are neither fully representative of the U.S. population nor of air travelers in general. However, given these limitations, the survey response data do provide several useful findings.

The first is relates air travel propensity (average air trips per year) to various household characteristics, including household income and age and gender of the respondent. In particular, female respondents made fewer air trips per year for business than male respondents, although there appears to be little difference between male and female respondents in terms of the number of personal air trips per year that they make.

As expected, the average number of air trips per year increased with household income, although the increase was not proportional to income. Survey respondents with an annual household income between \$200,000 and \$250,000 or more made an average of 8.5 air trips per year for all purposes, while those with an annual household income between \$10,000 and \$30,000 made an average of about 3.4 air trips per year for all purposes. Although those in the higher income range had a household income of almost twelve times the income of those in the lower income range (based on the mid-points of each range), they only made two and a half times as many air trips.

The second useful contribution of the survey is that survey respondents reported the number of business and personal air trips they had made in the past year. This allows some analysis of air travel propensity by trip purpose. Although the average number of both business trips and personal air trips per year increased with income, the average number of business trips increased much faster than personal trips. Survey respondents in the highest income range (\$250,000 and over) made six times the average number of business trips than those in the income range from \$10,000 to \$30,000, whereas they made less than twice (1.8 times) the average number of personal trips than those in the lower income range.

The final observation is that because the survey respondents are not representative of air travelers in general, being older and having higher incomes, as well as other differences, it will be necessary to weight the survey responses in order to obtain air travel propensity values that are representative of air travelers in general. Furthermore, because the selection criteria for survey participants required them to have made a paid domestic air trip in the previous six months, the survey respondents tended to exclude those who made relatively few air trips per year.

Airlines for America Surveys

A4A has commissioned two recent online surveys of the U.S. adult population that were performed by the polling firm Ipsos Public Affairs. The first survey was performed from December 14 to 22, 2015 and collected data from 3,019 adults age 18 or over resident in the continental U.S., Alaska and Hawaii. The second survey was performed from January 6 to 13, 2017 and collected data from 5,047 adults age 18 or over resident in the continental U.S., Alaska and Hawaii.

The survey respondents were drawn from an Ipsos panel, supplemented with panels from partner organizations, and other sources. The sample was selected to reflect the demographics of the U.S. population based on the U.S. Census American Community Survey and post-hoc weights were applied to reflect population characteristics on gender, age, region, race/ethnicity and income.

The surveys addressed a wide range of air travel issues, but collected data on the demographic and socioeconomic characteristics of the respondents, as well as the number of air trips that the respondents had made in the previous year and (for those respondents who had not flown in the previous year) whether they had ever flown on a commercial flight. For the 2015 survey, respondents were asked how many round trips by airline they had already made in 2015 or planned to make in the remaining weeks of 2015. For the 2017 survey, respondents were asked how many round trips by airline they had made in 2016. In both cases respondents were asked to give separate totals for trips that were primarily for business purposes, primarily for personal leisure, and primarily for personal non-leisure purposes (such as traveling to/from college, family event, job interview, or medical reasons). Respondents were also asked how many of their total trips combined business and personal purposes.

Detailed survey response data have not been obtained. However, A4A staff has shared aggregate results (Heimlich, 2016; Heimlich & Jackson, 2017) and topline statistics for each question have been published on the Ipsos website (ipsos-na.com/news-polls/pressrelease.aspx?id=7208 and [id=7585](http://ipsos-na.com/news-polls/pressrelease.aspx?id=7585)).

The surveys found that 19% of 2015 respondents and 11% of 2017 respondents indicated that they had never flown on an airline. The percentage of 2015 respondents who had never flown on an airline was similar to the percentage found in a previous survey in 1997 performed by the Gallup Organization for the Air Transport Association (the former name of A4A). The percentage of 2015 respondents who had never flown on an airline seems too high, both relative to the 1997 percentage as well as the much lower percentage a year later.

Of those respondents who indicated that they had flown before, 55% of 2015 respondents indicated that they had made no air trips that year, while 51% of 2017 respondents indicated that they had made no air trips in 2016.

The distribution of the number of air trips taken by survey respondents who made at least one air trip in each year is shown in Table C-93, together with the percentage of air trips for each trip purpose and the average number of trips per respondent who had made an air trip during the year.

The decline in the percentage of survey respondents who indicated that they made nine or more air trips in the past year from 2015 to 2016 explains the drop in the total average trips per respondent from 4.8 to 4.5. Given the larger sample size in the 2017 survey and the fact that the overall level of air travel increased by about 3.5% from 2015 to 2016, based on US Department of Transportation data, it seems likely that the difference is more an artifact of the sampling than an actual trend and that the 2016 data is probably more accurate.

Table C-93. Distribution of Air Trips per Year by A4A Survey Respondents Who Made Air Trips in Each Year

Air Trips	2015	2016
1	31%	27%
2	20%	20%
3	10%	13%
4	9%	13%
5	5%	5%
6	6%	6%
7	2%	3%
8	2%	2%
9 or more	15%	11%
	100%	100%
Trip Purpose		
Business	31%	31%
Personal Leisure	48%	51%
Personal Other	21%	18%
	100%	100%
Average Trips		
Business	1.5	1.4
Personal Leisure	2.3	2.3
Personal Other	1.0	0.8
Total	4.8	4.5

The average number of air trips in the past year for all survey respondents (all American adults) for each year by race/ethnicity and age is shown in **Error! Not a valid bookmark self-reference.** The increase in total average trips per adult from 2015 to 2016 is broadly consistent with the increase in the overall level of air travel, allowing for rounding in the data sources. The relatively high average number of air trips by Hispanic and Asian respondents is surprising, while the apparent decline in the average number of trips by Hispanic respondents from 2015 to 2016 suggests that these data may be influenced by sample size effects.

The average numbers of air trips by age group indicate that the age group from 25 to 44 makes a significantly higher number of trips than other age groups, particularly the age group from 45 to 64. This is different from the findings of air passenger surveys conducted at airports, which broadly show similar levels of annual air trips by respondents in age ranges from 35 to 64, with lower levels of air trips by respondents in the age group from 25 to 34 (which would reduce the average for the age range from 25 to 44).

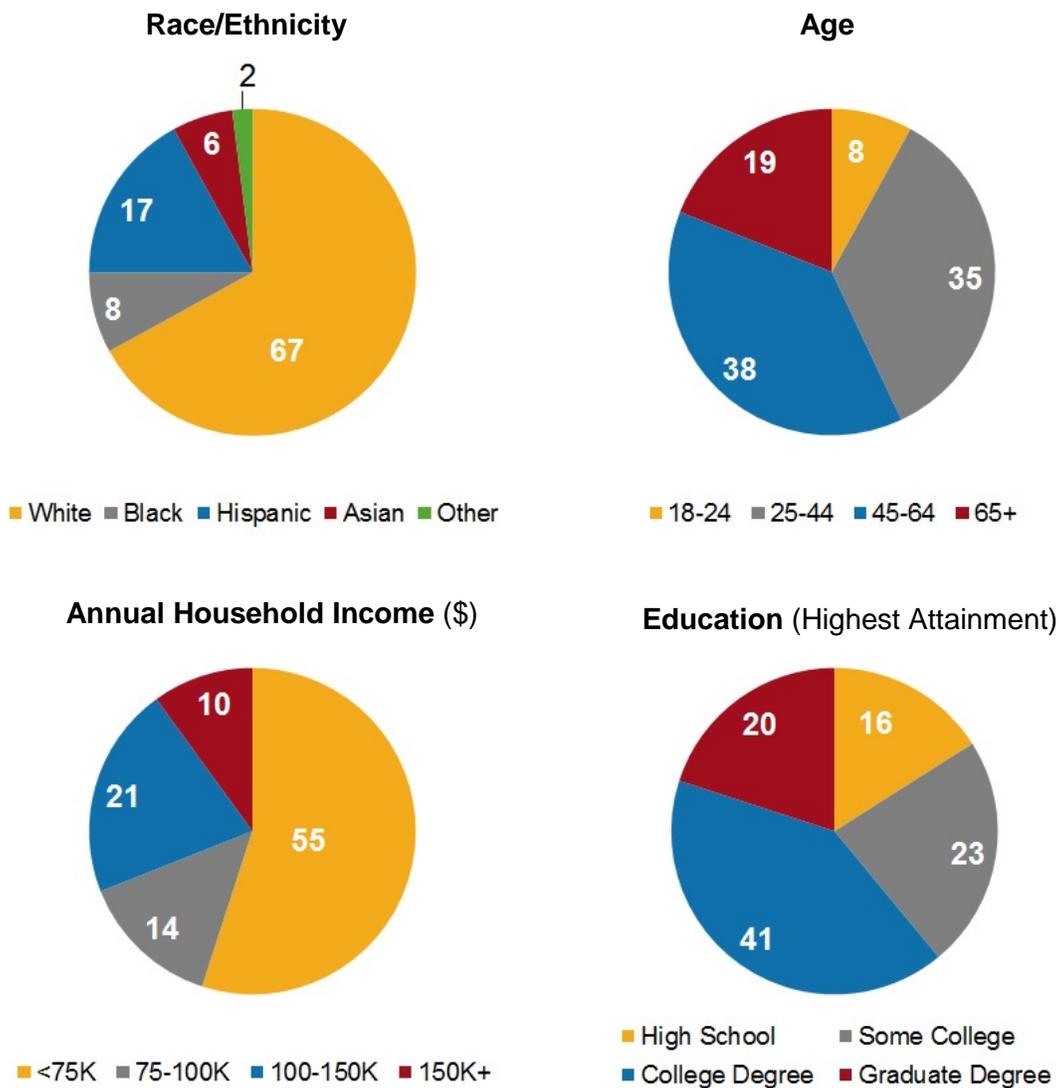
One possible explanation of the difference is a higher proportion of adults in the age range from 45 to 64 who made no air trips in the past year. The decline in the average number of air trips by survey respondents in the age range from 18 to 24 from 2015 to 2016 seems odd, particularly in the light of the overall increase in the average number of air trips.

Table C-94. Average Air Trips per Year by All A4A Survey Respondents by Race/Ethnicity and Age

Air Trips	2015	2016
Race/Ethnicity		
White	2.0	2.2
Black	1.4	1.1
Hispanic	3.4	2.6
Asian	3.2	3.4
Other	1.0	1.1
Total	2.1	2.2
Age		
18-24	2.1	1.3
25-44	3.2	3.3
45-64	1.6	1.5
65+	1.1	1.1
Total	2.1	2.2

The demographic and socioeconomic profile of the 2015 survey respondents who made an air trip in the past year (2015) is shown in Figure C-33. The numbers in the figure show the percentage of survey respondents in each category.¹

¹ A survey of air passengers in the United States conducted in 2017 for A4A showed distributions of air passenger characteristics similar to those reported in Figure C-33 (Heimlich 2018). In the 2017 survey, 65 percent of respondents identified as “White Non-Hispanic” compared to 67 percent in 2015 as shown in Figure C-33 above. In 2017, nine percent identified as “Black non-Hispanic” (eight percent in 2015), 16 percent as “Hispanic” (17 percent in 2015), five percent as “Asian” (six percent in 2015), and five percent as “Other” (two percent in 2015). In 2017, 11 percent of air passengers responding to the survey were between 18 and 24, compared to eight percent of 2015 respondents. In 2017 38 percent of respondents were between 25 and 44 (35 percent in 2015), 34 percent were between 45 and 64 in 2017 (38 percent in 2015), and 17 percent were 65 or older in 2017 (19 percent in 2015). In 2017 58 percent of responding air passengers reported household incomes of \$75,000 or less, compared to 55 percent of 2015 air passengers. Incomes in 2017 were between \$75,000 and \$99,000 for 14 percent of air passengers (14 percent in 2015), 20 percent reported household incomes between \$100,000 and \$149,000 in 2017 (21 percent in 2015), and nine percent of 2017 respondents reported household incomes exceeding \$150,000 (10 percent in 2015). Finally, in 2017 21 percent of responding air passengers reported having no more than a high school education, compared to 16 percent reporting similar educational attainment in 2015. In 2017, 22 percent of responding air passengers reported having attended some college (23 percent in 2015), 36 percent reported themselves as college graduates in 2017 (41 percent in 2015), and 21 percent of 2017 responding air passengers reported having attained a graduate degree (20 percent in 2015).



Source: John P. Heimlich, *Status of Air Travel in the USA*, Presentation to TRB Airline Subcommittee, June 29, 2016.

Figure C-33. Demographic and Socioeconomic Profile of 2015 Survey Respondents Who Made an Air Trip in 2015

Two-thirds of survey respondents who made one or more air trips in 2015 were white, with Hispanic respondents accounting for 17%, black respondents accounting for 8%, and Asian respondents accounting for 6%. Table C-95 compares the percentages shown in Figure C-33 with the corresponding percentages for all U.S. adults from the 2015 American Community Survey of the U.S. Census Bureau. The survey has a somewhat higher proportion of white, Hispanic, and Asian respondents than the population as a whole, and a correspondingly lower proportion of black respondents and respondents of other races. While this appears to suggest that black Americans are under-represented in the air traveler population, the difference for “other” races is

less clear since it could be influenced by how survey respondents reported their race in the two surveys, particularly in cases of respondents of multiple races.

Table C-95. Comparison of A4A 2015 Survey Respondents to U.S. Population – Race/Ethnicity and Age

Characteristics	2015 A4A Survey	U.S. Population
Race/Ethnicity		
White	67%	63%
Black	8%	11%
Hispanic	17%	14%
Asian	6%	5%
Other	2%	7%
Total	100%	100%
Age		
18-24	8%	13%
25-44	35%	34%
45-64	38%	34%
65+	19%	19%
Total	100%	100%

The age profile of the respondents to the A4A survey is similar to that of the U.S. population with the exception of the age range 18 to 24. Perhaps not surprisingly, people in this age group appear to have a lower proportion of those who made an air trip in the past year than those in the older age groups. However, the proportion of the older age groups who made an air trip in the past year varies with age, with the highest proportion in the age range 45 to 64. Since the percentages shown in Figure C-33 are rounded to the nearest integer, differences of one percent could simply be due to rounding.

The age group with the most respondents who made air trips was 45 to 64, followed by those aged 25 to 44. These two age groups accounted for about 73% of all respondents who had made air trips, with those aged 65 or over accounting for a further 19%. However, these percentages cannot be compared directly to the distribution of air passengers by age found in air passenger surveys conducted at airports because the average number of air trips per year by respondents in each age group differed substantially. Based on the average number of air trips per year by age range shown in Table 2.68 survey respondents aged 25 to 44 would have made about 53% of all air trips in 2015 or 84% more air trips in total than those aged 45 to 64 (who made about 29% of all air trips). This is significantly greater than the percentage of total air trips made by residents of the San Francisco Bay Area in the two age groups found in the 2014/15 air passenger survey conducted at San Francisco International Airport, which found that those aged 25 to 44 made only 46% of all air trips by Bay Area residents in the previous year or only 40% more air trips than those aged 45 to 64 (who made 33% of all air trips). Both surveys found that those 65 and older made a similar percentage of total air trips, about 10%, while the SFO survey found a slightly higher percentage of total air trips was made by Bay Area Residents aged 18 to 24 (11%) than was found by the A4A survey (about 8%). This may reflect the demographics of the San Francisco Bay Area.

