

census data to cover nonwork travel and to keep travel patterns up to date.

A major change can be made in the coding of work addresses. One option is to allow MPOs and local governments to perform this function in the future. This will permit more rapid processing, because coding can proceed simultaneously with data collection, not sequentially as it does now with the Census Bureau doing it all. MPOs and localities can selectively process by sampling the file and code to levels of geography according to their needs.

To avoid the problem of confidentiality, all that is needed is for the Census Bureau to supply a list of addresses to the MPO, local government, or state identified only with a serial number that the Census Bureau can relate back to the interview. After local coding of these anonymous addresses, the Census Bureau can rematch them to the proper interview and provide summary data according to the rules now in effect.

Certain additional data are needed in order to make the data base more relevant to current planning issues. These include information on

1. Departure and arrival time for the work trip,
2. Parking cost, and
3. All modes of travel used.

Data are also needed, most importantly, on whether a work trip was made yesterday and what mode was used (as opposed to the usual mode).

SUMMARY

Despite its shortcomings, the census journey-to-work data are a valuable asset for transportation planning. The experience with and use of the 1980 data in one urban area have been reviewed. Although changes need to be made in 1990 to improve turn-around time and reliability, planning in the 1990s will require the kind of comprehensive information provided by this type of survey. Certain relevant additions can also greatly enhance the utility of the data base at little additional cost. User-based geography (i.e., traffic zones) is essential.

Transit agencies would also be well served by a question relevant to whether any household member used transit yesterday for a nonwork transit trip. This question would complete the picture of transit use in a region and enable the MPO and transit authority to develop relationships that would be extremely useful to forecast total transit demand. Above all, user-based geography is essential if the data are to be relevant to needs.

Analysis and Use of 1980 Urban Transportation Planning Package in the Delaware Valley Region

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ABSTRACT

The 1980 Urban Transportation Planning Package (UTPP) for the Delaware Valley region is analyzed with special emphasis on journey-to-work trips, employment, mode of transportation to work, car ownership, employed persons, and other socioeconomic data essential to transportation planning and travel forecasting. A review of the UTPP computer tapes and data showed some programming, sampling, and bias problems, which were resolved before the data were used as a base for trend analysis, traffic simulation, highway and transit project studies, strategic planning, and economic development. The trip information should be adjusted before it can be used for transportation planning. The errors in the 1980 UTPP data are generally small and the package shows a significant improvement over the 1970 UTPP. Most of the 1980 UTPP problems can be avoided in the future if the recommendations made in this paper and by other interested planning agencies are considered in the 1990 census.

Information on 1980 census work trips, employed persons, employment, and many other socioeconomic variables is available in the 1980 Urban Transportation Planning Package (UTPP). The UTPP is a special tabulation of census data used in transportation planning by individual Standard Metropolitan Statistical Areas (SMSAs) and tailored to a geographic area. The tabulations and data items were specified by an ad hoc committee of transportation planners representing TRB's Committee on Transportation Information Systems and Data Requirements. Funding for the development of the UTPP program was provided by the U.S. Department of Transportation.

In June 1983 the board of the Delaware Valley Regional Planning Commission (DVRPC) authorized \$50,000 for the purchase of the 1980 UTPP for the Delaware Valley region, which includes portions of Pennsylvania and New Jersey. Specifically, the region includes four suburban counties in Pennsylvania (Bucks, Chester, Delaware, and Montgomery), four suburban counties in New Jersey (Burlington, Camden, Gloucester, and Mercer), and the city of Philadelphia. The Delaware Valley includes an area of 3,833 miles² and a population of more than 5 million. There are 352 municipalities, including such major cities as Trenton and Camden in New Jersey and Chester in Pennsylvania.

DVRPC received the UTPP data tapes on January 30, 1984, almost 4 years after Census Day in 1980. Work was initiated to process and print UTPP data for various levels of geographic units for purposes of transportation planning analysis and evaluation and for project studies. Because the contents of the UTPP are extensive, work on the processing and evaluation of data is still under way and will probably continue into 1985.

The purpose of this paper is to briefly discuss the experience of DVRPC with the UTPP data with special emphasis on the journey-to-work information and other socioeconomic information useful to transportation planning, such as population, households, employed persons, car ownership, and employment. Some specific problems found in the UTPP information are defined and some solutions are suggested. The data are evaluated and some figures are presented to illustrate the magnitude of the errors in the data selected. The use of UTPP data in several DVRPC transportation and nontransportation planning projects is described.

