

# NCHRP 08-36, Task 098

## Improving Employment Data for Transportation Planning

### Requested by:

American Association of State Highway and  
Transportation Officials (AASHTO)  
Standing Committee on Planning

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# List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ACS	American Community Survey
ARS	Annual Refiling Survey
BLS	Bureau of Labor Statistics
BRB	Business Register Bridge
CPR	Composite Person Record
CPS	Current Population Survey
CTPP	Census Transportation Planning Products
DOL	Department of Labor
DOT	Department of Transportation
ECF	Employer Characteristics File
EQUI	Enhanced Quarterly Unemployment Insurance
ESA	Employment Security Agency
FEIN	Federal Employer Identification Number
FHWA	Federal Highway Administration
FIPS	Federal Information Processing Standard
FUTA	Federal Unemployment Tax Act
GAL	Geocoded Address List
HUD	Department of Housing and Urban Development
ICF	Individual Characteristics File
HIS	Indian Health Service
IRS	Internal Revenue Service
JTW	Journey to Work
LED	Local Employment Dynamics
LEHD	Longitudinal Employer Household Dynamics
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MWR	Multiple Worksite Report
NAICS	North American Industrial Classification System
NHPN	National Highway Planning Network.
OD	Origin-Destination
OPM	Office of Personnel Management
PCF	Person Characteristics File
PIK	Protected Identification Key
PPD	Posterior Predictive Distribution
QCEW	Quarterly Census of Employment and Wages
QWI	Quarterly Workforce Indicators
RAC	Resident Area Characteristics
SEIN	State Employer Identification Number
SEINUNIT	State Employer Identification Unit Number
SSA	Social Security Administration
SSN	Social Security Number

SSS	Selective Service System
StARS	Statistical Administrative Records System
UCFE	Unemployment Compensation for Federal Employees
UI	Unemployment Insurance
VDRC	Virtual Resource Data Center
WAC	Workplace Area Characteristics
WIB	Workforce Investment Board

# Executive Summary

High quality employment data, including workplace location, industry type, the number and demographic characteristics of workers, and the geographic distribution of home-to-work trips are critical to transportation planning and policy analysis. For several decades, transportation planners have relied heavily on journey-to-work data collected as part of the decennial Census long form to obtain workplace location and distributions of home-to-work trips. However, the replacement of the decennial Census long form by the continuous sample American Community Survey (ACS) following the 2000 Census has raised concerns within the transportation planning community about the adequacy of the sample sizes to provide reliable data on workplace locations and home-to-work flows. Consequently, alternative data sources are being sought.

This guidebook investigates three alternative, publicly available sources of employment data that may be useful for transportation planning and travel behavior research applications. These databases are the Quarterly Census of Employment and Wages (QCEW) collected by the Bureau of Labor Statistics (BLS), and two databases produced from the Census Bureau's Longitudinal Employment Household Dynamics (LEHD) Program – the Quarterly Workforce Indicators (QWI) and OnTheMap (OTM).

## **Quarterly Census of Employment and Wages**

The QCEW database contains information on all firms that have paid employees and are subject to state and federal unemployment insurance (UI) laws. This represents approximately 93 percent of all civilian employment in the United States, but excludes self-employed individuals, uniformed military, and certain small groups specifically exempted from federal and state UI laws. Relevant employment data contained in the QCEW that is of potential interest to transportation planners include number of establishments, total monthly employment, and total wages paid by quarter by industry type and employer ownership type (government vs. private). QCEW data are published quarterly, within six months of each reference quarter. Due to disclosure restrictions, publicly accessible QCEW data are available only at a level of geographic resolution that includes counties, metropolitan statistical areas (MSAs), or entire states. Some state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) have successfully negotiated agreements with their state employment security agency (ESA) to obtain QCEW data files at more detailed levels of geographical resolution, but these agreements vary considerably from state to state with respect to access, permitted uses, and levels of geographic detail for which the data are provided.

The QCEW is a joint federal/state cooperative arrangement between the BLS and state ESAs. The ESAs are responsible for collecting quarterly data on employment and wages from employers covered under state UI laws. BLS provides statistical methodology and direction to the ESAs to insure accuracy and comparability across states. BLS also provides funding to the ESAs for quality assurance and data editing, and the conduct of the multiple worksite report (MWR) and the annual refiling survey (ARS). The MWR collects information about an employer's primary and secondary worksite locations that allows for accurate allocation of employment and wages to each worksite. The ARS collects update information to help determine the correct industry for each employer, as well as the physical location, single or multi-unit status, and respondent contact information. Lastly, the BLS QCEW specifies that each state review and validate the UI, MWR and ARS data using a series of edits and other tools to insure that the resulting data are accurate and relevant for all users.

## **Longitudinal Employer Household Dynamics**

The LEHD Program is based on a negotiated partnership arrangement between the Census Bureau and each state ESA. This partnership has evolved over a period of more than a decade, with the last few states joining as recently as 2010. Under the LEHD Program, the Census Bureau obtains a copy of the same enhanced microdata files that used to produce the QCEW, and merges these data with additional administrative data on individual workers that the Census Bureau collects from other federal agencies. The data are merged internally within the Census Bureau and are subjected to a series of "disclosure proofing" procedures to prevent release of confidential information on the identity of an individual worker or employer. The integrated employer-worker data is then made available through two different databases - the QWI and OTM.

### *Quarterly Workforce Indicators*

The QWI database is published quarterly, like the QCEW, but contains more extensive information on changes in labor force during the quarter, including number of new hires, layoffs, stable jobs, and changes in monthly earnings. Publicly accessible data is available at detailed levels of industry type, but only at a level of geographic resolution that includes counties, MSAs and states.

### *OnTheMap*

The LEHD-OTM is a unique database that combines information on both the residence and workplace locations of workers at a level of geographic resolution (Census Block) that is most useful for transportation planning and travel demand modeling applications. Unlike the QCEW and QWI, which are employer-based, the LEHD-OTM is more worker-based, providing information on where workers in specific socio-demographic categories (i.e., age, income) and industry sectors

live and work. The LEHD-OTM is published annually, approximately one year following the reference year for which the data are collected.

Each of the three databases is discussed in detail, with information presented on how the data are developed; primary users and applications for the data; potential uses and limitations of the data for transportation planning applications; how the data can be accessed, including download instructions, file and record formats, and data dictionaries; and links to additional technical documentation.

### Comparison of LEHD-OTM and CTPP Databases

The LEHD-OTM work flow data were compared with journey-to-work trip data collected through the Census Transportation Planning Products (CTPP) in an effort to further evaluate the strengths and limitations of LEHD-OTM data for transportation planning applications. The comparisons included county-to-county flows using the LEHD-OTM, CTPP 2000, and the CTPP 2006-2008 3-year summary databases, and Tract-to-Tract flows for two metropolitan areas using the LEHD-OTM and CTPP 2000 databases. Table ES.1 highlights key differences among the three databases.

**Table ES.1 Key Differences in Employment Data Available from the CTPP and the LEHD-OTM Databases**

	<b>CTPP 2000</b>	<b>CTPP 2006-2008</b>	<b>LEHD-OTM (2008)</b>
<b>Data Source</b>	2000 Decennial Census Journey to Work (JTW) questions	3-year compilation of JTW questions from American Community Survey (ACS)	Administrative records of workers and employers covered by state UI
<b>Sample Size</b>	~17% of all U.S. households	~7.5% of all U.S. households	Full enumeration of covered employment categories
<b>Geographic Coverage</b>	Includes all counties	Excludes counties with less than 20,000 population	Excludes data from newer LED states: (CT, DC, MA, NH)
<b>Geographic Resolution</b>	Block Groups	Counties (over 20,000 population)	Census Blocks
<b>Employer-Industry Categories</b>	All employers and industry categories in sample universe	All employers and industry categories in sample universe	Excludes employment not covered by state UI
<b>Job Categories</b>	Excludes second jobs held by workers with multiple jobs	Excludes second jobs held by workers with multiple jobs	Includes all jobs held by workers in covered employment categories

Comparisons at the county and Census Tract levels showed that both the CTPP 2000 and CTPP 2006-2008 databases include more total home-to-work flows than the LEHD-OTM database, but distribute those flows among a significantly smaller number of OD pairs. This results in significantly higher average flow rates for each non-zero OD pair in the CTPP databases, but many more OD pairs (with lower average flow rates) in the LEHD-OTM database.

The comparisons suggest that the LEHD-OTM data captures many more of the low frequency OD pairs than either the CTPP 2000 or CTPP 2006-2008 databases. The CTPP databases are derived from a sample of U.S. households, which are then expanded to the universe of all households based on demographic factors. One consequence of this methodology is that OD pairs with a low frequency of home-to-work trips that are sampled in the CTPP get weighted more heavily, while low frequency OD pairs that are not sampled are assumed to have no home-to-work flows. The result is a “lumpy” distribution of flows that becomes even more “lumpy” as the sample size decreases (i.e., from the CTPP 2000 to the CTPP 2006-2008).

The county-to-county and Tract-to-Tract flows from the LEHD-OTM were also compared against the CTPP databases with respect to travel distance between OD pairs. While the distributions are generally similar in shape, a larger percentage of flows in the LEHD-OTM are longer distance (i.e., 25+ miles) than in the CTPP databases. While some of this difference can be attributed to the large number of longer distance, low-frequency OD pairs identified in the LEHD-OTM that were not sampled in CTPP databases, other contributing factors may include (1) the absence of self-employed workers in the LEHD-OTM, who are more likely to work at home or at workplaces closer to home than other employment categories; and (2) employers with multiple worksites who file incomplete multiple worksite reports (MWR) with a state ESA. Workers could therefore be misallocated to an employer’s primary worksite, rather than a secondary worksite that is closer to their residence.

LEHD-OTM data were compared to CTPP databases with respect to both employment destinations and residence-to-workplace flows, both at the county and Census Tract levels of geography. The findings from these comparisons were inconclusive as to whether inaccuracies in MWR reporting leads to serious inaccuracies in employment site locations. While significant differences in work destinations were clearly observed between the databases, many of these differences could be attributed to missing employment categories in the LEHD-OTM, the absence of flows between low frequency OD pairs in the CTPP data, or temporal differences in when the data was collected (i.e., 2000 CTPP vs. 2006 LEHD-OTM). Additionally, potential indicators of locational inaccuracies attributable to multi-site employers (e.g., higher work flows to locations housing state capitals or headquarters for large corporations) were not consistent from one site to another.

## **Recommendations and Considerations in the Use of Employment Databases for Transportation Planning**

### *LEHD – OnTheMap*

The LEHD-OTM should not be viewed as an alternative to either household travel surveys (including the CTPP) or to employer-based surveys (such as the QCEW), but rather as a complement to both types of data. The LEHD-OTM database does not contain information about the work trip itself; there are no attributes describing the choice of mode, route, travel and departure times, or costs for the trip to work. However, the LEHD-OTM is an excellent source of data for constructing or validating a detailed OD table of home-to-work flows between geographic areas that can range from as small as individual Census Blocks to entire states.

Unlike sample-based surveys (such as the CTPP), the LEHD-OTM provides a (nearly) complete enumeration of home-to-work flows covering over 90 percent of all workers and employers in the United States. As such, it includes many more OD pairs containing low frequency home-to-work flows than are collected through sampled data.

To comply with federal privacy restrictions, the LEHD-OTM is subjected to several “disclosure proofing” procedures. The most significant is that the distributions of worker attributes are perturbed slightly, creating a synthetic population for each Census Block. The changes made to worker characteristics do not change the number of flows between specific OD pairs, and the synthetic distributions converge to actual observed distributions at more aggregate geographic areas, such as Census Tracts and counties.

The LEHD-OTM database currently does not include employment data for federal workers, self-employed individuals, uniformed military personnel, railroad workers, and certain other small employment groups not covered under federal or state unemployment insurance laws. State DOTs or MPOs with significant concentrations of these excluded employment categories may need to supplement the LEHD-OTM with targeted data from surveys or other data sources.

LEHD-OTM data is currently not available for two states (MA and NH) and the District of Columbia. Data for these states is currently being processed, and should become available within the next year.

Concerns expressed by transportation researchers regarding inaccurate or missing secondary worksite locations for multi-worksite employers who refuse to file MWRs appear to be less serious than first thought. An analyses of the most recent MWR submissions conducted by the BLS indicates that less than 2 percent of all covered employment, nationwide, may be assigned to an incorrect

worksite location due to employer noncompliance with MWR submissions. However, the analysis also showed that noncompliance rates vary significantly from state to state and by employer ownership category. For small geographic areas such as Census Tracts or TAZs, even a small discrepancy in workplace location could have significant impacts, by assigning too many workers to the primary worksite and no workers to secondary worksites.

To evaluate the severity of this problem and mitigate its impacts for specific applications, transportation planners and modelers could take the following actions:

- Use BLS analysis findings (see Appendix Table A.1) to determine, at a state level, what percentage of multi-worksite employers do not file MWRs, and how many employees they represent. States with higher noncompliance rates are more likely to have problems with misallocation of employment to secondary worksites, at least in some areas.
- Examine Census Blocks that contain large concentrations of employment for specific industry or ownership categories, like school district headquarters, corporate headquarters, hospitals, state capitals, universities, and regional shopping centers to see if the employment totals are unusually large, or if it looks like employment has not been distributed to secondary worksites.
- Where specific discrepancies are identified, use alternative data sources to help allocate employment to secondary worksites.

### *LEHD – Quarterly Workforce Indicators*

The LEHD-QWI is described as the “flagship” of the LEHD program. However, this database is designed primarily for analyses of workforce dynamics. Most of the additional attribute data that it includes pertain to changes in employment and wages, stratified by worker demographics and industry type, and are not particularly relevant to most transportation planning or travel demand modeling applications. Furthermore, LEHD-QWI data are only published for counties, MSAs, or states, making the available level of geographic resolution too coarse for most transportation applications.

### *QCEW*

The QCEW is the principal source of administrative record data on employer location, total employment and wages collected on a nationwide basis. It is an essential input to the LEHD Program and therefore shares many of the strengths and limitations of the LEHD-OTM database. Unlike the LEHD-OTM database, however, the QCEW contains only employer-based data; there is no information on worker related characteristics, such as residence location, worker demographic characteristics, or home-to-work flows.

Most of the information contained in the QCEW is also available in the LEHD-OTM database, with the following differences:

- Publicly available QCEW data are only published for geographic areas that include counties, MSA's, and states; LEHD-OTM data is available at the level of the Census Block.
- The QCEW includes industry codes down to the 6-digit NAICS<sup>1</sup> level; LEHD-OTM data is only available at the 2-digit NAICS Sector level.
- The QCEW includes attribute data on total employment, number of establishments, and employer size; LEHD-OTM only includes attribute data on total employment.
- QCEW data is published quarterly and is available within 6 months of the reference quarter; LEHD-OTM data is published annually, approximately one year after the reference year.

In lieu of using the publicly available QCEW database, some state DOTs (and even some MPOs) have entered into formal agreements with their state ESAs to obtain access to the enhanced QCEW microdata files that are used by BLS to develop the QCEW.<sup>2</sup> These microdata files contain data on individual employers, including addresses and geocoding of primary and secondary workplaces, additional contact information, monthly employment and quarterly wages by workplace, and current status. Due to the confidential information contained in these files, all agreements include restrictions on disclosure and use. Because there is currently no formal, nationwide standard or model agreement, each agreement must be negotiated separately, and is subject to variations in interpretation by each state ESA regarding permitted uses of the data, requirements for data security and access, and even what data items are released.

### *CTPP*

Although formal evaluation of the CTPP database was not, strictly speaking, the subject of this study, statistical comparisons between the CTPP and LEHD-OTM database inevitably raise questions about whether one database is “better” than the other for specific transportation planning and modeling applications.

As mentioned previously, the LEHD-OTM database should not be viewed as a alternative for the CTPP, but rather as a complementary source of additional information. The CTPP contains information on journey-to-work trips, based on a nationwide survey of sampled households conducted as part of the American

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<sup>1</sup> NAICS – North American Industrial Classification System

<sup>2</sup> These files are more commonly known in the transportation community as ES-202 data, but this terminology is no longer used by BLS.

Community Survey (ACS). It therefore includes trip related attributes (travel time, mode, departure time), that are not available in the LEHD-OTM.

By contrast, the LEHD-OTM provides a nearly complete enumeration of flows between worker residences and workplaces, including flows between low frequency OD pairs. As such, it provides a distribution of home to work flows that is much closer to reality than can possibly be obtained from any sample-based data collection method.

LEHD-OTM data can, and should be used in conjunction with sample-based travel survey data, like the CTPP, to smooth out the geographic distribution of home-to-work trips, and to develop more complete areawide OD matrices for home-based work trips that could be used in travel modeling applications.

## **Recommendations for Additional Research and Actions**

### *Follow-on Analyses of LEHD-OTM Data*

While analyses at the county and Census Tracts levels have provided valuable insight into the accuracy and completeness of the LEHD-OTM data, additional research, focused specifically on more detailed geographic comparisons of LEHD-OTM data with other data sources, and at other case study sites, is clearly warranted. Potential analyses should include:

- Mapping both the absolute number and share of work destinations by geographic area (i.e., Census Tract or Block Group) to identify areas with unusually high or low employment.
- Comparing LEHD-OTM work destinations against a more comprehensive employment database than the CTPP (i.e., commercial employment data) to identify areas with large discrepancies.
- Examining areas with large discrepancies in greater detail for possible causes, including missing employment categories (e.g., federal workers), new commercial development, or incorrectly assigned worker categories (e.g., no education employees in an area with several schools, or no health care workers in an area with a large hospital).
- Comparing differences in discrepancies across case study sites, including voluntary vs. mandatory reporting states, single vs. multi-state metropolitan areas, and large vs. small metropolitan areas.

Better understanding of the overall accuracy and completeness of the LEHD-OTM type as well as the magnitude of potential errors will give the transportation community more confidence in using the LEHD-OTM, and will provide direction for needed enhancements to the current data.

### *Better Documentation of Key LEHD-OTM Processing Steps*

Several of the processing steps used by the Census Bureau to develop the LEHD-OTM database lack sufficient or understandable documentation to enable transportation researchers to understand underlying theories, assumptions and methodologies. These processing steps include:

- The process by which federal databases on personal characteristics are integrated within StARS;
- The process by which employer locations are geocoded in the QCEW and LEHD (e.g., is geocoding done by state ESAs, BLS, Census Bureau, or all three agencies, and are edits shared among, and incorporated into, all databases?)
- The model and procedure used to assign individual workers to worksites for multi-worksites employers, based on Minnesota data;
- Disclosure proofing procedures used in developing the LEHD-OTM database, particularly the creation of synthesized distributions of worker attributes.

By developing documentation that is both understandable to transportation planners and that specifically addresses how these procedures impact data applicability for transportation planning purposes, much of the current apprehension in using these data can be mitigated.

### *Improving Access to QCEW Enhanced Microdata*

While many of the potential transportation benefits associated with QCEW enhanced microdata files are already available in the LEHD-OTM data, better coordination between transportation agencies and state ESAs could help improve the quality and accuracy of employer location information, and provide access to even more detailed employment data for specific transportation applications. Currently, data sharing agreements are negotiated between transportation agencies and state ESAs on a case-by-case basis, with little or no general guidance on levels of access, allowable uses, or data security.

One potentially useful follow-on project would be to survey existing agreements between transportation agencies and state ESAs, and in coordination with AASHTO and BLS, develop a model agreement for sharing QCEW microdata that could be used universally by state and local transportation agencies.

### *Improved Coordination with the Census Bureau on LEHD-OTM Data*

To the extent that the LEHD-OTM data becomes accepted as a valuable resource for transportation planning, additional coordination will be needed between the transportation planning community and the Census Bureau's LEHD staff

concerning future enhancements to the LEHD-OTM. Potential enhancements might include:

- Inclusion of additional employment groups, particularly self-employed workers, sole proprietors, and small businesses with no paid employees.
- Adjustments in the stratification categories to improve compatibility with other transportation demographic data sources (e.g., income or age ranges).

# 1.0 Introduction

High quality employment data, including workplace location, industry type, the number and demographic characteristics of workers, and the geographic distribution of home-to-work trips are critical to transportation planning and policy analysis. Second only to residence location, the workplace is a major generator of trips within metropolitan areas, and is therefore a key geographic variable in travel demand analysis and forecasting. Increasingly, detailed employment data are also being used to analyze emerging transportation related issues such as greenhouse gas emissions, performance-based planning criteria, and livability. For example, a transportation planner investigating the impacts of a proposed transit-oriented development (TOD) may be interested in correlating mode choice to work with worker demographics and industry types at the work place in the vicinity of the TOD.

Transportation planners use a variety of both public and commercial sources of employment data, including:

- Demographic Data – Census Transportation Planning Products (CTPP)
- Establishment Data – Economic Census (2007), County Business Patterns, Quarterly Census of Employment and Wages (QCEW)
- Commercial Data Sources – Dun & Bradstreet, InfoGroup, Global Insight

Additionally, a number of metropolitan planning organizations (MPOs) have conducted their own surveys of workplace establishments, often in coordination with a regional household travel or activity survey. However, response rates for non-mandatory surveys continue to decline, leading to significant increases in survey costs and the inability to obtain statistically valid samples for low incidence survey populations.

For several decades, transportation planners have relied heavily on journey-to-work data collected as part of the decennial Census long form to obtain workplace location and distributions of home-to-work trips. Since 1990, special tabulations of the Census journey-to-work data have been developed and distributed to the transportation planning community through the CTPP Program.<sup>3</sup> However, the replacement of the decennial Census long form by the

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<sup>3</sup> The CTPP Program is a cooperative effort between the American Association of State Transportation Officials (AASHTO), the Federal Highway Administration (FHWA) and state DOTs. Although journey to work data were first compiled as a special tabulation by the Census Bureau in 1970, it did not become a nationwide program until 1990. For more information on the CTPP Program, visit: <http://ctpp.transportation.org>

continuous sample American Community Survey (ACS) following the 2000 Census has raised concerns within the transportation planning community about the adequacy of the sample sizes to provide reliable data on workplace locations and home-to-work flows. Consequently, alternative data sources are being sought.

This guidebook examines three alternative, publicly available sources of employment data that may be useful for transportation planning applications. These databases are the Quarterly Census of Employment and Wages (QCEW) collected by the Bureau of Labor Statistics (BLS), and two databases produced from the Census Bureau's Longitudinal Employment Household Dynamics (LEHD) Program - the Quarterly Workforce Indicators (QWI) and OnTheMap (OTM).

Chapter 2 describes each data source, providing information on how the data are developed; primary users and applications for the data; potential uses and limitations for transportation planning applications; how the data can be accessed, including download instructions, file and record formats, and data dictionaries; and links to additional technical documentation.

Chapter 3 compares the home-to-work flows derived from the LEHD-OTM data with those derived from the 2000 CTPP and the CTPP 3-year data based on the 2006-2008 samples from the ACS. Statistical analyses were conducted to determine whether the flows from these data sources are significantly different, and if so, why.

Chapter 4 reviews the applicability and limitations of the employment databases with respect to transportation planning, and discusses opportunities for improving data quality, completeness, and accuracy.

## 2.0 Descriptions and Comparison of QCEW and LEHD Data

### 2.1 QCEW DATA

#### Overview

The [Quarterly Census of Employment and Wages \(QCEW\) Program](#) is a cooperative program between the U.S. Department of Labor (DOL) Bureau of Labor Statistics (BLS) and employment security agencies (ESAs) in each state. It produces a comprehensive tabulation of employment and wage information reported by employers subject to state unemployment insurance (UI) laws and by federal agencies for workers covered by the Unemployment Compensation for Federal Employees (UCFE) Program. The QCEW name was adopted in 2003, replacing the formerly named ES-202 Program, which was derived from an obsolete transmittal with that number that was part of the Employment Security Program. The term ES-202 is still occasionally used today, but is synonymous with the name QCEW.

The QCEW grew out of the need to better manage the UI systems. The data that was collected became so important to economic analysis that the administrative and methodological duties were transferred from the Employment and Training Administration to BLS in the 1970's. BLS funds the states annually through a cooperative agreement, that, like a contract, provides funds for a specified level of activity, quality and timeliness. BLS manages the conduct of this program to insure that methods are followed and that the resulting data are of high levels of accuracy, timeliness and comparability across the states.

The QCEW is published on a cross sectional basis each quarter and annually. Also, through longitudinal linking, BLS uses the QCEW data to produce the Business Employment Dynamics data (quarterly and annually) covering job creation, destruction at national industry, size of firm, age, and state levels.