The distribution of survey respondents who made air trips in 2015 by annual household income shows that over half the respondents had incomes under \$75,000. Of course, this is different from the percentages of air passengers in each household income range because individuals in higher income households tend to make more air trips per year. As expected, the percentages shown in Figure C-33 differ from the percentages of households in each income range in the total population because the percentage of adults who make no air trips in a given year tends to decline with increasing income.

As shown in Figure C-33 over 60% of survey respondents who made air trips in 2015 had a college degree, with 20% holding a graduate degree, while a further 23% had some college education. Of course, higher educational attainment is generally correlated with higher household income, so it is unclear whether those with higher levels of educational make more air trips on average after accounting for difference in household income. This may be an issue to pursue in further research during the remainder of the project.

Table C-96 compares the distributions for household income and educational attainment shown in Figure C-33 with the corresponding percentages for the U.S. population from the 2016 Current Population Survey by the U.S. Census Bureau (Proctor, Semega & Kollar, 2016) and the 2015 American Community Survey (US Census Bureau, 2017).

Table C-96. Comparison of A4A 2015 Survey Respondents to U.S. Population – Income and Educations

Characteristics	2015 A4A Survey	U.S. Population
Household Income		
Less than \$75,000	55%	62%
\$75,000 – 100,000	14%	12%
\$100,000 – 150,000	21%	14%
\$150,000 or more	10%	12%
Total	100%	100%
Educational Attainment		
High school	16%	40%
Some college	23%	21%
College degree	41%	27%
Graduate degree	20%	12%
Total	100%	100%

As expected, the percentage of survey respondents with household incomes below \$75,000 is lower than the proportion of total U.S. households in the same income range, reflecting the lower percentage of adults in that income range that made an air trip in 2015 compared to those with higher incomes. Also as expected, the percentage of survey respondents with household incomes between \$75,000 and \$150,000 is greater than the proportion of total U.S. households in those two income ranges, significantly so in the case of survey respondents with household incomes between \$100,000 and \$150,000. Curiously, the percentage of survey respondents with household incomes above \$150,000 is lower than the proportion of total U.S. households in that income range, whereas one would have expected an even higher percentage of

adults in that income group to have made an air trip in 2015. This apparent anomaly may indicate that the survey under-sampled households in the highest income group.

Table C-96 shows clearly that the proportion of adults who made an air trip in 2015 increases strongly with educational attainment, with the percentage of survey respondents who made an air trip in 2015 and who hold a graduate degree being about 70% higher than the proportion of adults holding a graduate or professional degree in the U.S. population. Thus communities that attract a higher than average proportion of residents holding a college or graduate degree are likely to generate an above average number of air trips per adult resident.

The effect of higher educational attainment on the percentage of adults who made at least one air trip per year appears to be stronger than the effect of higher household income although this comparison is distorted by the surprisingly low percentage of adults who made an air trip in 2015 in the highest household income group.

Summary

The A4A surveys provides a useful complement to the other air passenger surveys discussed above and to the household travel surveys discussed in the next section, since they are surveys of all American adults, whether or not they made an air trip in the past year. The survey results thus allow a comparison between air travelers (those who made at least one air trip in the past year) and the larger population. The surveys also collected data on the race/ethnicity and educational attainment of the respondents, characteristics that are not typically available from air passenger surveys (although sometimes available from other surveys, such as the CES).

Some of the distributions of respondent characteristics reported in presentations by A4A staff seem odd and suggest that the survey may have under-sampled some population segments or the weighting of the survey data may have distorted the results. It may be possible to resolve some of these issues through further discussions with A4A staff.

c. Household Travel Surveys

Household travel surveys provide an alternative perspective on air travel to that provided by intercept surveys of air travelers undertaken at airports or through online surveys of air travelers. These surveys commonly take the form of an interview survey that asks household members to report the details of their travel on a particular day or days as well as the household socioeconomic characteristics. Since most respondents will not have taken a long-distance trip on the particular day they were asked to report, some household travel surveys include a long distance travel component that asks respondents to provide details of long-distance travel undertaken within a longer recent recall period. As discussed in the review of a number of household travel surveys in Appendix B to the project Final Report, the definition of a long-distance trip and the length of the recall period vary among different surveys.

One valuable feature of most household travel surveys that address long-distance trips is that they typically include long-distance trips by all modes, not just air trips. While air trips are the primary focus of the current research, analysis of household travel surveys can contribute to a better understanding of how mode choice decisions in making long-distance trips affect the demand for air travel.

The research for the current project identified four household travel surveys that contained adequate data on long-distance travel including air travel to offer the potential for useful analysis, two surveys at the national level and two statewide surveys (the 2012 California Household Travel Survey and the 2015 Michigan Travel Counts survey).

National Household Travel Surveys

The two national household travel surveys were both undertaken around the same time between 2000 and 2003. They thus span the changes in the air transportation system that occurred following the terrorist attacks of September 11, 2001. They are also much older than the other surveys analyzed in the research. Unfortunately subsequent national household travel surveys have not included a long-distance travel component. Therefore in order to understand changes over time at a national level, it is necessary to compare the findings of the earlier national surveys with more recent findings from surveys for selected states or individual airports. However, these comparisons will be valuable for several reasons. First, the surveys provide long-distance travel behavior results for a variety of socioeconomic and demographic factors, enabling a form of baseline analysis and parameter building that can be then extended to more recent local or regional survey results, which may not have been as comprehensive. Second, the results from these somewhat dated national surveys may be useful for the case study analyses, which will use historical data to produce “forecasts” of recent air travel behavior. In such an application, the research focus is on the extent to which survey results improve model forecasts compared to past forecast efforts over the same time periods that relied on aggregate socioeconomic data only. Third, local survey results may not be available for some airports or regions in these years, and the national results reported in these surveys may represent the best available data for historical comparisons, allowing some indication of how patterns in these disaggregated variables have changed over time.

2001-2002 National Household Travel Survey

The 2001-2002 National Household Travel Survey (NHTS) collected data on all trips over 50 miles made by members of responding households during a four-week recall period. Obviously many households would not have made any air trips in a given four-week period and for those that did there is no information on how many air trips they made in the previous year. However, the relationship between household characteristics and the average number of air trips and long-distance trips by other modes made during the four-week recall period can give an indication how air travel propensity and long-distance travel mode split varies with household characteristics.

Although the travel patterns given by the 2001-2002 NHTS are now about 15 years old, comparison between these travel patterns and those given by more recent household travel surveys, such as the two statewide household travel surveys discussed below, may provide an indication of how these patterns have been changing over time.

As an example, consider the relationship between household income and the use of air travel for long-distance travel. Note that for all income groups identified, long-distance travel by private automobile was the travel mode selected by households for over 90 percent of trips. The following figures report survey results from the 2001-2002 NHTS for long-distance travel using

modes other than the personal vehicle – air, bus, train, and other. The NHTS reports 192 million air trips were taken during the survey year (based on an annualization of the results from the four week survey period). Figure C-34 shows the percentage of these total air trips taken by members of households with three annual income categories (under \$25,000, between \$25,000 and \$49,999, and over \$50,000). The figure also shows the distribution of U.S. households in 2001 for these household income ranges. As the figure shows, the great majority of air trips (79%) were taken by members of households making \$50,000 or more annually, even though such households represented less than half (43%) of U.S. households in 2001. Similarly, around five percent of 2001 air trips were taken by members of U.S. households with income less than \$25,000 in 2001, even though such households made up nearly 30% of the national total.

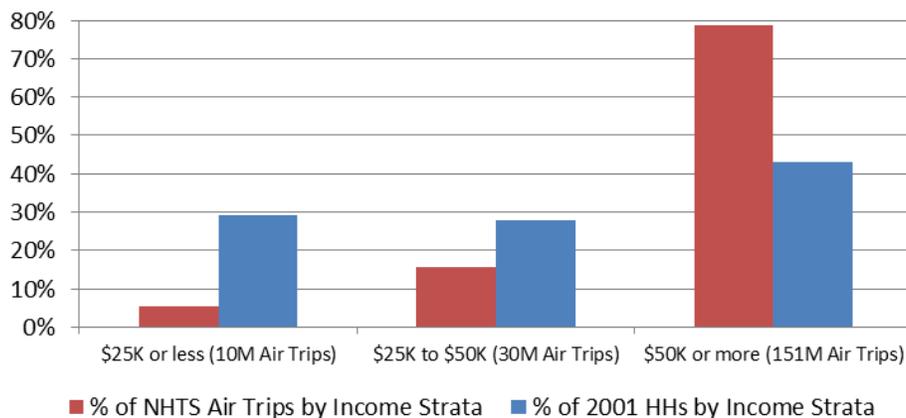


Figure C-34. Annual Air Trips by Household Income Groups (2001-2002 NHTS)

This difference in behavior by income groups provides a clear indication of the difference in the propensity of household members to use air travel for different household income levels. Figure C-35 shows that the 2001-2002 NHTS households in these income strata made very different long-distance travel choices. Of the 27 million non-automobile long-distance trips taken by members of households making less than \$25,000 in 2001, the plurality (48%) were made by bus, with about 39% made by air. This mode choice pattern is starkly different from that chosen by higher income households, which chose to use air travel for nearly 80% of the 151 million long-distance trips taken by their members in 2001, with just over 10% taken by bus. These results indicate the factors that must be considered when analyzing the influence of travel opportunities on other long-distance travel modes on the air travel demand at an individual airport or some other region.

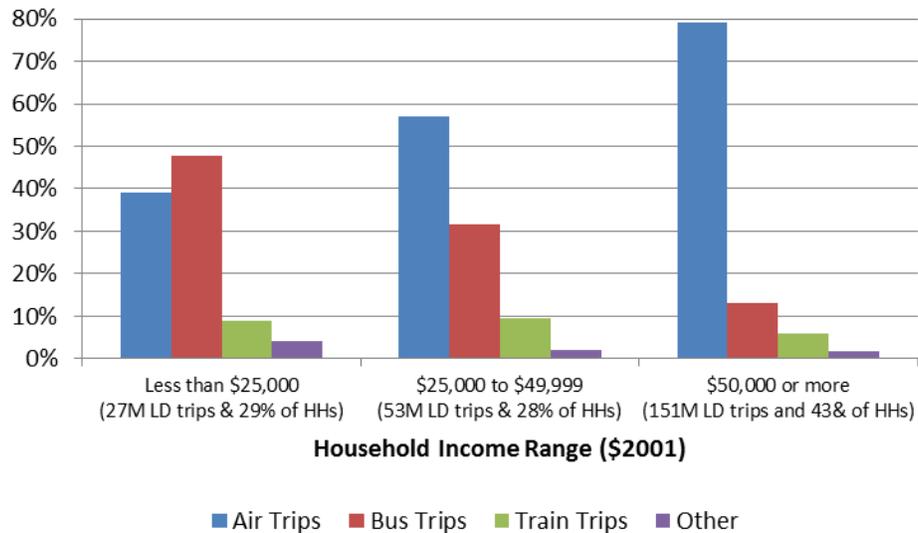


Figure C-35. Mode Choices for Long Distance Travel by Income Groups (2001-2002 NHTS)

The percentages shown in Figure C-34 indicate that of the approximately 192 million air trips made by U.S. households in 2001, 151 million (about 79%) were made by households with incomes of \$50,000 or more, 30 million (about 16%) were made by households with incomes between \$25,000 and \$50,000, and only 10 million (about 5%) were made by households with incomes of \$25,000 or less. Figure C-35 shows the percentage of households in each income range.

These data allow a comparison of the increase in air travel propensity with income based on the survey responses. In 2001 there were 109.3 million households in the U.S. (Proctor, *et al.*, 2016). For all income ranges the data imply an average of about 1.76 air trips per household, with a ten-fold difference between household with incomes below \$25,000 (0.32 air trips per household) and households with incomes of \$50,000 or more (3.21 air trips per household).

One issue in interpreting these data is how an “air trip” is defined. A total of 192 million air trips seems broadly consistent with counting air *passenger* trips rather than air *party* trips. There were about 570 million U.S. domestic enplanements in total and 34 million international departures by U.S. residents in 2001. If each domestic air trip involved 2.7 enplanements on average and about 7% of domestic enplanements were by non-U.S. residents (based on the assumptions in Table C-5 above), this would give around 232 million air trips by U.S. residents. However, the NHTS was undertaken between March 2001 and March 2002, so the number of air trips during this period would have been somewhat lower due to the decline in air travel in the first quarter of 2002 relative to the same quarter in 2001. Also some of the domestic air travel would have been part of an international trip and thus double-counted in the above calculation.

These values of air travel propensity based on the NHTS data are well below the values found in more recent surveys, such as the Michigan Travel Counts Survey discussed below. Furthermore, the difference in average air trips per household between the three household income ranges is much wider than found in other surveys. Until these differences are resolved it

would appear that the NHTS data on air trips are not only now rather dated but should be regarded with considerable caution.

Omnibus Household Travel Survey

The U.S. Department of Transportation Bureau of Transportation Statistics (BTS) undertook a monthly or bi-monthly Omnibus Household Survey of approximately 1,000 randomly selected households from August 2000 to October 2003, with an additional survey in October 2009. The survey included information on air travel as well as respondent and household socioeconomic characteristics and thus provides additional information on air travel to that given by the 2001-2002 NHTS, which was undertaken at approximately the same time. However, unlike the NHTS, which collected data on long-distance travel in a four-week recall period, the Omnibus Household Travel Survey not only asked about air travel in the previous month, but the surveys from February 2002 asked how long ago the respondents made a commercial flight. This allows some analysis of how air travel in the previous month is related to annual air travel propensity.

Although each survey only included about 1,000 respondents, over the period from August 2000 to October 2003 surveys were performed in 29 months, giving a total of 29,705 responses, allowing fairly detailed analysis of subsets of the survey responses, including seasonal and regional differences. The survey questions relevant to air travel and the socioeconomics of the survey respondents evolved somewhat over the course of the survey period. The first survey, in August 2000, only asked about the number of days on which a respondent flew in the previous 30 days, without distinguishing between commercial flights and general aviation flights. However, subsequent surveys had separate questions for commercial and general aviation flights. Prior to July 2001, the questions asked about air travel in the previous 30 days. From July 2001, subsequent surveys asked about air travel in the previous month. While the distinction is fairly minor, in calculating air travel propensity some adjustment will need to be made for months with fewer or more days. Also from July 2001, the survey asked how many days in the previous month the respondent made an air trip for business or work.

The survey wording asked about the number of days on which the respondent used commercial air travel, not the number of air trips made in the previous month (or 30 days). For the surveys from August 2000 to March 2001, the responses for all air travel were coded into ranges of 1-2 days, 3-5 days, 6-10 days, and more than 10 days. For the following survey in July 2001 the responses for all air travel were coded into ranges of 1-2 days, 3-10 days, 10-19 days, and 20 days or more. However, for the number of days when an air trip was made for business or work, the actual number of days was recorded. Thereafter, from the surveys for August 2001 to October 2003 the actual number of days when an air trip was made for all purposes as well as for business or work were recorded.