CONTENTS OF THE 1980 UTPP

The UTPP information was collected from the 1980 long-form census questionnaire distributed to about 17 percent (1 in 6) of all households. However, because of census budgetary constraints, only one-half (1 in 12) of this sample was processed for work-trip information at the place of work (see the paper by Fulton in this Record on allocating incomplete place-of-work responses). The UTPP consists of six parts containing 82 tabulations of data items specified as follows (1):

- Part I includes 29 tabulations of data items such as population, households, workers, automobile ownership, mode of travel, and income. This information is stratified by place of residence for all block groups and tracts in the Delaware Valley region.
- Part II contains 19 tabulations of data items related to households and workers for large geographic areas such as the Philadelphia central business district (CBD), central city, county, SMSA, and region. This information is tabulated by place of residence.
- Part III includes 14 tabulations for workers classified by place of work at the tract level. For example, it provides the number of workers by sex and industry who work in a particular census tract.
- Part IV includes 3 tabulations on workers' travel between place of residence and employment at the tract level. Essentially, it provides a work-trip matrix for all tracts in the region and for Philadelphia center city block groups.
- Part V contains 7 tabulations of the place-of-work data at the block-group level aggregated to census tracts. For example, it provides the number of workers by sex and occupation. This part is similar to Part III except for the geographic level.
- Part VI includes 10 tabulations of data items classified by county of residence to county of work, including 20 counties and cities external to the Delaware Valley but which have a significant flow of work trips to and from the region.

The data were collected using census areal units consisting of block, block group, tract, enumeration district, minor civil division (MCD)--township,

borough, city, and village and county--and SMSA. In 1975 the DVRPC grid system, used for the collection of data in 1960 origin and destination surveys, was converted to the census areal system. This conversion was made to eliminate the need for a correspondence table between the two areal systems that occurred in the acquisition of the 1970 UTPP. At that time, the Census Bureau required DVRPC to provide an equivalency table of all counties, tracts, blocks, enumeration districts, and transportation zones. The preparation of such a tabulation proved to be tedious, costly, and time consuming because the region includes more than 50,000 blocks, 1,200 tracts, 5,500 modified grids, and 700 transportation zones and districts.

In 1983 DVRPC requested the Census Bureau to produce all six parts of the 1980 UTPP for the Delaware Valley region. Table 1 gives the geographic units of each part. It was believed that this aggregation of data would satisfy the majority of data requests required for transportation planning studies that would be conducted by DVRPC staff, its member governments, or transportation consultants.

TABLE 1 1980 UTPP Data Aggregation for the Delaware Valley Region

Geographic Unit	Part of UTPP					
	I	II	III	IV	V	VI
Block group of residence	X					
Block group of work					X	
Tract of residence	X					
Tract of work			X		X	
Tract of residence to tract of work				X		
Central business district		X	X			
Minor Civil Division	X		X	X	X	
Central city	X	X	X	X		
County	X		X		X	X
Urbanized area		X				
External county and city						X
SMSA and region	X	X	X		X	X

As previously noted, 20 external counties and cities to the Delaware Valley were specified for Part VI of the UTPP. Except for York County in Pennsylvania, Union County in New Jersey, and New York City, Figure 1 shows all surrounding counties and major cities that have a large number of commuters to and from the Delaware Valley region.

ANALYSIS AND EVALUATION OF 1980 UTPP DATA

A review of the 1980 UTPP data for the Delaware Valley region indicated some programming, definitional, and statistical problems. Unlike the 1970 UTPP, however, the 1980 data on work-trip destinations do not contain trips not identified by block, tract, or MCD. The Census Bureau allocated all 1980 trips not identified by street addresses to block groups and tracts. (See Allocating Incomplete Place-of-Work Responses in the 1980 Census Urban Transportation Planning Package by P.N. Fulton in this Record.) In the 1970s, DVRPC spent a considerable amount of time and money in developing a method for coding the unallocated trips (trips with no work-place addresses) to transportation zones within the region.