The QCEW Program serves as a nearly complete Census of monthly employment and quarterly wage information by 6-digit NAICS code<sup>4</sup> at the national, state and

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<sup>4</sup> The [North American Industrial Classification System \(NAICS\)](#) is the standard used by Federal statistical agencies to classify business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

county levels. At the national level, the QCEW Program publishes employment and wage data for nearly every NAICS industry. At the state, MSA, and county level, the QCEW Program publishes employment and wage data down to the 6-digit NAICS level, as long as disclosure restrictions are met. States in New England and New Jersey also publish data at the city and town levels. In accordance with BLS policy, data provided to the BLS in confidence are not published and are used only for specified statistical purposes. BLS withholds publication of employment and wage data for any industry level when necessary to protect the identity of cooperating employers. Totals at the industry level for the states and for the nation include the data that has been suppressed in the more disaggregate tables. However, these totals cannot be used to reveal the suppressed data.

Wages represent total compensation paid during each calendar quarter, regardless of when services were performed. Included in wages are pay for vacation and other paid leave, bonuses, stock options, tips, the cash value of meals and lodging, and in some states, contributions to deferred compensation plans (such as 401(k) plans).

QCEW data serve as an important input to many other BLS programs. The data are used as the benchmark source for employment by the Current Employment Statistics (CES), Occupational Employment Statistics (OES), Job Openings and Labor Turnover Survey (JOLTS), the Green Goods and Services Survey (GGS), and the Occupational Safety and Health Statistics (OSHS) programs. The QCEW Program also serves as a sampling frame for many BLS establishment surveys including the CES, OES, JOLTS, GGS, OSHS, and the National Compensation Surveys. QCEW data accurately reflect the extent of coverage of the state UI laws and are used to measure UI revenues; national, state and local area employment; and total and UI taxable wage trends.

About \$250 billion in federal funds are allocated using QCEW data. Many states use the QCEW to allocate program funding as well. The Social Security Administration (SSA) uses QCEW data as a check on Internal Revenue Service (IRS) data in managing its various funds.

The QCEW is the primary source of data on employers and workplace locations for the Census Bureau's LEHD Program. The data are also used by the Census Bureau as a major source of industry codes and as a quality control measure for the decennial redesign of the Current Population Survey (CPS) after each population census.

## **QCEW Data Sources**

The QCEW Program derives its data from quarterly contribution reports submitted to state ESAs by over eight million employers subject to state UI laws and by federal agencies subject to the UCFE Program. These reports cover over

nine million workplace establishments, and account for approximately 99.7 percent of all wage and salary civilian employment.

Figure 2.1 shows an example of a typical quarterly contribution report form. Each state has its own reporting form and submission procedures. Many states require employers to submit their information electronically. At a minimum, each report contains:

- The employer's State Employer Identification Number (SEIN)
- The employer's Federal Employer Identification Number (FEIN)
- The number of employees who were on the payroll during each of the three months of the quarter.<sup>5</sup>
- The total wages paid to all employees during the quarter.

Employers are also required to submit a quarterly wage report, which lists the name, social security number (SSN) and total wages paid to each employee during the quarter. Some states combine the quarterly contribution and wage reports into a single submission.

Basic information on the physical location and the type of industrial activity(ies) carried out by the employer are obtained from the initial application an employer must submit to obtain a state UI account, and is linked to the quarterly contribution and wage reports through the SEIN.

### *Employers With Multiple Worksites*

Each state UI system requires a single quarterly contribution report from each employer covering all activities within the state. However, an employer may have more than one worksite location within a state. Employers with multiple worksites include large corporations with several manufacturing plants (e.g., auto manufacturers), school districts with teachers and staff located in different schools, and retail establishments with multiple store locations.

Information about separate worksite locations are collected via the Multiple Worksite Report (MWR) form.<sup>6</sup> The MWR asks multi-worksite employers to provide employment and wage data for each of their worksites covered under the same UI account in a state. Multi-worksite employers with a total of ten or

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<sup>5</sup> The QCEW uses the official OMB definition of employment, which is the number of employees who worked or received pay for the pay period that included the 12<sup>th</sup> of the month.

<sup>6</sup> <http://www.bls.gov/cew/cewmwr00.htm>

Figure 2.1 Quarterly Contribution Report (Sample)

This is a fillable form. Please click on the appropriate area to enter information. Tab between fields and PRINT when completed.

**QUARTERLY CONTRIBUTION REPORT  
TO BE FILED WITH QUARTERLY WAGE RPT.**

**INSTRUCTIONS ON REVERSE SIDE**

1. U.I. ACCOUNT NUMBER      2. QUARTER      YEAR

1a. INTERNET ACCESS NUMBER  
<http://dwd.wisconsin.gov/utax>

3. REPORT AND PAYMENT DUE      4. ACCOUNT NUMBER

5. FEIN      6. EMPLOYER TELEPHONE NO.

7. EMPLOYER NAME AND ADDRESS

**ITEM 8. MUST BE COMPLETED**

8. MONTHLY DATA SHOULD COUNT ALL FULL-TIME AND PART-TIME WORKERS IN COVERED EMPLOYMENT WHO WORKED DURING OR RECEIVED PAY FOR THE PAYROLL PERIOD WHICH INCLUDES THE 12TH OF THE MONTH. IF NONE, ENTER -0-

1ST MONTH--	2ND MONTH--	3RD MONTH--

9. TOTAL COVERED WAGE  
Must agree with total wages on Wage Report

	DOLLARS	CENTS

10. LESS EXCLUSIONS FOR WAGES OVER \$13,000

	DOLLARS	CENTS

11. DEFINED (TAXABLE) PAYROLL  
Item 9 minus Item 10  
**THIS LINE MUST BE COMPLETED**

	DOLLARS	CENTS

12. Multiply Item 11 by:

	DOLLARS	CENTS

13. TAX DUE

	DOLLARS	CENTS

14. IF FILED AFTER DUE DATE, ADD INTEREST OF 1% PER MONTH OF ITEM 13, above.

	DOLLARS	CENTS

15. IF WAGE Report, (Form UC-7523) FILED AFTER DUE DATE, ADD \$50.00 LATE FILING FEE. (See reverse side)

	DOLLARS	CENTS

16. LESS ELECTRONIC FUND TRANSFER (EFT) PAYMENT

	DOLLARS	CENTS

17. LESS CREDIT AVAILABLE as of

	DOLLARS	CENTS

18. TOTAL AMOUNT ENCLOSED WITH THIS REPORT

	DOLLARS	CENTS

RETURN THIS FORM AND ANY PAYMENT DUE MAKE CHECK OR MONEY ORDER PAYABLE TO: DIVISION OF UNEMPLOYMENT INSURANCE. FOR INFORMATION CALL (608) 261-6700.

19. I CERTIFY THE TAX AND WAGE REPORTS ARE CORRECT

SIGNATURE	TITLE	DATE

**GENERAL INFORMATION**

This report is required from all employers covered under Wisconsin's Unemployment Insurance (UI) Law. A completed Quarterly Wage Report must be submitted in addition to this report.

Two mailing addresses have been provided. If submitting the report WITH a check or money order or if payment was made by EFT for taxes due, mail to:

Department of Workforce Development  
Division of Unemployment Insurance  
P.O. Box 78960  
Milwaukee, Wisconsin 53278-0960

For reimbursable employer reports and reports WITHOUT payment, mail to:

Department of Workforce Development  
Division of Unemployment Insurance  
P.O. Box 7945  
Madison, Wisconsin 53707-7945

Do not make any adjustment for prior calendar quarters on this report. Request an adjustment form from the Division of Unemployment Insurance, Employer Service Team, P.O. Box 7942, Madison, Wisconsin 53707 or telephone (608) 261-6700.

**INSTRUCTIONS ON THE REVERSE SIDE.**

UCT-101-E (R. 02/14/2011)

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more employees combined in their secondary worksite locations are requested to complete the MWR. An employer's primary worksite is the location with the most employees in a state. All other locations within the state are secondary worksites. Employers fill out separate MWRs in each state where they have multiple worksites that meet the above criteria. Figure 2.2 shows a typical MWR.

The MWR is designed to collect information showing the distribution of the employment and wages of business establishments by geographic area. Information on the MWR form is used to more accurately classify employment and wage data of multi-worksite employers by location within a state. By collecting and storing employment and wage data by worksite, the QCEW can disaggregate these data below the state level for more extensive and detailed analyses of business and economic conditions within each state, including local and regional employment totals.

The QCEW Program offers many ways for employers to submit an MWR. In addition to paper-based forms, BLS has offered electronic submission directly to the BLS EDI center in Chicago since the mid-1990s. BLS works to identify and encourage large multi-state firms to submit MWR files electronically. In many cases, BLS has been successful in gaining MWRs from businesses for voluntary states as a pre-condition to receiving files for the mandatory states. Currently, about 11 million employees are included in the EDI submissions.

Starting in 2007, BLS also offers Internet-based collection for multi-worksite businesses. BLS now collects MWR data for over 30,000 businesses and about 9.55 million employees through this option. Also, BLS has worked hard over several years to obtain detailed MWR reports for virtually all federal government locations. BLS has also had some success in working with third-party payroll providers to submit MWRs for their clients. Lastly, BLS has worked with Florida to obtain client-level reporting for most professional employer organizations, hugely improving the allocation of employment in that state.

The QCEW Program conducts a variety of quality control checks to ensure that the data submitted by multi-worksite employers are complete, accurate, and consistent from one submission to the next. State ESA staff can and often do, recontact employers to validate data, capture causes for unusual employee movements, and other quality enhancing aspects. Ultimately, however, the accuracy of the submissions rests with the employers themselves.

Despite this large investment by BLS in MWR collection, there are still employers in both mandatory and voluntary states which do not provide MWRs. The compliance rates of multi-worksite employers in providing MWRs vary from state to state. Currently, just over half of the states have laws that require employers to fill out the MWR; compliance in the other states is strongly encouraged, but voluntary. Figure 2.3 presents a map showing which states require submission of an MWR and which are voluntary.

Figure 2.2 Multiple Worksite Report (Sample)

**Multiple Worksite Report - BLS 3020**  
 Form Approved, O.M.B. No. 1220-0134 Expiration Date: 05/31/13  
 In Cooperation with the U.S. Department of Labor



**STATE OF MASSACHUSETTS** PAGE 1 OF 2

**1** This report is authorized by law, 29 U.S.C. 2. Your voluntary cooperation is needed to make the results of this survey complete, accurate, and timely. The totals on this form must match the corresponding totals on your Employer's Quarterly Contribution Report (Form 0001).

**2**

**QUARTERLY REPORT INFORMATION**

U.I. NUMBER

QUARTER ENDING

DUE DATE

*Please update address and contact information in the address block shown at the left.*

**SEE INSTRUCTIONS ON THE BACK OF THIS PAGE**

**3 WORKSITES**

OFFICE USE	BUSINESS NAME (division, subsidiary, etc) STREET ADDRESS (physical location) CITY, STATE, AND ZIP CODE WORKSITE DESCRIPTION (plant name, store number, etc)	NUMBER OF EMPLOYEES (subject to UI laws) During the Pay Period Which Includes the 12 <sup>th</sup> of the Month			QUARTERLY WAGES OF WORKSITE (subject to UI laws) Round to the nearest dollar	
					.00	
		COMMENTS:				
					.00	
		COMMENTS:				
					.00	
		COMMENTS:				
					.00	
		COMMENTS:				
					.00	
		COMMENTS:				
		<b>TOTALS</b>	0	0	0	0.00

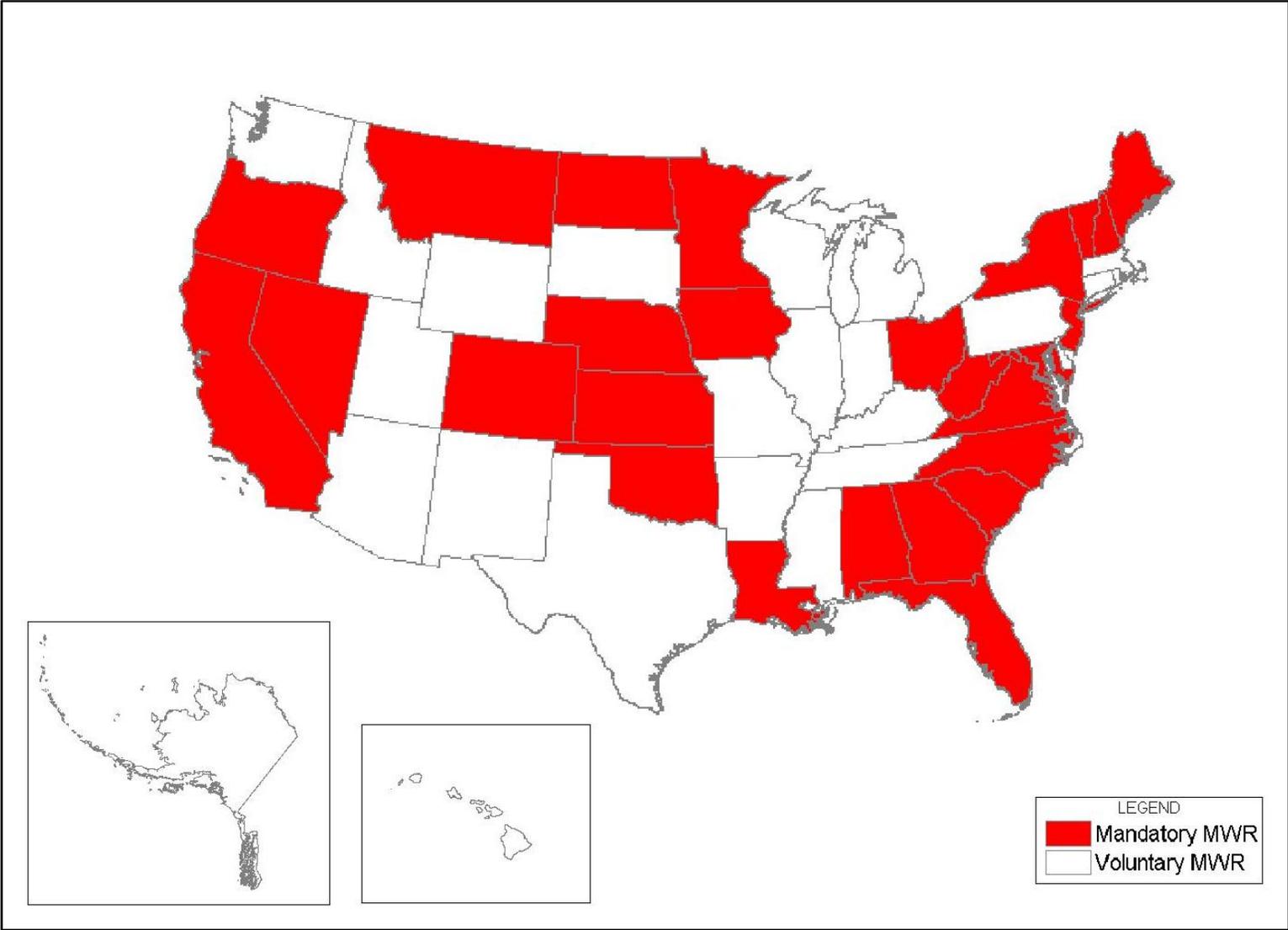
Note: The totals MUST agree (except for rounding) with your Form 0001.

CONTACT PERSON (for questions regarding this report). Please print.

NAME:  TITLE:

VOICE PHONE: ( )  Ext.  FAX NUMBER: ( )  DATE:

Figure 2.3 States with Mandatory Multiple Workplace Reporting (MWR) Requirements



In support of this study, the BLS conducted an internal statistical analysis to determine the compliance rates of multi-worksites employers in providing MWR data to the QCEW. The analysis examined the number and percentage of employers who had multiple worksites, the number of employees who worked for those employers, and employers who submitted MWR reports to their state ESAs. The analysis further stratified the data by states with mandatory versus voluntary MWR reporting requirements, and by employer ownership type (i.e., federal, state, and local government agencies, and private sector employers). Table 2.1 provides nationwide summary statistics on multi-worksites employers for the most recently processed QCEW submission, the first Quarter of 2011.

The statistics compiled by BLS show that, nationwide, multi-unit (or multi-worksites) employers account for less than 3 percent all employers, nationwide, but employ nearly 45 percent of all workers covered by federal and state UI laws.

Over 58 percent of multi-unit employers report employment data at the worksites level; these employers account for over 92 percent of all multi-site employment. Approximately 36 percent of multi-unit employers (accounting for about 3 percent of multi-unit employment) do not file MWRs because their secondary employment sites combined have less than 10 employees. This leaves about 5.6 percent of all multi-unit employers (accounting for about 4.5 percent of all multi-unit employment) who refuse to provide separate worksites data.

On a nationwide level, nearly 99 percent of all covered workplace locations (including both single- and multi-worksites employers) are represented in the QCEW data. These workplace locations account for nearly 97 percent of all covered employment.

Table 2.2 shows the non-compliance rates for multi-worksites employers (i.e., employers who refuse to provide worksites data even though they exceed the 10 employee threshold at their secondary worksites) stratified by mandatory vs. voluntary reporting states and by employer ownership categories. Non-compliance rates appear to be more than twice as high in states where MWR is voluntary, compared to mandatory states. But even in those states where MWR reporting is voluntary, over 98 percent of all covered workplace locations, and 96 percent of all covered employment are accounted for.

Looking at non-compliance rates by employer ownership, rates are lowest among federal government agencies, averaging well below 1 percent. Non-compliance rates among state government agencies are next lowest, averaging about 2 percent in mandatory states and about 3 percent in voluntary states. However, combined federal and state government agencies account for only about 3 percent of all multi-worksites employers, and 10 percent of all covered employment.

**Table 2.1 Multi-Worksite Employer Statistics: National Summary**

OWNER		Total Establishments (Single-Unit and Multi-Unit)		Total Multi-Unit Establishments		Multi-Unit that is providing data at the Worksite Level		Multi-Unit that refuses to provide Worksite data. Reporting as a Single Unit		Multi-Unit that is below BLS threshold for filing an MWR. Reporting as a Single Unit	
		Units	Employees	Units	Employees	Units	Employees	Units	Employees	Units	Employees
Mandatory States	Federal	1,454	1,589,818	951	1,563,002	941	1,562,247	2	48	8	707
	State	17,333	2,790,249	1,242	1,742,616	1,155	1,658,496	24	41,555	63	42,565
	Local	38,581	8,475,892	6,294	4,588,784	5,164	4,182,832	331	312,004	799	93,948
	Private	4,623,013	61,082,882	115,111	25,317,215	67,122	23,698,469	4,169	684,324	43,820	934,422
	<b>Total Mandatory</b>	<b>4,680,381</b>	<b>73,938,841</b>	<b>123,598</b>	<b>33,211,617</b>	<b>74,382</b>	<b>31,102,044</b>	<b>4,526</b>	<b>1,037,931</b>	<b>44,690</b>	<b>1,071,642</b>
	% Total National	60.98%	57.39%	1.61%	25.78%	0.97%	24.14%	0.06%	0.81%	0.58%	0.83%
	% Total Mandatory			2.64%	44.92%	1.59%	42.06%	0.10%	1.40%	0.95%	1.45%
	% Total Multi-Unit					60.18%	93.65%	3.66%	3.13%	36.16%	3.23%
Voluntary States	Federal	1,427	1,286,641	879	1,153,418	869	1,152,443	2	517	8	458
	State	2,323	2,044,126	747	1,415,871	708	1,386,013	22	26,888	17	2,970
	Local	37,969	5,895,422	5,212	2,710,070	4,156	2,276,400	698	407,862	358	25,808
	Private	2,952,632	45,677,465	98,196	19,185,201	53,676	17,407,930	7,578	1,090,622	36,942	686,649
	<b>Total Voluntary</b>	<b>2,994,351</b>	<b>54,903,654</b>	<b>105,034</b>	<b>24,464,560</b>	<b>59,409</b>	<b>22,222,786</b>	<b>8,300</b>	<b>1,525,889</b>	<b>37,325</b>	<b>715,885</b>
	% Total National	39.02%	42.61%	1.37%	18.99%	0.77%	17.25%	0.11%	1.18%	0.49%	0.56%
	% Total Voluntary			3.51%	44.56%	1.98%	40.48%	0.28%	2.78%	1.25%	1.30%
	% Total Multi-Unit					56.56%	90.84%	7.90%	6.24%	35.54%	2.93%
All States	Federal	2,881	2,876,459	1,830	2,716,420	1,810	2,714,690	4	565	16	1,165
	State	19,656	4,834,375	1,989	3,158,487	1,863	3,044,509	46	68,443	80	45,535
	Local	76,550	14,371,314	11,506	7,298,854	9,320	6,459,232	1,029	719,866	1,157	119,756
	Private	7,575,645	106,760,347	213,307	44,502,416	120,798	41,106,399	11,747	1,774,946	80,762	1,621,071
	<b>Total National</b>	<b>7,674,732</b>	<b>128,842,495</b>	<b>228,632</b>	<b>57,676,177</b>	<b>133,791</b>	<b>53,324,830</b>	<b>12,826</b>	<b>2,563,820</b>	<b>82,015</b>	<b>1,787,527</b>
	% Total National			2.98%	44.76%	1.74%	41.39%	0.17%	1.99%	1.07%	1.39%
	% Total Multi-Unit					58.52%	92.46%	5.61%	4.45%	35.87%	3.10%

Note: Data compiled by the Bureau of Labor Statistics based on 1<sup>st</sup> Quarter 2011 MWR submissions

**Table 2.2 Non-Compliance Rates for Multi-Worksite Employers**

OWNER		Multi-Unit that is providing data at the Worksite Level		Multi-Unit that refuses to provide Worksite data. Reporting as a Single Unit		Non-Compliance Rates (% of Total Multi-Unit Employers)	
		Units	Employees	Units	Employees	Units	Employees
Mandatory States	Federal	941	1,562,247	2	48	0.21%	0.00%
	State	1,155	1,658,496	24	41,555	1.93%	2.38%
	Local	5,164	4,182,832	331	312,004	5.26%	6.80%
	Private	67,122	23,698,469	4,169	684,324	3.62%	2.70%
	<b>Total Mandatory</b>	<b>74,382</b>	<b>31,102,044</b>	<b>4,526</b>	<b>1,037,931</b>	<b>3.66%</b>	<b>3.13%</b>
Voluntary States	Federal	869	1,152,443	2	517	0.23%	0.04%
	State	708	1,386,013	22	26,888	2.95%	1.90%
	Local	4,156	2,276,400	698	407,862	13.39%	15.05%
	Private	53,676	17,407,930	7,578	1,090,622	7.72%	5.68%
	<b>Total Voluntary</b>	<b>59,409</b>	<b>22,222,786</b>	<b>8,300</b>	<b>1,525,889</b>	<b>7.90%</b>	<b>6.24%</b>
All States	Federal	1,810	2,714,690	4	565	0.22%	0.02%
	State	1,863	3,044,509	46	68,443	2.31%	2.17%
	Local	9,320	6,459,232	1,029	719,866	8.94%	9.86%
	Private	120,798	41,106,399	11,747	1,774,946	5.51%	3.99%
	<b>Total National</b>	<b>133,791</b>	<b>53,324,830</b>	<b>12,826</b>	<b>2,563,820</b>	<b>5.61%</b>	<b>4.45%</b>

Private sector employers comprise the largest share of multi-worksites and employees, accounting for over 90 percent of all employers and 77 percent of all employment. The non-compliance rate among private sector employers averages about 3.6 percent in mandatory states and 7.7 percent in voluntary states.

Local government agencies, which include counties, municipalities and school districts, have the highest rates of non-compliance of all employer ownership categories, averaging 5.3 percent in mandatory states and 13.4 percent in voluntary states.

The percentage of multi-worksites varies significantly from state to state, as does the non-compliance rate and the percentage of total employment represented by multi-worksites. Appendix Table A.1 provides summary statistics on multi-worksites for each state.

In a majority of the states, worksite data is reported by employers representing over 90 percent of all multi-worksites employment. In ten states (AR, DC, MD, MI, MN, MO, MT, OH, RI, and WV), worksite data is reported for over 99 percent of all multi-worksites employment.