There are three issues with this question wording and response coding that needs to be accounted for in the analysis of the survey results. The first is that the reported air travel is only for the survey respondent, not other members of the household. The second is that an air trip involving one or more nights away would involve air travel on two days, whereas an air trip returning the same day would only count as one day. Thus the survey wording is unable to distinguish between two same-day trips and one multi-day trip. The third difficulty arises from

the ranges used to record the responses for all commercial air travel in surveys prior to August 2001. In the case of the survey for July 2001, there is obviously a big difference in air travel use between a respondent using air travel on three days in the previous month and one using air travel on ten days. Given the typical range of air travel propensity, the distribution across the range of 3-10 days is likely to be heavily skewed toward the lower end of the range, while most respondents would be in the range of 1-2 days or none. This issue is less acute with the narrower ranges used in the surveys from August 2000 to March 2001.

The questions about socioeconomic factors included the respondent age, gender, ethnic group, and education level for all surveys. The October 2000 survey asked how many household members were aged 16 or over. From November 2000 this changed in each survey to how many household members were aged 18 or over. No surveys asked about the number of younger children in each household. From July 2001, each survey asked about household income, while from November 2001, each survey also asked for the residential zip code of the respondents.

Given the changes in question wording, inclusion of household income in the survey, and the coding of days using commercial air travel, the analysis of variation in air travel use by socioeconomic factors discussed below was based on the surveys from August 2001 to October 2003. This period covered 20,827 survey responses, representing a significantly larger sample of households reporting air travel use than in the 2001-2002 NHTS, although the survey data provides much less information about the air trips made.

For the analysis described below, the data was divided onto two periods: August 2001 to July 2002 and August 2001 to October 2003. This allowed the analysis to address any changes in air travel patterns that occurred between the two periods, in particular the short-term and longer-term effects that resulted from the terrorist attacks of September 11, 2001.

Analysis of August 2001 to July 2002 Data

Survey data was collected for 11 months of the period from August 2001 to July 2002, excluding September 2001, when air travel was disrupted by the terrorist attacks of September 11. During this period survey responses were obtained from 11,325 households, of which 1,293 (11%) reported making at least one air trip on a commercial flight during the previous month. Those survey respondents who reported taking one or more commercial flights during the previous month took flights on an average of 2.64 days in the month.

Table C-97 shows how the use of commercial air travel in the previous month by the survey respondents varied with household income as well as the use of commercial air travel for business or work-related trips.

Table C-97. Use of Commercial Air Travel in Previous Month by Omnibus Travel Survey Respondents by Annual Household Income – August 2001 to July 2002

Household Income	Used Commercial Air Travel	Average Days Used Commercial Air Travel	Percent Made Business Air Trips	Average Days Used Air Travel on Business	Percent of Air Travel Days Making Business Trips
Under \$15,000	2.2%	2.14	13.6%	1.67	10.6%
\$15,000 - \$29,999	5.0%	2.08	23.6%	2.86	32.4%
\$30,000 - \$49,999	6.7%	2.42	35.4%	3.12	45.6%
\$50,000 - \$74,999	12.1%	2.36	32.0%	2.99	40.6%
\$75,000 - \$99,999	18.5%	2.64	45.1%	3.15	53.9%
\$100,000 or more	31.9%	3.19	56.3%	3.73	65.7%
Total	11.4% (1)	2.64 (1)	47.6% (1)	3.32	59.2%
Valid responses (2)	9,717				
Total responses	11,323				

Notes: 1) Includes respondents who did not indicate their household income.

2) Valid survey responses gave both household income and number of days on which they used commercial air travel in previous month.

It can be seen that the use of air travel increases with household income, as expected, as well as the percentage of survey respondents that made business air trips in the previous month. The average number of days in the previous month on which the survey respondents took a commercial flight also increases with income, both in total and for business trips, although the increase with income is not as great as the percentage of survey respondents who used commercial air travel in the previous month or made one or more business air trips. Table C-97 also shows that the percentage of air travel days that involved taking a flight for a business or work-related trip also increases with income, reflecting both the greater percentage that made business trips and the higher average number of days in the month on which an air trip for business was made.

Analysis of August 2002 to October 2003 Data

Additional survey data were collected for nine months between August 2002 and October 2003. During this 15-month period, survey responses were received from 9,502 households, of which 1,070 (11%) reported taking one or more commercial flights during the previous month. Those survey respondents took commercial flights on an average of 2.76 days in the month, a slightly higher use of air travel than reported in the survey for the period from August 2001 to July 2002, which seems reasonable given that the earlier period included the immediate aftermath of the terrorist attacks of September 11, 2001.

Table C-98 shows how the use of commercial air travel in the previous month by the survey respondents during the period from August 2002 to October 2003 varied with household income as well as the use of commercial air travel for business or work-related trips.

Table C-98. Use of Commercial Air Travel in Previous Month by Omnibus Travel Survey Respondents by Annual Household Income – August 2002 to October 2003

Household Income	Used Commercial Air Travel	Average Days Used Commercial Air Travel	Percent Made Business Air Trips	Average Days Used Air Travel on Business	Percent of Air Travel Days Making Business Trips
Under \$15,000	2.5%	3.10	23.8%	2.00	15.4%
\$15,000 - \$29,999	4.3%	2.25	17.5%	2.36	18.3%
\$30,000 - \$49,999	7.3%	2.32	22.1%	2.88	27.5%
\$50,000 - \$74,999	12.1%	2.70	40.8%	2.95	44.6%
\$75,000 - \$99,999	17.3%	2.91	45.2%	3.59	55.8%
\$100,000 or more	31.0%	3.09	49.4%	3.59	57.4%
Total	11.3% (1)	2.76 (1)	45.6% (1)	3.30	53.9%
Valid responses (2)	7,959				
Total responses	9,499				

Notes: 1) Includes respondents who did not indicate their household income.

2) Valid survey responses gave both household income and number of days on which they used commercial air travel in previous month (including none).

The survey results shown in Table C-98 are generally quite similar to those for the previous period reported in the draft Interim Project Report, although they show a slightly lower use of business travel, with only 46% of respondents who reporting making air trips in the previous month making one or more business trips, compared to 48% in the previous period. The average number of days in the previous month on which respondents made a business air trip (3.30) was also marginally lower than during the previous period (3.32). Combined with the small increase in overall air travel, from an average of 2.64 days per month to 2.76, only 54% of the air travel days involving business trips, compared to 59% in the previous period.

The percentage of survey respondents in each household income range who reported taking a commercial flight during the previous month was generally similar to the survey results for the previous period, with a slightly lower percentage of survey respondents with a household income of \$75,000 or more taking a commercial flight in the previous month and a slightly higher percentage of respondents with a household income of less than \$50,000 taking a commercial flight.

It should be noted that the 15-month period from August 2002 to October 2003 included two summer periods, when it could be expected that there would be less business air travel and more personal air travel.

Summary

The most striking findings of the analysis of the survey results for both periods is that although the percentage of survey respondents who reported taking one or more commercial flights in the previous month increased strongly with income, with only about 2% to 3% of survey respondents with a household income under \$15,000 taking at least one flight but over 30% of survey respondents with a household income of \$100,000 or more taking at least one flight, the average number of days during the previous month when those who reported taking at

least one flight used commercial air travel (which is a surrogate measure for the number of air trips taken) did not vary very much by household income, increasing slightly with income from a little over 2 days for survey respondents with household incomes between \$15,000 and \$30,000 to a little over 3 days for survey respondents with household incomes of \$100,000 or more. This is perhaps not all that surprising, since even people who make many air trips per year may only make one or two in a given month.

State Household Travel Surveys

The research plan identified three recent statewide household travel surveys that included a long-distance travel component, although one of the surveys, for Utah, had a much smaller sample size than the other two surveys, as well as other limitations. Therefore it was decided to limit the analysis of statewide household travel surveys to the surveys for California and Michigan. Survey response data has been obtained for the 2012-2013 California Household Travel Survey and the corresponding data for the long-distance component of the 2015 Michigan Travel Counts survey has been provided by the staff at the Michigan Department of Transportation.

2012 California Household Travel Survey

The California Department of Transportation (Caltrans) undertakes the statewide California Household Travel Survey (CHTS) every ten years (Caltrans, 2016). The most recent survey was undertaken from January 2012 following a pre-test in late fall 2011, and ending on January 31, 2013. The survey obtained complete travel data from 42,431 households. In addition, partial data was collected from a further 20,651 households (NuStats, 2013). Travel data was collected from households in all 58 California counties as well as parts of three adjacent Nevada counties. Data was collected by a combination of computer assisted telephone interviewing (CATI), an online survey, and three types of global positioning system (GPS) devices: a wearable device, an in-vehicle device, and an in-vehicle device plus an on-board diagnostic (OBD) unit. 36,714 households did not use GPS devices, 3,855 used wearable GPS devices, 422 used in-vehicle devices, and 1,440 used in-vehicle devices with an OBD unit. All participating households were asked to record their travel for a pre-assigned 24-hour period and complete a long-distance travel log covering trips by household members to a location 50 miles or more away in the eight weeks prior to the assigned travel day. Households participating in the GPS-assisted survey used the wearable GPS devices for three days or the in-vehicle devices for seven days.

Households were initially recruited by telephone and those agreeing to participate were mailed copies of the travel diaries and long-distance travel log. Target households were mailed an advance letter about one week prior to placing the initial recruitment call. This served to inform households about the survey and provided an option for households willing to participate in the survey to complete the recruitment survey online or call a toll-free number to complete the recruitment survey by telephone at their convenience. The recruitment survey collected a range of information about each household that agreed to participate in the survey, including the following:

- Household address, type of residence, and home ownership status
- Household size

- Total household income for the past year
- Number of years at current address (and previous address if at current address for less than six years)
- Number of cell and landline phone numbers in household
- Use of public transportation
- Bicycle and vehicle availability and a range of details about available vehicles
- Plans to purchase a new vehicle in next five years
- Name, age, gender, and race of each household member
- Relationship among household members
- Country of birth of each household member and year moved to U.S. if not born in the U.S.
- Number of household members possessing a driver's license
- Employment status of each household member, together with details of employment, including employment location, hours worked per week, typical work days, transportation mode to work, and availability of flexible hours
- Student status and highest education level of each household member, together with details of school location, grade level, and whether home or online schooling
- Any household member with a disability, including type of disability and use of or eligibility for transportation options for the disabled

The long-distance travel log provided space for recording up to eight long-distance trips of 50 or more miles made by any household member during the eight weeks preceding the travel diary day, starting with the most recent trip. Thus if the household members made more than eight such trips, only the most recent eight trips could be recorded on the long-distance travel log that was provided. The information requested for each trip comprised:

- The date of departure
- The place name and address where the trip started
- The place name and address of the final destination
- The main purpose of the trip (using trip purpose codes provided)
- The number of people traveling with the respondent
- The number of household members traveling with the respondent and which ones (using person codes from the travel diaries)
- The method of travel that was used for the longest distance (using codes provided for each mode of travel)

Respondents were instructed to treat each direction as a separate trip. This effectively limited the long-distance travel log that was provided to a maximum of four round trips. Since it covered all trips of 50 miles or more, it is quite likely that many households made far more long-distance trips than this during an eight week period. Respondents who made more than eight long-distance trips during the eight-week period were instructed to record the details of the additional trips on a separate sheet of paper. Given the total costs of performing the survey, it is hard to understand why the long-distance travel log did not include additional pages to cover more trips. An additional problem with the long-distance travel log is the wording of the instructions for entering the number of people traveling together. This refers to the number of people traveling with "you" (the person completing the log), *i.e.*, excluding the respondent.

However, this implies that the respondent was traveling on all the trips, which may not have been the case. It would have been less ambiguous to have asked about the total number of people traveling together, including the respondent if applicable.

Following the travel day (or the period of GPS data collection for households using the GPS devices), the travel diary long-distance travel log information was collected through a retrieval survey that was conducted in one of three ways:

- Online on the survey website using the household personal identification number (PIN) provided with the survey materials
- A telephone interview initiated by the survey contractor or by the household calling a toll-free number provided with the survey materials
- The household returning the travel diary and long-distance travel log by mail with a follow-up telephone interview after the information had been entered into the computer database to clarify any details and obtain additional information

The retrieval survey also gathered additional data on the activities undertaken during the course of the travel day. According to the retrieval survey script in the survey Final Report, for long-distance trips taken using airplane, bus or train, the retrieval survey requested the following additional information:

- The time the trip started
- The airport, bus or train station departed from
- How the party traveled to the departure airport or station
- The airport, bus or train station arrived at
- How the party traveled from the arrival airport or station to the final destination

Since this information was not requested on the long-distance travel log, presumably the retrieval survey relied on the recall of the respondent, who may not have known the details of long-distance trips made by other household members at the time of the retrieval survey.

Long-Distance Travel

The long-distance travel file contains records for 68,193 trip legs reported by 18,012 households. Some records were missing data on the mode used or the number of people on the trip. These trip leg records were dropped from the analysis, which resulted in 67,125 trip legs reported by 17,736 households. The distribution of the number of trip legs per household is shown in Table C-99. It can be seen that the number of reported trips drops off sharply above eight trip legs, suggesting that many households did not attempt to record more than eight trip legs (the number that could be recorded on the long-distance travel log provided with the survey materials). It can also be seen that the number of odd trip legs reported is much lower than the following number of even legs. It is of course possible for a round trip to involve an odd number of legs, for example a trip Fresno-Sacramento-Oakland-Fresno, although it can be expected that most round trips would involve an even number of legs. Furthermore, a four-leg trip or two three-leg trips would also result in an even number of trip legs. Therefore it is to be expected that more households would reporting an even number of trip legs than an odd number of trip legs. However, no household should report only one trip leg, since any round trip has to involve at

least two legs. This suggests that many households may have only reported one direction of a round trip, which is borne out by an examination of the trip data.

Table C-99. Long-Distance Trip Legs in Previous Eight Weeks Reported by California Household Travel Survey Respondents

Trip Legs	Households	Cumulative Percent
1	3,545	20.0%
2	5,856	53.0%
3	1,232	60.0%
4	2,589	74.5%
5	612	78.0%
6	1,345	85.6%
7	424	88.0%
8	1,059	93.9%
9	153	94.8%
10	216	96.0%
11	84	96.5%
12	153	97.4%
13 - 20	343	99.3%
25 +	125	100%
Total	17,736	

The largest number of reported trip legs by a given household in the long-distance travel file was 50, by ten different households. Although this is a very small fraction of the total households reporting long-distance trips (less than 0.1%) only one or two households in each case reported a number of trip legs between 41 and 49, suggesting that the number of reported trip legs recorded in the retrieval survey may have been limited to 50. These trip legs were then classified as outbound, intermediate, or return legs, based on the origin and destination zip code of each leg, where an intermediate leg was one that neither began nor ended at the respondents home (for example, the middle leg in a trip Oakland-Los Angeles-Chicago-Oakland). This allowed the number of outbound legs of round trips to be counted, which gave a total of 38,115 outbound legs by 17,480 households. The lower number of households was because a few households did not report any outbound legs. This could have resulted from the outbound leg of a trip taking place before the eight-week recall period, but more likely was because the respondents failed to report the outbound leg.