Programming Problems

After receiving the 1980 UTPP tapes from the Census

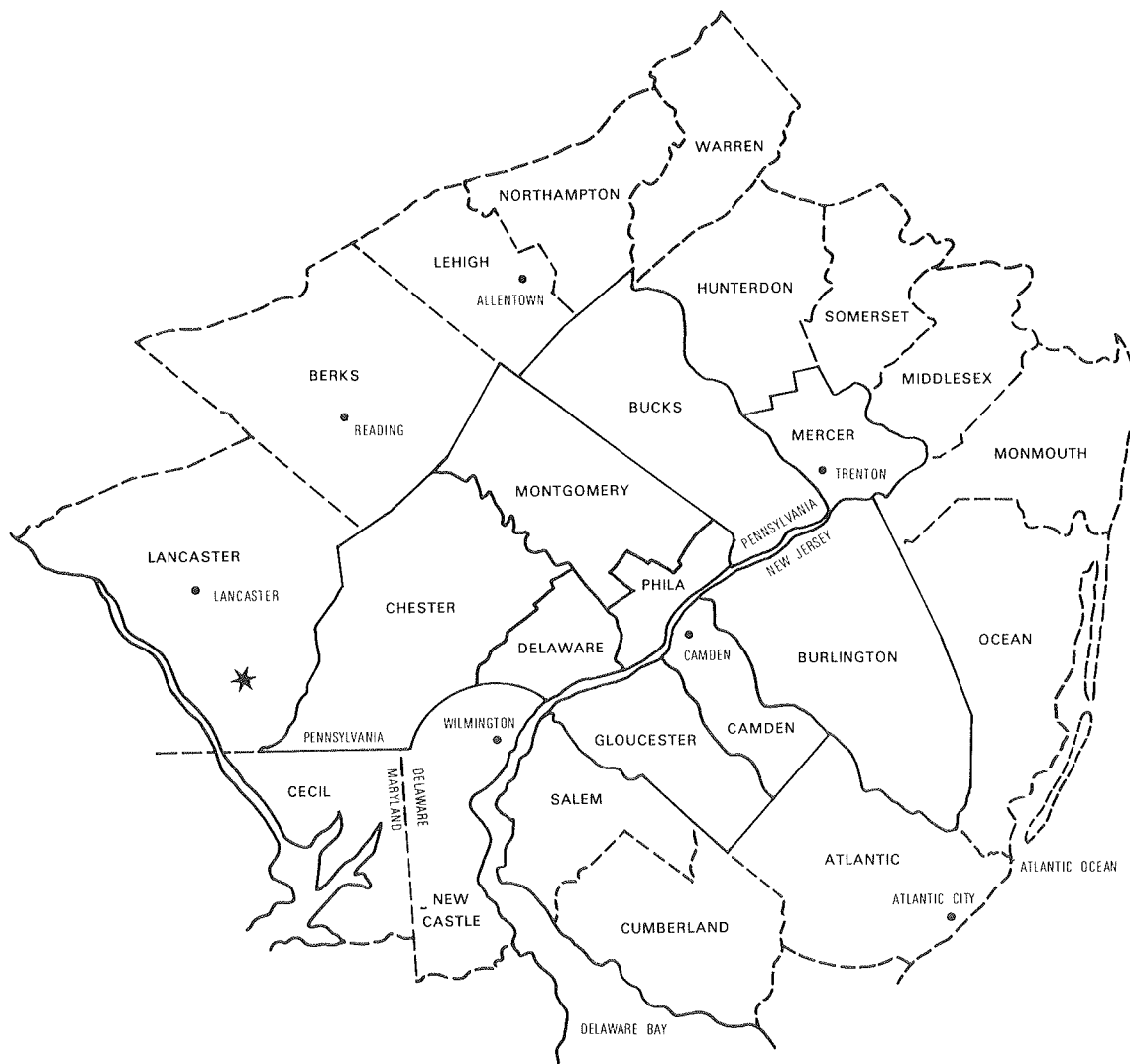


FIGURE 1 Greater Delaware Valley region.

Bureau, DVRPC examined the print program to produce data for various transportation planning studies. It was found that the format of the UTPP tapes is quite complex. It contains subtle differences from the regular census format such as the S in suppressed data fields and the presence of unallocated MCD and place-level data in tract records. The print program provided with the UTPP tapes is not operational for large regions, and DVRPC programmers were required to spend an extensive amount of time developing miniprograms to extract information from the various parts of the UTPP. The documentation of the data is good in general, although some items, such as the unallocated (000) tract- and block-level trips, are not clear.

Examination of Part V of the package indicated an error in the data. It appeared that the entry of data for Mercer County occurred twice, thereby almost doubling Mercer County employment and overestimating employment in all other DVRPC counties. Furthermore, it was found that the trips made by Salem County residents were omitted from Part VI. However, in response to a request from DVRPC, the Census Bureau corrected the errors and provided corrected versions of the UTPP tapes.

Problems of Definition and Statistics

As stated previously, the Census Bureau obtained information on workers and not on trips; the latter is usually collected in home interview surveys for transportation planning studies. The analysis of workers' trip tables (Parts IV and VI) by travel mode indicated that some walk and railroad trips were unrealistic in terms of travel time or distance. It was found, for example, that some workers walked from Philadelphia to counties a considerable distance from the city. Similarly, there were railroad trips where no such service existed. These few irrational trips are due to errors in census coding, sampling error, or incorrect information returned by respondents who did not understand the census questionnaire. Many respondents confused the access mode with the principal mode of travel.