By contrast, worksite data is reported for less than 70 percent of multi-worksites employment in two states (VT and WY). However, in Vermont, which is a mandatory reporting state, the low reporting rate is due primarily to the unusually high percentage (24%) of multi-worksites employers with 10 or fewer employees at secondary worksite locations. In Wyoming, a voluntary state, the non-compliance rate for multi-worksites employers is nearly 12 percent, but these employers account for more than 28 percent of all multi-site employees in the state. Other states with non-compliance rates over 10 percent include AZ, ID, IL, OK, TN, and WA. All but one of these states are voluntary reporting states.

## **Processing Steps**

State ESAs collect and compile quarterly contribution reports, wage reports and MWRs from employers covered by state UI laws, as well as federal civilian workers covered by the UCFE Program. Reports are due from employers at the end of the month following each reference quarter. Each employer is assigned a 6-digit NAICS code based on the reported description of its industrial activity and is grouped into 1 of 4 ownership categories – private, federal, state, or local. Address information on the employer’s primary and secondary workplace locations are checked and edited, as necessary. The ESAs conduct a wide ranging series of checks and edits to insure data accuracy. A unique feature among tax based data collection is that ESA staff can and often do, recontact businesses to validate data, capture causes for unusual employee movements and other quality enhancing aspects. They also check for missing information and errors; prepare imputations of data for delinquent reports; and enter the data

into a standardized record format, known as the Enhanced Quarterly Unemployment Insurance (EQUI) file.<sup>7</sup> Each record contains information for a specific employer workplace location. The ESAs send these files to BLS about 15 weeks after the end of each quarter, with revisions and updates provided quarterly.

In order to assure accurate data, BLS conducts several additional quality checks and edits of the data its receives, and often requests ESAs to review questionable entries and provide updates or explanations where necessary. BLS also uses the physical location addresses to assign geocodes to each workplace record. The edited and geocoded records are returned to the states.

BLS also conducts an annual refiling survey (ARS) through the ESAs. Each year, one third of the covered employers in each state are sent an ARS form requesting them to verify specific information concerning the employer's industrial activity, geographic location, business mailing address, and physical location address. The ARS also asks employers to identify any new workplace locations in the state. If an employer meets MWR reporting criteria, then a MWR is mailed to the employer requesting employment and wages for each new workplace. Thus, the ARS is also used to identify new potential MWR-eligible employers.

Employer- and workplace-level data are aggregated by NAICS code to county-level geography. BLS tabulates and publishes data by county, state, MSA, and national totals for each quarter, as well as an annual summary. At the county level, certain data items (i.e., NAICS code) may be suppressed or combined to protect the identify of an individual employer, as required by federal law.

## **Employers Excluded from the QCEW**

The QCEW includes all employers covered by federal and state UI laws. State UI coverage (and reporting requirements) include all categories of employers subject to the Federal Unemployment Tax Act (FUTA). Under the FUTA, an “employer” is defined as any person or corporate entity that, over a calendar year, pays more than \$1,500 in wages within one quarter, or employs one or more workers on 20 or more different days during the calendar year. These definitions are relaxed somewhat for agricultural labor by raising the minimum wage threshold to \$20,000 in one quarter, and raising the minimum number of employees from one to ten. A majority of the states use these federal definitions; states with modified employer definitions are listed in Appendix A, Table A-2.

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<sup>7</sup> The record layout for the EQUI file can be found at:  
<http://lehd.did.census.gov/led/partnersonly/doc/SOP3020.4.pdf>

Workers excluded from FUTA coverage include uniformed members of the U.S. military, sole proprietors, self-employed individuals, and a list of 20 categories of employment that are exempt from mandatory coverage. These exempted categories are listed and defined in Appendix A, Figure A-1.

Over the years, many states have legislated unemployment insurance protection for additional categories of workers beyond the base established by federal legislation, or have included exemptions for specific miscellaneous worker categories (e.g., real estate agents on commission). Details on specific state coverage laws are provided in [Comparisons of State Unemployment Insurance Laws](#)<sup>8</sup> on the DOL website.

The best estimate of total annual employment for 2008 (based on Labor Force Statistics from the CPS) is **145.4 million** workers<sup>9</sup>. The average annual employment for 2008 based on the QCEW is **134.8 million** workers. Therefore, the QCEW includes approximately 93 percent of all U.S. civilian employment.

Most of the exempt categories represent statistically small numbers of workers. However, a few of the exempt categories include relatively large numbers of workers, whose workplace locations may be concentrated geographically within a state or metropolitan area (e.g., state employees). Table 2.3 lists the estimated number of workers, nationwide, in selected employment categories that are (and are not) covered (or reported) under federal and state UI statutes.

## QCEW Data Access and Use

QCEW data is available via several alternative download tools from the BLS web site<sup>10</sup>. Data for specific geographic areas and industries can be retrieved using a simple point and click interface. However, this interface provides access to only a fraction of the publically available QCEW data due to database size limitations. Selected groupings of data are also available through the QCEW State and County Map application<sup>11</sup>, which provides NAICS supersector data at the county, MSA, state and national levels in map, table, comma separated value (CSV), and extensible markup language (XML) formats.

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<sup>8</sup> <http://workforcesecurity.doleta.gov/unemploy/uilawcompar/2006/comparison2006.asp>

<sup>9</sup> Throughout this guidebook, 2008 is used to compare data sources because it is the most recent year for which all sources have published data.

<sup>10</sup> <http://www.bls.gov/cew/data.htm>

<sup>11</sup> <http://beta.bls.gov/maps/cew/us>

**Table 2.3 Coverage Exclusions in 2008, for Selected Workers<sup>12</sup>**

<b>Group</b>	<b>Number Excluded (in millions)</b>	<b>Number Included (in millions)</b>
<b>Wage and salary agricultural workers</b>	<b>0.1</b>	<b>1.2</b>
<b>Self-employed farmers</b>	<b>0.9</b>	<b>Not covered</b>
<b>Self-employed nonagricultural workers</b>	<b>9.2</b>	<b>Not covered</b>
<b>Domestic workers</b>	<b>0.1</b>	<b>0.7</b>
<b>Unpaid family workers</b>	<b>0.1</b>	<b>Not covered</b>
<b>State and local government workers</b>	<b>0.9</b>	<b>18.9</b>
<b>Railroad workers</b>	<b>0.2</b>	<b>&lt;0.1</b>
<b>Total Exclusions</b>	<b>11.5</b>	<b>~20.8</b>

Complete copies of the QCEW public data files can be downloaded from the BLS special request FTP site<sup>13</sup>. Public data are available only for counties and higher levels of geographic aggregation (i.e., states, MSAs). Data records for more detailed levels of geography (e.g., individual establishments) are available only to researchers from government, academia, and non-profit organizations. Researchers requesting such data must sign non-disclosure agreements with their state’s Department of Labor in order to obtain the QCEW microdata.

QCEW public data files are stored in directories, by reporting year. Data files are currently available for the years 1990 – 2010. Each directory contains up to seven zipped archive files.<sup>14</sup> For example, the following seven archive files are available for the year 2008:

<sup>12</sup>This table was taken from the [Employment and Wages, Annual Averages 2008](#), and is based on data compiled from the [Current Population Survey](#).

<sup>13</sup> <ftp://ftp.bls.gov/pub/special.requests/cew/beta/>

<sup>14</sup>In order to better serve user requests, the QCEW Program now publishes its data files in CSV format, in addition to its former ENB and END file formats, which required users to download a file formatter macro available from BLS to convert the data files into Excel, Access, or SAS standard data formats. QCEW data currently can be downloaded from the special request FTP site in either format.

1. 2008.q1-q4.by\_area.zip
2. 2008.q1-q4.by\_industry.zip
3. 2008.q1-q4.singlefile.zip
  
4. 2008.annual.by\_area.zip
5. 2008.annual.by\_industry.zip
6. 2008.annual.singlefile.zip
  
7. 2008.q1.by\_size.zip

The name of each quarterly archive file (files 1, 2, and 3) indicates the most recent quarter for which data are available (e.g., 2010.q1-q2.singlefile.zip contains data for the first two quarters of 2010). Annual archive files (files 4, 5, and 6) are published only after all four quarters have been collected and processed by BLS.

Both the quarterly and annual archive files include separate groupings by area and industry, and well as a single, combined file.

The **area** grouping contains separate CSV files for each geographic area for which QCEW data is published including states, counties, Metropolitan and Micropolitan Statistical Areas, Consolidated Statistical Areas, and the entire United States. It is designed for users who want all data published for a specific area.

The **industry** grouping contains separate CSV files for each industry category for which QCEW data is published, ranging from 6-digit NAICS code (where available) to supersector. It is designed for users who are interested in all the data published for a specific industry, regardless of where it is located in the US, Puerto Rico, and the US Virgin Islands.

The **singlefile** grouping contains all geographic areas and industry categories in a single combined CSV file. It is designed for users who want to maintain a single large database of that can be queried either by industry or geography.

The seventh archive file (file 7) is the only QCEW public data file that stratifies the QCEW data by establishment size (i.e., number of employees), and is published only for the first quarter of each year. This archive file includes a single CSV file with separate records for each industry category, stratified by establishment size for each state, and nationally. Only private sector employers are included.

Each of the CSV files has a similar record format. Each record contains wage and employment data for specific combinations of:

- Geographic Area (i.e., county, state, MSA)
- Industry (NAICS code)

- Ownership (government vs. private – 7 categories)
- Establishment size (number of employees – 10 categories)

The quarterly files have up to four rows per record – one for each quarter. The annual files have one row per record. Quarterly files contain quarterly summaries for number of establishments and total wages, average weekly wages, and total employment by month. Annual files contain summaries for total wages, and annual averages for number of establishments, employment, weekly wages, and annual pay. Table 2.4 shows the layout for the annual CSV file. More extensive documentation on other file layouts, field definitions, and attribute codes can be found on the QCEW web site.<sup>15</sup>

**Table 2.4 QCEW File Layout**

Field Name	Max Length	Description
area_fips	5	5-character FIPS code
own_code	1	1-digit ownership code
industry_code	6	NAICS code
agglvl_code	2	2-digit aggregation level code
size_code	1	1-digit establishment size code
year	4	Reporting year
qtr	1	Reporting quarter (A – annual)
disclosure_code	1	Either “ ” (blank) or “N” (not disclosed)
*area_title	55	Place name associated with area FIPS
*own_title	48	Title associated with ownership code
*industry_title	58	Industry name associated with NAICS code
*agglvl_title	62	Title associated with aggregation level code
*size_title	40	Title associated with establishment size code
annual_avg_estabs_count	8	Annual average of quarterly establishment counts
annual_avg_emplvl	9	Annual average of monthly employment levels
total_annual_wages	15	Sum of quarterly total wages
taxable_annual_wages	15	Sum of quarterly total taxable wages
annual_contributions	13	Sum of quarterly contribution totals
annual_avg_wkly_wage	8	Average weekly wage based on total annual wages and 12 monthly employment levels
avg_annual_pay	8	Average annual pay based on employment and wage levels

<sup>15</sup> <http://www.bls.gov/cew/home.htm>

## 2.2 LEHD DATA<sup>16</sup>

### Overview

The [Longitudinal Employment Household Dynamics \(LEHD\) Program](#) is an employment-based framework developed by the U.S. Census Bureau to represent the universe of worker-employer interactions covered by state UI system reporting requirements. A primary source of input data used in the LEHD are the enhanced QCEW microdata files obtained from each participating Local Employment Dynamics (LED) state.<sup>17</sup>

The LEHD produces a number of data products and tools to track information about jobs, workers, and economic conditions at finer levels of geography (i.e., subcounty) than can typically be made available in other public use data. Of particular interest to transportation planners are the OnTheMap mapping tool and database, and the Quarterly Workforce Indicators (QWI) database.

[OnTheMap \(OTM\)](#) is a web-based mapping and reporting application that shows both where workers are employed and where they live. It also provides information on worker age, income, race and ethnicity, education level, industry classification, and employer ownership type. LEHD-OTM provides an easy-to-use interface for creating, viewing, printing and downloading workforce related maps, profiles, and underlying data.

[Quarterly Workforce Indicators \(QWI\)](#) are a set of economic indicators that provide information on employment, job creation, wages, and worker turnover at different levels of geography (e.g., state, county, MSA), by industry and ownership type, as well as by gender and age of workers. While several of the LEHD-QWI attributes (e.g., employment, earnings) are comparable to attributes in the QCEW, the LEHD-QWI contains additional data on worker characteristics that are not available in the QCEW.

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<sup>16</sup> Throughout this report, we use the term LEHD data to refer collectively to databases produced by the Census Bureau's LEHD Program. When referring to one of the two specific databases of interest to transportation planners, we use either LEHD-OTM for OnTheMap or LEHD-QWI for the Quarterly Workforce Indicators.

<sup>17</sup> Local Employment Dynamics (LED) is a voluntary partnership between state ESAs and the Census Bureau to develop new information about local labor market conditions at low cost, with no added respondent burden, and with the same confidentiality protections afforded Census and survey data. As of January 2011, all 50 States plus the District of Columbia, Puerto Rico, and the U.S. Virgin Islands have joined as LED partners.

## LEHD Data Sources<sup>18</sup>

Unlike the QCEW, which focuses on the employer as the unit of observation, the LEHD Program integrates data on both employers and individual workers. The key to establishing this link are the quarterly wage records of workers submitted by employers covered under each state's UI system. Each UI wage record includes a unique identifier for the worker – the worker's Social Security Number (SSN), and a unique identifier for the employer – the State Employer Identification Number (SEIN). These two identifiers allow the Census Bureau to link each worker to an employer, and provide links to additional employer and worker information contained in other databases.

Employer information, including workplace locations, monthly employment, and quarterly wages comes from the same quarterly enhanced QCEW microdata files that are used by BLS. Each employer record includes the employer's SEIN, and for multi-site employers, a unique unit identifier for each separate workplace establishment (SEINUNIT).

Information on individual workers comes from the Statistical Administrative Records System (StARS). StARS is a centralized repository, developed and maintained by the Census Bureau to support its various demographic and economic statistical programs. The Census Bureau compiles administrative records databases collected by other federal and state agencies, including the Internal Revenue Service (IRS), Social Security Administration (SSA), Department of Labor (DOL), Housing and Urban Development (HUD), Medicare, Indian Health Services (IHS), and the Selective Service System (SSS). Information from these various administrative databases can be linked through a common personal identifier (i.e., SSN). Under the StARS program, Census Bureau staff replace the SSN with a protected identification key (PIK), remove other personal identifiers, and create aggregated demographic records that can be used to improve the quality and usefulness of its various statistical reports and data.

## Processing Steps

In creating the LEHD, the Census Bureau uses StARS to produce two intermediate demographic files – the Person Characteristics File (PCF) and the Composite Person Record (CPR). The PCF contains information on gender, date and place of birth, citizenship, and race, most of which is extracted from the

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<sup>18</sup> For more information on the data sources and processing steps for the LEHD, read Abowd, J.M. et al, [The LEHD Infrastructure Files and the Creation of the Quarterly Workforce Indicators](#), Technical Paper No. TP-2006-01, U.S. Census Bureau, LEHD Program.

Social Security Administration's Numident file – the database containing applicant information for SSNs. The CPR contains current place of residence compiled from IRS 1040 and 1099 tax returns, supplemented by files from Medicare, SSS, HUD rental assistance, and IHS.

Using these input data files, the Census Bureau conducts additional processing, including quality control checks for longitudinal consistency, and imputation of missing attribute values. Two products of this internal processing are the Individual Characteristics File (ICF), which contains personal characteristics (e.g., age, gender, race, education, earnings, employer(s)) and residential location for each worker, and the Employer Characteristics File (ECF), which contains characteristics of each employer (e.g., number of employees, quarterly wages, industry and ownership type) and the location(s) for each workplace establishment. Additionally, a Geocoded Address List (GAL) is maintained that enables the Census Bureau to geocode each commercial and residential address in the ICF and ECF to latitude/longitude coordinates and to various levels of Census geography (Census Block, Tract, urbanized area, county, etc.). Figure 2.4 provides a flow chart showing the LEHD processing steps.

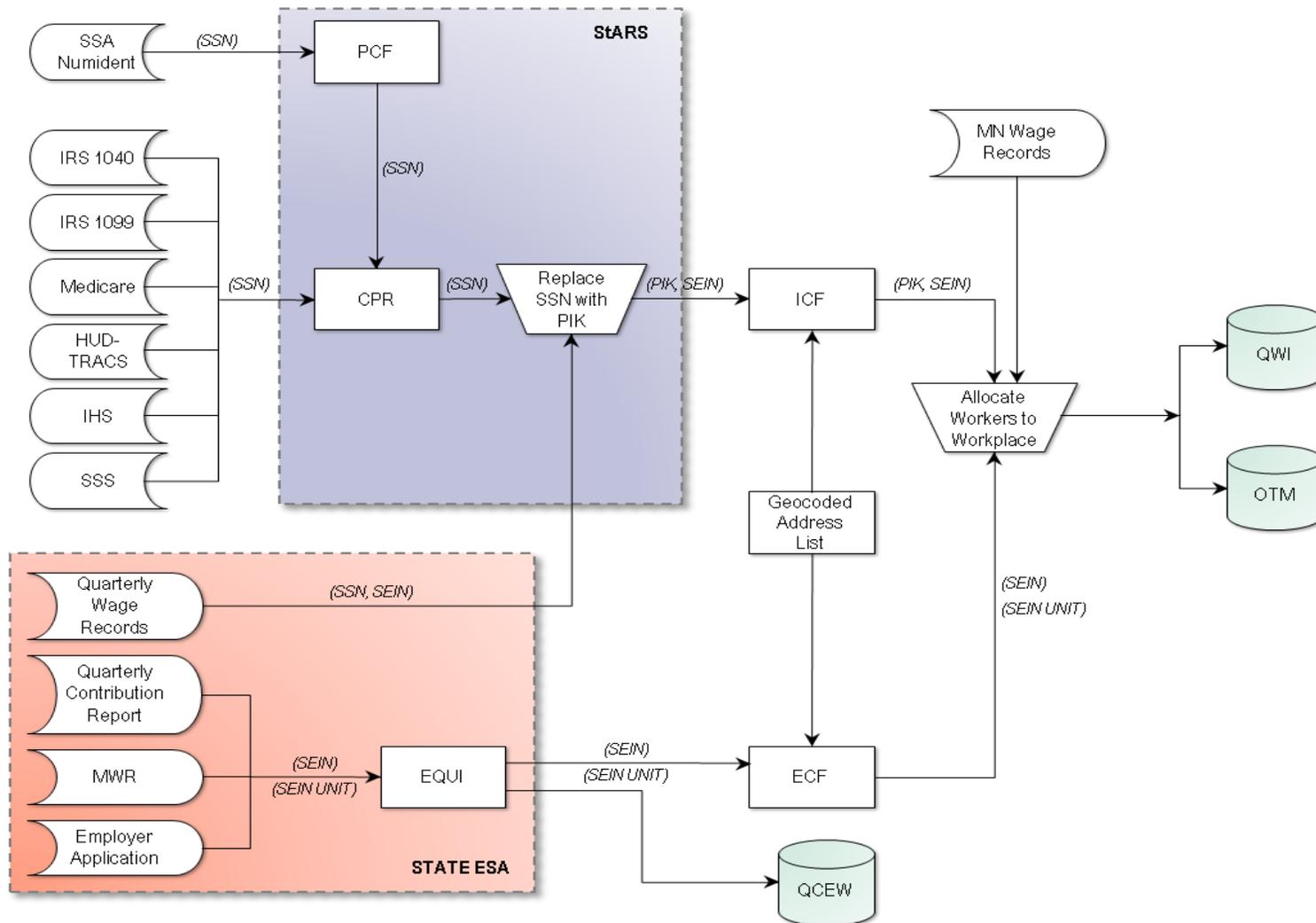
The ECF database can be linked to additional economic data using the Census Bureau's Business Register Bridge (BRB). The BRB provides a crosswalk between the SEINs associated with an employer located in multiple states, and the Federal Employer Identification Number (FEIN), which is used to create the Census Bureau's Business Register, as well as to identify potential respondents in the quinquennial Economic Census and annual surveys of industry.

To protect the identity and confidentiality of individual workers and employers contained in the UI wage records, the Census Bureau applies a series of processing steps to “disclosure proof” the data. Three distinct processes are used. The first step introduces a small amount of noise into workplace variables at the establishment level (e.g., total number of employees, total wages, etc.) The noise is small and introduced in such a way that it is consistent from one time period to the next, and cancels out as individual establishment records are aggregated to higher levels of geography and industry categories.

The second level of disclosure proofing is introduced when worker residence and workplace locations are joined to create work trip flows. For each workplace location, the residence characteristics of workers are synthesized based on combinations of four workplace variables:

- Industry code (20 NAICS two-digit sectors);
- Ownership (public vs. private)
- Age of worker (under 29, 30-54, 55 and over)
- Average monthly worker earnings (under \$1,250, \$1,251-\$3,333, over \$3,333)

Figure 2.4 LEHD Processing Steps



To protect individual confidentiality, a synthetic distribution is created using aggregated values of the four workplace attributes. These synthetic values, called a Prior, are combined with the actual distributions of worker characteristics for each residence block to create Posterior Predictive Distribution or PPD. As the number of workers in a residence block increases, the synthetic distribution approaches the actual distribution of worker characteristics.<sup>19</sup>

The third type of disclosure proofing is to suppress data for those residence or workplace blocks that have fewer than three workers or establishments. Suppression is only used when the combination of noise and synthetic distributions still allow an individual worker or employment establishment to be identified. However, the number of records with suppressed data is significantly smaller in the LEHD databases than in the QCEW, where disclosure proofing is not used.<sup>20</sup>

## Matching Workers to Workplace Locations

A primary objective of the LEHD Program is to link individual employers, workers, and home-to-work flows at very detailed levels of geography (e.g., workplace establishment or Census Block) and industry type. The link between individual workers and employers is made through the state UI wage records. However, only Minnesota requires multi-site employers to file separate UI wage records for each workplace establishment (identified by the SEINUNIT). All other states only require employers to file one wage record, listing all employees regardless of their workplace locations. Consequently, except for Minnesota, there is no way to directly link individual employees of multi-worksites to a specific workplace location.

The Census Bureau uses the Minnesota wage record data to estimate a probability model of home-to-work flow distance based on several variables, including length of employment at the firm, size and age of the firm, and number of secondary workplace locations. The resulting model is used to impute the most likely workplace location for each worker in each of the other states.

Multi-worksites employers represent less than 3 percent of all employers, nationwide, but employ between 30 and 60 percent of all workers within a state,

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<sup>19</sup>The original Prior distribution for the 2002 LEHD was based on the journey-to-work flows from the 2000 CTPP. For each year after 2002, the PPD of the previous year is used as the Prior distribution for the subsequent year.

<sup>20</sup>For more information on the disclosure proofing used in the LEHD, read Abowd, J. M., et al, [\*Confidentiality Protection in the Census Bureau's Quarterly Workforce Indicators\*](#), Technical Paper No. TP-2006-02, U.S. Census Bureau, LEHD Program.

and imputation of these work trips is a potential source of statistical uncertainty in the LEHD databases. It rests on the (unverified) assumption that the distribution of home-to-work trip distances in Minnesota is representative of home-to-work trip distances in all other states. To the extent that average trip distances or the distributions of trip distances are not comparable from state to state, use of a single state model may introduce significant, but unknown bias.

## LEHD Data Access and Use

LEHD-OTM data can be accessed interactively using the OnTheMap web-based geographic information system (GIS)<sup>21</sup>, or the raw data files can be downloaded from the OnTheMap web site.<sup>22</sup>

The raw data files are structured as CSV records, and can be downloaded as zipped files grouped by state. Within each state directory, the data are organized into three groups:

1. **RAC** - Residence Area Characteristics data, the number and characteristics of workers summarized by their place of residence. Data items include total number of workers, number of workers by age (3 categories), by earnings (3 categories), by industry type (20 NAICS sectors), by race (6 categories), by ethnicity (2 categories) and by education (4 categories).
2. **WAC** - Workplace Area Characteristics data, the number and characteristics of workers summarized by their place of work. Data items include total number of workers, number of workers by age (3 categories), by earnings (3 categories), by industry type (20 NAICS sectors), by race (6 categories), by ethnicity (2 categories) and by education (4 categories). Table 2.5 lists the variables in the RAC and WAC data files and their definitions.
3. **OD** - Origin-Destination data, the number and summary characteristics of workers who reside in one Census Block and work in another Census Block (including the same Census Block). Data items include total number of jobs, number of workers (or jobs) for the OD pair, workers by age (3 categories), workers by earnings (3 categories), and jobs by industry (3 categories). Table 2.6 lists the variables in the OD data file and their definitions.