Households reporting making long-distance trips during the recall period comprised 42% of all households participating in the survey. Of those households that reported making outbound long-distance trips during the recall period, 49% reported only making one such outbound trip. Because some respondents reported air trips beginning or ending at an airport rather than their home zip code, those trip legs were classified as outbound or return legs if the airport in questions was within 150 miles of the home zip code. Examination of the data showed that a small number of reported air trips were made by general aviation, military flights, or were not in fact air trips and these were excluded from valid airline trips.

Trips involving valid airline travel were reported by 3,666 households, or 20.4% of all households reporting long-distance trips and 8.6% of the 42,436 households participating in the

survey. Nineteen households did not report the air travel party size for all their airline trip legs and these households were generally excluded from the analysis, since it is not clear how many air passenger trips were made by those households. The 3,647 households that reported the air travel party size for all their airline trips reported 5,117 air trips, or an average of about 1.40 air trips per household. The great majority of these households (about 74%) only made one air trip in the eight-week recall period. The largest number of air trips reported by a household was nine. The distribution of reported air trips is shown in Table C-100. Less than 9% of households reporting making air trips made more than two air trips and less than 4% made more than three air trips.

Table C-100. Air Trips in Previous Eight Weeks Reported by California Household Travel Survey Respondents

Air Trips	Households	Cumulative Percent
1	2,709	74.3%
2	617	91.2%
3	200	96.7%
4	77	98.8%
5	20	99.3%
6	10	99.6%
7	7	99.8%
8	6	100.0%
9	1	100.0%
Total	3,647	

The distribution of the number of households that reported making long-distance trips during the eight-week recall period and the number that reported making air trips during this period by annual household income is shown in Table C-101.

Table C-101. Long-Distance Trips Reported by California Household Travel Survey Respondents by Household Income

Household Income	All Long-Distance Trips		Air Trips	
	Households	Percent	Households	Percent
Up to \$9,999	348	2.1%	31	0.9%
\$10,000 - \$24,999	1,173	7.1%	96	2.9%
\$25,000 - \$34,999	1,079	6.5%	123	3.7%
\$35,000 - \$49,999	1,688	10.2%	214	6.5%
\$50,000 - \$74,999	3,025	18.2%	446	13.5%
\$75,000 - \$99,999	2,905	17.5%	523	15.8%
\$100,000 - \$149,999	3,466	20.9%	799	24.1%
\$150,000 - \$199,999	1,488	9.0%	458	13.8%
\$200,000 - \$249,999	682	4.1%	263	7.9%
\$250,000 or more	750	4.5%	361	10.9%
	16,604	100%	3,314	100%
Total (1)	18,012		3,666	

Note: 1) Includes respondents who did not indicate their household income.

About 8% of households that reported making long-distance trips and 10% of households that reported making air trips did not report their household income. As expected, it can be seen from Table C-101 that a larger proportion of households that reported making air trips are in the higher income categories, with the largest percentage in the income range from \$100,000 to \$149,999.

Table C-102 shows the distribution of all households that responded to the survey and those that reported making air trips in the eight-week recall period by household income, together with the number of air trips reported by those households and percent of all households that reported making air trips. The number of households that reported making air trips during the recall period shown in Table C-102 excludes those households that did not report the number of household members traveling on every trip, for the reason noted above.

Table C-102. Air Trips Reported by California Household Travel Survey Respondents by Household Income

Household Income	Households	Percent	Households with Air Trips (1)	Percent	Air Trips (2)	Percent Households w/ Air Trips (3)
Up to \$9,999	1,689	4.4%	31	0.9%	37	1.8%
\$10,000 - \$24,999	4,751	12.2%	95	2.9%	102	2.0%
\$25,000 - \$34,999	3,382	8.7%	123	3.7%	133	3.6%
\$35,000 - \$49,999	4,541	11.7%	213	6.5%	245	4.7%
\$50,000 - \$74,999	6,902	17.8%	443	13.4%	548	6.5%
\$75,000 - \$99,999	5,868	15.1%	520	15.8%	651	8.9%
\$100,000 - \$149,999	6,466	16.7%	793	24.1%	1,102	12.4%
\$150,000 - \$199,999	2,722	7.0%	456	13.8%	689	16.8%
\$200,000 - \$249,999	1,186	3.1%	262	7.9%	395	22.2%
\$250,000 or more	1,283	3.3%	360	10.9%	690	28.1%
	38,790	100%	3,296	100%	4,592	8.5%
Total (4)	42,431		3,646		5,116	8.6%

- Note: 1) Households that reported the number of household members on all reported air trips.
 2) Air trips by households that reported the number of household members on all reported air trips.
 3) Includes air trips for which the number of household members on the trip was not reported.
 4) Includes respondents who did not indicate their age range.

As expected, it can be seen from Table C-102 that the percentage of households that reported making air trips in the eight-week recall period increased steadily with income. As a result, a higher proportion of households that reported making air trips are in the household income ranges above \$75,000 per year than for the households responding to the survey overall.

Table C-103 shows how the average number of air party trips and air passenger trips per household varies with household income, expressed both in terms of the number of households reporting air trips in the eight-week recall period and all households responding to the survey. The average numbers of air passenger trips per household are shown for both the recall period and on an annual basis.

Table C-103. Average Number of Air Trips Reported by California Household Travel Survey Respondents by Household Income

Household Income	Average Air Trips per Household		Average Air Party Size	Average Air Passenger Trips per Household			
	Households w/ Air Trips (1)	All Households		Recall Period		Annual	
				Households w/ Air Trips (1)	All Households	Households w/ Air Trips (1)	All Households
Up to \$9,999	1.19	0.022	1.17	1.39	0.026	9.06	0.17
\$10,000 - \$24,999	1.07	0.022	1.21	1.30	0.026	8.46	0.17
\$25,000 - \$34,999	1.08	0.039	1.29	1.39	0.051	9.06	0.33
\$35,000 - \$49,999	1.15	0.054	1.38	1.59	0.075	10.34	0.49
\$50,000 - \$74,999	1.24	0.080	1.37	1.70	0.110	11.04	0.71
\$75,000 - \$99,999	1.25	0.112	1.51	1.89	0.168	12.26	1.09
\$100,000 - \$149,999	1.39	0.172	1.50	2.08	0.258	13.55	1.67
\$150,000 - \$199,999	1.51	0.254	1.46	2.20	0.370	14.29	2.40
\$200,000 - \$249,999	1.51	0.334	1.55	2.34	0.518	15.20	3.37
\$250,000 or more	1.92	0.539	1.47	2.83	0.795	18.37	5.17
Total	1.39	0.119	1.46	2.03	0.174	13.21	1.13
Total (2)	1.40	0.121	1.46	2.04	0.176	13.27	1.15

Note: 1) Households that reported the number of household members on all reported air trips.
 2) Includes respondents who did not indicate their household income.

The average number of air trips reported per household for households reporting air trips during the recall period increases steadily with household income, as expected, except for the lowest income category below \$10,000 which had a higher average number of air trips than households in the next four higher income ranges. However, due to differences in average air party size, the average number of air passenger trips per household by those reporting air trips for households in the lowest income category was only slightly higher than for households in the next higher income range and effectively the same as for households in the next income range above that. This pattern is fairly consistent with the findings of air passengers surveys performed at airports that respondents in the lowest income category often report a higher rate of making air trips than those in the next income categories above them. However, due to the differences in the percentage of households reporting air trips by household income, the average numbers of air trips and air passenger trips per household across all households responding to the survey by households in the lowest income is essentially the same as for households in the next higher income range and increases steadily above that.

Although the survey provides a direct measure of the number of air trips reported for the eight-week period prior to the assigned travel day, in order to estimate the average number of annual air trips made by households with given characteristics, it is necessary to convert the number of air trips in an eight-week period to the number in a year. Since the survey was performed over the course of a little over a year from January 2012 to January 2013, the survey responses cover air travel undertaken over the 15-month period from November 2012 to January 2013, although this should not affect the analysis of air travel propensity of households with different characteristics, since each household only reported the number of air trips in an eight-week recall period. Assuming that the number of air trips made in the eight-week recall period is representative of the average rate of air travel over the year for any given subset of households or for the survey respondents in total, the average number of air trips per household given by the

survey responses was multiplied by 6.5 (52/8) to give the average number of air passenger trips per year shown in Table C-103. The overall average number of annual air passenger trips per household of 1.15 is well below the average number of annual air trips reported by respondents to the air passenger intercept surveys discussed above.

There are several factors that could, at least partially, account for this difference. The first is that it is not known how many of the households that did not report any air trips in the eight-week recall period in fact made no air trips in the previous year. Obviously such households would not show up in an air passenger intercept survey, which would tend to reduce the average number of air trips per household compared to those found in an air passenger survey. The second factor is that air passenger intercept surveys are surveys of air passenger trips, not of households. An air traveler who makes a large number of air trips per year is more likely to be interviewed in an airport intercept survey than an air traveler who only makes one or two air trips per year. This will tend to inflate the average of the reported number of air trips per year. On the other hand, it seems likely that survey respondents in airport intercept surveys are reporting the number of air trips that they personally made during the previous year, which will generally be less than the number of air passenger trips made by their household in total.

The analysis of air passenger travel by U.S. residents in 2014 shown in Table C-5 above implies an average of about 2.20 air passenger trips per household per year (273 million passenger trips by 124 million households), or about 1.9 times the average given by the CHTS survey responses (1.15). However, the average number of annual air travel party trips per household given by the CHTS data ($0.121 * 6.5 = 0.79$) is about 40% higher than that given by the national Consumer Expenditure Survey data (0.56).

We were not able to come up with a definitive explanation for these discrepancies, but this is an important topic for future research in order to better understand these differences in reported air travel propensity between the findings of household travel surveys and airport intercept surveys.

Nonetheless, because the survey collected a large amount of detailed socioeconomic data about each household that participated in the survey, the results of the survey can be used to explore how the relative frequency of making air trips differs across households of different characteristics. Because individual characteristics such as age, gender, and race/ethnicity can vary across different household members, the analysis identified a “respondent” for each household. Where the household member who completed the long-distance travel log was identified, this person was considered the respondent. Where the household member who completed the log was not identified, the respondent was considered to be the household member who was reported as making (or being part of) the most air trips reported by the household. For households that did not report making any air trips or where the household members making any of the reported air trips were not identified, the household member identified as “person 1” in the survey interview (typically the head of the household) was considered to be the respondent.

Table C-104 shows the distribution of all households that responded to the survey and those that reported making air trips in the eight-week recall period by the age range of the survey respondent, together with the number of air trips reported by those households and percent of all households that reported making air trips. The number of households that reported making air

trips during the recall period shown in Table C-104 excludes those households that did not report the number of household members traveling on every trip, for the reason noted above.

Table C-104. Air Trips Reported by California Household Travel Survey Respondents by Age Range of Respondent

Age of Survey Respondent	Households	Percent	Households with Air Trips (1)	Percent	Air Trips (2)	Percent Households w/ Air Trips (3)
Under 18	203	0.5%	26	0.7%	32	12.8%
18-24	758	1.8%	42	1.2%	49	5.5%
25-34	2,916	7.1%	206	5.9%	268	7.1%
35-44	5,592	13.6%	456	13.0%	657	8.2%
45-54	9,288	22.6%	895	25.5%	1,328	9.7%
55-64	12,537	30.6%	1,213	34.6%	1,747	9.7%
65-74	6,794	16.6%	538	15.3%	677	8.0%
75 and over	2,926	7.1%	130	3.7%	153	4.4%
	41,014	100%	3,506	100%	4,911	8.6%
Total (4)	42,431		3,646		5,116	8.6%

- Note: 1) Households that reported the number of household members on all reported air trips.
 2) Air trips by households that reported the number of household members on all reported air trips.
 3) Includes air trips for which the number of household members on the trip was not reported.
 4) Includes respondents who did not indicate their age range.

It can be seen from Table C-104 that the highest response rate to the survey came from households with respondents in the age range 55 to 64, which accounted for 31% of all households participating in the survey and 35% of all households that reported making air trips in the eight-week recall period. Given that most age ranges span 10 years and although some difference in the distribution of households by the age range of the head of household (who was generally the respondent to the survey and completed the long-distance travel log) could be expected, the distributions shown in Table C-104 strongly suggest that households with adults in the younger age ranges are under-represented in the survey responses.

The percentage of households that reported making air trips during the eight-week recall period generally increases with the age of the respondent up to age 64 and declines thereafter, with the exception of households with respondents under age 18, which reported the highest percentage of having made air trips. This is perhaps not surprising, since the relatively small percentage of households with a respondent under age 18 (only 0.5%) are likely students or others living away from home, who might reasonably be expected to have a higher use of air travel than households in general.

Table C-105 shows the average number of air trips (*i.e.*, air travel party trips) and air passenger trips per household for both those households that reported making air trips during the recall period and all households by age range of the respondent, together with the average air travel party size for the reported air trips. The average number of air passenger trips per household is also shown in an annual basis, assuming the average number of air trips per household during the recall period would apply during the rest of the year, as discussed above.

Table C-105. Average Number of Air Trips Reported by California Household Travel Survey Respondents by Age Range of Respondent

Age of Survey Respondent	Average Air Trips per Household		Average Air Party Size	Average Air Passenger Trips per Household			
	Households w/ Air Trips (1)	All Households		Recall Period		Annual	
				Households w/ Air Trips (1)	All Households	Households w/ Air Trips (1)	All Households
Under 18	1.23	0.158	1.95	2.41	0.308	15.6	2.00
18-24	1.17	0.065	1.24	1.45	0.080	9.4	0.52
25-34	1.30	0.092	1.32	1.72	0.122	11.2	0.79
35-44	1.44	0.119	1.67	2.41	0.198	15.6	1.29
45-54	1.48	0.144	1.47	2.19	0.212	14.2	1.37
55-64	1.44	0.140	1.39	2.00	0.194	13.0	1.26
65-74	1.26	0.100	1.44	1.81	0.145	11.8	0.94
75 and over	1.18	0.052	1.38	1.63	0.072	10.6	0.47
Total (2)	1.40	0.121	1.46	2.04	0.176	13.3	1.15

Note: 1) Households that reported the number of household members on all reported air trips.
 2) Includes respondents who did not indicate their age range.

It can be seen from Table C-105 that the average number of air passenger trips per household for those households that reported making air trips in the recall period generally increased with the age of the respondent until the age range from 35 to 44, then declined thereafter, although the difference between the age ranges is not large. Because of the difference in the percentage of all households that reported making air trips with the age range of the respondent shown in Table C-104, the average number of air passenger trips per household for all households continued to increase with the age of the respondent until the age range from 45 to 54 then declined. In both cases the small number of households with a respondent under age 18 had the highest average number of air passenger trips per household for any of the age ranges.

Female respondents reported a somewhat higher average air party size than male respondents for age ranges from 18 to 54 and a somewhat lower average air party size for age ranges over 54, as well as a slightly higher average air party size overall. There was no significant difference in average air party size for respondents under age 18. The average number of air trips per household reported by male respondents was generally higher than reported by female respondents for all age ranges except respondents in age ranges 18 to 24 and 75 and over, and somewhat higher overall, although the difference for the oldest age range may not be statistically significant. Due to the differences in average air party size, the average number of air passenger trips reported by female respondents in the ranges from 18 to 44 was higher than reported by male respondents and lower in the other age ranges, as well as slightly lower overall.