The evaluation of employment data by industrial sector showed that some misunderstood the census question that adopted the Standard Industrial Classification (SIC) system. Some were not able to identify their industry correctly because some SIC categories are not easily defined. The public administration sector is especially complicated. An

employee of a municipal utility authority, for example, may consider himself either a member of the public administration sector or a member of the public utilities sector.

Quality of the Data

Generally, the 1980 UTPP data are good for transportation planning purposes. The data on population, household, car ownership, employed persons, and other socioeconomic characteristics obtained from Part I are quite accurate and do not require any adjustment due to sampling or nonsampling errors. The suppression of the characteristics of a small group of people (30 persons or 10 housing units) by the Census Bureau does not significantly affect the quality of tract or block-group information.

Part I data compare favorably with the 100 percent census counts. Table 2 shows the magnitude of difference between the population produced from Part I and from the 100 percent counts for a few tracts, MCDs, and counties selected at random. As can be seen, the differences are small and are acceptable for planning purposes.

TABLE 2 Comparison of 1980 UTPP Population Data and Total Census Counts

Areal Unit	1980 Population			Percent Difference
	Total Count	UTPP	Difference	
Census tract				
0069	4,960	4,960	0	0
0200	3,086	3,114	28	0.9
0840	1,995	1,995	0	0
1056	3,291	3,283	-8	-0.2
1256	9,744	9,744	0	0
Minor Civil Division				
170	12,919	12,919	0	0
160	2,836	2,836	0	0
025	35,509	35,509	0	0
County				
Philadelphia	1,688,210	1,688,144	-66	0
Montgomery	643,621	643,598	-23	0
Gloucester	199,917	199,917	0	0
Total region	5,024,681	5,024,534	-147	0

As described previously, Parts III, IV, V, and VI contain trip data at the place of work for various geographic units such as tracts, MCDs, and counties. If trip destinations by resident and nonresident workers living in commutershed areas are added together, the sum will be approximately equal to the number of jobs, or employment. A certain percentage of these work-trip destinations (employment) should be added to account for workers who were absent during the census week due to illness, vacation, or other personal reasons and for workers who had more than one job (2). Based on the Bureau of Economic Analysis (BEA) and DVRPC employment data, the UTPP employment, or number of trips to the place of work, was increased by 9.27 percent, 1.54 percent for absentees, and 7.73 percent for multiple-job workers (3).

Table 3 shows a comparison of UTPP employment before and after adjustments for selected municipalities, counties, and the total region. It also shows the percent difference between the adjusted UTPP employment estimates and those estimated by BEA or DVRPC. As shown in the table, the differences

TABLE 3 Comparison of 1980 UTPP, DVRPC, and BEA Employment Estimates

Areal Unit	1980 Total Employment			
	UTPP		BEA or DVRPC Data	Percent Difference ^a
	Unadjusted	Adjusted		
Municipality				
Abington	19,884	21,872	21,180	-3.2
Cherry Hill	36,983	40,681	37,102	-8.8
Deptford	7,254	7,979	7,821	-2.0
Upper Gwynned	8,376	9,214	9,509	3.2
County				
Bucks	170,284	186,069	186,485	0.2
Philadelphia	760,156	830,628	849,092	2.2
Burlington	124,544	136,086	133,505	-1.9
Gloucester	56,495	61,732	63,352	2.6
Total region	2,076,372	2,268,857	2,315,008	2.0

Sources: BEA: county and regional employment; DVRPC: municipal employment.

^aUTPP adjusted versus BEA/DVRPC.

between the two sets of regional and county employment data are very small (2.0 percent). It should be noted, however, that the percent difference between the two sets of employment estimates increases as the size of a geographic unit decreases due to the sampling error.

As stated before, the 1980 UTPP employment data for the Delaware Valley region are about 9 percent lower than those estimated by BEA or DVRPC. The Washington Metropolitan Area Council of Governments compared the census journey-to-work data obtained from the Annual Housing Survey with its employment file and found that census data for Washington, D.C., are about 20 percent lower than local agency estimates of 1.5 million jobs. Total census work trips and transit work trips, however, were underestimated by only 6 and 5 percent, respectively (4).