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<sup>21</sup> <http://lehdmap.did.census.gov/>

<sup>22</sup> <http://lehd.did.census.gov/led/onthemap/>

**Table 2.5 RAC and WAC File Variable Definitions**

<b>Variable</b>	<b>Definition</b>
h_geocode / w_geocode	FIPS State – FIPS County – Census Tract – Census Block for residence block or work place block
C000	Total number of workers/jobs
CA01	Number of workers age 29 or younger
CA02	Number of workers age 30-54
CA03	Number of workers age 55 or older
CE01	Number of workers earning \$1,250 or less per month
CE02	Number of workers earning \$1,251 to \$3,333 per month
CE03	Number of workers earning more than \$3,333 per month
CNS01	Number of jobs in Agriculture, Forestry, Fishing & Hunting (NAICS 11)
CNS02	Jobs in Mining (NAICS 21)
CNS03	Jobs in Utilities (NAICS 22)
CNS04	Jobs in Construction (NAICS 23)
CNS05	Jobs in Manufacturing (NAICS 31-33)
CNS06	Jobs in Wholesale Trade (NAICS 42)
CNS07	Jobs in Retail Trade (NAICS 44-45)
CNS08	Jobs in Transportation and Warehousing (NAICS 48-49)
CNS09	Jobs in Information (NAICS 51)
CNS10	Jobs in Finance and Insurance (NAICS 52)
CNS11	Jobs in Real Estate and Rental and Leasing (NAICS 53)
CNS12	Jobs in Professional, Scientific, & Technical Services (NAICS 54)
CNS13	Jobs in Management of Companies & Enterprises (NAICS 55)
CNS14	Jobs in Administration, Support, Waste Management, and Remediation Services (NAICS 56)
CNS15	Jobs in Educational Services (NAICS 61)
CNS16	Jobs in Health Care and Social Assistance (NAICS 62)
CNS17	Jobs in Arts, Entertainment, and Recreation (NAICS 71)
CNS18	Jobs in Accommodation and Food Services (NAICS 72)
CNS19	Jobs in Other Services (except Public Administration) (NAICS 81)
CNS20	Jobs in Public Administration (NAICS 92)
CR01	Number of workers with Race = White
CR02	Number of workers with Race = Black or African American
CR03	Number of workers with Race = American Indian or Alaska Native
CR04	Number of workers with Race = Asian
CR05	Number of workers with Race = Native Hawaiian or Pacific Islander
CR07	Number of workers with Race = Two or more Race Groups
CT01	Number of workers with Ethnicity = Not Hispanic or Latino
CT02	Number of workers with Ethnicity = Hispanic or Latino
CD01	Number of workers with Education = Less than High School
CD02	Number of workers with Education = High School or Equivalent
CD03	Number of workers with Education = Some College / Associate Degree
CD04	Number of workers with Education = Bachelor's or Advanced Degree
createdate	Indicates the calendar date when data set was created

**Table 2.6 OD File Variable Definitions**

Variable	Definition
w_geocode	Workplace Census Block Code
h_geocode	Residence Census Block Code
S000	Total number of workers for that OD pair
SA01	Number of workers age 30 or less
SA02	Number of workers age 31-54
SA03	Number of workers age 55 or older
SE01	Number of workers earning \$1,200 or less per month
SE02	Number of workers earning \$1,201 to \$3,400 per month
SE03	Number of workers earning more than \$3,400 per month
SI01	Number of workers in Goods Producing: (NAICS 11, 21, 23, and 31-33)
SI02	Number of workers in Trade Transportation and Utilities: (NAICS 42, 44-45, 48-49, 22)
SI03	Number of workers in All Other Services: remaining NAICS
createdate	Indicates the calendar date when data set was created

Within each of the three groups, there are separate files for each year that job data are available (generally 2002 – 2011), for four “job type” categories (all jobs, primary jobs, all private jobs, and private primary jobs). Additionally, within the OD group, there are separate files for jobs where both the residence and workplace locations are within the same state, versus where the residence location is outside the state. RAC and WAC groups also have separate files for each age, earnings, and industry category used in the OD file structure. Additional information about file formats is available in the LEHD OnTheMap Technical Documentation.<sup>23</sup>

LEHD-QWI data files can be downloaded from the Cornell University Virtual Resource Data Center (VRDC)<sup>24</sup>. Like the LEHD-OTM data files, the LEHD-QWI data are structured as CSV records, and can be downloaded as zipped files organized hierarchically, first by reporting year and quarter, and then by state.

Within each state directory, the data are organized into separate files based on four levels of geography (statewide, county, metropolitan area, and state workforce investment board (WIB) area), three levels of industry (2-digit NAICS sector, 3-digit NAICS code, and 4-digit NAICS code), and two levels of ownership (all employers and private sector employers).

<sup>23</sup> [http://www.vrdc.cornell.edu/onthemap/doc/otm\\_public\\_master.pdf](http://www.vrdc.cornell.edu/onthemap/doc/otm_public_master.pdf)

<sup>24</sup> <http://www.vrdc.cornell.edu/qwipu/>

The number and content of the data records within each of the above files vary, depending on the specific geographic area, industry, and ownership category. For example, the county level - NAICS sector - all employer file (file name *wia\_county\_naicssec*) contains separate records for each 2-digit NAICS sector (21 groups), employment ownership (all vs. private), gender of workers (male, female and all), and age of worker (9 groups), for a total of  $(21 \times 2 \times 3 \times 9) = 1,134$  possible records for each county. Each record includes summary counts of total employment, changes in employment (new hires, separations, etc.) from the previous quarter, average monthly earnings, changes in monthly earnings from the previous quarter, for the county, both as a workplace, and as a residence location of workers. Table 2.7 lists the variables and their definitions in the QWI (file name *wia\_county\_naicssec*). Additional information about LEHD-QWI file formats and contents are available on the VRDC download site.

**Table 2.7 QWI File Variable Definitions**

Variable	Definition
CreateDate	File Creation Date
state	Group: FIPS state numeric code
Year	Time: Year
quarter	Time: Quarter
qwi_geo	Group: QWI Geocode
county	Group: FIPS County code
countyfm	Group: FIPS County name
sex	Group: Gender code
Sexfm	Group: Gender code name
qwi_ind	Group: QWI NAICS Industry Code
naicssec	Group: NAICS Sector code
naicssecfm	Group: NAICS Sector name
ownercode	Group: Ownership group code
ownerfm	Group: Ownership group name
agegrp	Group: Age group code (WIA)
agegrpfm	Group: Age group name (WIA)
HirA	Hires All: Counts
Emp	Employment: Counts
EmpEnd	Employment end-of-quarter: Counts
EmpS	Employment stable jobs: Counts
TurnOvrS	Turnover stable jobs: Ratio
HirAS	Hires All stable jobs: Counts
FrmJbGnS	Firm Gain stable jobs: Counts
FrmJbLsS	Firm Loss stable jobs: Counts
FrmJbCS	Firm stable jobs change: Net Change
SepS	Separations stable jobs: Counts
HirN	Hires New: Counts
HirNS	Hires New stable jobs: Counts
FrmJbGn	Firm Job Gains: Counts

FrmJbLs	Firm Job Loss: Counts
FrmJbC	Firm jobs change: Net Change
HirR	Hires Recalls: Counts
Sep	Separations: Counts
EmpTotal	Employment reference quarter: Counts
Payroll	Total quarterly payroll: Sum
NEmpHirA	Hires All: Average quarters of non-employment
NEmpHirN	Hires New: Average quarters of non-employment
NEmpHirR	Hire Recalls: Average quarters of non-employment
NEmpSep	Separations: Average periods of non-employment
EarnEnd	Employees end-of-quarter: Average monthly earnings
EarnS	Employees stable jobs: Average monthly earnings
EarnHirAS	Hires All stable jobs: Average monthly earnings
EarnSepS	Separations stable jobs: Average monthly earnings
EarnHirNS	Hires New stable jobs: Average monthly earnings
EarnHirAC	Hires All: Average change in monthly earnings
EarnSepC	Separations: Average change in monthly earnings
sHirA	Status: Hires All: Counts
sEmp	Status: Employment: Counts
sEmpEnd	Status: Employment end-of-quarter: Counts
sEmpS	Status: Employment stable jobs: Counts
sTurnOvrS	Status: Turnover stable jobs: Ratio
sHirAS	Status: Hires All stable jobs: Counts
sFrmJbGnS	Status: Firm Gain stable jobs: Counts
sFrmJbLsS	Status: Firm Loss stable jobs: Counts
sFrmJbCS	Status: Firm stable jobs change: Net Change
sSepS	Status: Separations stable jobs: Counts
sHirN	Status: Hires New: Counts
sHirNS	Status: Hires New stable jobs: Counts
sFrmJbGn	Status: Firm Job Gains: Counts
sFrmJbLs	Status: Firm Job Loss: Counts
sFrmJbC	Status: Firm jobs change: Net Change
sHirR	Status: Hires Recalls: Counts
sSep	Status: Separations: Counts
sEmpTotal	Status: Employment reference quarter: Counts
sPayroll	Status: Total quarterly payroll: Sum
sNEmpHirA	Status: Hires All: Average quarters of non-employment
sNEmpHirN	Status: Hires New: Average quarters of non-employment
sNEmpHirR	Status: Hire Recalls: Average quarters of non-employment
sNEmpSep	Status: Separations: Average periods of non-employment
sEarnEnd	Status: Employees end-of-quarter: Average monthly earnings
sEarnS	Status: Employees stable jobs: Average monthly earnings
sEarnHirAS	Status: Hires All stable jobs: Average monthly earnings
sEarnSepS	Status: Separations stable jobs: Average monthly earnings
sEarnHirNS	Status: Hires New stable jobs: Average monthly earnings
sEarnHirAC	Status: Hires All: Average change in monthly earnings
sEarnSepC	Status: Separations: Average change in monthly earnings

## 2.3 QCEW AND LEHD DATA DIFFERENCES AND ISSUES

This section compares the QCEW and LEHD databases as sources of employment data for transportation planning applications, including workplace location and characteristics, and home-to-work flows.

### Excluded Employment and State-to-State Variations

The primary source of employment data contained in the LEHD databases are the enhanced microdata files used by BLS to produce the QCEW. The Census Bureau compiles these enhanced QCEW microdata files from each participating LED state. As described earlier in this chapter, certain categories of employers and/or workers who are exempt from federal and state UI coverage are not included in either database. Although many of these excluded groups are small and inconsequential for most transportation planning applications (e.g., unpaid family workers, employers of foreign governments, crews on ships and fishing vessels) there are a few groups whose exclusion could significantly impact travel demand analysis results and forecasts in certain geographic areas. They include:

1. **U.S. Military Personnel** - There is no publicly available source of data on the distribution of U.S. military personnel below the national level.<sup>25</sup> The total number of uniformed military personnel stationed in the U.S. in 2008 was 0.9 million. Exclusion of military personnel can have significant impacts in those areas with large military installations (e.g., Washington, DC; Newport News-Hampton, VA; Killeen, TX; etc.). Transportation planning applications in areas with a large military presence would need to supplement the data from either of these sources with home-to-work flow data obtained from local military installations.
2. **Self-Employed, Sole Proprietors, Partnerships, and Small Corporations with no paid Employees** - These groups comprise approximately 7 percent of the total employed civilian workforce (10.1 million workers). Many of these workers are likely to work at or close to home (e.g., self-employer farmers), or have no fixed workplace location (e.g., tradesmen, outside sales). Consequently, the impacts of their home-to-work trips for transportation planning are likely to be diffuse and randomly distributed throughout a transportation planning study area.

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<sup>25</sup> Data on total U.S. military personnel, nationwide, is available from the Department of Defense. See <http://siadapp.dmdc.osd.mil/personnel/MILITARY/miltop.htm>

However, the exclusion of self-employed workers could significantly influence the computation of average trip length for the work trip. With many self-employed working at or close to home, the average trip lengths derived from data sources that exclude these workers are likely to be longer than from data sources (e.g., household surveys, CTPP) that include them.

Neither the QCEW nor the LEHD databases currently include self-employed workers in their employment databases. The Census Bureau plans to add self-employed workers in future releases of the LEHD-OTM database, although they have not released any definitive schedule for when the data will be available.

3. **State and Municipal Government Workers** - Most state and municipal workers are currently covered under state UI laws and are therefore included in the data files that ESAs submit for the QCEW. However, such coverage varies slightly from state to state. For example, many (but not all) states exclude elected officials, temporary emergency workers, and special advisors or political appointees. Exclusion of these specific workers from the QCEW can result in a small underreporting of state workers, primarily in counties or metropolitan areas where the state capital is located.
4. **Federal Civilian Employees** - The QCEW compiles employment and wage data on federal workers from the Office of Personnel Management (OPM) and combines it with employment data compiled from individual states to produce the QCEW. Employment data on federal workers are not currently included in the LEHD databases, although the Census Bureau plans to add them in future releases, beginning with the 2010 release of the LEHD-OTM data.

The exclusion of federal workers from the LEHD databases can lead to a significant underreporting of work flows in those areas with large federal civilian employment - most notably the Washington DC, metropolitan area, but also areas including state capitals, and large federal installations.

The impact of these excluded employment categories can vary from state to state. Table 2.8 lists 2008 employment totals by state for the QCEW, the LEHD-OTM, and for specific excluded categories of employment as reported from other national employment data sources. These other sources include:

- [Federal Employment Statistics](#) - Employment statistics on most federal civilian employees maintained by the Office of Personnel Management. Excluded are uniformed military personnel, most Judicial and Legislative Branch personnel, and civilian employees engaged in highly sensitive, national security activities (e.g., DEA or ATF undercover agents). The nationwide total of federal civilian employees for 2008 is 1.9 million. Federal employees were excluded from the 2008 LEHD databases, but were included in the 2008 QCEW.

**Table 2.8 2008 Employment by State and Data Source**

State	QCEW Annual Employment (2008)	Percent of Total Jobs	LEHD Annual Employment (2008)	Percent of Total Jobs	Federal Employment (2008)	Percent of Total Jobs	Non-Employer (2008)	Percent of Total Jobs	Railroad Employment (2008)	Percent of Total Jobs	Total Employment (2008)
Alabama	1,936,489	92.75%	1,885,298	90.30%	37,800	1.81%	311,388	7.04%	4,375	0.21%	2,087,859
Alaska	315,285	92.72%	293,619	86.34%	12,996	3.82%	52,219	7.25%	119	0.03%	340,055
Arizona	2,583,215	93.37%	2,526,135	91.30%	39,172	1.42%	381,653	6.51%	3,358	0.12%	2,766,737
Arkansas	1,172,208	92.59%	1,127,885	89.09%	14,044	1.11%	190,281	7.10%	3,981	0.31%	1,266,013
California	15,494,915	92.35%	14,669,924	87.43%	157,016	0.94%	2,688,453	7.56%	14,917	0.09%	16,778,949
Colorado	2,310,865	92.05%	2,215,190	88.24%	37,302	1.49%	414,663	7.80%	3,829	0.15%	2,510,441
Connecticut	1,687,902	93.26%	-	0.00%	8,080	0.45%	253,343	6.61%	2,346	0.13%	1,809,842
Delaware	423,083	94.11%	411,411	91.52%	3,322	0.74%	53,210	5.59%	1,346	0.30%	449,547
District of Columbia	685,069	97.10%	-	0.00%	152,749	21.65%	42,683	2.86%	338	0.05%	705,556
Florida	7,666,374	90.90%	7,485,684	88.76%	80,854	0.96%	1,608,887	9.01%	7,604	0.09%	8,433,473
Georgia	4,031,467	91.93%	3,914,084	89.25%	72,971	1.66%	731,494	7.87%	8,566	0.20%	4,385,344
Hawaii	619,703	93.34%	519,251	78.21%	23,003	3.46%	93,704	6.66%	13	0.00%	663,950
Idaho	653,108	92.39%	635,681	89.92%	10,201	1.44%	110,461	7.38%	1,675	0.24%	706,927
Illinois	5,841,692	93.12%	5,666,071	90.32%	47,145	0.75%	874,540	6.58%	18,773	0.30%	6,273,302
Indiana	2,872,442	93.98%	2,803,613	91.73%	22,424	0.73%	371,621	5.74%	8,430	0.28%	3,056,300
Iowa	1,490,575	93.84%	1,468,142	92.42%	8,748	0.55%	198,028	5.88%	4,444	0.28%	1,588,501
Kansas	1,366,878	93.77%	1,347,531	92.44%	15,733	1.08%	178,533	5.78%	6,511	0.45%	1,457,668
Kentucky	1,791,017	93.09%	1,762,054	91.58%	22,708	1.18%	270,572	6.64%	5,291	0.27%	1,924,035
Louisiana	1,890,007	92.61%	1,780,684	87.25%	20,329	1.00%	311,347	7.20%	3,907	0.19%	2,040,889
Maine	602,074	91.72%	574,103	87.46%	10,440	1.59%	113,522	8.16%	742	0.11%	656,405
Maryland	2,537,752	92.64%	2,402,740	87.71%	114,847	4.19%	416,970	7.19%	4,767	0.17%	2,739,355
Massachusetts	3,245,983	93.70%	-	0.00%	26,883	0.78%	455,641	6.21%	3,325	0.10%	3,464,399
Michigan	4,070,914	93.00%	3,974,184	90.79%	27,111	0.62%	640,719	6.91%	4,177	0.10%	4,377,550
Minnesota	2,679,527	93.61%	2,601,922	90.90%	17,291	0.60%	376,397	6.21%	5,176	0.18%	2,862,386
Mississippi	1,131,096	92.64%	1,113,171	91.17%	18,877	1.55%	185,926	7.19%	2,129	0.17%	1,220,994
Missouri	2,715,183	93.50%	2,658,962	91.56%	35,632	1.23%	381,644	6.20%	8,599	0.30%	2,903,942
Montana	437,591	91.27%	419,780	87.55%	11,245	2.35%	81,999	8.07%	3,156	0.66%	479,456

State	QCEW Annual Employment (2008)	Percent of Total Jobs	LEHD Annual Employment (2008)	Percent of Total Jobs	Federal Employment (2008)	Percent of Total Jobs	Non-Employer (2008)	Percent of Total Jobs	Railroad Employment (2008)	Percent of Total Jobs	Total Employment (2008)
Nebraska	922,929	92.90%	899,955	90.59%	9,711	0.98%	120,019	5.70%	13,854	1.39%	993,439
Nevada	1,252,987	93.99%	1,240,991	93.09%	10,676	0.80%	168,014	5.95%	861	0.06%	1,333,161
New Hampshire	628,763	92.67%	-	0.00%	4,396	0.65%	104,570	7.28%	404	0.06%	678,531
New Jersey	3,934,789	93.32%	3,850,210	91.31%	29,236	0.69%	580,217	6.50%	7,871	0.19%	4,216,559
New Mexico	825,736	93.31%	787,492	88.99%	25,148	2.84%	121,162	6.46%	2,026	0.23%	884,958
New York	8,608,351	92.16%	8,088,062	86.59%	64,909	0.69%	1,513,170	7.65%	17,624	0.19%	9,340,285
North Carolina	4,043,486	93.08%	-	0.00%	39,273	0.90%	629,728	6.84%	3,132	0.07%	4,343,889
North Dakota	350,440	93.64%	334,903	89.49%	6,264	1.67%	46,052	5.81%	2,045	0.55%	374,224
Ohio	5,235,972	93.86%	5,066,516	90.82%	47,637	0.85%	706,539	5.98%	9,152	0.16%	5,578,654
Oklahoma	1,550,489	92.47%	1,501,805	89.57%	34,899	2.08%	262,667	7.39%	2,278	0.14%	1,676,762
Oregon	1,713,764	93.28%	1,668,551	90.82%	21,735	1.18%	255,818	6.57%	2,711	0.15%	1,837,237
Pennsylvania	5,658,771	93.82%	5,459,172	90.52%	66,543	1.10%	761,673	5.96%	12,892	0.21%	6,031,220
Rhode Island	469,701	93.25%	458,109	90.95%	6,643	1.32%	71,021	6.66%	448	0.09%	503,675
South Carolina	1,876,081	93.25%	1,854,901	92.20%	19,876	0.99%	282,855	6.64%	2,302	0.11%	2,011,908
South Dakota	397,108	93.41%	377,674	88.84%	8,246	1.94%	57,094	6.34%	1,043	0.25%	425,103
Tennessee	2,721,990	92.55%	2,714,913	92.31%	27,216	0.93%	453,314	7.28%	5,034	0.17%	2,941,016
Texas	10,452,907	92.18%	10,155,348	89.56%	127,666	1.13%	1,835,870	7.64%	20,136	0.18%	11,339,688
Utah	1,221,052	93.22%	1,183,100	90.33%	28,801	2.20%	183,280	6.61%	2,251	0.17%	1,309,823
Vermont	302,627	91.30%	294,027	88.71%	4,242	1.28%	60,463	8.61%	281	0.08%	331,450
Virginia	3,665,654	93.83%	3,493,039	89.41%	132,005	3.38%	494,516	5.98%	7,486	0.19%	3,906,582
Washington	2,950,773	93.82%	2,802,373	89.10%	52,625	1.67%	400,718	6.01%	5,306	0.17%	3,145,243
West Virginia	709,657	93.86%	684,051	90.48%	15,214	2.01%	90,727	5.66%	3,559	0.47%	756,045
Wisconsin	2,772,889	94.73%	2,721,714	92.98%	14,300	0.49%	318,541	5.14%	3,872	0.13%	2,927,132
Wyoming	286,333	92.33%	270,041	87.08%	6,142	1.98%	43,394	6.61%	3,299	1.06%	310,117
<b>Total United States</b>	<b>134,805,663</b>	<b>92.88%</b>	<b>120,164,066</b>	<b>82.79%</b>	<b>1,889,459</b>	<b>1.30%</b>	<b>21,351,320</b>	<b>6.94%</b>	<b>261,761</b>	<b>0.18%</b>	<b>145,146,575</b>

Notes: **Blue highlights** identify states with lowest percentage of jobs in employment category  
**Red highlights** identify states with highest percentage of jobs in employment category  
**Shaded Columns** The federal and LEHD employment columns should be combined for comparisons with the QCEW

- [Nonemployer Statistics](#) - An annual database compiled by the Census Bureau on businesses with no paid employees, which are subject to federal income tax. Most nonemployers are self-employed individuals, sole proprietors, partnerships or small corporations with no paid employees. This group is excluded from both the QCEW and the LEHD databases.

The nationwide total of reported nonemployers for 2008 is 21.4 million, which is more than double the estimate of self-employed workers from the CPS, and most likely overestimates the total number of distinct individuals who are self-employed. The Census Bureau's primary source for Nonemployer Statistics are IRS individual tax returns; specifically Schedule C: Profit and Loss from Business. Many self-employed individuals file multiple Schedule C forms with each tax return, and these are counted separately in the Nonemployer Statistics.

- [Railroad Employment by State and County](#) - A database collected and maintained by the Railroad Retirement Board (RRB) on railroad employees subject to compensation under the Railroad Unemployment Insurance Act. The nationwide total of railroad employees for 2008 is 262,000. This group is excluded from both the QCEW and the LEHD databases.

The total employment (last column in Table 2.8) is calculated by adding the QCEW employment, nonemployer,<sup>26</sup> and railroad employment columns. The calculated national total employment is 145.1 million, which is approximately 0.3 million below the estimate of total employment for 2008 from the CPS. This difference can be attributed to the absence of employment data on domestic employees, unpaid family workers, and other categories of employment excluded from state UI laws.

In comparing the national employment from the LEHD-OTM with that from the QCEW, the LEHD-OTM has 14.6 million fewer workers. Most of this discrepancy (over 10 million workers) can be attributed to the absence of data from four states (CT, MA, NH, NC) and the District of Columbia (DC) in the 2008. Two of the states (MA, NH) were not yet participating LED partners, and data had not yet being processed for the other states. Another 1.9 million Federal civilian workers were also excluded from the LEHD-OTM database in

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<sup>26</sup> To compensate for the apparent overestimate of workers reported in the nonemployer statistics, each entry nonemployer column was multiplied by 0.472, which is the ratio of the total nationwide self-employed reported in the CPS (10.1 million) to the total reported in the Nonemployer Statistics (21.35 million). This factor was only used to compute the Total Employment column.

2008. As discussed earlier, the Census Bureau plans to add both federal employees and self-employed workers in future LEHD-OTM releases.