Further research would be needed to explore whether these differences reflect differences in household composition by age range or other factors, such as differences in household income.

Table C-106 shows the average air party size, average number of air trips, and average number of air passenger trips for those households that reported making air trips in the eight-week recall period by the age range and gender of the survey respondent. Female respondents reported a somewhat higher average air party size than male respondents for age ranges from 18 to 54 and a somewhat lower average air party size for age ranges over 54, as well as a slightly

higher average air party size overall. There was no significant difference in average air party size for respondents under age 18. The average number of air trips per household reported by male respondents was generally higher than reported by female respondents for all age ranges except respondents in age ranges 18 to 24 and 75 and over, and somewhat higher overall, although the difference for the oldest age range may not be statistically significant. Due to the differences in average air party size, the average number of air passenger trips reported by female respondents in the ranges from 18 to 44 was higher than reported by male respondents and lower in the other age ranges, as well as slightly lower overall.

Further research would be needed to explore whether these differences reflect differences in household composition by age range or other factors, such as differences in household income.

Table C-106. Average Number of Air Trips Reported by California Household Travel Survey Respondents by Gender and Age Range of Respondent

Age of Survey Respondent	Average Air Party Size		Average Air Trips per Household (1)		Average Air Passenger Trips per Household (1)	
	Male	Female	Male	Female	Male	Female
Under 18	1.96	1.95	1.31	1.15	2.56	2.25
18-24	1.13	1.35	1.09	1.26	1.23	1.71
25-34	1.23	1.40	1.37	1.25	1.68	1.75
35-44	1.50	1.87	1.50	1.37	2.25	2.57
45-54	1.44	1.51	1.56	1.41	2.25	2.12
55-64	1.40	1.38	1.49	1.40	2.08	1.94
65-74	1.48	1.40	1.28	1.24	1.89	1.73
75 and over	1.55	1.21	1.17	1.19	1.81	1.43
Total (2)	1.43	1.48	1.45	1.36	2.08	2.00

Note: 1) Households that reported the number of household members on all reported air trips.
 2) Includes respondents who did not indicate their age range.

Table C-107 shows the distribution of all households that responded to the survey and those that reported making air trips in the eight-week recall period by the race/ethnicity of the survey respondent, together with the number of air trips reported by those households and percent of all households that reported making air trips. The number of households that reported making air trips during the recall period shown in the table excludes those households that did not report the number of household members traveling on every trip, for the reason noted above.

70% of the respondents from all the households responding to the survey and an even higher percentage of those reporting making an air trip during the eight-week recall period, 83%, classified themselves as being white. The next largest category of respondents were those who classified themselves as Hispanic, at about 19%, followed by those who classified themselves as Asian, at about 5%. These are significantly lower than the proportion of the Hispanic and Asian population in California, suggesting that the survey may have over-sampled white households

Table C-107. Air Trips Reported by California Household Travel Survey Respondents by Race/Ethnicity of Respondent

Race/Ethnicity of Survey Respondent	Households	Percent	Households with Air Trips (1)	Percent	Air Trips (2)	Percent Households w/ Air Trips (3)
White	29,058	70.0%	2,963	83.3%	4,216	10.2%
Hispanic	7,850	18.9%	260	7.3%	329	3.3%
Black / African American	1,410	3.4%	63	1.8%	76	4.5%
Asian	2,107	5.1%	200	5.6%	286	9.6%
American Indian / Alaska Native	322	0.8%	10	0.3%	13	3.1%
Native Hawaiian / Pacific Islander	104	0.3%	3	0.1%	5	2.9%
Multi-racial	686	1.7%	60	1.7%	71	8.7%
	41,537	100%	3,559	100%	4,996	8.6%
Total (4)	42,431		3,646		5,116	8.6%

- Note: 1) Households that reported the number of household members on all reported air trips.
 2) Air trips by households that reported the number of household members on all reported air trips.
 3) Includes air trips for which the number of household members on the trip was not reported.
 4) Includes respondents who did not indicate their race/ethnicity.

White respondents had the highest percentage of households that reported making air trips during the recall period, about 10%, followed by Asian respondents, with only a slightly lower percentage. The percentages of Hispanic, American Indian or Alaska Native, and Native Hawaiian or Pacific Islander respondents that reported making air trips during the recall period were much lower, at rates around a third of the households with white and Asian respondents.

Table C-108 shows the average number of air trips and air passenger trips per household for both those households that reported making air trips during the recall period and all households by the race/ethnicity of the respondent, together with the average air travel party size for the reported air trips. The average number of air passenger trips per household is also shown in an annual basis, assuming the average number of air trips per household during the recall period would apply during the rest of the year, as discussed above.

Households with white and Asian respondents had a somewhat higher average number of air trips per household that reported making air trips during the eight-week recall period than households with respondents of other race/ethnicity categories, with the exception of Native Hawaiian or Pacific Islander respondents. However, there were only three households in this category that reported making air trips, so the average number of air trips per household is quite unreliable. In any case, because of the small percentage of households with Native Hawaiian or Pacific Islander respondents that reported making air trips during the recall period, the average number of air trips per household across all households responding to the survey was much lower than for households with white or Asian respondents.

Table C-108. Average Number of Air Trips Reported by California Household Travel Survey Respondents by Age Range of Respondent

Race/Ethnicity of Survey Respondent	Average Air Trips per Household		Average Air Party Size	Average Air Passenger Trips per Household			
	Households w/ Air Trips (1)	All Households		Recall Period		Annual	
				Households w/ Air Trips (1)	All Households	Households w/ Air Trips (1)	All Households
White	1.42	0.146	1.45	2.06	0.211	13.4	1.37
Hispanic	1.27	0.042	1.54	1.94	0.065	12.6	0.42
Black / African American	1.21	0.054	1.39	1.68	0.075	10.9	0.49
Asian	1.43	0.138	1.55	2.22	0.213	14.4	1.39
American Indian / Alaska Native	1.30	0.040	1.25	1.63	0.050	10.6	0.33
Native Hawaiian / Pacific Islander	1.67	0.048	1.00	1.67	0.048	10.8	0.31
Multi-racial	1.18	0.103	1.41	1.67	0.146	10.9	0.95
Total (2)	1.40	0.121	1.46	2.04	0.176	13.3	1.15

Note: 1) Households that reported the number of household members on all reported air trips.
 2) Includes respondents who did not indicate their race/ethnicity.

The average air party size did not vary much across households with respondents of different race/ethnicity, with the exception of households with Native Hawaiian or Pacific Islander respondents, very few of which made any air trips so the average air party size is not reliable. Households with Asian respondents had the highest average number of air passenger trips per household that reported making air trips during the recall period, closely followed by households with white respondents. Although households with a Hispanic respondent had the third highest average number of air passenger trips per household that reported making air trips during the recall period, when expressed as the average number of air passenger trips for all households, the rate for these households dropped below the average rates for households with black or African American or multi-racial respondents.

It is of course quite likely that these differences in the average number of air trips and air passenger trips per household are largely due to other factors than race/ethnicity that vary across households of different race/ethnicity, such as household income and occupation. Further research would be helpful to explore whether there are differences in the use of air travel by the race/ethnicity of household members after controlling for these other factors.

Survey Response Weighting

The CHTS survey contractor calculated weighting factors to adjust survey responses for over- and under-sampling. Two different factors were calculated: a household weighting factor based on household characteristics that can be applied to each household and a person weighting factor based on both household and individual characteristics that can be applied to each person identified in the survey. The intent in each case was to allow survey results to be expanded to give county and statewide totals. The details of the derivation of the weighting factors are documented in the Final Report on the survey (NuStats, 2013).

The household weights considered the following factors:

- Geography (county of residence)
- Household income (six income ranges)
- Household size
- Number of workers in household
- Number of vehicles in household

The weights were derived using an iterative raking procedure (described in the Final Report) to correspond to the statewide distribution for each of these factors.

The person weights were derived by starting with the final household weight and applying an iterative raking procedure that considered the following factors:

- Hispanic or not
- Ethnicity
- Age (five age ranges)
- Employment status (full-time, etc.)
- County of residence (population)

The objective was to obtain person weights that gave survey totals that corresponded to the statewide distributions for each of these factors.

It should be noted that the household weights do not explicitly consider race/ethnicity or age of the household members, except to the extents that these are partially accounted for by other factor, such as household income. Finally, the weights were factored so that the weighted total of the survey response data corresponded to the statewide number of households (household weight) or statewide population (person weights).

The weighting procedure raises the question whether the analysis of air travel propensity from the long-distance trips reported in the survey should use weighted or unweighted data. In order to determine how much the household or person weights might affect the number of air trips reported by a given household, the distribution of the household and respondent person weights were calculated and normalized to the average weight. These distributions are shown in Figure C-36.

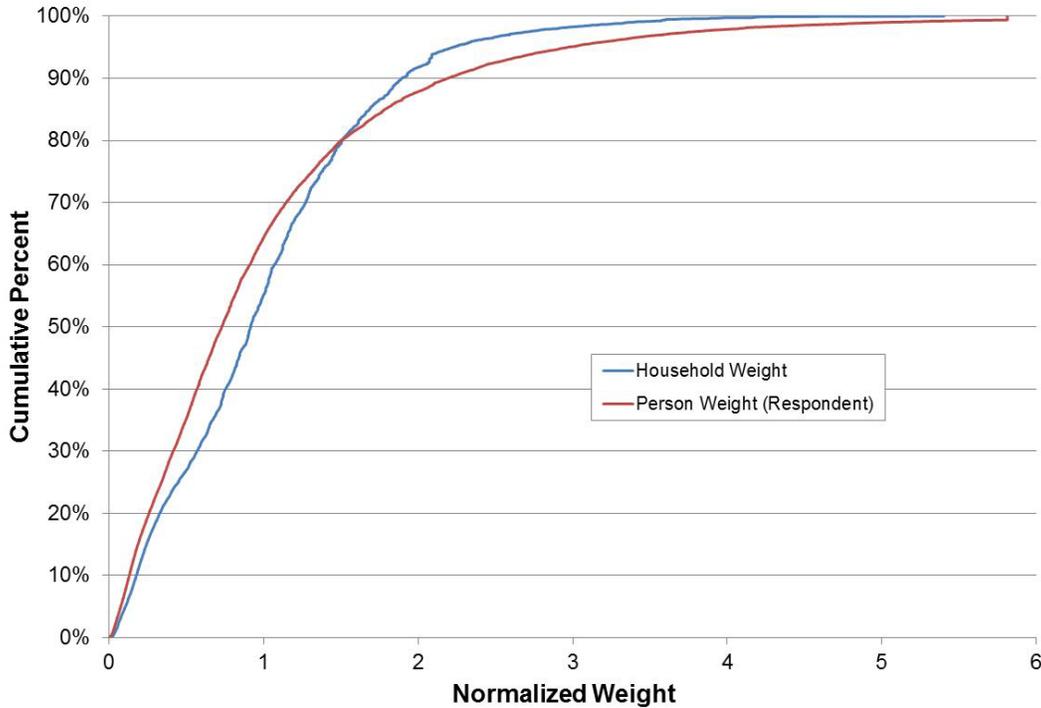


Figure C-36. Distribution of Response Weights for California Household Travel Survey

It can be seen that the weights cover a very wide range. For the household weights, the range of the normalized weights extends from 0.0035 to 5.40, with 95% of the weights in the range from 0.064 to 2.71, or a factor of 42 times. For the respondent person weights, the range of the normalized weights extends from 0.00065 to 5.81, with 95% of the weights in the range from 0.045 to 3.77, or a factor of 84 times. Therefore, applying the weights to relatively small subsets of the total survey sample, such as households with particular characteristics that reported air trips in the eight-week recall period, could significantly distort the estimated average air travel use by those households if households with particularly low or high weights happened to make a relatively large number of trips.

Thus on balance it appears better to use unweighted data, with the caveat that the proportions of households with a particular characteristic (e.g., a given household income) on the survey data may not reflect the proportion of households with that characteristic in the total population.

2015 Michigan Travel Counts Survey

Starting in 2004, the Michigan Department of Transportation has undertaken a series of statewide household travel surveys termed MI Travel Counts. The first survey was undertaken in 2004-2005 and updated in 2009. The latest survey was undertaken in 2015, starting in January and continuing throughout the year. Travel data was obtained from 16,276 households across the state. Households were initially contacted by mail with follow-up telephone calls and those that agreed to participate were mailed an information packet that included an identification code (PIN), instructions, and paper copies of travel logs for each member of the household to

complete on their assigned travel day. After their assigned travel day, respondents could enter their household information and travel details on the MI Travel Counts website or by calling a toll-free telephone number and providing the information to a survey representative.

Participating households provided information on household composition and other characteristics and each household member completed a travel log for an assigned day. In addition, each household completed a long-distance travel log that covered all trips over 100 miles made by household members in the three months prior to the assigned travel day. A subsample of households was provided with wearable GPS devices for each household member that recorded details of the trips taken on the assigned day. Information on household composition and characteristics collected included the age, gender, and employment status of each household member, the vehicles owned by the household members, and the household income.

The long-distance travel log included the following information for each long-distance trip:

- Destination city and state
- Household members traveling on trip
- Dates of departure and return
- Main reason to making the trip
- How the travel party got to the destination and got around at the destination
- The number of times that this trip was made in the previous three months

The reason for the trip and means of travel were free-form entry fields on the travel log, although these were coded when the data were reported. If a trip involved multiple destinations, respondents were instructed to report the furthest destination.

Of the 16,276 households responding to the survey, 9,961 (61%) reported making long-distance trips. The long-distance travel file contains one record for each long-distance trip reported by survey respondents.

Long-Distance Travel

The long-distance travel file contains records for 17,402 long-distance trips, of which 2,102 (12%) involved the use of air travel. These air trips were made by 1,620 households (10% of all households participating in the survey and 16% of the households reporting making long-distance trips). The households that reported making air trips reported an average of 1.30 air trips per household. The largest number of air trips during the three-month recall period reported by a household was seven, while the largest number of all long-distance trips during the period reported by a household during the was 14. The distributions of the reported number of long-distance trips per household and the reported number of air trips are shown in Table C-109.

Almost 60% of the households that reported making long-distance trips during the previous three months only reported one such trip, while almost 80% of the households that reported making one or more air trips during the same period only reported making one air trip. Although the percentage of households that reported making one or more long-distance trip that

only reported making one long-distance trip (59%) was higher than was found in the California Household Travel Survey (49%), the definition of a long-distance trip was twice the distance used in the California survey, which would have excluded a large number of trips that would have been counted in the California survey. However, the definition of a long-distance trip should not have affected the number of air trips that would have been reported, since these are generally longer than 100 miles. The percentage of all households participating in the survey that reported making air trips (10%) was slightly higher than found in the California survey (8.6%), which is consistent with the longer recall period. The percent of households that reported making one or more air trips that only reported making one air trip (80%) was also somewhat higher than in the California survey (74%), in spite of the longer recall period (three months compared to eight weeks for the California survey), suggesting a lower overall use of air travel by respondents to the Michigan survey than respondents to the California survey.