Most parts of the UTPP include information on the worker's mode of transportation to work. A respondent was asked to choose one of 12 travel modes that he or she usually took to travel to work for most of the distance between the place of residence and work. The travel-mode proportions appear to be reasonable because they compare favorably with DVRPC highway traffic counts and transit surveys for large areas and the region. Table 4 shows that the difference between the UTPP data and actual counts for total public transportation work trips is less than 1 percent. However, such a difference becomes large for travel submodes within smaller areas. In the Philadelphia central business district (CBD), the difference between the UTPP and actual subway-elevated trips is about 33 percent. Such large differences are mainly due to incorrect responses to the questionnaire. It appears that many respondents confused the access mode to the subway station with the subway mode, which is supposed to be the principal mode of travel to work according to census definition. For example, persons who live in Delaware County and work in the Philadelphia CBD must take buses or trolleys to the 69th Street terminal where they transfer to the Market-Frankford subway-elevated line. Thus, bus or trolley rather than subway was reported as the principal means of transportation of workers in these areas. As shown in Table 4, the surface trips (bus and trolley) are overestimated as much as the subway-elevated trips are underestimated.

These problems are similar to those experienced with the 1970 UTPP (5). However, the magnitude of the 1980 errors is less. For this reason, the UTPP trip information should be adjusted before it is

TABLE 4 Comparison of 1980 UTPP and DVRPC Work-Trip Estimates for Highway and Public Transportation

Areal Unit	Mode	1980 Highway and Public Transportation Work Trips			
		UTPP		DVRPC Estimates	Percent Difference
		Unadjusted	Adjusted		
Philadelphia CBD	Public transportation				
	Railroad	41,493	45,642	40,945	11.5
	Subway-elevated	40,442	44,486	57,649	-32.8
	Surface	55,903	61,493	46,223	33.0
	Total	137,838	151,621	144,817	4.7
DVRPC region	Highway	80,758	88,834	87,274	1.8
	Public transportation	285,366	313,902	315,700	-0.6
	Highway	1,577,760	1,722,914	1,648,810	4.5

used for transportation planning. The adjusted UTPP employment data for the Delaware Valley region are quite reasonable.

USES OF THE 1980 UTPP AT DVRPC

The uses of the 1980 UTPP in the Delaware Valley region are somewhat similar to those applications outlined in the Transportation Planners' Guide to Using the 1980 Census (2). DVRPC has already utilized census data in various studies and will continue to use the UTPP in transportation planning and other planning activities. As mentioned earlier, the UTPP includes many socioeconomic data items and trip information that are invaluable to local and state governments, transit operators, and private corporations for making a variety of transportation and locational decisions. These include such decisions as the locations of shopping centers, industrial parks, banks, and service industries and the estimation of parking requirements, transit fleet sizes, and service schedules.

In order to assist state and local planners, transit operators, and others interested in interpreting and using census information, DVRPC held a one-day seminar on May 2, 1984. Representatives from FHWA and the Bureau of the Census discussed the development of the UTPP and journey-to-work data and how the data can be applied in transportation planning activities. DVRPC staff presented its plans for utilizing the information and how the data can be obtained for local use in transportation planning and locational studies. The response to the seminar was very good and the attendees were informed about the UTPP and its uses in their current and future planning studies.

There are at least six major uses of the 1980 UTPP in the Delaware Valley region. Some of these have been applied and some will continue in the future.

Establishment of Data Base for Transportation Planning

DVRPC has initiated a project to prepare a data bank for transportation planning at the block-group and tract levels. This information includes population, employment, work trips, and other socioeconomic variables required for traffic simulation and transportation analysis and planning. Such data have been extracted from Parts I, III, IV, and V of the UTPP. All data items have been edited for reasonableness and will be adjusted if necessary based on other census data and DVRPC surveys, counts, and files as

described in the previous section of this paper. These data will be used in most transportation system and project planning studies.

Preparation of Data Summaries and Evaluation of Trends

DVRPC completed a report on the journey-to-work trends in the Delaware Valley region (3). This report compares the 1970 and 1980 journey-to-work information, means of transportation for commuting to work, employed persons, and employment at the county and regional levels. It also analyzes the commuting flow between the counties of the Delaware Valley region and surrounding counties and cities. The report was well received by planners and decision makers because it provides factual information about trends in development and travel patterns in the region. For example, Table 5, taken from the report, gives the 1970-1980 trend in the distribution of Montgomery County workers by place of work. Other tables show the trends in employment and mode of travel for all DVRPC counties.