After adding the employment from the missing states, plus missing federal workers to the LEHD-OTM data, the LEHD-OTM data still averages about two percent less than the QCEW, nationally, and varies on a state-by-state basis ranging from 0.74 percent higher (in Tennessee) to 12.5 percent lower (in Hawaii). These differences are most likely due to differences in how the two data sources were compiled. The QCEW computes an average annual employment from monthly employment reports for all four quarters. The LEHD-OTM data only includes workers who were employed at a firm in both the 1<sup>st</sup> and 2<sup>nd</sup> quarters of the reference year. Consequently, a worker who either was hired during the second quarter, or left a firm during the 1<sup>st</sup> quarter is not counted as an employee of that firm in the LEHD-OTM database, but is included in some of the monthly employment reports that are used to compute average annual employment in the QCEW.

Some notable differences in the relative share of excluded employment categories across states are highlighted below:

- In the District of Columbia, federal employment comprises over 21 percent of total employment, compared to an average of just over one percent, nationwide. Federal employment is also higher than average in Maryland and Virginia, which border the District, and in Alaska and Hawaii.
- Florida has the highest percentage of self-employed workers at over 9 percent, compared to an average of just under 7 percent, nationwide. The District of Columbia has the lowest percentage of self-employed workers, at just under 3 percent. Other states with high percentages of self-employed workers include Maine, Montana and Vermont.
- Nebraska and Wyoming have the highest percentage of railroad workers, at just over 1 percent, compared to an average of under 0.2 percent, nationwide.

## **Disclosure and Suppression of Confidential Information**

Both the QCEW and the LEHD are subject to federal restrictions on disclosure of confidential information about individuals workers or firms. However, protection of confidential data is handled differently in the two programs. The QCEW relies primarily on data suppression, and does not release data for any combination of geographic area and employer characteristics (e.g., industry type, firm size) in which an individual employer could be identified. In general, this means that a minimum of three employers with similar identifying

characteristics must be present in the same geographic area (e.g., county) before data can be released.

Data suppression can significantly undermine the usefulness of QCEW data at sub-state levels of geography. The QCEW is not available as a public database for sub-county levels of geography. Even at the county level, attribute data on a major employer might be suppressed unless two other employers in the same industry sector and of similar firm size were located in the same county.

The LEHD by contrast, uses a combination of disclosure proofing techniques including data synthesis to hide the identities of individual employers and workers. Data synthesis introduces minor distortions to the actual reported characteristics of workers at detailed levels of geography (e.g., Census Block), but the distortions are constructed so as to converge to the observed distribution of worker characteristics at higher levels of geography, such as counties or even Census Tracts. Although some data suppression may still be required, the LEHD provides employment data at levels of geography that are more compatible with transportation planning applications.

## **Employment Variables and Stratifications**

The QCEW and LEHD databases contain information on the total number of jobs within a specific geographic area, and further stratify job counts based on characteristics of the employer and/or worker. However, the stratifications vary significantly among the databases. Table 2.9 summarizes the key differences between the QCEW, LEHD-OTM and LEHD-QWI databases with respect to the characteristics and categories used to stratify employment data. These differences are discussed below:

1. **Geography** - Publicly accessible versions of the QCEW and LEHD-QWI databases use counties and MSAs as the basic geographic units, with separate files produced for counties, MSAs, and states. LEHD-OTM databases, including the RAC, WAC and OD files, use Census Blocks as the basic geographic unit. Census Block geography can be aggregated to Census Tracts, transportation analysis zones, counties, MSAs, and states.
2. **Update Frequency and Timeliness** - The QCEW and LEHD-QWI databases are published four times per year, with employment data summarized by quarter. Public data files for both the QCEW and LEHD-QWI are typically available within six months after the reference quarter. Additionally, BLS publishes an annual release of the QCEW, containing summaries for each quarter and for the full year.

**Table 2.9 Comparison of Employment Variables and Stratification Levels Used in the QCEW and LEHD Databases**

	QCEW	LEHD-OTM	LEHD-QWI
<b><u>Stratification Levels</u></b>			
<b>Geography</b>	County, MSA, State	Census Block	County, MSA, State
<b>Time Period</b>	Quarter, Annual	Annual	Quarter
<b>Industry Type</b>	6-, 4- and 3-digit NAICS, 2-digit NAICS sector, 1-digit NAICS super sector	2-digit NAICS sector	4- and 3-digit NAICS, 2-digit NAICS sector
<b>Ownership Categories</b>	Federal, State, Local, Private, All Public, All non-Federal	All, Private	All, Private
<b>Employer Size</b>	9 Categories	<b>N/A</b>	<b>N/A</b>
<b>Type of Job</b>	<b>N/A</b>	All, Primary	<b>N/A</b>
<b>Age of Worker</b>	<b>N/A</b>	3 Categories	8 Categories
<b>Gender</b>	<b>N/A</b>	<b>N/A</b>	Male, Female
<b>Education</b>	<b>N/A</b>	4 Categories	4 Categories
<b>Ethnicity</b>	<b>N/A</b>	2 Categories	2 Categories
<b>Race</b>	<b>N/A</b>	6 Categories	6 Categories
<b><u>Employment Variables</u></b>			
<b>Number of Jobs</b>	Total by Record	Total by Record	Total by Record
<b>Number of Establishments</b>	Total by Record	<b>N/A</b>	<b>N/A</b>
<b>Average Wages</b>	Average by Record	3 Categories	Average by Record

LEHD-OTM data is updated on an annual basis, with employment data summarized by year. New releases of the LEHD-OTM data are published approximately 12 months after the reference year.

3. **Industry Type** - In the QCEW, separate records are produced for each 6-digit NAICS category identified within a county or MSA, as well as for aggregations of NAICS codes into 4- and 3-digit NAICS, 2-digit NAICS sectors, and 1-digit super sectors. However, if an individual employer can be identified within a county or MSA based on its NAICS code, then employment data for that NAICS code at that level of geography is suppressed.

In the LEHD-QWI, separate data files are produced for counties and MSAs by 4- and 3-digit NAICS, and 2-digit NAICS sectors (subject to disclosure restrictions). In the LEHD-OTM RAC and WAC databases, each record contains a separate variable for the number of workers or jobs located within a Census Block in each of the 20 NAICS sectors. In the LEHD-OTM OD database, NAICS sectors are aggregated into 3 generic industry groups (Goods Producing; Trade, Transportation & Utilities; and All Other Services).

4. **Ownership Categories** - The QCEW provides the most detailed stratification by ownership category, producing separate records for federal, state, and local government employers, total government, private sector employers, and all non-federal (i.e., state, local and private sector). The LEHD databases only differentiate between private sector jobs and "all" jobs (i.e., private plus state and local governments employment). In both the LEHD-QWI and LEHD-OTM databases, separate files are produced for "all" jobs and for private sector jobs.
5. **Employer Size** - Only the QCEW stratifies employers by size (i.e., number of employees). Separate records are produced for up to nine different employer size groups, ranging from under 5 employees to over 1,000. None of the LEHD databases include any data on employer size.
6. **Type of Job** - Only the LEHD-OTM databases distinguish between primary and secondary jobs for workers that have multiple jobs. A primary job is defined as the one with the highest average earnings; all other jobs associated with the same worker are defined as secondary jobs. Two Type of Job categories (All Jobs, Primary Jobs) are combined with two Ownership categories (All Jobs, Private Jobs) to create four separate files (i.e., All Jobs, Primary Jobs, All Private Jobs, Primary Private Jobs). Neither the LEHD-QWI nor the QCEW contains any data on primary vs. secondary jobs.
7. **Age of Worker** - Because the QCEW is based only on employer records, it contains no data on individual worker characteristics. The LEHD databases are developed using both worker and employer records, and therefore

provide additional information on worker characteristics at both the worker's residence and work place. The LEHD-QWI database includes age as a classification variable in each record, and separate records are produced for up to 8 age groups, ranging from 14-18 to 65-99. In the LEHD-OTM database, three age categories: "29 or younger," "30 - 54," and "55 and older" are specified.

8. **Gender** - Only the LEHD-QWI stratifies jobs by gender. Gender is included as a classification variable in each record, and separate records are produced for jobs by male, female, and all workers.
9. **Education** - Beginning with 2009 databases, worker education is included as a classification variable in the LEHD databases. Four categories of education level are specified: "Less than High School," "High School Graduate," "Some College or Associate Degree," and "Bachelor's or Graduate Degree."
10. **Ethnicity** - Beginning with 2009 databases, ethnicity is included as a classification variable in the LEHD databases. Two categories of ethnicity are specified: "Hispanic or Latino," and "Not Hispanic or Latino."
11. **Race** - Beginning with 2009 databases, race is included as a classification variable in the LEHD databases. Six categories of race are specified: "White Alone," "Black or African American Alone," "Asian Alone," "American Indian or Alaskan Native Alone," "Native Hawaiian or Other Pacific Islander Alone," and "Two or More Race Groups."
12. **Employment** - Employment (i.e., number of jobs) is the primary measure in all three databases. In the QCEW annual file, employment is included in each data record both as a count for each month, and as a computed annual average, based on the monthly counts. The QCEW uses the official OMB definition of employment, which is the number of employees who worked or received pay for the pay period including the 12<sup>th</sup> of the month.

In the LEHD-QWI, each record contains several employment attributes, including number of jobs at start of each quarter (equivalent to the QCEW measure for the first month of each quarter), plus additional variables on employment changes from the beginning to the end of each quarter (e.g., new hires, separations, etc.)

In the LEHD-OTM, each area characteristic record contains a count of the total number of jobs (or workers) located within a defined Census Block, as well as stratifications of this count by various demographic and industry categories. Jobs counts in the LEHD-OTM only include workers who were employed at the same firm during both the 1<sup>st</sup> and 2<sup>nd</sup> quarters of the reference year.

13. **Number of Establishments** - Only the QCEW contains data on the total number of employment establishments. Number of establishments is included in each data record both as a total count for each quarter, and as a computed annual average number of establishments.
14. **Average Wages** - In the QCEW, wages are included in each data record as an average weekly wage for each quarter, and as an average weekly wage and average annual pay for the entire year. In the LEHD-QWI database, wages are included in each data record as an average monthly earnings over the quarter. In the LEHD-OTM databases, wages are included as a classification variable, with three wage categories of "\$1,250/month or less," "\$1,251 - \$3,333/month," and "over \$3,333/month."

### **LEHD-OTM Residence Location Limitations**

Only the LEHD-OTM database includes information on the residence location of workers. Residence location is used to group workers by residence area in order to create the RAC database, and to estimate the distribution of home-to-work trips in constructing the OD database. However, the source of worker residence location data in LEHD raises certain issues that may impact locational accuracy.

The residence address of workers in the LEHD comes from the Census Bureau's Statistical Administrative Records System (StARS). StARS combines several federal administrative files, including IRS, Medicare, and HUD Rental Assistance databases, which include both the worker's SSN and their current residential address at the time the paperwork was completed.

The following examples indicate situations where the addresses in StARS may not correspond to the current residence of a worker identified in a state's UI wage record:

- College/university students living and working at school may report a parent's address when filing their annual income tax (IRS-1040) return;
- Summer (or other temporary) workers are also likely to report their permanent address rather than their temporary residence location;
- Moving residences within a year. Most residence information is taken from IRS 1040 return (residence as of April 15), while employer location is taken from 2<sup>nd</sup> Quarter (April - June) quarterly wage records. Workers who change their job and residence location within this time window may produce a mismatch in which their former residence is matched to their new workplace.

With the exception of college students reporting their parents' address, most of the other examples represent temporary situations that should not have a major impact on transportation planning analyses. The most likely impact might be the generation of data "outliers" (e.g., home-to-work trips between geographic areas that are several hundred miles apart.) However, transportation studies conducted in areas with large non-resident college populations (e.g., Boston, Raleigh-Durham) may need to carry out additional data cleaning, or conduct supplemental surveys to address potential biases in the employment data.

### **Workplace Locations for Employers with Multiple Worksites**

Employers having multiple worksites within the same state represent less than three percent of all employers, nationwide, but account for 30 to 60 percent of all covered employment with a state. Both the QCEW and the LEHD rely on the Multiple Worksite Report (MWR) (see figure 2.2) to identify the secondary worksite locations of multi-worksite employers.

Based on the analysis conducted by BLS for this study, approximately 58 percent of multi-worksite employers provide wage and employment data at the worksite level, but these employers account for over 92 percent of all multi-site employment. When combined with worksite location provided by single worksite employers, nearly 97 percent of all covered employment, nationwide, are assigned to the correct worksite location.

An additional 36 percent of multi-worksite employers are not required to file MWRs because the total number of their employees working at secondary worksites is less than 10. For these employers, at least 90 percent of their employees are correctly assigned to the primary worksite. This leaves approximately 6 percent of all multi-worksite employers, accounting for less than 2 percent of all covered employment, who refuse to file MWRs .

However, the distribution of those multi-worksite employers who refuse to file MWRs varies significantly from state to state and by employer ownership type. On average, noncompliance rates are approximately twice as high in states with voluntary reporting compared to states with mandatory reporting requirements. Additionally, noncompliance rates are significantly higher, on average, among local government agencies than among any other employer ownership category.

The impacts created by the refusal of multi-worksite employers to identify the locations and employment at secondary worksites are most apparent at smaller units of geography. For multi-worksite employers who do not file MWRs, the QCEW assigns all employees to the primary worksite. This results in an over

reporting of employment in those areas (i.e., Census Block, Tract, or county) where the primary worksite is located, and a corresponding under reporting in those areas where secondary worksites are located. Depending on the number of employees working in secondary worksites, these discrepancies can be substantial for specific locations.

Transportation planners and analysts who use QCEW and LEHD data should be aware of the potential discrepancies in employment for sub-state geographic areas caused by the refusal of some employers to file MWRs, and take actions to correct the most serious discrepancies, where necessary.

## 3.0 Comparison of LEHD-OTM and CTPP Databases

Transportation planners require data on employment locations and home-to-work flows for a variety of transportation planning analyses, including the development of travel demand models. The Census Transportation Planning Products (CTPP) and the LEHD-OTM are the only two publicly available, nationwide sources of data on home-to-work flows at county and sub-county levels of geography. However, several important questions need to be answered regarding these data sources in order to evaluate their usefulness for transportation planning applications:

1. Are the CTPP and LEHD-OTM comparable in terms of coverage and completeness of employment locations and home-to-work flows?
2. If they are not comparable, what are reasons for these differences?
3. Which data source is more complete and/or accurate?

In this Chapter we attempt to answer these questions by comparing the LEHD-OTM OD database with the home-to-work flows that are available from the 2000 CTPP (based on the 2000 Census long form questionnaire) and the recently released 2006-2008 CTPP (based on the 3-year summary from the American Community Survey (ACS)). The comparisons include both county-to-county flows using all three databases, and Census Tract-to-Tract flows for two metropolitan areas using the LEHD-OTM and CTPP 2000 databases.

### 3.1 METHODOLOGICAL DIFFERENCES BETWEEN THE CTPP AND LEHD-OTM

The LEHD-OTM and CTPP data are produced using very different data collection methods, making direct comparisons difficult. The CTPP is based on a series of questions related to the journey to work posed to a sample of U.S. households. These questions were originally asked in conjunction with the decennial Census (i.e., the Census long form questionnaire). Following the 2000 Census, however, the long form questionnaire was dropped from the decennial

Census, and the questions were incorporated into the new annual American Community Survey (ACS).

Because households are selected at random to participate in the ACS, there is a finite probability that a worker in any type of employment category will respond to the journey to work questions. However, the journey to work questions are limited to one workplace location (i.e., the location where the respondent worked most often in the previous week). Consequently, the CTPP does not capture information on multiple work locations from workers with more than one job or workplace location.

The LEHD-OTM database, as discussed in the previous chapter, draws most its employment data from the enhanced QCEW microdata files obtained from each participating LED state. Unlike the CTPP, the LEHD-OTM does not include specific information on the actual trip to work (e.g., mode of travel, departure time, route, travel time, or trip frequency). Instead, it produces a relatively comprehensive matrix of origin-to-destination flows between worker residence and workplace, at a level of geographic resolution (i.e., Census Block) that is more detailed than the traffic analysis zones used in most contemporary travel forecasting models.

The LEHD-OTM currently contains data on employers and workers who are covered by state UI laws. The most significant groups of workers not included in the LEHD-OTM are self-employed individuals, sole proprietors, and workers covered by other unemployment compensation programs (i.e., federal employees, uniformed military personnel, and railroad employees). However, because the LEHD-OTM data is compiled from employer-based administrative records, it does include all covered jobs held by workers with more than one job.

Both the CTPP and LEHD-OTM are subject to restrictions on disclosure of confidential information on individual workers and employers. The CTPP limits disclosure by suppressing data that could potentially allow individual households to be identified. One consequence is that geographic areas with low population densities are more likely to be excluded from the publicly released CTPP data files. For example, the 2006-2008 3-year CTPP does not include data from any county with a population of less than 20,000. The 5-year CTPP (containing survey responses from 2006 to 2010) is expected to include data for all counties and Census Tracts with sufficient population, but will not include data at the Census Block or Block Group levels of geography.

By contrast, the LEHD-OTM limits disclosure of individual workers or employers by creating synthetic populations of workers residing within a small geographic area (i.e., a Census Block) based on combinations worker and

workplace variables. The synthetic populations are constructed so as to prevent disclosure of the identity of individual workers, but will retain the appropriate distributions of worker and workplace characteristics at more aggregate levels of geography, such as Census Tracts or counties.

Table 3.1 summarizes the key differences between each of the two data sources.

**Table 3.1 Key Differences in Employment Data Available from the CTPP and the LEHD-OTM Databases**

	<b>CTPP 2000</b>	<b>CTPP 2006-2008</b>	<b>LEHD-OTM</b>
<b>Data Source</b>	2000 Decennial Census Journey to Work (JTW) questions	3-year compilation of JTW questions from American Community Survey (ACS)	Administrative records of workers and employers covered by State UI
<b>Sample Size</b>	~17% of all U.S. households	~7.5% of all U.S. households	Full enumeration of covered employment categories
<b>Geographic Coverage</b>	Includes all counties	Excludes counties with less than 20,000 population	Excludes data from newer LED states: (CT, DC, MA, NH)
<b>Geographic Resolution</b>	Block Groups	Counties (over 20,000 population)	Census Blocks
<b>Employer-Industry Categories</b>	All employers and industry categories in sample universe	All employers and industry categories in sample universe	Excludes employment not covered by state UI
<b>Job Categories</b>	Excludes second jobs held by workers with multiple jobs	Excludes second jobs held by workers with multiple jobs	Includes all jobs held by workers in covered employment categories

### 3.2 DIFFERENCES IN TOTAL EMPLOYMENT BY STATE

Table 3.2 presents the total employment, by state, as derived from the CTPP 2000, the CTPP 2006-2008, and the LEHD-OTM, and compares each of these against the best estimate of total employment by state for 2008, as derived in the previous Chapter. The employment totals in the CTPP 2000 were adjusted by the percent change in statewide employment from 2000 to 2008.

The adjusted CTPP 2000 and the CTPP 2006-2008 databases are nearly identical to one another with respect to total employment nationwide, but are more than eight percent below the best estimate of total nationwide employment, derived

**Table 3.2 Employment by State for CTPP 2000, CTPP 2006-2008, and LEHD-OTM**

State	Total Employment (2008)	CTPP 2000 Adjusted to (2006-2008)				CTPP 2006-2008		LEHD-OTM (2006-2008)	
		Total Employment (2000)	Employment Change (2000-2008)	Adjusted Employment (2006-2008)	Percent Difference <sup>1</sup>	Average Employment (2006-2008)	Percent Difference <sup>1</sup>	Average Employment (2006-2008)	Percent Difference <sup>1</sup>
Alabama	2,087,859	1,863,728	3.34%	1,925,918	-7.76%	1,839,853	-11.88%	1,870,482	-10.41%
Alaska	340,055	293,174	13.02%	331,342	-2.56%	257,874	<b>-24.17%</b>	290,436	-14.59%
Arizona	2,766,737	2,195,568	17.52%	2,580,244	-6.74%	2,763,969	-0.10%	2,534,193	-8.40%
Arkansas	1,266,013	1,169,249	3.61%	1,211,480	-4.31%	1,011,482	<b>-20.10%</b>	1,135,864	-10.28%
California	16,778,949	14,509,109	4.30%	15,133,233	-9.81%	16,380,688	-2.37%	14,545,425	-13.31%
Colorado	2,510,441	2,209,164	4.43%	2,307,060	-8.10%	2,217,519	-11.67%	2,184,385	-12.99%
Connecticut	1,809,842	1,642,089	0.37%	1,648,200	-8.93%	1,700,261	-6.05%		-100.00%
Delaware	449,547	390,577	3.52%	404,329	-10.06%	414,693	-7.75%	410,746	-8.63%
District of Columbia	705,556	671,678	6.59%	715,949	1.47%	725,308	2.80%		-100.00%
Florida	8,433,473	6,880,355	11.31%	7,658,370	-9.19%	8,024,318	-4.85%	7,664,907	-9.11%
Georgia	4,385,344	3,847,719	3.34%	3,976,420	-9.32%	3,992,631	-8.96%	3,884,376	-11.42%
Hawaii	663,950	562,982	12.50%	633,369	-4.61%	635,654	-4.26%	515,339	<b>-22.38%</b>
Idaho	706,927	579,547	15.98%	672,144	-4.92%	564,298	<b>-20.18%</b>	630,929	-10.75%
Illinois	6,273,302	5,744,343	-1.60%	5,652,331	-9.90%	5,744,861	-8.42%	5,626,192	-10.32%
Indiana	3,056,300	2,869,742	-1.51%	2,826,411	-7.52%	2,742,545	-10.27%	2,826,473	-7.52%
Iowa	1,588,501	1,474,350	2.89%	1,517,005	-4.50%	1,097,187	<b>-30.93%</b>	1,449,266	-8.77%
Kansas	1,457,668	1,317,070	2.80%	1,353,936	-7.12%	1,124,611	<b>-22.85%</b>	1,321,097	-9.37%
Kentucky	1,924,035	1,786,841	1.83%	1,819,461	-5.44%	1,508,780	<b>-21.58%</b>	1,749,109	-9.09%
Louisiana	2,040,889	1,835,157	-0.78%	1,820,756	-10.79%	1,769,982	-13.27%	1,754,085	-14.05%
Maine	656,405	599,822	1.81%	610,696	-6.96%	618,304	-5.80%	571,123	-12.99%
Maryland	2,739,355	2,323,903	5.70%	2,456,281	-10.33%	2,544,505	-7.11%	2,390,720	-12.73%
Massachusetts	3,464,399	3,178,756	-1.27%	3,138,358	-9.41%	3,269,929	-5.61%		-100.00%
Michigan	4,377,550	4,512,082	-9.27%	4,093,888	-6.48%	4,270,032	-2.46%	4,050,231	-7.48%
Minnesota	2,862,386	2,559,957	2.84%	2,632,697	-8.02%	2,468,044	-13.78%	2,588,114	-9.58%
Mississippi	1,220,994	1,131,871	-0.62%	1,124,830	-7.88%	964,739	<b>-20.99%</b>	1,096,045	-10.23%
Missouri	2,903,942	2,684,576	1.37%	2,721,377	-6.29%	2,495,432	-14.07%	2,623,124	-9.67%
Montana	479,456	420,179	14.40%	480,701	0.26%	321,042	<b>-33.04%</b>	414,744	-13.50%

State	Total Employment (2008)	CTPP 2000 Adjusted to (2006-2008)				CTPP 2006-2008		LEHD-OTM (2006-2008)	
		Total Employment (2000)	Employment Change (2000-2008)	Adjusted Employment (2006-2008)	Percent Difference <sup>1</sup>	Average Employment (2006-2008)	Percent Difference <sup>1</sup>	Average Employment (2006-2008)	Percent Difference <sup>1</sup>
Nebraska	993,439	892,770	3.59%	924,859	-6.90%	689,526	<b>-30.59%</b>	886,120	-10.80%
Nevada	1,333,161	941,590	24.79%	1,175,023	-11.86%	1,206,160	-9.53%	1,246,796	-6.48%
New Hampshire	678,531	592,551	3.77%	614,895	-9.38%	638,970	-5.83%		-100.00%
New Jersey	4,216,559	3,659,740	1.92%	3,729,846	-11.54%	3,918,314	-7.07%	3,840,763	-8.91%
New Mexico	884,958	748,593	14.13%	854,368	-3.46%	792,645	-10.43%	770,541	-12.93%
New York	9,340,285	8,464,492	0.65%	8,519,519	-8.79%	9,215,573	-1.34%	8,054,864	-13.76%
North Carolina	4,343,889	3,857,301	4.35%	4,025,032	-7.34%	4,068,626	-6.34%	3,860,990	-11.12%
North Dakota	374,224	336,421	10.83%	372,871	-0.36%	231,789	<b>-38.06%</b>	326,919	-12.64%
Ohio	5,578,654	5,333,620	-4.19%	5,110,384	-8.39%	5,290,033	-5.17%	5,092,363	-8.72%
Oklahoma	1,676,762	1,509,089	5.86%	1,597,588	-4.72%	1,444,933	-13.83%	1,468,288	-12.43%
Oregon	1,837,237	1,642,777	6.72%	1,753,240	-4.57%	1,768,069	-3.76%	1,651,402	-10.11%
Pennsylvania	6,031,220	5,503,833	1.56%	5,589,785	-7.32%	5,617,041	-6.87%	5,434,863	-9.89%
Rhode Island	503,675	458,534	2.09%	468,120	-7.06%	480,688	-4.56%	458,433	-8.98%
South Carolina	2,011,908	1,790,569	2.97%	1,843,799	-8.36%	1,883,766	-6.37%	1,839,081	-8.59%
South Dakota	425,103	378,512	7.35%	406,336	-4.41%	243,862	<b>-42.63%</b>	369,128	-13.17%
Tennessee	2,941,016	2,656,656	2.40%	2,720,294	-7.50%	2,620,645	-10.89%	2,693,388	-8.42%
Texas	11,339,688	9,156,731	9.93%	10,066,310	-11.23%	10,249,561	-9.61%	9,865,817	-13.00%
Utah	1,309,823	1,033,771	15.31%	1,192,075	-8.99%	1,186,255	-9.43%	1,158,281	-11.57%
Vermont	331,450	306,487	2.53%	314,252	-5.19%	313,373	-5.45%	292,897	-11.63%
Virginia	3,906,582	3,388,783	6.76%	3,617,707	-7.39%	3,341,945	-14.45%	3,480,338	-10.91%
Washington	3,145,243	2,739,792	7.58%	2,947,529	-6.29%	3,002,743	-4.53%	2,751,854	-12.51%
West Virginia	756,045	693,409	3.07%	714,675	-5.47%	607,764	-19.61%	682,626	-9.71%
Wisconsin	2,927,132	2,637,146	1.50%	2,676,776	-8.55%	2,622,341	-10.41%	2,714,834	-7.25%
Wyoming	310,117	239,544	20.14%	287,777	-7.20%	207,570	<b>-33.07%</b>	262,986	-15.20%
<b>Total United States</b>	<b>145,146,575</b>	<b>128,216,299</b>	<b>3.69%</b>	<b>132,943,918</b>	<b>-8.41%</b>	<b>133,110,733</b>	<b>-8.29%</b>	<b>123,330,981</b>	<b>-15.03%</b>

Notes: **Red highlights** identify states with differences in total employment greater than 20 percent.