Table C-109. Long-Distance Trips in Previous Three Months Reported by Michigan Travel Count Survey Respondents

Trips	All Long-Distance Trips		Air Trips	
	Households	Cumulative Percent	Households	Cumulative Percent
1	5,920	59.4%	1,294	79.9%
2	2,322	82.7%	237	94.5%
3	930	92.1%	53	97.8%
4	386	96.0%	16	98.8%
5	186	97.8%	10	99.4%
6	96	98.8%	9	99.9%
7	57	99.4%	1	100.0%
8	29	99.6%		
9	12	99.8%		
10	9	99.9%		
11	7	99.9%		
12	2	99.9%		
13	2	100.0%		
14	3	100.0%		
Total	9,961		1,620	

Households responding to the survey were asked their total household income for the previous year in nine categories. About 12% of all responding households that reported making long-distance trips did not report their annual household income using these income categories, while about 13% of households that reported making one or more air trips did not report their income using these categories. Those respondents who did not provide their income using these categories were asked follow-up questions to attempt to obtain the household's annual income in only four categories and about half did. However, due to the limited number of categories, no attempt has been made to include these households in the analysis of the income distribution of households reporting long-distance trips.

The income distributions of all households that reported making long-distance trips and of those that reported making air trips are shown in Table C-110, together with the average

number of air trips reported by households in each income category that reported making air trips.

Table C-110. Annual Household Income Reported by Michigan Travel Count Survey Respondents

Household Income	All Long-Distance Trips		Air Trips	
	Households	Percent	Households	Percent
Less than \$15,000	471	5.3%	38	2.7%
\$15,000-\$24,999	614	7.0%	59	4.2%
\$25,000-\$34,999	841	9.6%	77	5.5%
\$35,000-\$49,999	1,323	15.0%	144	10.2%
\$50,000-\$74,999	2,100	23.9%	302	21.4%
\$75,000-\$99,999	1,407	16.0%	233	16.5%
\$100,000-\$124,999	958	10.9%	221	15.7%
\$125,000-\$149,999	475	5.4%	127	9.0%
\$150,000 or more	616	7.0%	211	14.9%
	8,805	100%	1,412	100%
Total (1)	9,961		1,620	

Note: 1) Includes respondents who did not indicate their household income.

As expected, it can be seen from Table C-110 that a higher proportion of households that reported making air trips are in the higher income categories, as was also found in the California Household Travel Survey.

In addition to collecting details in each long-distance trip undertaken in the previous three months reported by survey respondents, the survey asked if any of those trips were made multiple times during the three-month period and if so, how many times. If respondents reported that a particular trip was made multiple times in the previous three months, the survey also asked how many times the trip had been made in the previous 12 months.

One potential problem with this approach is that it is unclear whether the same number of household members went on each trip in the case where the same trip was made multiple times. Indeed, it is unclear how the “same” trip was defined. Was a trip considered the same if it was to the same destination, or did other aspects of the trip, such as the main mode used, also have to be the same? Obviously, it does not matter if survey respondents reported multiple trips to the same destination as separate trips, since the information for each of these trips would be included in the long-distance travel file. However, if multiple trips to the same destination were reported as the “same” trip when in fact they involved different numbers of household members or even the use of a different main mode, then the resulting number of air passenger trips could be under- or over-estimated.

A second issue with estimating the number of air passenger trips reported by survey respondents results from the fact that survey respondents did not identify which household members went on 1.3% of all the reported air trips or, in a few cases, how many times a given trip was made in the previous three months. The missing travel party size data can be corrected for some analyses by assuming that the average number of household members who went on

trips where this was not stated is given by the average number of household members who went on air trips where the travel party size was reported.

Analysis of the survey data on repeated trips suggests that on average survey respondents make somewhat more than four times the number of reported air trips in a three-month period on an annual basis. The survey respondents reported 553 repeated trips in the previous three months and 2,649 repeated trips in the previous 12 months, or about 20% more than four times the number in the previous three months.

Taking account of the number of household members traveling on each air trip and the number of times a given trip was repeated in the previous three-month period, the average number of air trips made in the previous three months per household making air trips and the average number of air passenger trips for each household income range are shown in Table C-111, together with the average air travel party size.

Table C-111. Air Trips in Previous 3 Months Reported by Michigan Travel Counts Survey Respondents by Household Income

Household Income	Air Trips				Average Air Party Size	Air Passenger Trips	
	Households	Percent	Air Trips	Average Air Trips per Household		Trips	Average Trips per Household
Less than \$15,000	38	2.7%	47	1.24	1.11	52	1.37
\$15,000-\$24,999	58	4.2%	72	1.24	1.14	82	1.41
\$25,000-\$34,999	77	5.5%	95	1.23	1.22	116	1.51
\$35,000-\$49,999	143	10.3%	196	1.37	1.28	251	1.76
\$50,000-\$74,999	299	21.5%	384	1.28	1.42	546	1.83
\$75,000-\$99,999	229	16.4%	301	1.31	1.53	461	2.01
\$100,000-\$124,999	218	15.6%	300	1.38	1.52	456	2.09
\$125,000-\$149,999	125	9.0%	209	1.67	1.45	303	2.42
\$150,000 or more	206	14.8%	493	2.39	1.53	755	3.67
Total	1,393	100.0%	2,097	1.51	1.44	3,022	2.17
Total (1)	1,596		2,427	1.52	1.52	3,502	2.19

Note: 1) Includes respondents who did not indicate their household income.

The average number of air trips reported per household increases with household income, as expected, except for the lowest income category. However, this is consistent with the findings of air passengers surveys performed at airports that respondents in the lowest income categories often report a higher rate of making air trips than those in the next income categories above them. It is possible that other household characteristics that are correlated with income, such as household size or student status, could explain this.

Although the average air trips per household generally shows an increase with increasing household income, the difference between households with annual incomes below \$125,000 is not particularly large. However, these averages should be treated with some caution, since they only reflect air trips made over three-month period, so the likelihood of the members of any given household making more than one air trip in this period is fairly small, even if the household makes several air trips per year. This is reflected both in the high percentage of

households that reported making air trips that reported only one such trip (80%) and the high percentage of households that reported making long-distance trips in the three-month period (84%) that did not report making any air trips at all.

The average air travel party size generally increased with household income, as shown in Table C-111. As a result, the average number of *air passenger* trips per household shows a stronger increase with household income than the number of *air party* trips and the increase in average air party size offsets the drop in the average number of air trips with income for households with annual household incomes between \$15,000 and \$24,999 and the higher average number of air trips per household for households with annual incomes between \$35,000 and \$49,999, resulting in a steady increase in the average number of air passenger trips per household with increasing income.

The overall air travel propensity shown in Table C-111 is equivalent to 8.6 air passenger trips per household on an annual basis, assuming that the numbers of annual trips are four times the number reported for the previous three-month period. This is almost the same as the weighted average of about 8.7 air trips in the previous twelve months reported in the airport air passenger surveys shown in Table 8 of the Final Report of the project. However, it should be noted that the air travel propensity given in Table C-111 is the number of air passenger trips per household, while that given in Table 8 is the average number of annual trips reported by each survey respondent. Presumably the survey respondents were reporting the number of trips that they had made personally, not the number made by all members of their household.

The corresponding average air trips and air passenger trips per household for all households responding to the survey is shown in As can be expected, the distribution of households that reported making air trips during the recall period, as shown in Table C-111, has greater percentages in the higher income categories than for all households that responded to the survey. The percentage of households in each household income category that reported making air trips shows a steady increase with income, as do the average air trips per household and air passenger trips per household for all households that responded to the survey. The average number of air passenger trips per household in total (0.218) is somewhat lower than found in the California Household Travel Survey if the latter is adjusted for the shorter recall period of only eight weeks ($0.176 * 13/8 = 0.286$). This may at least partly reflect the difference in household income distribution, with about 17% of respondents to the Michigan survey reporting household incomes over \$100,000 compared to about 30% in the California survey, which was performed three years earlier.

Table C-112, together with the distribution of households responding to the survey by household income and the percentage of all household that reported air trips in the three-month recall period. As can be expected, the distribution of households that reported making air trips during the recall period, as shown in Table C-111, has greater percentages in the higher income categories than for all households that responded to the survey. The percentage of households in each household income category that reported making air trips shows a steady increase with income, as do the average air trips per household and air passenger trips per household for all households that responded to the survey. The average number of air passenger trips per household in total (0.218) is somewhat lower than found in the California Household Travel Survey if the latter is adjusted for the shorter recall period of only eight weeks ($0.176 * 13/8 =$

0.286). This may at least partly reflect the difference in household income distribution, with about 17% of respondents to the Michigan survey reporting household incomes over \$100,000 compared to about 30% in the California survey, which was performed three years earlier.

Table C-112. Air Trips in Previous 3 Months Reported by Michigan Travel Counts Survey Respondents by Household Income (All Households)

Household Income	All Households	Percent	Percent with Air Trips	Average Air Trips per Household	Average Air Passenger Trips per Household
Less than \$15,000	1,481	10.3%	2.6%	0.032	0.036
\$15,000-\$24,999	1,528	10.6%	3.9%	0.048	0.054
\$25,000-\$34,999	1,636	11.4%	4.7%	0.059	0.072
\$35,000-\$49,999	2,234	15.5%	6.4%	0.089	0.114
\$50,000-\$74,999	3,113	21.6%	9.7%	0.125	0.178
\$75,000-\$99,999	1,890	13.1%	12.3%	0.162	0.248
\$100,000-\$124,999	1,208	8.4%	18.3%	0.252	0.383
\$125,000-\$149,999	568	3.9%	22.4%	0.373	0.541
\$150,000 or more	738	5.1%	28.6%	0.678	1.038
Total	14,396	100%	9.8%	0.148	0.213
Total (1)	16,276		10.0%	0.151	0.218

Note: 1) Includes respondents who did not indicate their household income.

The Michigan survey collected somewhat less socioeconomic data about each household than the California Household Travel Survey. In addition to household income, the survey recorded the age and gender of each household member and used this to construct a “life cycle” variable for each household that reflected the household composition and ages of the household members. However, no data was collected on the race or ethnicity of survey respondents.

Table C-113 shows the distribution of all households that responded to the survey and those that reported making air trips in the three-month recall period by the age range of the survey respondent, together with the number of air trips reported by those households and percent of all households that reported making air trips. The number of households that reported making air trips during the recall period shown in Table C-113 excludes a few households that did not report the household members traveling on every trip.

Table C-113. Air Trips Reported by Michigan Travel Counts Survey Respondents by Age Range of Respondent

Age of Survey Respondent	Households	Percent	Households with Air Trips (1)	Percent	Air Trips (2)	Percent Households w/ Air Trips (3)
18-24	659	4.2%	44	2.8%	64	6.7%
25-34	2,278	14.5%	268	17.3%	392	11.8%
35-44	2,026	12.9%	220	14.2%	352	10.9%
45-54	2,869	18.2%	280	18.1%	459	9.8%
55-64	3,975	25.2%	409	26.4%	647	10.3%
65-74	2,806	17.8%	255	16.5%	346	9.1%
75 and over	1,140	7.2%	72	4.7%	98	6.3%
	15,753	100%	1,548	100%	2,358	9.8%
Total (4)	16,276		1,596		2,427	

- Note: 1) Households that reported the number of household members on all reported air trips.
 2) Air trips by households that reported the number of household members on all reported air trips.
 3) Includes air trips for which the number of household members on the trip was not reported.
 4) Includes respondents who did not indicate their age.

Table C-114 shows the average number of air trips (*i.e.*, air travel party trips) and air passenger trips per household for both those households that reported making air trips during the recall period and all households by age range of the respondent, together with the average air travel party size for the reported air trips. The average number of air passenger trips per household is also shown in an annual basis, assuming the average number of air trips per household during the recall period would apply during the rest of the year.

Table C-114. Average Number of Air Trips Reported by Michigan Travel Counts Survey Respondents by Age Range of Respondent

Age of Survey Respondent	Average Air Trips per Household		Average Air Party Size	Average Air Passenger Trips per Household			
	Households w/ Air Trips (1)	All Households		Recall Period		Annual	
				Households w/ Air Trips (1)	All Households	Households w/ Air Trips (1)	All Households
18-24	1.45	0.097	1.34	1.95	0.131	7.82	0.522
25-34	1.46	0.172	1.37	2.00	0.236	8.01	0.943
35-44	1.60	0.174	1.66	2.65	0.288	10.62	1.153
45-54	1.64	0.160	1.47	2.40	0.235	9.61	0.938
55-64	1.58	0.163	1.36	2.15	0.221	8.60	0.885
65-74	1.36	0.123	1.47	2.00	0.182	8.00	0.727
75 and over	1.36	0.086	1.37	1.86	0.118	7.44	0.470
Total (2)	1.52	0.149	1.44	2.19	0.215	8.78	0.861

- Note: 1) Households that reported the number of household members on all reported air trips.
 2) Includes respondents who did not indicate their age.

Error! Not a valid bookmark self-reference. shows the average air party size, average number of air trips, and average number of air passenger trips for those households that reported making air trips in the three-month recall period by the age range and gender of the survey respondent. Female respondents reported a somewhat higher average air party size than male respondents for age ranges from 25 to 54 and a significantly lower average air party size for age ranges over 54, as well as a marginally lower average air party size overall. There was no significant difference in average air party size for respondents under age 25.

Table C-115. Average Number of Air Trips Reported by Michigan Travel Counts Survey Respondents by Gender and Age Range of Respondent

Age of Survey Respondent	Average Air Party Size		Average Air Trips per Household (1)		Average Air Passenger Trips per Household (1)	
	Male	Female	Male	Female	Male	Female
18-24	1.35	1.34	1.54	1.42	2.08	1.90
25-34	1.33	1.40	1.60	1.38	2.12	1.93
35-44	1.48	1.79	1.72	1.52	2.55	2.73
45-54	1.42	1.50	1.81	1.53	2.58	2.30
55-64	1.42	1.31	1.63	1.55	2.32	2.04
65-74	1.61	1.35	1.35	1.36	2.17	1.84
75 and over	1.56	1.22	1.43	1.31	2.23	1.60
Total (2)	1.45	1.44	1.60	1.47	2.32	2.10

Note: 1) Households that reported the number of household members on all reported air trips.
 2) Includes respondents who did not indicate their age.

The average number of air trips per household reported by male respondents was generally higher than reported by female respondents for all age ranges except respondents in the age range from 65 to 74 and significantly higher overall, although the difference for respondents in the age range from 65 to 74 may not be statistically significant. Due to the differences in average air party size, the average number of air passenger trips reported by female respondents was lower than reported by male respondents for all age ranges except respondents age 35 to 44, as well as lower overall. Further research would be needed to explore whether these differences reflect differences in household composition by age range or other factors, such as differences in household income.