Six short data bulletins were also published. Each includes one or two information items obtained

TABLE 5 Montgomery County Resident Workers: Distribution by Place of Work (3)

Place of Work	No. of Workers		Percent Difference
	1970	1980	
DVRPC region			
Bucks County	8,488	14,325	68.8
Chester County	5,900	10,525	78.4
Delaware County	5,897	7,773	31.8
Montgomery County	158,986	204,673	28.7
Philadelphia	54,489	55,598	2.0
Burlington County	1,632	532	-67.4
Camden	3,089	1,643	-46.8
Gloucester County	883	225	-74.5
Mercer County	1,877	354	-81.1
Total	241,241	295,648	22.6
Outside DVRPC region			
Berks County	2,499	3,070	22.8
Lancaster County	82	172	109.8
Lehigh County	633	773	22.1
New Castle County	513	282	-45.0
Northampton County	665	196	-70.5
Other	5,504	4,185	-24.0
Total	9,896	8,678	-12.3
Total workers	251,137	304,326	21.2

from Parts I or II of the UTPP. For example, a bulletin was prepared on car ownership growth between 1970 and 1980 for the counties in the Delaware Valley region. It also includes households stratified by the number of cars owned (zero, one, two, or three or more cars).

Update of DVRPC Traffic Simulation Models

A project has been initiated to update the DVRPC travel forecasting models using the 1980 UTPP. During the 1970s, the 1970 UTPP was used to check and validate the DVRPC traffic simulation models. These models will be updated again using 1980 census data. Because the DVRPC travel simulation models follow the traditional steps of trip generation, trip distribution, modal split, and travel assignment, they utilize computer programs included in the federally

sponsored Urban Transportation Planning System (UTPS). Generally, the models are similar to those utilized in other large urban areas that depend on census data for system and project studies.

Figure 2 shows the activities needed to update the DVRPC traffic simulation process. This work will be completed by the end of FY 1985. A careful review and evaluation of the results of each model will be conducted and necessary adjustments will be made to achieve the most accurate calibration. The simulated traffic volumes will be compared with actual highway traffic counts and public transportation ridership to assure that acceptable accuracy of the simulated results is obtained from these models.