<sup>1</sup> Percent difference is computed by subtracting the Total Employment (2008) from employment reported for each database, and dividing this difference by Total Employment.

by combining the QCEW, Nonemployer and Railroad Employee databases. This difference can be attributed, at least partly, to second jobs held by workers with more than one job, which are not specifically surveyed in the journey to work questions.

When compared on a state-by-state basis, however, the adjusted CTPP 2000 data differs from the best estimate of total employment by no more than 12 percent in any state, while the CTPP 2006-2008 data is more than 20 percent lower in 12 states with large numbers of rural, low-population counties. As shown in Figure 3.1, these 12 states contain 573 of the 1,341 counties with populations less than 20,000 whose data were suppressed in the CTPP 2006-2008. The number of counties with suppressed data should decrease with the 5-year ACS sample.

The LEHD-OTM data is approximately 15 percent below the best estimate of total nationwide employment, but is missing data from three states (CT, MA, NH) and the District of Columbia. If these states are excluded from the best estimate of total nationwide employment, the difference is reduced to approximately 11 percent. Most of this difference can be attributed to the absence of employment data for federal employees, railroad workers and the self-employed in the LEHD-OTM database for 2006-2008.

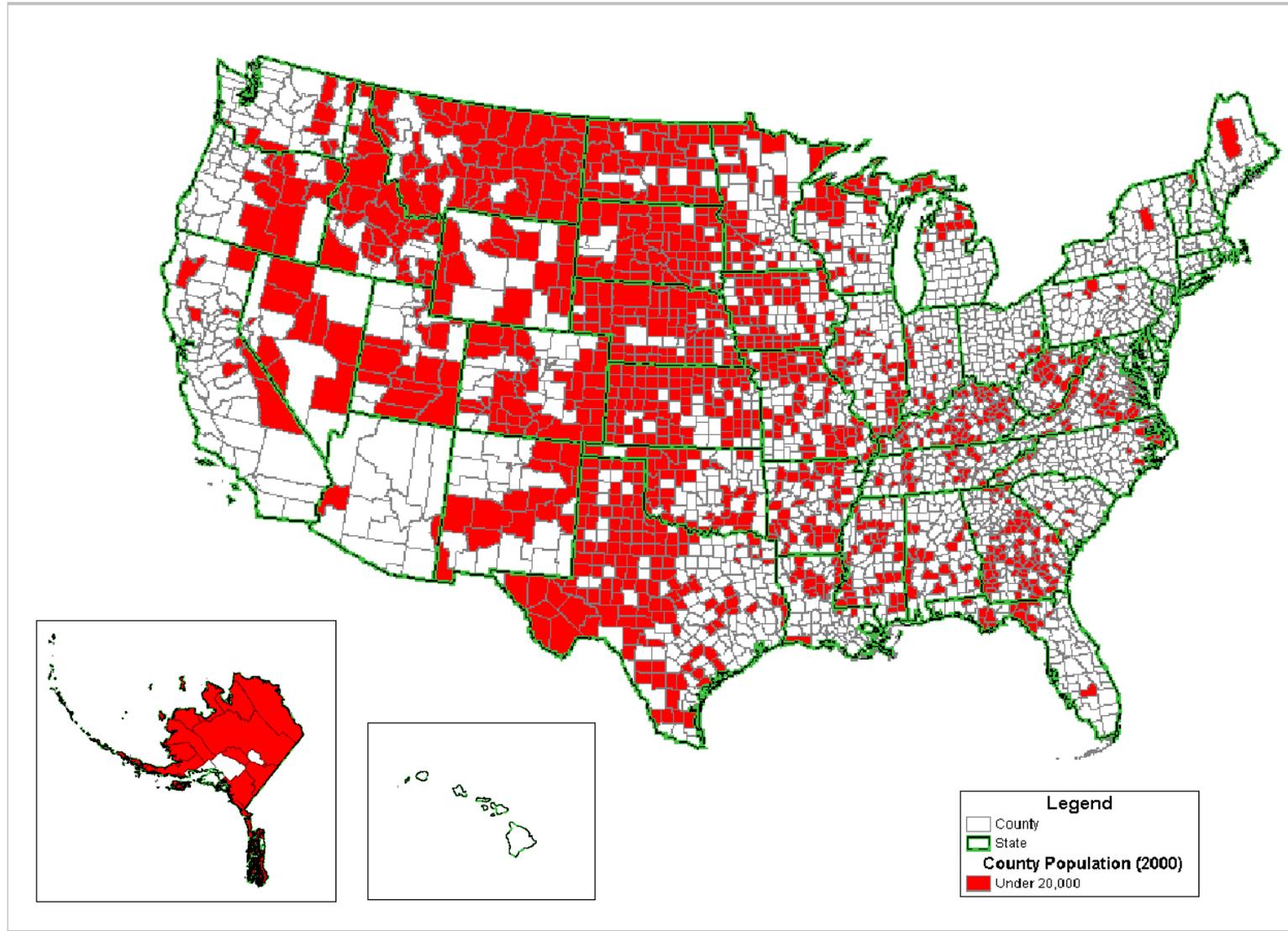
On a statewide basis, the LEHD-OTM differs from the best estimate of total employment by more than 15 percent in only two states - (Hawaii (22.4%) and Wyoming (15.2%)), while 19 states it differed by less than 10 percent. In three states, (Indiana, Nevada, and Wisconsin), the LEHD-OTM is closer to the best estimate of total statewide employment than either the adjusted CTPP 2000 or the CTPP 2006-2008.

### **3.3 COUNTY-LEVEL COMPARISONS OF HOME-TO-WORK FLOWS**

County-to-county home-to-work flows from the LEHD-OTM for the years 2006-2008 were compared with similar flow data from the 2000 CTPP and the 2006-2008 CTPP. The following adjustments were made to make the databases more comparable:

1. In the LEHD-OTM data, only Primary jobs were used, thereby eliminating worker flows to secondary jobs.
2. In the LEHD-OTM data, flows between the same origin-destination (OD) pairs in different years were averaged to obtain a single (OD) flow value.

Figure 3.1 Counties with Less than 20,000 Population



3. Flows to or from counties located in Connecticut, Massachusetts, New Hampshire, the District of Columbia, and all outlying U.S. territories were removed from all three databases.
4. Flows with either an origin or destination outside the United States were removed from all three databases.
5. Flows to or from counties with less than 20,000 population were removed from any comparisons involving the 2006-2008 CTPP.

After excluding counties located in U.S. territories and in those states for which no LEHD-OTM data was published, a total of 1,805 valid counties remained, resulting in a possible  $(1,805 \times 1,805) = 9,659,664$  OD pairs. The actual number of county pairs containing at least one home-to-work flow in any of the three databases was 808,064, or about 8.4 percent of all possible county OD pairs. Table 3.3 summarizes the number of valid and missing observations in each of the databases.

**Table 3.3 Number of Valid and Missing County OD Pairs by Data Source**

	Number of County OD Pairs		
	Valid	Missing	Total
<b>CTPP 2000</b>	159,865	648,199	808,064
<b>CTPP 2006-2008</b>	40,758	767,306	808,064
<b>LEHD 2006-2008</b>	775,751	32,313	808,064

Of the total number of 808,064 county pairs with observed flows, 775,751, or 96 percent of all county pairs, were included in the LEHD-OTM database. By contrast, 159,865, or about 20 percent of all pairs were included in the CTPP 2000 database, while only 40,758, or about 5 percent of all pairs were included in the CTPP 2006-2008 database.

Using the number of valid OD pairs in the LEHD-OTM as the universe for comparison, the OD pairs from each of the three data sources were further stratified into three categories: internal flows (i.e., the home and work counties are the same), within state flows (i.e., the home and work counties differ but the states are the same), and out-of-state flows (the home and work states are different). Table 3.4 shows the number of county pairs in each of the above

**Table 3.4 Employment Data Sources: Summary Statistics**

	County-to-County Home-to-Work Flows			
	Number of OD Pairs	Total Home-to-Work Flows	Mean	Standard Deviation
<b>LEHD-OTM (2006-2008)</b>	775,751	114,914,851	148.13	5,927.52
<b>Internal</b>	3,106	66,743,574	21,488.59	88,734.14
<b>Within State</b>	29,518	43,880,817	191.19	3,434.32
<b>Out-of-State</b>	543,127	4,290,459	7.90	218.78
<b>CTPP 2000</b>	127,552	121,631,187	953.58	17,815.69
<b>Internal</b>	3,105	90,133,208	29,028.41	109,087.58
<b>Within State</b>	74,432	28,211,183	379.02	3,652.34
<b>Out-of-State</b>	50,015	3,286,796	65.72	785.00
<b>CTPP 2006-2008</b>	39,753	126,518,022	3,182.60	35,573.36
<b>Internal</b>	1,790	94,267,650	52,663.49	157,675.09
<b>Within State</b>	25,335	29,085,841	1,148.05	6,799.91
<b>Out-of-State</b>	12,628	3,164,531	250.60	1,701.66

**Note:** Number of OD Pairs represents the actual number of county pairs for which at least one home-to-work trip (or flow in the LEHD-OTM) was reported in the database. Total home-to-work flows represents the total number of trips (or flows) between OD pairs, where multiple trips can be associated with a specific OD pair. The mean and standard deviations apply to the flows.

categories within each of the three databases, together with the mean and standard deviation for total origin-to-destination flows in each category.

Of the 775,751 OD county pairs in the LEHD-OTM database, there are 127,552 matching pairs in the CTPP 2000 data, and only 39,753 matching pairs in the CTPP 2006-2008 data. The majority of OD pairs that are unique to LEHD-OTM consist of out-of-state pairs with relatively low flow volumes between them.

Not surprisingly, because both the CTPP 2000 and the CTPP 2006-2008 databases represent samples of the universe of home-to-work flows, they are less likely to include OD pairs with low flow volumes between them.

The largest average flow volumes in all three data sources are associated with internal flows (i.e., trips where both the home and workplace are in the same county). The average volume for internal flows in the CTPP 2006-2008 is over 80 percent higher than that in the CTPP 2000 and nearly 250 percent higher than that in the LEHD-OTM.

More generally, the CTPP 2006-2008 data includes more total home-to-work flows than either the LEHD-OTM or the CTPP 2000, but distributes them among a significantly smaller number of county-to-county pairs (i.e., only 5 percent of the OD pairs found in the LEHD-OTM, and only 30 percent of the OD pairs found in the CTPP 2000).

This suggests that the CTPP 2006-2008 data is much “lumpier” than the other two data sources, assigning higher flows to OD pairs where a sample trip was surveyed to compensate for those OD pairs with lower home-to-work flow volumes where no trip was sampled.

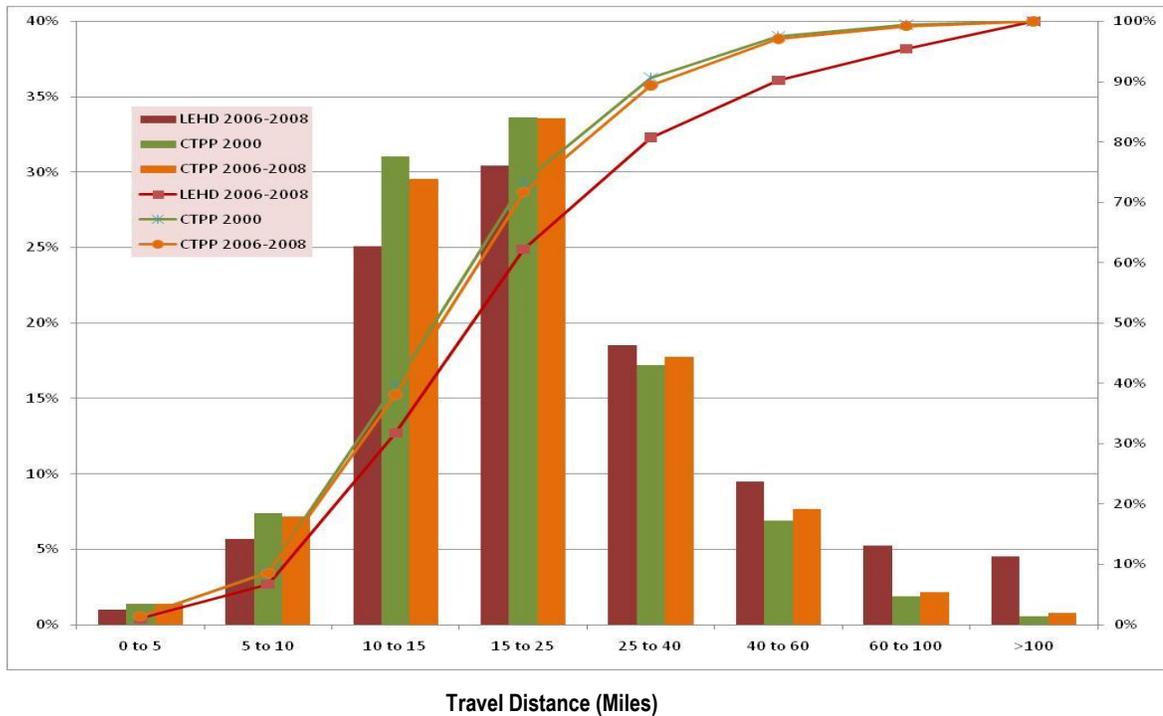
The lumpier distribution in the CTPP 2006-2008 database is also influenced by the methodology used to tabulate trips. All OD pairs with sampled volumes between one and seven trips are reported in the CTPP 2006-2008 database as four trips. Consequently, the minimum home-to-work flow associated with any non-zero OD pair in the CTPP 2008-2006 is four, compared to one in both the CTPP 2000 and the LEHD-OTM.

## **Home-to-Work Flows by Travel Distance**

The county-to-county flows from the three datasets were grouped based on travel distance between the county pairs. The travel distances used for this analysis were obtained from the county-to-county distance matrix developed by Oak Ridge National Laboratory (ORNL) and are available from their web site at <http://cta.ornl.gov/transnet/SkimTree.htm>. These distances are based on highway network distances obtained from the ORNL version of the FHWA’s National Highway Planning Network (NHPN). Figure 3.2 shows the distribution of home-to-work flows by travel distance for each of the three databases.

While the distributions are generally similar in shape, a larger percentage of flows in the LEHD-OTM are longer distance (i.e., 25+ miles) than in the two CTPP databases. Some of this difference can be attributed to the large number of longer distance, low frequency out-of-state OD pairs identified in the LEHD-OTM 2006-2008 that were not sampled in either the CTPP 2000 or the CTPP 2006-2008.

**Figure 3.2 Home-to-Work Flows by Travel Distance**



Other contributing factors may include:

1. The absence of self-employed workers in the LEHD-OTM, who are more likely to work at home or at workplaces closer to home than other employment categories.
2. Employers with multiple worksites who file incomplete or no MWR. Consequently, workers may be assigned to a primary workplace location that is more distant from their residence in the LEHD-OTM database.
3. College students who work near their school, but file tax returns using their parents home address, or workers whose residential address or work locations may have changed during the year, but are not yet reflected in the administrative records used in the LEHD-OTM.<sup>27</sup>

<sup>27</sup> Murakami, E. "Understanding LEHD and Synthetic Home to Work Flows in "ON THE MAP"". <http://www.fhwa.dot.gov/planning/census/lehdonthemap.htm>

## **Home-to-Work Flows by Metropolitan Region**

In addition to the county- and state-level comparisons, the three data sources were also compared with respect to specific metropolitan regions to investigate whether there are systematic differences in the data sources for work flows within the metropolitan region itself, between the metropolitan region and other counties within the state, and between the metropolitan region and other states.

Nine metropolitan regions were selected for analysis. These regions reflect considerable variation in size (both population and geographic area), regional versus national economic influence, and single versus multi-state jurisdiction. Table 3.5 presents a summary of key characteristics for each of the regions.

Within the selected metropolitan regions, some counties are missing data, either because they are located in one of the four states (CT, DC, MA, NH) for which LEHD-OTM data was not available in 2006-2008, or because their population was below the 20,000 threshold for data suppression in the CTPP 2006-2008. The most severe impact is in the New York City region, where no employment data was available for three counties located in Connecticut.

In six of the regions, the metropolitan counties were stratified into two groups. The MPO Core counties consist of those counties that comprise the official metropolitan planning area. Counties included in the “Rest of Region” are located adjacent to the metropolitan planning area, and typically interact with the MPO in activities such as regional surveys, air quality planning, etc. For the other three MPO regions – Dallas, Miami, and the Quad Cities – the surrounding counties are either predominantly rural, or are associated with another MPO.

For each region, up to 12 possible flow combinations were examined between four different geographic categories of counties:

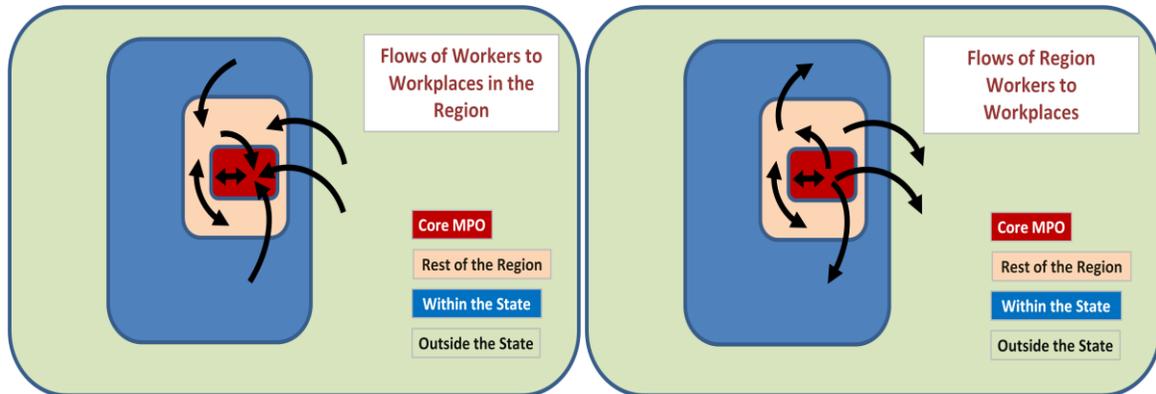
1. **MPO Core** – counties that comprise of official MPO planning area
2. **Rest of Region** – counties adjacent to the MPO core that interact closely with the MPO
3. **Within State** – counties located within the state but outside the metropolitan region
4. **Outside the State** – counties located outside the state or states where the metro core is located.

Figure 3.3 presents a graphic illustration of the possible flow combinations within and between the metropolitan region and other counties.

**Table 3.5 Metropolitan Regions and Associated Counties**

Principal City(ies)	Metropolitan Planning Organization	State(s)	MPO Core Counties	Counties in Rest of Metropolitan Region
Atlanta	Atlanta Regional Commission	GA	Cherokee, Clayton, Cobb, DeKalb, Douglas, Fayette, Gwinnett, Henry, Rockdale	Barrow, Bartow, Carroll, Coweta, Forsyth, Newton, Paulding, Pickens, Spalding, Walton
Davenport, Rock Island, Moline, Bettencort	Bi-State Regional Commission	IA, IL	Henry, <i>Mercer</i> , Rock Island, Scott (IA)	
Chicago	Chicago Metropolitan Agency for Planning	IL (IN, WI)	Cook, DuPage, Kane, Lake, McHenry, Will	DeKalb, Grundy, Jasper (IN), Kankakee, Kendall, Kenosha (WI), Lake (IN), LaPorte (IN), <i>Newton (IN)</i> , Porter (IN)
Dallas, Fort Worth	North Central Texas Council of Governments	TX	Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwell, <i>Somervell</i> , Tarrant, Wise	
Miami, Ft. Lauderdale, West Palm Beach	Southeast Florida Transportation Council	FL	Broward, Miami-Dade, Palm Beach	
Minneapolis, St. Paul	Metropolitan Council	MN (WI)	Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, Washington	Chisago, Isanti, Pierce, Sherburne, St. Croix (WI), Wright (WI)
New York City	New York Metropolitan Transportation Council	NY (CT, NJ, PA))	Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester	Bergen NJ), Dutchess, Essex (NJ), <i>Fairfield (CT)</i> , Hudson, Hunterdon (NJ), <i>Litchfield (CT)</i> , Mercer (NJ), Middlesex (NJ), Monmouth (NJ), Morris (NJ), <i>New Haven (CT)</i> , Orange, Passaic (NJ), Pike (PA), Somerset (NJ), Sussex (NJ), Ulster, Union (NJ)
Portland	Metro	OR (WA)	Clackamas, Multnomah, Washington	Clark (WA), Columbia, Marion, Polk, <i>Skamania (WA)</i> , Yamhill
Seattle	Puget Sound Regional Council	WA	King, Kitsap, Pierce, Snohomish	Island, Mason, Skagit, Thurston

**Figure 3.3 An Illustrative Representation of Flow Combinations**



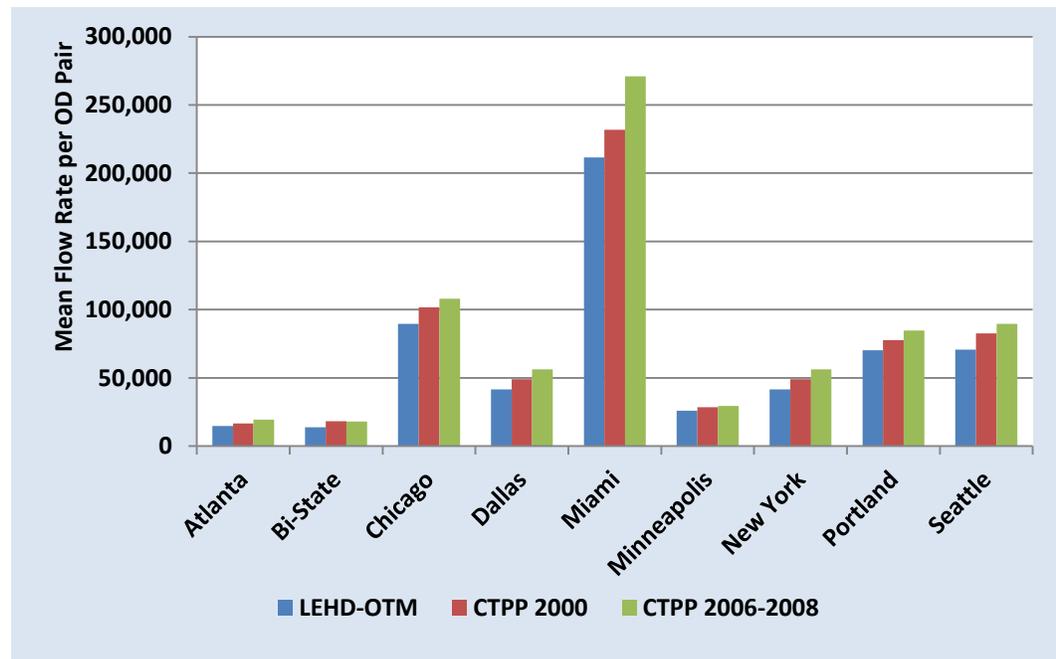
For each of the nine metropolitan regions, county-to-county OD pairs with either an origin or destination in a designated MPO Core or Rest of Region county were grouped into one of the 12 flow combination categories. Total work flows were then computed for each category using each of the three data sources - LEHD-OTM (2006-2008), CTPP 2000, and CTPP 2006-2008. In addition to total flows, mean flows (and standard deviation of the mean) between county OD pairs were calculated for each category in each metropolitan region. Appendix C, Tables C-1 through C-9, present the summary statistics for each of the metropolitan regions.