Table C-116 shows the number of households that reported making air trips during the three-month recall period by the survey lifecycle classification, together with the average number of air passenger trips per household for each lifecycle category. It can be seen from the table that households with one adult reported a lower average number of air passenger trips per household than households in the corresponding life cycle with two or more adults. This is not surprising, since households with more adults will tend to make more air passenger trips in any given period. Households with one non-retired adult and no children reported making the lowest average number of air passenger trips per household of all the lifecycle categories, although this was more than half the average value for households with two or more non-retired adults and no children.

Table C-116. Average Number of Air Trips Reported by Michigan Travel Counts Survey Respondents by Gender and Age Range of Respondent

Household Lifecycle	Households (1)	Percent	Average Air Passenger Trips per Household (1)
1 adult, not retired, no children	251	15.8%	1.53
2+ adults, not retired, no children	522	32.8%	2.30
1 adult, youngest child 0 to 4	8	0.5%	1.88
2+ adults, youngest child 0 to 4	142	8.9%	2.65
1 adult, youngest child 5 to 17	24	1.5%	1.67
2+ adults, youngest child 5 to 17	222	14.0%	2.89
2 adults, age gap 15+ years	51	3.2%	1.73
3+ adults, age gap 15+ years	113	7.1%	2.37
All adults retired, no children	257	16.2%	1.82
	1,590	100%	2.19
Total (2)	1,596		2.19

- Note: 1) Households that reported the number of household members on all reported air trips.
 2) Includes respondents who did not provide enough information to determine their lifecycle.

Although these differences partly reflect the number of household members, they may also be influenced by the life cycle stage of the households and potentially other factors correlated with that, such as household income and age of the adults in the household. Further research would be needed to separate the effects on air travel propensity of household size and composition, age of household members, life cycle stage, and household income. The number and age of children in the household could be expected to have a significant effect on air travel propensity for any given household income level, since the household expenses incurred for the children would affect the discretionary income available for air travel.

C.4 Summary and Implications for Air Passenger Demand Studies

The analysis of the various air passenger and household surveys described in the previous section shows, not surprisingly, that the average number of air travel party and air passenger trips per household or per air traveler varies widely with the household or air traveler characteristics. There also appears to be broad consistency in the findings across different surveys. Also not surprisingly, the use of air travel has been found to vary widely by household income, with higher income households making more air trips per household. The use of air travel also varies with the age and gender of survey respondents, as well as their race and ethnicity. However, the survey sample sizes have generally not been large enough to allow more detailed cross-tabulation analysis of the extent to which the influence of these other factors when considered separately partly reflect differences in household income. This is a major issue to explore in future research.

a. Implications for Air Passenger Demand Studies

The findings of the analysis of air passenger and household travel surveys documented in this appendix have important implications for air passenger demand studies. Not surprisingly, the survey results show that air travel propensity, expressed as the average number of air trips in the previous year, varies considerably by household socioeconomic characteristics, including income, age of the survey respondent, gender, and race/ethnicity. Naturally, some of the characteristics are correlated, such as household income and age of the head of household (or at least the household member responding to the survey), so some of the differences in air travel propensity with any one of these characteristics may be partly due to correlation with other characteristics. Ideally, it would be desirable to develop a model of air travel propensity that considers all the relevant household characteristics simultaneously.

The survey findings also show, again not surprisingly, that travelers making business trips tend to have a higher air travel propensity on average than those making personal trips. Surveys that have asked how many trips respondents have made in the past year by trip purpose clearly show that, the average number of air trips for business purposes by those who made at least one business air trip is considerably higher than the average number of personal trips by those who made at least one personal trip (which includes almost all air travelers). However, many surveys only ask how many air trips respondents made in the past year in total (if they ask about previous air travel at all). Even so, because travelers who have made at least one business air trip in the past year make more air trips per year on average than travelers who have only made personal air trips, the average number of total trips per year by travelers making a business trip when they were surveyed is higher than for those making a personal trip.

Since air passenger surveys are generally the only way to obtain data on the trip purpose of air travelers at a given airport and are typically performed over a relatively short period of time (often a week or two) at fairly widely spaced intervals (in many cases several years apart), data on air passenger trip purpose at a given airport is not very reliable, particularly in terms of how trip purpose varies seasonally or from year to year. Nonetheless, the available data suggest, not unreasonably, that the percentage of air passengers at a given airport who are making a business trip varies from airport to airport and is heavily influenced by the composition of the

local economy of the region served by each airport. As could be expected, regions that are major tourist destinations can be expected to have a smaller percentage of business trips than regions that are major business centers. However, it is important to remember that air passenger surveys performed at airports typically only ask about the number of air trips made in the past year from that airport or the airports serving the region and thus can only estimate the air travel propensity of residents of the region served by the airport, since many of the air trips made in the past year by visitors to the region will have been made to different destinations.

The findings of airport air passenger surveys also show that the air travel propensity of female survey respondents is lower on average than that of male survey respondents, and that this appears to be largely the result of the much higher proportion of survey respondents making business trips who are male. When considering only personal trips, female survey respondents appear to have a slightly higher air travel propensity than male survey respondents. However, some caution is appropriate in interpreting this finding because the surveys typically only record the gender of the survey respondent and in the case of air travel parties of more than one person there is no information on the gender of the other members of the travel party.

One unexpected finding from the analysis of air trip propensity from household travel surveys is that the reported number of air trips in the previous year appears to be significantly less than reported by respondents to airport air passenger surveys. In the case of the Consumer Expenditure Survey (CES), the largest household survey that includes air travel information, some assumptions are necessary to estimate overall air travel propensity, since the survey only includes air trips that were paid for entirely or partly by the responding households and does not provide any information on the number of household members who went on each trip. Even so, after making appropriate assumptions, the survey appears to account for less than half of all domestic air trips, compared to conventional air travel statistics from the U.S. DOT. Although this could be a consequence of the CES survey methodology or a systematic under-reporting by survey respondents, a similar shortfall in total estimated air travel is found in analyzing the results of the two state household travel surveys described above.

One possible explanation for this is the fact that someone who makes more air trips per year is more likely to be surveyed than someone who makes fewer air trips per year, since they have a greater likelihood of being at the airport when the survey is being performed and therefore being included in the sample. However, although this may explain differences in estimated air travel propensity between respondents to household travel surveys (which are a sample of households) and airport air passenger surveys (which are a sample of air passenger trips), it does not explain the shortfall in total air passenger trips when the air travel propensity by household (expressed as air passenger trips per household) estimated from household travel surveys is multiplied by the total number of households in the country. This is an issue that will be explored in more detail in the remainder of the project.

Air Travel Propensity by Household Characteristics

Based on the analysis of air passenger and household travel survey data, the principal household characteristic from the perspective of the influence of these characteristics on air travel propensity is annual household income. The survey results show that although air travel propensity increases progressively with household income, it is not directly proportional to

household income (at least as reported by survey respondents). The survey questions on household income are generally vague on what income is being asked (before tax, after tax, wage and salary only, etc.), but it assumed that most respondents would report their gross income before taxes. Furthermore, it is assumed that survey respondents would have reported their annual household income for the calendar year preceding the year in which the survey was performed, expressed in then-year dollars, since that is the income they are most likely to remember from filing their most recent tax return.

Since household income expressed in one way or another is recognized as a major determinant of air travel demand, the distribution of air travel propensity by household income provides an important insight into how changes in income distribution could affect air travel demand. In order to compare the distributions of air travel propensity with income across surveys performed at different times and using different income ranges, the break points of the household income ranges were first converted to constant 2015 dollars. The estimated average air travel propensity for each income range was then assigned to the mid-point of the range and a smooth curve fitted to the resulting data. Some assumptions are required for the highest income range, particularly when that range has a relatively low lower limit (for example \$200,000) that results in a significant percentage of survey respondents in this range.

The 2015 Survey of International Air Travelers (SIAT) asked respondents to state their actual household income, as discussed above, so these income data provide an indication of the distribution of household incomes above any given threshold, from which the average income for that range can be calculated. Although this distribution of household incomes strictly applies to U.S. resident air travelers making international air trips, it seems reasonable that this would reflect the income distribution of U.S. resident air travelers in general, at least for higher income households. Nonetheless, this assumption could be examined by comparing the household income distributions of air passenger surveys that used different lower bounds to the highest income category.

Similarly, assumptions about the average income for households in the lowest income range are required, since their incomes are not likely to be evenly distributed between zero and the upper limit of the range. Since very few households with incomes below \$10,000 are likely to be able to afford to take air trips, it was assumed that the incomes in the lowest range were distributed evenly between \$10,000 and the upper limit of the range. It is recognized that this is a somewhat simplistic assumption which could be refined with more detailed analysis.

Air travel propensity functions from several air passenger surveys performed over the period from 2006 to 2015 for survey respondents making a business trip are shown in Figure C-37. The fitted models for each survey shown in Figure C-37 were obtained by fitting an inverse tangent mathematical function to the average annual air trip data for each annual income range, as discussed above. The general format of this function is:

$$AAAT = a * \text{atan}((AHI - b)/c)$$

where AAAT is the average number of annual air trips and AHI is the annual household income.

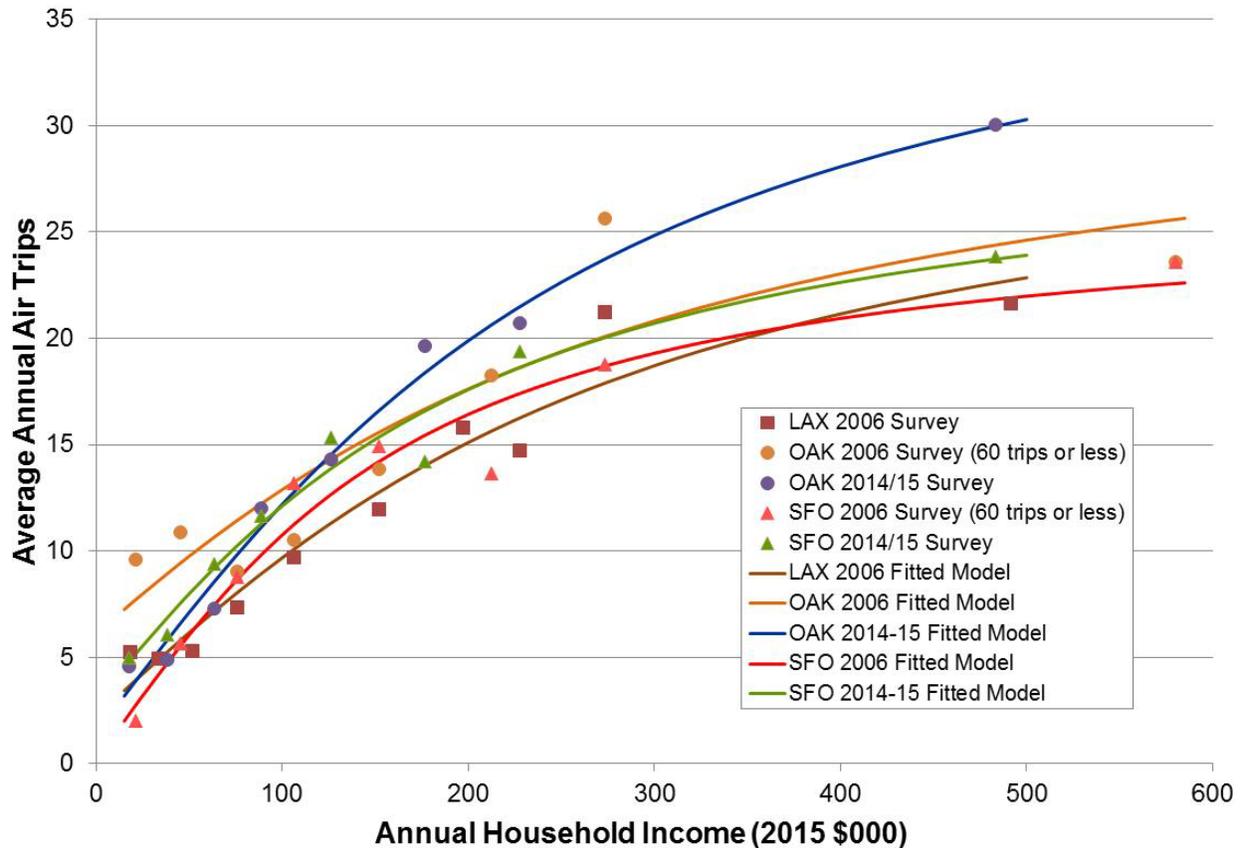


Figure C-37. Change in Average Annual Air Trips with Annual Household Income for Selected Air Passenger Surveys – Respondents Making a Business Trip

This function was found to generally give the best fit to the data while reflecting both a diminishing rate of growth of average annual air trips with increasing income, implied by the survey data, and a continuously increasing relationship between average annual air trips and income, as required by logic. However, it should be noted that these are purely empirical relationships and not based on any underlying causal explanation, such as a relationship between disposable household income and the percentage of disposable income used for air travel.

It should also be noted that the number of survey responses for each income level varied widely, with fewer responses in the higher income levels. In fitting the curves to the data points, no attempt was made to weight the data to reflect the number of survey responses at each income level. Furthermore, because household incomes were reported in ranges, the data point for each range was assumed to be the mid-point of the range, except for the highest income range, which was open-ended and assigned an assumed value, and the lowest income range, for the reason discussed above. The fact that the fitted curves pass through some of the data points for the highest income range is coincidental.

The fitted models shown in Figure C-37 are generally consistent across the various surveys with the exception of the 2014/15 OAK survey, which implies a much higher average number of air trips at higher levels of household income than given by the other surveys. The fitted relationship for the 2006 LAX survey gives a somewhat lower average number of annual

air trips for any given household income as the fitted relationship for the 2006 SFO survey for household incomes between about \$75,000 and \$325,000, with generally similar values above and below those incomes, and both relationships give a somewhat lower average number of annual air trips than given by the fitted relationship for the 2006 OAK survey. The difference between the relationships for OAK and SFO for both the 2006 and 2014/15 surveys could reflect a preference for OAK by air travelers who made large numbers of business trips in the West Coast markets that were well-served by the airlines at OAK (primarily Southwest Airlines and Alaska Airlines).

The relationships for the 2014/15 surveys at both OAK and SFO give higher numbers of average annual air trips for any given household income than those for the 2006 surveys at each airport for all household incomes at SFO and for household incomes above about \$125,000 at OAK. This suggests that there has been an increase in business air travel from the 2006 to the 2014/15 surveys.

The corresponding relationships for survey respondents who were making a personal trip are shown in Figure C-38. The fitted relationships for the four Bay Area surveys give higher average numbers of annual air trips than the relationship for the 2006 LAX survey, consistent with the results for survey respondents making a business trip. The relationship for the 2006 SFO survey does not show the same decline in the rate of increase of the average number of annual air trips with increasing household income shown by the relationships for the other surveys, while the relationship for the 2006 OAK survey flattens out more quickly at higher incomes than for the 2006 LAX survey and the 2014/15 OAK and SFO surveys. Both effects are a consequence of the irregularity of the underlying data, as discussed for each survey above.

Nonetheless, the general pattern of the relationships is broadly consistent, particularly if the data for the 2006 OAK and SFO surveys were to be combined. In contrast to the results for survey respondents making a business trip, the relationship for the 2014/15 OAK survey gives a somewhat lower average number of annual air trips than that for the 2014/15 SFO survey at higher levels of household income, although the two relationships give very similar average numbers of annual air trips for household incomes below \$150,000.