Use in Highway and Transit Corridor Studies

The 1980 UTPP data, especially the journey-to-work

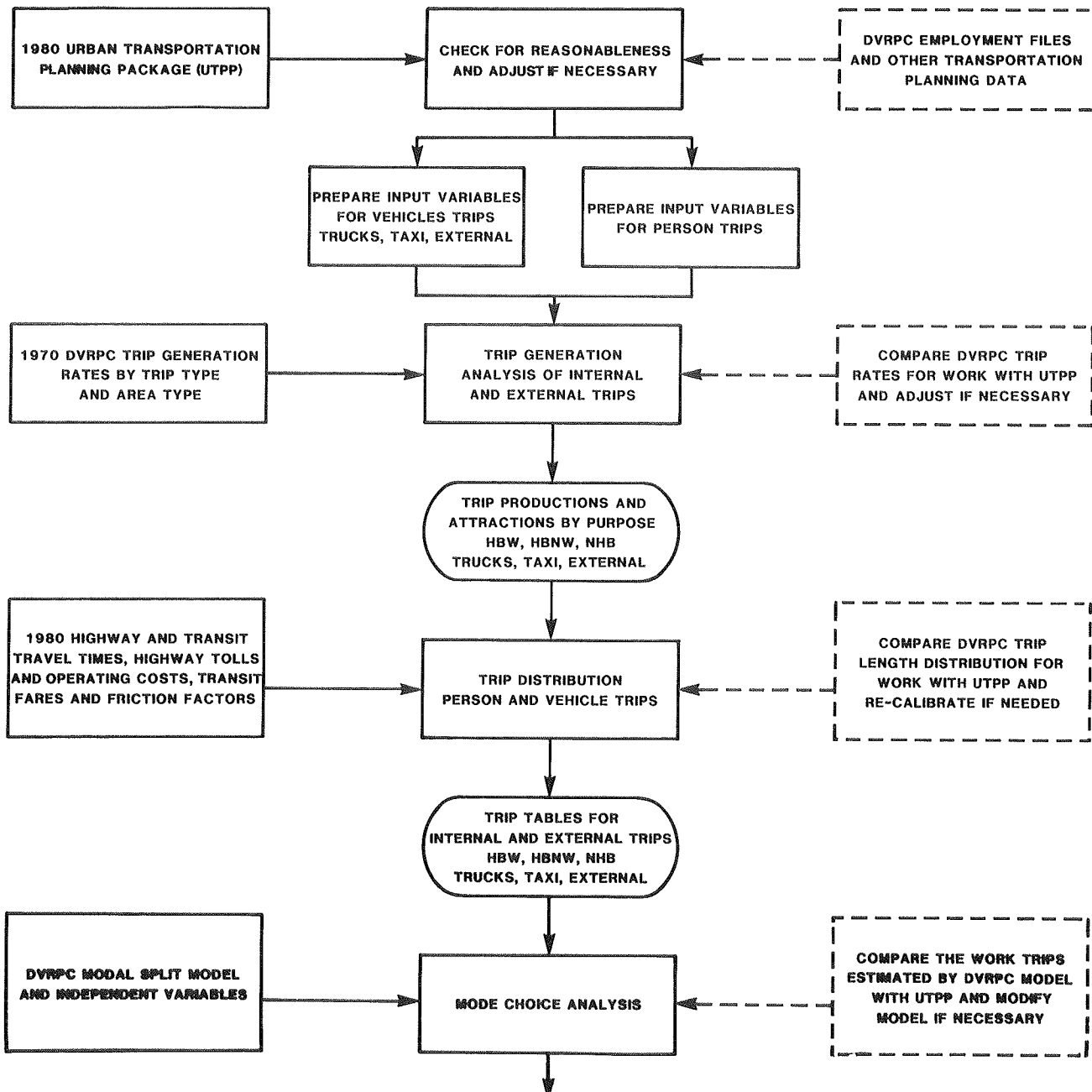


FIGURE 2 DVRPC traffic simulation update using 1980 UTPP.

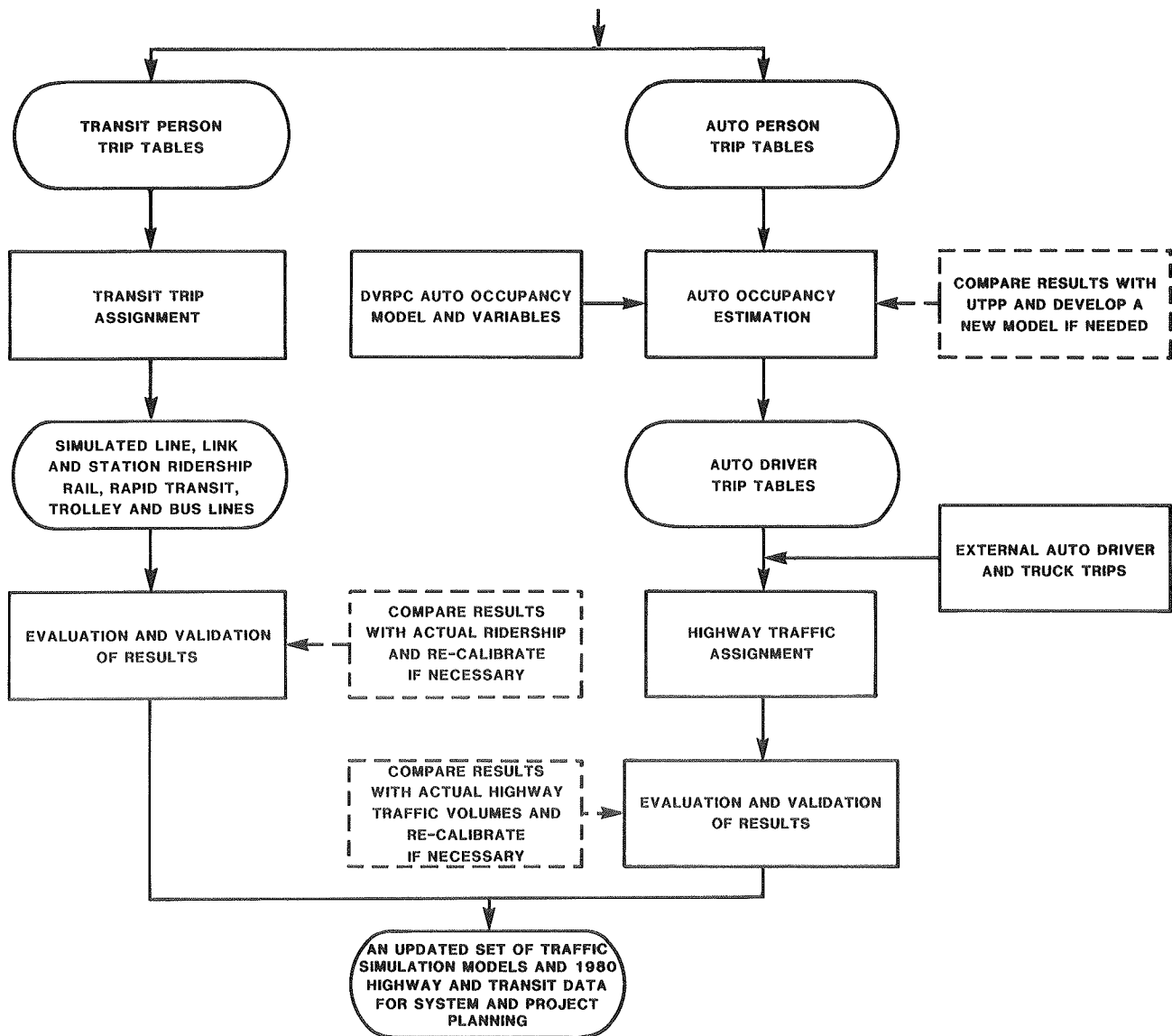


FIGURE 2 continued.