Figures 3.4 through 3.8 compare the mean OD flows by data source and metropolitan region for five of the flow combination categories common to all nine metropolitan regions. Each graph is discussed below.

**Core-to-Core** flows (Figure 3.4) include flows whose origin and destination counties are both within the metropolitan core. The mean flow rates in this category generally range between 10,000 and 100,000 trips, with Miami as an outlier with more than twice as many trips as the next highest metropolitan area. Core-to-core flow rates are also significantly higher than any other flow category.

Across all nine metropolitan areas, the LEHD-OTM consistently has slightly lower flow rates than either the CTPP 2000 or the CTPP 2006-2008 data sources, while the CTPP 2006-2008 has slightly higher rates than the CTPP 2000 in all metropolitan regions except Bi-State. This finding is consistent with the individual county comparisons, which showed that the CTPP 2006-2008 sample weighting apportions more trips to OD pairs with larger sample sizes.

**Figure 3.4 Mean Flow Rates for Core-to-Core Flows**



**Core-to-Rest of State** flows (Figure 3.5) include those flows from a residence county in the MPO Core to a workplace county located outside the core but within the state. **Rest of State-to-Core** flows (Figure 3.6) include those flows from a residence county located elsewhere in the state to a workplace located in one of the MPO Core counties. Not surprisingly, the mean flow rates for workers employed in the MPO Core are consistently higher than for workers who live in the core and travel to a workplace elsewhere in the state.

In all nine metropolitan regions, both the LEHD-OTM and the CTPP 2006-2008 flow rates are consistently higher than those produced by the CTPP 2000 data. In all but two of the regions (Atlanta and Bi-State), the flow rates from the LEHD-OTM are higher than the trip rates from either the CTPP 2000 or the CTPP 2006-2008 data. The Bi-State region is the only metropolitan region where two states were used to identify Rest of State OD pairs, and this may have impacted the mean trip rate in the LEHD data more than the other two sources.

The higher trip rates associated with the LEHD-OTM data may be attributable, at least partially, to the assignment of work trips for employers with multiple workplace establishments throughout the state to a single location (i.e., the corporate office or payroll processing site).

Figure 3.5 Mean Flow Rates for Core-to-Rest of State Flows

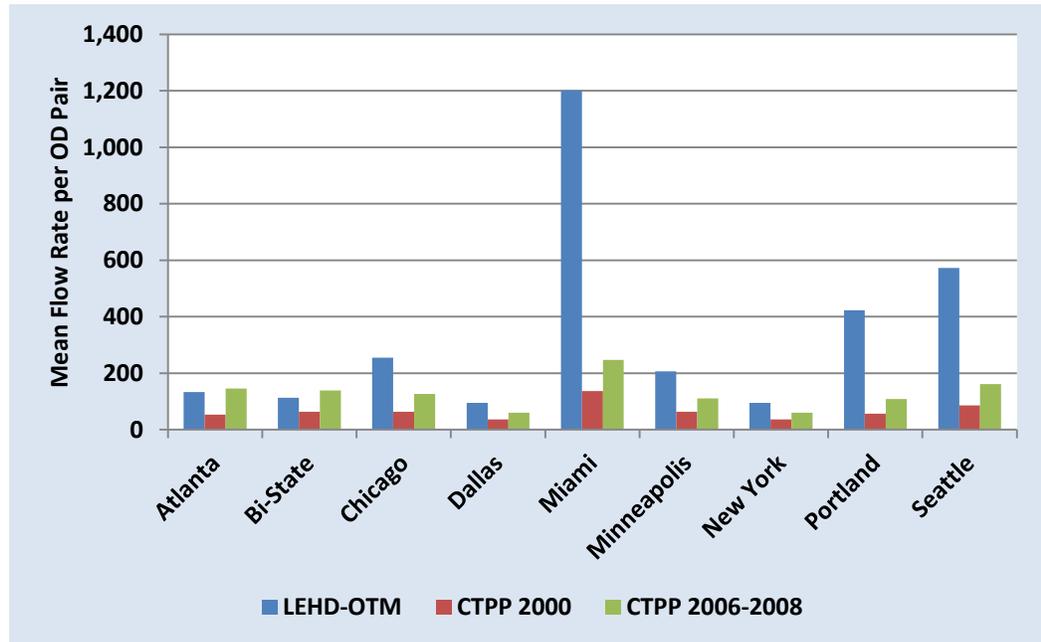
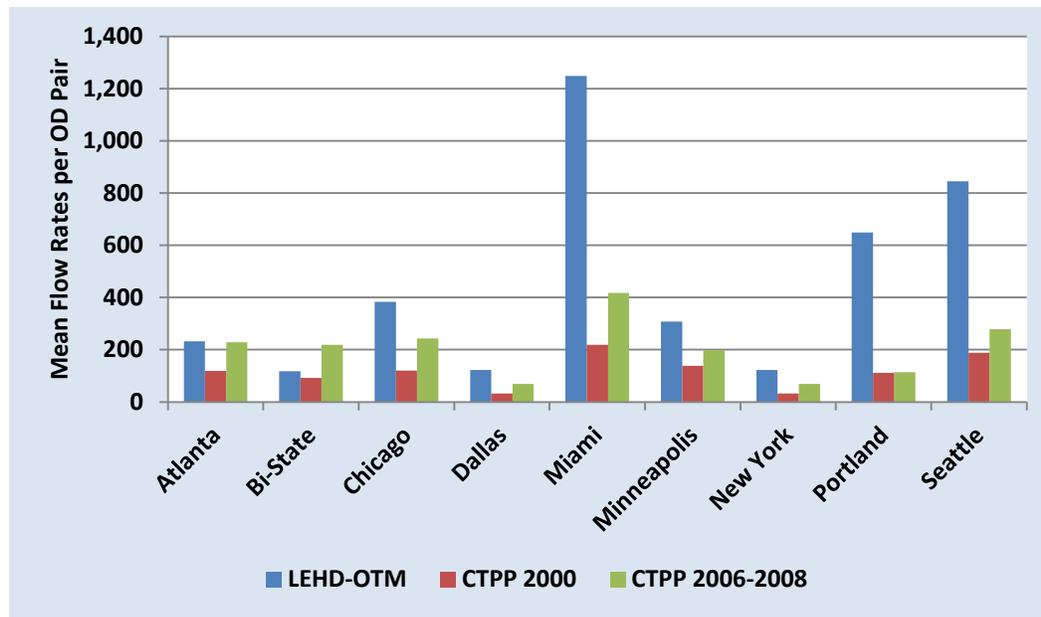


Figure 3.6 Mean Flow Rates for Rest of State-to-Core Flows



Larger employers often locate their corporate office within the largest city in a state, and all but one of the included metropolitan regions represent the largest city in their respective state. On the other hand, there is no discernible change from this general pattern in Minneapolis, which is located in the one state that requires employers to report actual workplace establishments for all workers.

In three regions – Miami, Portland and Seattle – the flow rates from the LEHD-OTM are significantly higher. The number of counties in the metropolitan core for these three regions is smaller than in the other regions, which suggests that trips from elsewhere in the state would be more concentrated among the core counties in these three regions, compared to the other regions.

**Core-to-Out of State** flows (Figure 3.7) include those flows from a residence county located in the MPO core to a workplace located in another state. **Out of State-to-Core** flows (Figure 3.8) include those flows from residence counties in other states to a workplace located in one of the MPO Core counties.

In all nine metropolitan areas, the mean flow rates between the metropolitan core and out-of-state counties are lowest in the LEHD-OTM (averaging less than 10 trips per OD pair), and are highest in the CTPP 2006-2008, typically by more than two times the rate reported in the CTPP 2000. At the same time, the LEHD-OTM data identifies 10 times the number of Core-to-Out of State OD pairs compared to the CTPP 2006-2008 data, and four to five times the number found in the CTPP 2000 data. This suggests that the LEHD-OTM is able to capture many more of the low frequency out-of-state work flows that would have a very low probability of being captured in the ACS sample.

Flows to and from the **Rest of Region** show less consistency across metropolitan areas, and may be influenced more by how similar the Rest of Region counties are to the Core counties. Figures 3.9 through 3.15 compare the mean flow rates between the Core and Rest of Region for the six metropolitan regions that include counties in the Rest of Region category.

Rest of Region to the MPO Core flows (Figure 3.9) average about 2 to 3 times higher than flows outward from the MPO Core to the Rest of Region (Figure 3.10), and about 7 to 10 times higher than flows from elsewhere in the state. Flows between the Rest of Region and the MPO Core are significantly higher in Portland and Seattle than in the other four metropolitan areas, suggesting a stronger economic tie or greater concentration of employment in the Core counties for these two regions.

With respect to the three data sources, the flows in the LEHD-OTM and the CTPP 2006-2008 are relatively similar, and both databases are slightly higher than the CTPP 2000.

Figure 3.7 Mean Flow Rates for Core-to-Out of State Flows

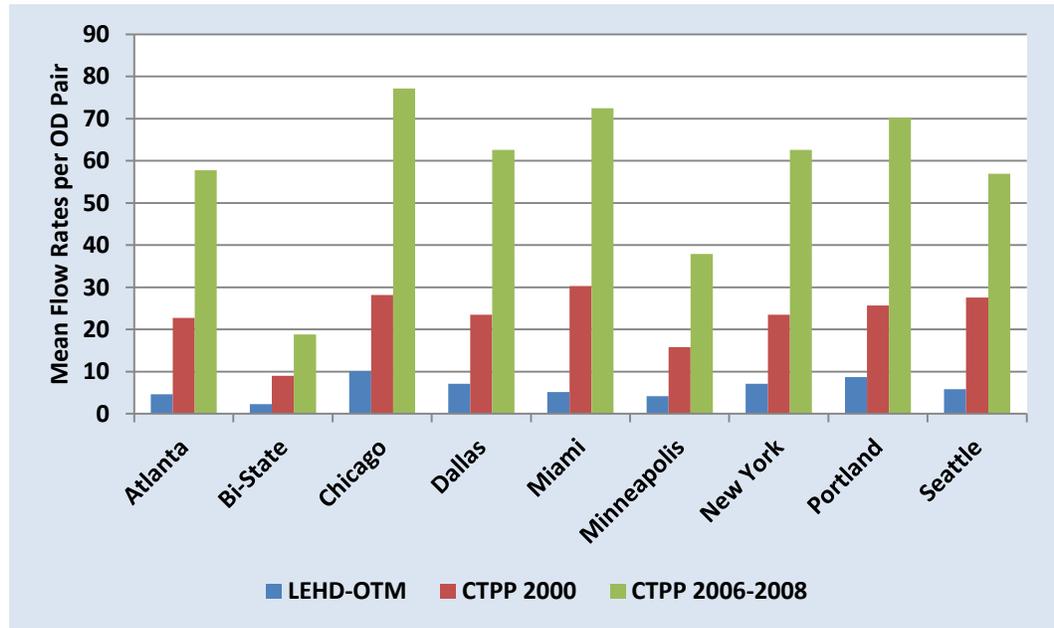
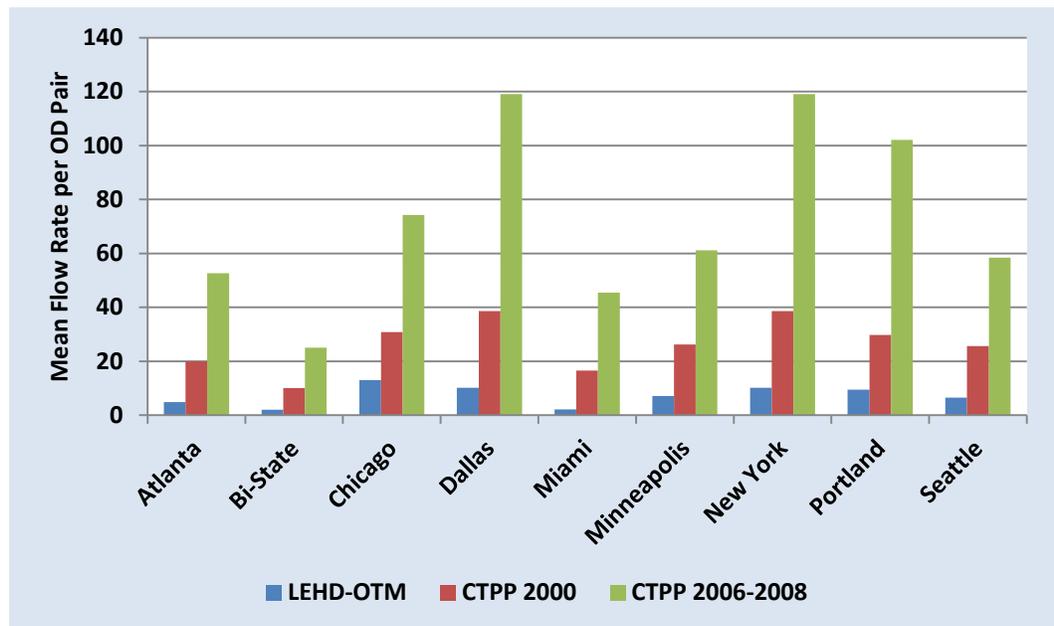
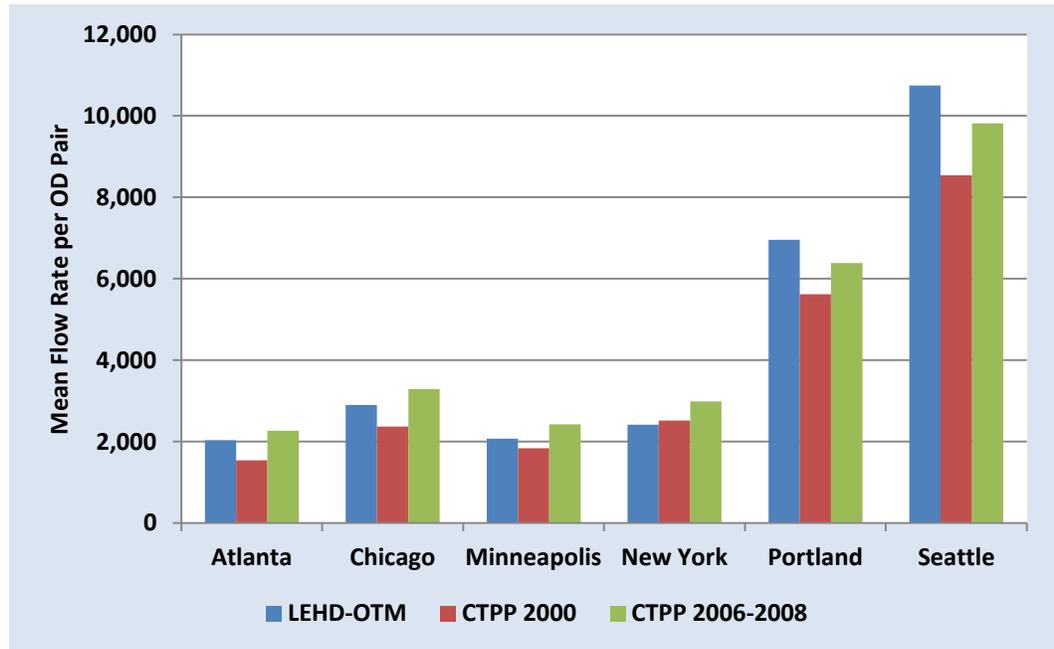


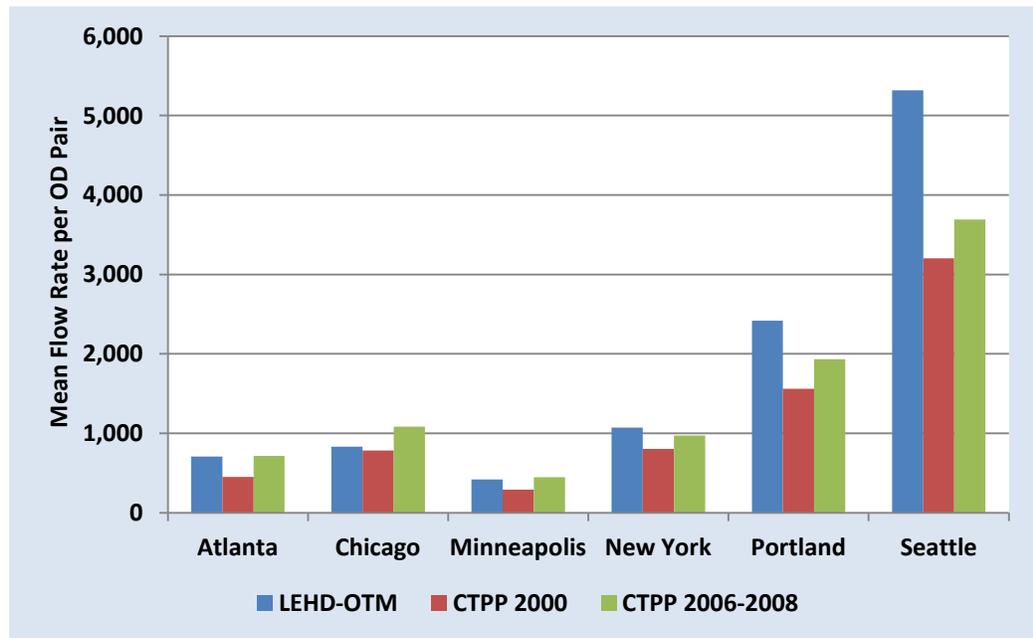
Figure 3.8 Mean Flow Rates for Out of State-to-Core Flows



**Figure 3.9 Mean Flow Rates for Rest-of-Region to Core Flows**



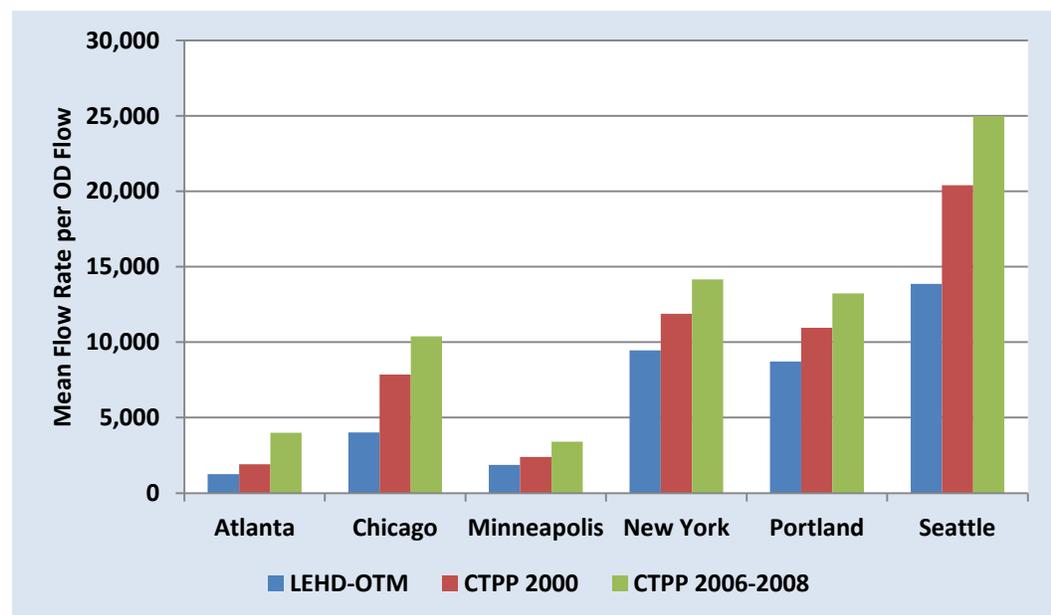
**Figure 3.10 Mean Flow Rates for Core to Rest-of-Region Flows**



Flows among Rest-of-Region counties (Figure 3.11) generally show no consistent pattern with respect to metropolitan region characteristics, with a few notable exceptions. The relatively low flow rate in Atlanta may be attributable to the fact that the Rest of Region counties form a one county wide ring around the Atlanta core counties, thereby increasing the relative travel distance between Rest of Region counties. By contrast, the majority of Rest of Region counties for New York are located in northern New Jersey (Rest of Region counties in Connecticut are missing from the LEHD data and were therefore not included in the statistics). Northern New Jersey has both substantial employment and residential population, and many workers living in New Jersey are just as likely to work in nearby New Jersey counties rather than commute into New York.

With respect to the three data sources, the LEHD-OTM data consistently has the lowest Rest-of-Region to Rest-of-Region flows, while the CTPP 2006-2008 consistently has the highest flows across all metropolitan regions.

**Figure 3.11 Mean Flow Rates for Rest-of-Region to Rest-of-Region Flows**



Figures 3.12 and 3.13 compare the flows between the Rest-of-Region counties and the Rest of State. In four of the six metropolitan regions, the flow rates in the CTPP 2006-2008 are significantly higher than those reported in either the LEHD-OTM or the CTPP 2000. However, these rates are based on a relatively small number of OD pairs – typically about 10 percent of the OD pairs included in the LEHD-OTM database.