The relationship for the 2006 SFO survey gives somewhat higher numbers of average annual air trips than the relationship for the 2014/15 SFO survey, with a fairly small difference for household incomes between about \$175,000 and \$275,000 and an-increasing difference as incomes decline below \$175,000 or increase above \$275,000. The relationship for the 2006 OAK survey gives somewhat higher numbers of average annual air trips than the relationship for the 2014/15 OAK survey for household incomes below about \$300,000 and somewhat lower numbers of average annual air trips above that, although this is a consequence of the flattening of the slope of the relationship for the 2006 OAK survey discussed above. On balance, it appears that the average numbers of annual air trips by those making a personal trip at any given household income level for the two Bay Area airports declined a little from the 2006 to 2014/15 surveys. This suggests that there has been a small decrease in personal air travel from the 2006 to the 2014/15 survey, in contrast to the apparent increase in business air travel discussed above.

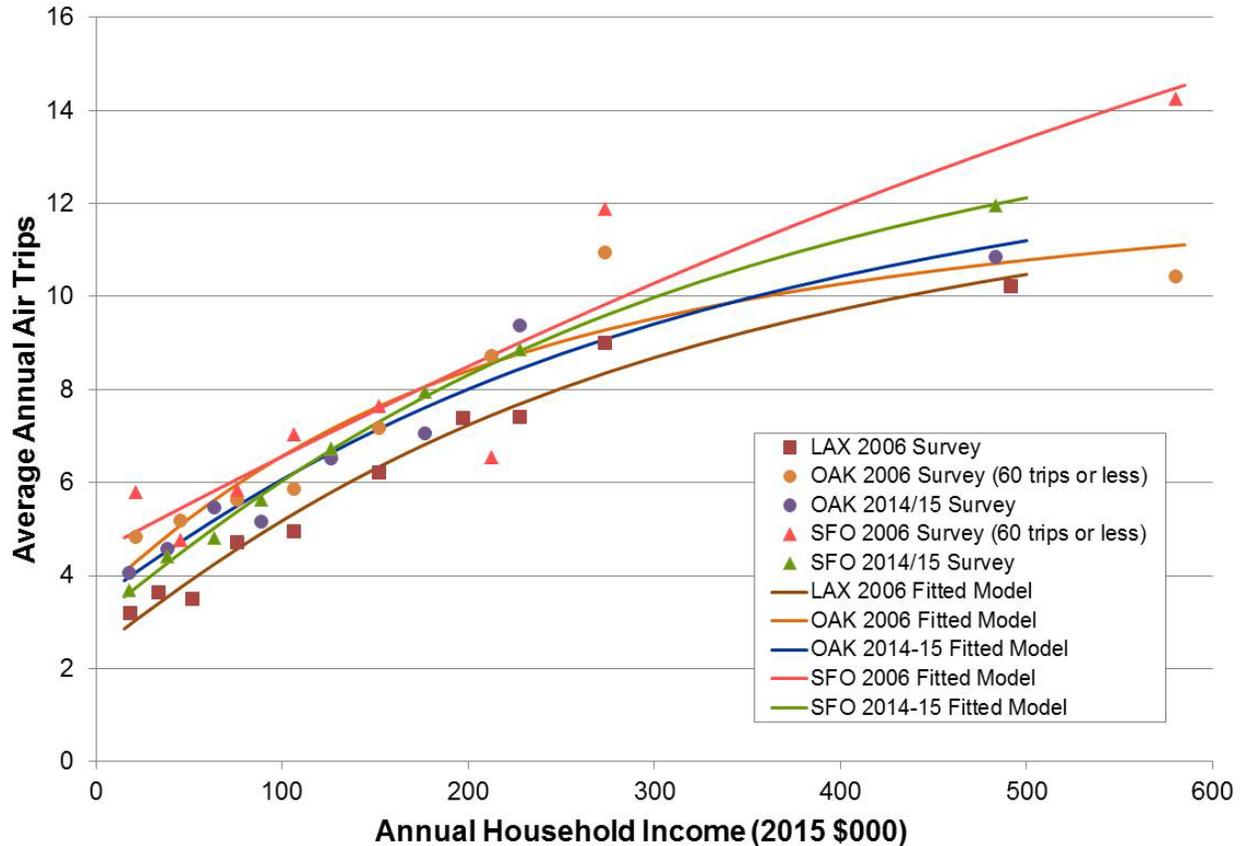


Figure C-38. Change in Average Annual Air Trips with Annual Household Income for Selected Air Passenger Surveys – Respondents Making a Personal Trip

The analysis of air passenger and household travel survey data also shows that air travel propensity varies with the age of the survey respondent. In the case of multi-person households, it is assumed that the age of the survey respondent is a good proxy for the respondent's spouse or partner, although of course this is not always the case. The situation is a little more complicated in the case of households with more than two adults, since the other adults could be adult children or parents or other relatives of the survey respondent and hence could be significantly younger or older than the survey respondent.

The data on U.S. demographic trends earlier in this appendix show that the number of households headed by someone age 55 or over has increased steadily over the past 20 years, while the number of households headed by someone younger than 35 has remained fairly flat. The number of households headed by someone age 35 to 44 peaked around 1995 and has declined since then, although this decline appears to have flattened out over the past five years. The number of households headed by someone age 45 to 54 peaked around 2008 and has declined since then. Given the decline in the number of households headed by someone age 35 to 44 from 2005 to 2010 it appears that this decline will continue for at least another five years. Therefore it appears clear that the number of households headed by someone age 55 or over will continue to increase for at least the next 20 years, while the number of households headed by someone age less than 55 is likely to remain fairly flat or even decline slightly, resulting in a

growing proportion of households headed by someone age 55 or over, and particularly a growing proportion of households headed by someone age 65 or over.

The data on past trends in household incomes discussed in the same section of this appendix also show that there have been notable changes in the median household income, expressed in constant 2015 dollars, of households headed by someone in each of the age groups over the past 20 years, with the median household income of households headed by someone age 55 or over increasing by more than the median household income of households headed by someone younger than 55. Indeed, the real median household income of households headed by someone in each of the age ranges younger than 55 declined from 1999 to 2010, while that for households headed by someone age 65 or over continued to increase and that for households headed by someone age 55 to 64 initially increased to 2006 then declined during the subsequent recession to end the decade at about the same level as it had been ten years before.

As noted above, some of the changes in air travel propensity with age over time may be due to changes in household income over the same period. It is important to separate these two effects, since the population is growing older over time as the baby boom generation of the years following the Second World War moves into retirement and health care improvements result in many people living longer, while at the same time real incomes are starting to increase again after the decline during the 2007-2009 recession and the subsequent slow recovery or stagnation for many people. These two effects will tend to influence air travel in opposite directions. The aging population will result in a higher proportion of the population in the older age ranges that make fewer air trips on average. On the other hand, rising real incomes will result in an increase in air travel for the population in each group.

An analysis of data from the 2014/15 SFO air passenger survey shown in Table C-117 shows the average annual air passenger trips reported by survey respondents by both household income and the age range of the respondents. This particular survey was chosen for the analysis because it had a large enough sample size to give meaningful analysis results.

The average annual air passenger trips shown in Table C-117 indicate that the change in the average number of annual air trips by age range of the survey respondents is not solely due to differences in the household income distributions for the different respondent age ranges, although these differences do account for part of the difference in the average number of annual air trips for different age ranges. However, for survey respondents in any given household income range, the average number of annual air trips show clear differences across the different age ranges, particularly for survey respondents aged 25 or less and those aged 65 or older who were making a personal trip. The pattern is less clear for respondents who were making a business trip, except broadly for those aged 65 or older. Therefore changes in the age distribution of the population, particularly an increase in the proportion age 65 or older, will change the overall air travel propensity, even if the household income distribution for each age range does not change.

Developing estimates of the average air travel propensity by both household income and age range will allow an analysis of changes in both household income distribution and age distribution of the population.

Table C-117. Average Annual Air Passenger Trips by Household Income and Age of Respondent – San Francisco International Airport 2014/15 Air Passenger Survey

Household Income	Age of Respondent					
	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 and over
Business Trips						
Under \$25,000	5.1	3.9	5.0		10.0	7.5
\$25,000 - \$49,999	7.9	6.5	3.6	5.8	3.7	3.5
\$50,000 - \$74,999	9.5	8.6	8.2	9.4	11.3	14.4
\$75,000 - \$99,999	15.7	12.7	10.0	12.1	4.5	3.3
\$100,000 - \$149,999	18.5	15.5	17.5	12.1	16.5	11.8
\$150,000 - \$199,999	7.0	14.4	14.1	15.0	13.5	14.0
\$200,000 - \$299,999	15.0	20.3	18.6	20.9	19.0	12.5
\$300,000 and over		16.9	25.2	25.4	24.7	18.4
Total (1)	10.7	13.6	16.9	17.9	18.2	13.6
Personal Trips						
Under \$25,000	3.8	4.0	4.0	3.1	2.5	2.8
\$25,000 - \$49,999	4.3	5.7	2.8	3.5	3.2	3.8
\$50,000 - \$74,999	4.4	5.9	3.4	4.3	4.3	3.3
\$75,000 - \$99,999	6.6	6.3	6.3	4.8	5.1	3.4
\$100,000 - \$149,999	4.1	8.4	7.1	6.1	4.7	5.5
\$150,000 - \$199,999	5.8	10.9	7.6	7.3	8.0	5.0
\$200,000 - \$299,999	4.6	11.1	10.5	8.4	9.3	5.0
\$300,000 and over	6.5	13.5	11.3	14.6	11.9	8.4
Total (1)	4.6	7.7	7.3	7.4	6.8	4.8

Note: 1) Excludes respondents who did not indicate their household income.

Choice of Disaggregated Socioeconomic Variables for Air Travel Demand Models

The air travel propensity functions shown in Figure C-37 and Figure C-38, particularly the varying slope of the functions with household income, suggest that simply using an aggregate measure of household income (or similar measure of overall economic activity, such as gross regional product) in air travel demand models will fail to fully capture the effect of changes in real income distribution and the associated changes in air travel propensity.

The functional relationships shown in Figure C-37 and Figure C-38 have two other important implications. The declining slope of the functions with increasing household income means that if real household incomes rise over time, the resulting change in air travel propensity for any given increase in income becomes less. Therefore it can be expected that the relationship between air travel and aggregate household income (or similar measures of overall economic activity) will tend to decline over time as real incomes rise unless offset by reductions in the real cost of air travel. The second implication arises from the significant difference in the average number of annual air trips at any given level of household income by those making a business trip and those making a personal trip. This means that the total amount of air travel at a given airport generated by any particular distribution of annual household incomes in the region served by the airport will depend on the relative proportions of business and personal air trips by the

residents of the region, which is likely to vary from region to region, depending on the composition of the local economy.

Given the effect on overall air travel propensity of changes in household income and the age distribution of the population, as well as the potential effect of changes in other household characteristics that have not yet been fully explored in the current research and the significant impact on overall air travel propensity of the relative proportions of business and personal trips in any given market, it seems unlikely that these complex interactions can be adequately reflected in air travel demand models by including just one or two socioeconomic variables that measure a limited number of dimensions of the underlying distributions. Instead, it may be more effective, and more flexible, to include an estimate of average air travel propensity in the models directly and develop a procedure to calculate the average air travel propensity from the underlying distributions of household income, age of the head of households, and other relevant socioeconomic characteristics, based on relationships estimated from air passenger and household travel surveys. The potential application of this approach is discussed in more detail in Appendix E in Section E.3(a) on alternative approaches to incorporating disaggregated socioeconomic data in air passenger demand models. Historical data on the underlying distributions of household income, age of the head of households, and other household characteristics are generally readily available at a national and regional level. Projections for changes in the distributions for future years are also available for some data, or scenarios for future changes in the distributions can be developed from current trends in the distributions and assumptions about potential changes in those trends.

b. Future Research Needs

The foregoing discussion illustrates the need for more extensive future research into how air travel propensity varies with air traveler and household characteristics. The air passenger and household travel surveys analyzed in the course of the current project present a huge mine of valuable data to address these future research needs and there are numerous other surveys beyond those analyzed in the current project that could be used to address these research needs or expand the findings from the surveys examined the current project.

It is clear from the analysis undertaken in the current project that existing surveys often fail to ask questions that would be extremely helpful to more comprehensive analysis of air travel propensity. Examples of such limitations include failing to record the gender of the other adult members of the air travel party, only asking about total air trips in the past year by survey respondents, rather than distinguishing between business and personal trips, limiting the ranges of household income, particularly higher incomes, when presenting respondents with ranges of income to select or recording responses using income ranges, and omitting questions about race and ethnicity or household size. One socioeconomic characteristic that is difficult to address in a survey is the sector of the economy in which business travelers are employed. However, this information would be extremely valuable to improve the understanding of how the extent of business air travel differs across different sectors of the economy. The difficulty is that most employees have no idea of the standard industrial classification code of the firm they work for, so the question has to be asked in a more open-ended way that is still sufficiently detailed to allow the relevant industrial sector to be identified. Developing appropriate and practical survey

questions to collect this information, as well as the necessary analysis techniques to translate survey responses to standard codes would be a valuable future research activity.

Although there are practical limits on how many questions can be added to an air passenger intercept survey before it becomes too long to expect travelers to answer, there are ways to address this problem through the design of the survey. It may not be necessary to ask every question of every respondent. Some survey questionnaires could focus on certain issues while others address different issues. The increasing use of programmable devices to collect survey data makes this fairly straightforward. While this would reduce the sample size for specific questions, many air passenger surveys have a sufficiently large sample for other reasons that this may not be a serious limitation. In any case, some data is better than none. Although the planning and design of air passenger surveys has been addressed in prior ACRP research (ACRP, 2009), additional guidance on the appropriate design of survey methodology and question wording would be very helpful in ensuring that air passenger surveys generate the necessary data to improve our understanding of air travel propensity and better support future air passenger demand studies.

The discussion of the findings of the analysis of the wide range of surveys documented in the previous section of this appendix has identified numerous issues deserving of further research. However, more broadly there are three critical aspects that need additional research:

- The apparent discrepancy between the average annual number of air passenger trips per household that is implied by the O&D air passenger travel statistics reported to the U.S. Department of Transportation by the airlines and the corresponding estimates obtained from the analysis of air passenger and household travel surveys.
- The extent to which differences in average air travel propensity by specific household characteristics in fact partly (or entirely) reflect the effect of other characteristics that are correlated with the characteristic in question. This is difficult to analyze using multi-dimensional cross-tabulation due to survey sample size limitations, so alternative analysis techniques are needed that can consider the influence of multiple variables simultaneously.
- A better understanding of the influence of the distribution of the number of air trips per year by individual air travelers on the difference between the findings of surveys of air passengers and surveys of households. Air travelers who make a large number of trips per year are more likely to be surveyed in intercept surveys of air passengers at airports than those who make fewer air trips per year, simply because they are more likely to be at the airport when the surveys are performed, whereas they are equally likely to be surveyed in household surveys, assuming those surveys obtain a representative sample of households..

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