information contained in Part IV, have been used in three transit corridor studies to check the travel demand or ridership for each transit submode, including high-speed rail line, express bus and park-and-ride service, and local bus service.

The 1980 UTPP data will also be used in many future highway and transit studies because it is the only information available for transportation planning. The use of these data minimizes any large-scale data collection in the Delaware Valley and decreases the rising costs of surveys required for transportation planning.

Application in Strategic Planning and Economic Development

DVRPC has used the 1980 UTPP information on employment, particularly Part V, to evaluate the significant changes in the type and location of industries and commercial establishments. This evaluation will result in recommendations and strategies aimed at attracting new industries and high-technology firms to the Delaware Valley. Also, employment information

is useful to the redevelopment of declining areas of old urban centers and provision of the required physical improvements for their rehabilitation.

Provision of 1980 UTPP Data to Public Agencies and Private Corporations

Finally, DVRPC intends to sell the 1980 UTPP information to any public or private agency involved in planning or urban studies. This may include studies for housing, finance, real estate, health facilities, social services, economic base, and economic development. It appears that some planning agencies and private companies in the Delaware Valley region are interested in obtaining the UTPP information for their various studies.

FINDINGS AND CONCLUSIONS

Generally, the 1980 UTPP for the Delaware Valley region contains quality data for transportation planning, economic base and employment location

studies, urban development analysis, and planning and evaluation of public services. However, the analysis of UTPP data indicates a few programming, statistical, and bias problems. Most of these problems were resolved before DVRPC used the UTPP as a data base for trend analysis, information purposes, traffic simulation, highway and transit project studies, strategic planning, and economic development. The errors in the 1980 data are generally smaller than those found in the 1970 UTPP.

Unlike the 1970 trips, the 1980 trip destinations were assigned or coded to block groups and tracts, and no effort by DVRPC was needed to develop or apply a procedure to allocate the uncoded trips. However, employment or trip information should be adjusted before it is used in transportation planning studies because it does not include all workers or jobs.

Most of the 1980 UTPP problems and errors can be avoided in the 1990 census by quality control edits and a careful review of the census questionnaire, sample size, and the computer programs required for processing the information. Specifically, the journey-to-work questions should be simplified to prevent any confusion on the part of respondents on such questions as mode of travel and industry classification. Many confused the access mode to subway-elevated or railroad lines with the principal mode of travel. The questionnaire should be redesigned to capture multimodal trip information from the place of residence to the place of work. It should also simplify the SIC categories to avoid any error or misunderstanding in the employment sectors.

The sample size (8.3 percent) for coding work-trip destinations should be increased 100 percent, as originally planned, to improve the quality of the trip matrix used to calibrate trip distribution models for travel forecasting and projection.

The format of the 1980 UTPP tapes is quite complex, and the print program is not operational for the Delaware Valley region. This caused extensive

delays in extracting the UTPP data. Finally, DVRPC received the UTPP almost 4 years after the data had been collected; a more timely release of data is obviously important to all census data users.

ACKNOWLEDGMENT

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The author is responsible for the findings and conclusions in this paper, which may not represent the official view or policies of the funding agencies.

Uses of the Urban Transportation Planning Package from the 1980 Census in the Denver-Boulder Region

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ABSTRACT

The initial uses of the Urban Transportation Planning Package in the Denver-Boulder region are described. The five main purposes for which the data have been used are presented. The processes used to analyze the data, the results obtained, difficulties encountered with using the data, and solutions to those difficulties are discussed. Where possible, comparisons with results of the 1970 census or previous travel surveys

are presented. Finally, some comments are made about the quality of the data and their usefulness in the Denver-Boulder region.

The Urban Transportation Planning Package (UTPP) from the 1980 census is a valuable source of detailed information for transportation planners. There are many possible uses of the data including, for example, recalibration and validation of various portions of regional transportation models, carpool planning, bus service planning, high-occupancy-vehicle (HOV) lane planning, and bicycle planning.