Figure 3.12 Mean Flow Rates for Rest-of-Region to Rest-of-State Flows

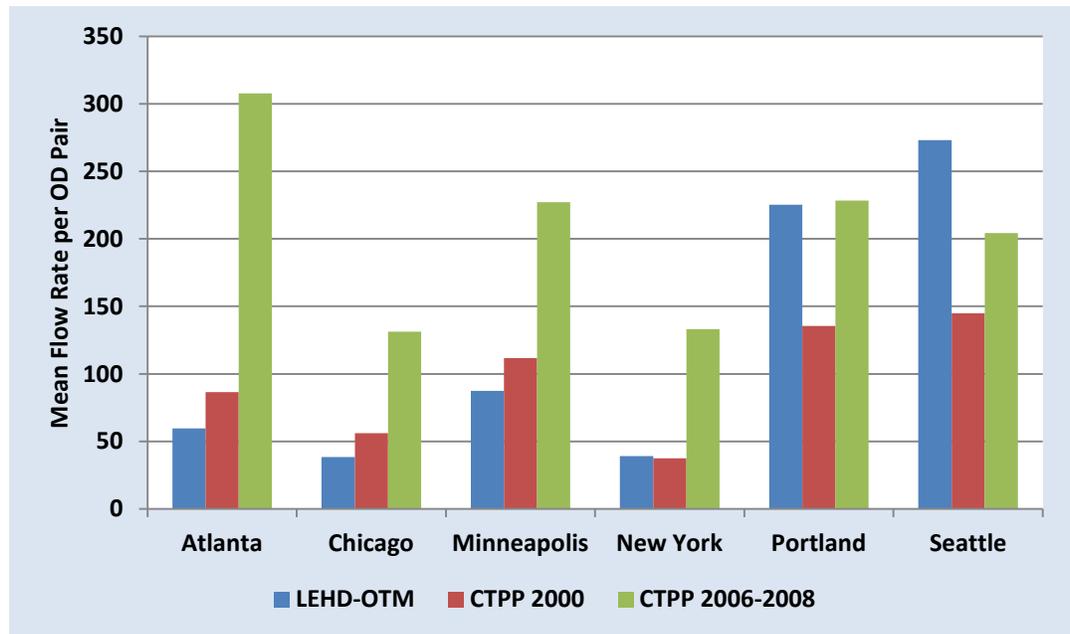
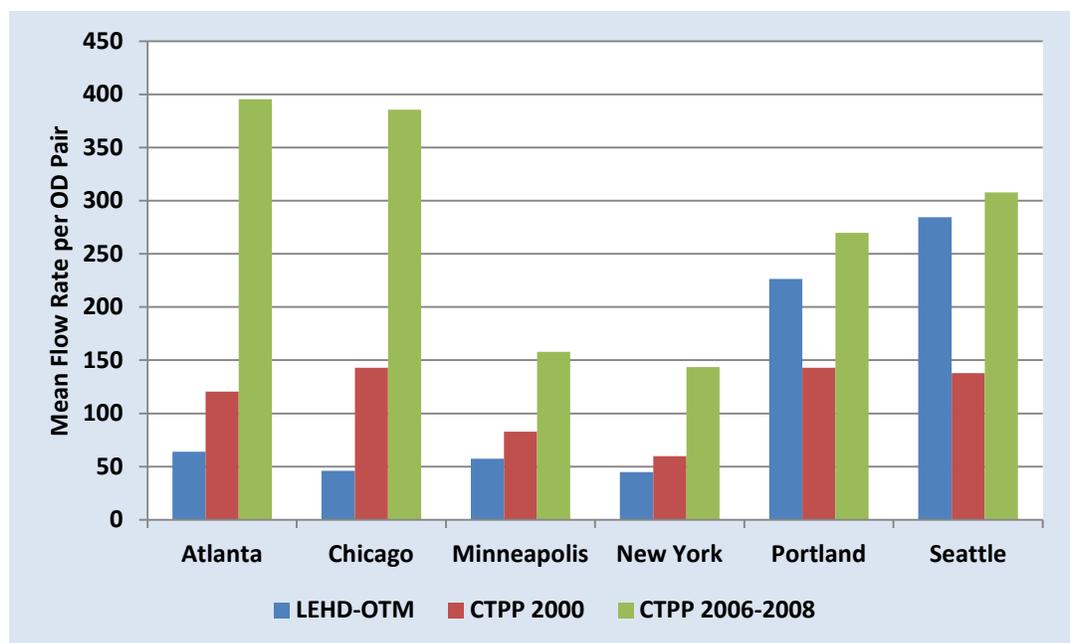


Figure 3.13 Mean trip rates for Rest-of-State to Rest-of-Region Flows



By contrast, in Portland and Seattle, where the number of OD pairs in the CTPP 2006-2008 for this category of trips represent about 30 to 50 percent of the OD pairs included in the LEHD-OTM, the mean flow rates are much closer in magnitude.

Figures 3.14 and 3.15 compare the mean flows between the Rest-of-Region counties and Out of State. For most of the metropolitan regions, mean flow rates in the LEHD-OTM are low compared to the CTPP 2000 and the CTPP 2006-2008, but are based on a substantially larger number of OD pairs. In fact, the total number of trips between Rest of Region counties and Out of State counties is significantly higher in the LEHD-OTM data than in either of the CTPP databases sources across all metropolitan regions.

The metropolitan level comparisons clearly show that the LEHD-OTM data captures many more of the low frequency OD pairs than either the CTPP 2000 or CTPP 2006-2008 databases. The CTPP databases are derived from a sample of U.S. households, which are then expanded to the universe of all households based on demographic factors. One consequence of this methodology seems to be that OD pairs with a low frequency of home-to-work trips which are sampled in the CTPP get weighted more heavily, while low frequency OD pairs that are not sampled are assumed to have no home-to-work flows. The result is a random and “lumpy” distribution of low frequency flows that becomes “more lumpy” as the sample size decreases (i.e., from the CTPP 2000 to the CTPP 2006-2008).

### 3.4 CENSUS TRACT LEVEL COMPARISONS OF HOME-TO-WORK FLOWS

Home-to-work flows from the LEHD-OTM were compared with flow data from the 2000 CTPP at the Census Tract level for two metropolitan areas – the Twin Cities (Minneapolis and St. Paul), MN and Kansas City, MO-KS.<sup>28</sup> The purpose of these comparisons was to investigate whether significant anomalies appear in the LEHD-OTM at more detailed levels of geographic resolution, and if so, can these anomalies be explained either by current data gaps or by the methodology used to construct the LEHD-OTM data.

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<sup>28</sup> CTPP 2006-2008 data is not available at geographic resolution below the county, due to disclosure restrictions.

Figure 3.14 Mean trip rates for Rest of Region-to-Out of State Flows

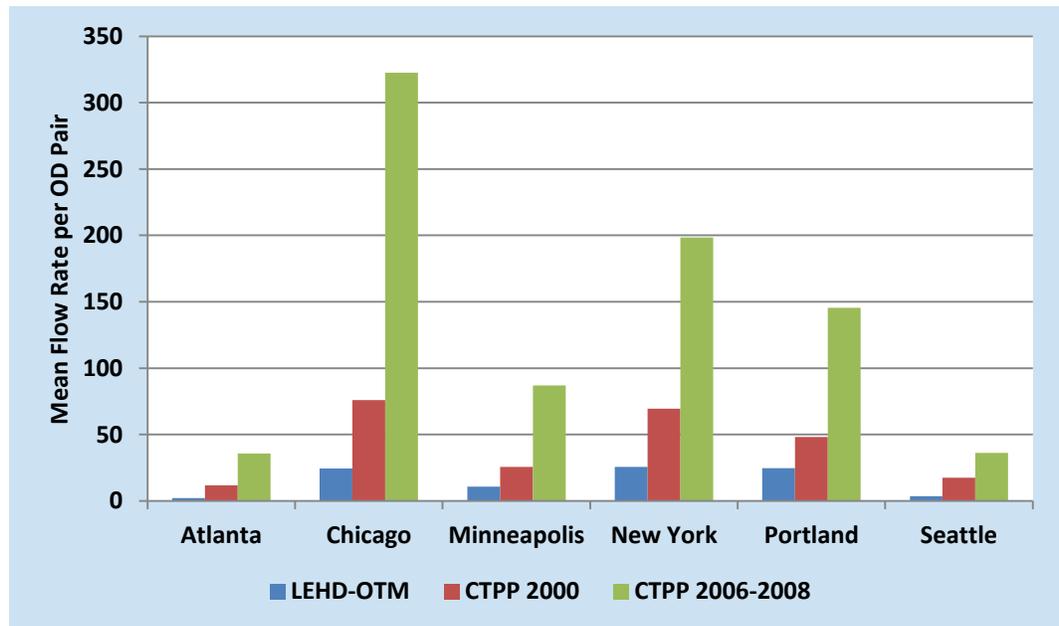
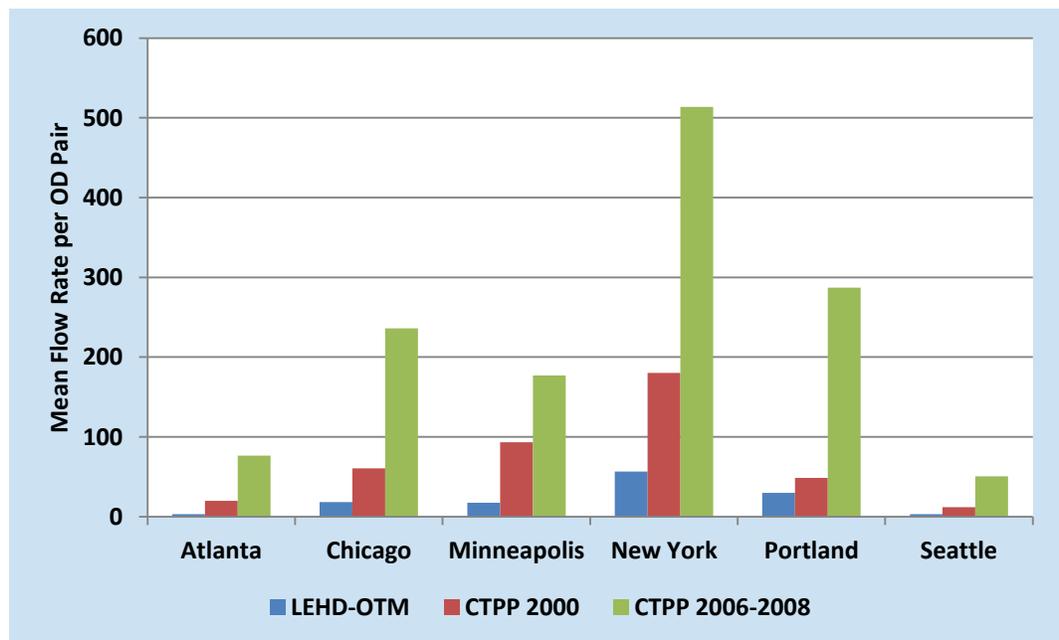


Figure 3.15 Mean trip rates for Out of State-to-Rest of Region Flows



## **Twin Cities, MN**

The Twin Cities metropolitan area consists of seven counties surrounding the cities of Minneapolis and St. Paul, Minnesota. It was selected as a site for comparing the LEHD-OTM and CTPP 2000 databases for the following reasons:

1. Minnesota is the only state where employers are required to submit quarterly wage reports (listing the employee names and SSN) for each workplace location rather than a single wage report for the employer. It should therefore provide the most accurate match between worker and workplace establishment in the LEHD-OTM database.
2. St. Paul is the state capital of Minnesota. Potential biases caused by mis-assigning state workers should result in significantly higher work destinations to Tracts near the State Capital.
3. The entire Twin Cities metropolitan area is located within a single state, eliminating potential biases caused by cross state work flows.
4. The Twin Cities area contains several large employers, including the University of Minnesota, Mid-America Mall, Anderson Windows, 3M Corporation General Mills, Best Buy, and Ameriprise Financial. Tracts containing these employers should show a large number of work destinations in both the LEHD-OTM and CTPP 2000 databases.

### *Comparison of OD Pairs and Work Flows*

The seven counties that comprise the Twin Cities metropolitan area contain a total of 689 Census Tracts, or 474,721 possible OD pairs of work flows. The actual number of OD pairs containing at least one home-to-work flow in either in the LEHD-OTM or the CTPP 2000 was 197,850, or approximately 42 percent of all possible OD pairs within the seven county area. An additional 96,176 Census Tracts, located outside the Twin Cities metropolitan area, were identified in one or both of the two databases as either a residence location for a work flow into the Twin Cities area, or a workplace location for workers residing in the Twin Cities area. Table 3.6 summarizes the number of OD pairs of Census Tracts and the total and average work flows reported from those OD pairs in the LEHD-OTM and the CTPP 2000 databases.

The total worker flows (both within and to/from the metro area) as reported by the LEHD-OTM and CTPP 2000 data differ by less than 1 percent. However, the flows in the LEHD-OTM database are distributed over more than 2.6 times as many OD pairs as those in the CTPP 2000 database, resulting in an average flow rate per OD pair that is over 2.6 times higher in the CTPP 2000 than in the LEHD-OTM (15.1 vs. 5.7 trips/OD pair).

**Table 3.6 Work Flow Summaries for Twin Cities Metro Area**

	Number of OD Pairs	Total Worker Flow		Average OD Flow Rate
<b>Total Study Area</b>				
LEHD-OTM	265,357		1,511,454	5.70
CTPP 2000	99,384		1,499,040	15.08
Common	70,715	LEHD-OTM	945,359	13.37
		CTPP 2000	1,306,386	18.47
<b>Metro-to-Outside</b>				
LEHD-OTM	28,048		65,753	2.34
CTPP 2000	3,940		32,016	8.13
Common	911	LEHD-OTM	8,041	8.83
		CTPP 2000	10,113	11.10
<b>Outside-to-Metro</b>				
LEHD-OTM	56,258		184,554	3.28
CTPP 2000	17,469		129,589	7.42
Common	8,628	LEHD-OTM	77,672	9.00
		CTPP 2000	91,957	10.66
<b>Metro-to-Metro</b>				
LEHD-OTM	181,051		1,261,147	6.97
CTPP 2000	77,975		1,337,435	17.15
Common	61,176	LEHD-OTM	859,646	14.05
		CTPP 2000	1,204,316	19.69

Less than 25 percent of the OD pairs in the study area are common to both databases (i.e., at least one work flow is reported between the OD pair in both databases). The flow rates for the common OD pairs are more similar for the two databases (18.5 vs. 13.4 trips/OD pairs for the CTPP 2000 and the LEHD-OTM, respectively). These results support earlier observations that the LEHD-OTM database is capturing many more OD pairs with low frequency work flows, while the CTPP 2000, because it is based on only a 16 percent sample of all work trips, is more likely to capture OD pairs with a higher frequency of work flows.

These findings are even more pronounced for flows to or from Census Tracts located outside the Twin Cities metro area. The number of OD pairs with work flows reported in the LEHD-OTM range from 3 to 9 times the OD pairs in the CTPP 2000, while the flow rates from these OD pairs average between 2 and 3 work flows per OD pair, compared to between 7 and 8 in the CTPP 2000.

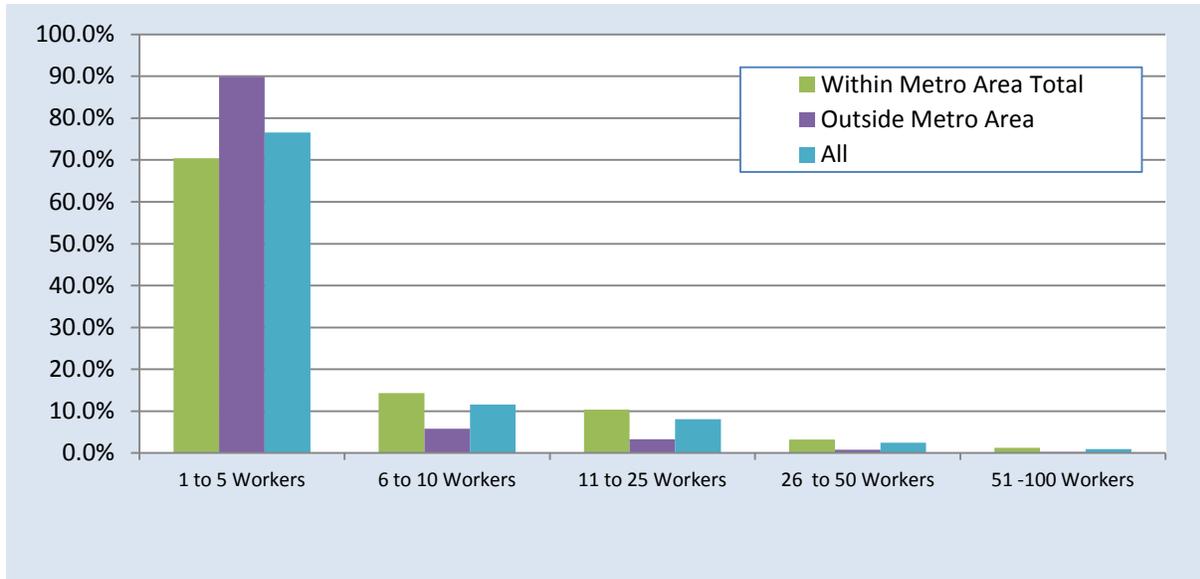
Work flows between Census Tracts where both origin and destination are located within the Twin Cities metro area have the highest average flow rates in both the LEHD-OTM and CTPP 2000 databases (6.97 and 17.15 trips/OD pair, respectively), but still show significant differences in both the number of OD pairs with reported work flows and in the magnitude of the average flow rate when compared to each other. Approximately 30 percent of the OD pairs located entirely within the seven county Twin cities metro area are common to both databases. Possible reasons for the large number of OD pairs that are not common between the two databases include:

- The CTPP 2000 is missing OD pairs with low work flows that were not captured in the selected sample.
- The LEHD-OTM is missing OD pairs whose workplace locations are dominated by excluded employment categories (e.g., Federal or railroad workers, self-employed workers).
- Some workers changed their residence or workplace location between the 2000 and 2006 (the years represented by the two databases).

Figures 3.16 and 3.17 graph the distribution of the magnitude of work flows between OD pairs for the LEHD-OTM and the CTPP 2000 databases. In the LEHD-OTM database, over 70 percent of the work flows between pairs of Census Tracts within the seven county Twin Cities metro area, and nearly 90 percent of the work flows to/from Census Tracts outside the metro area, represent five or fewer work trips. In the CTPP 2000, less than 18 percent of the work flows between Census Tract pairs within the metro area and only 56 percent of the work flows to/from the metro area, represent five or fewer worker trips. This is not unexpected, because the flow rates in the CTPP 2000 are based on samples that have been expanded to reflect the full universe of flows; consequently a single work trip captured in the CTPP sample may be expanded to as many as six work trips for a specific OD pair. This also suggests that differences in absolute magnitude of work flows between the two databases are more likely to be attributable to the sample weighting procedures used in the CTPP than to systematic biases in either data source.

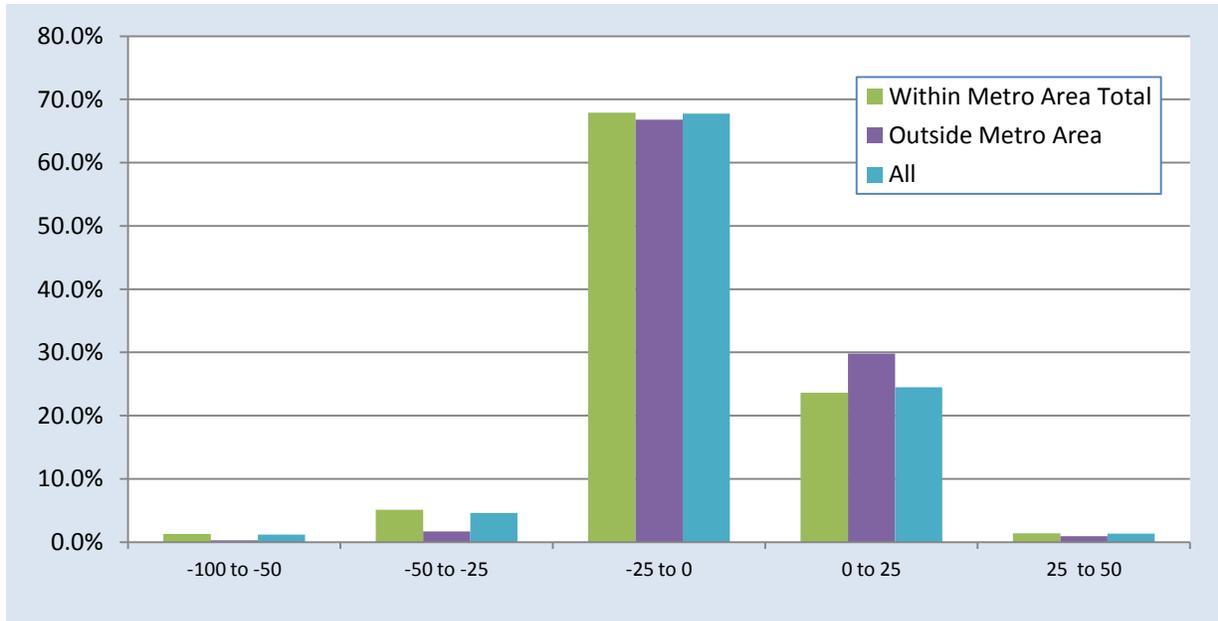
Figure 3.18 graphs the distribution of the differences in work flows between the LEHD-OTM and the CTPP 2000 databases for those OD pairs (70,715) that are common to both databases. The distribution shows that over 90 percent of the work flows differ by less than 25 trips between the two databases. As expected, the flow rates per OD pair are typically lower in the LEHD-OTM compared to the CTPP 2000.

**Figure 3.16 Distribution of the Magnitude of Work Flows in the LEHD-OTM for the Twin Cities Metro Area**



**Figure 3.17 Distribution of the Magnitude of Work Flows in the CTPP 2000 for the Twin Cities Metro Area**



**Figure 3.18 Distribution of Differences in Work Flows for Common OD Pairs**

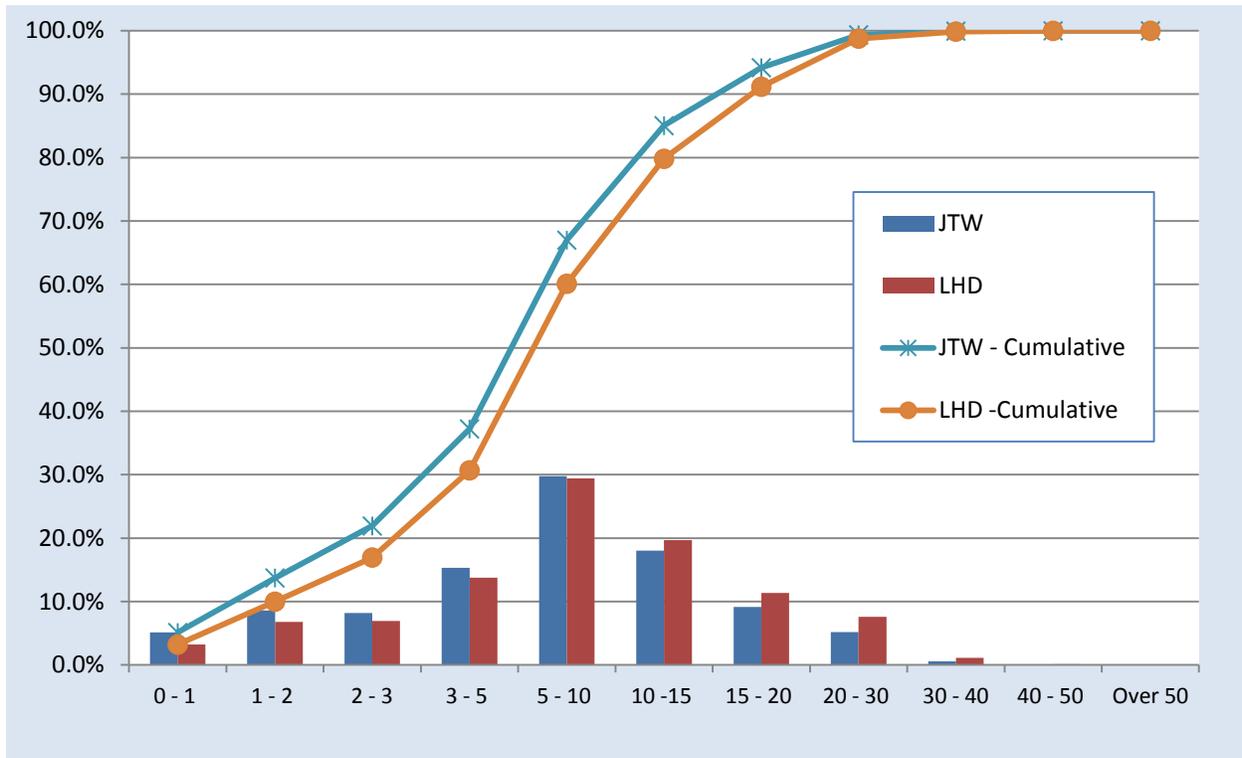
### *Trip Length Distribution*

Figure 3.19 graphs the trip length frequency distributions for work flows between all OD pairs within the seven county Twin Cities metro area for both the LEHD-OTM and CTPP 2000 databases. The distances represent straight-line distances between Census Tract centroids, and for intra-Tract flows, an estimated internal distance was calculated by taking three quarters of the average distance to the three nearest Tracts (a typical assumption in modeling).

The trip length distribution patterns are similar, although the CTPP 2000 has a higher share of shorter distance work flows (under 10 miles), while the LEHD-OTM has a higher share of work flows over 10 miles. Possible reasons for these differences are:

- The absence of self-employed workers, who are more likely to work at or near home, in the LEHD-OTM database.
- Even within the Twin Cities metro area, the LEHD-OTM has a much larger number of OD pairs with lower work flows. These low work flow pairs are much more likely to be between more distance Census Tracts.

**Figure 3.19 Trip Length Distribution for Work Flows within the Twin Cities**



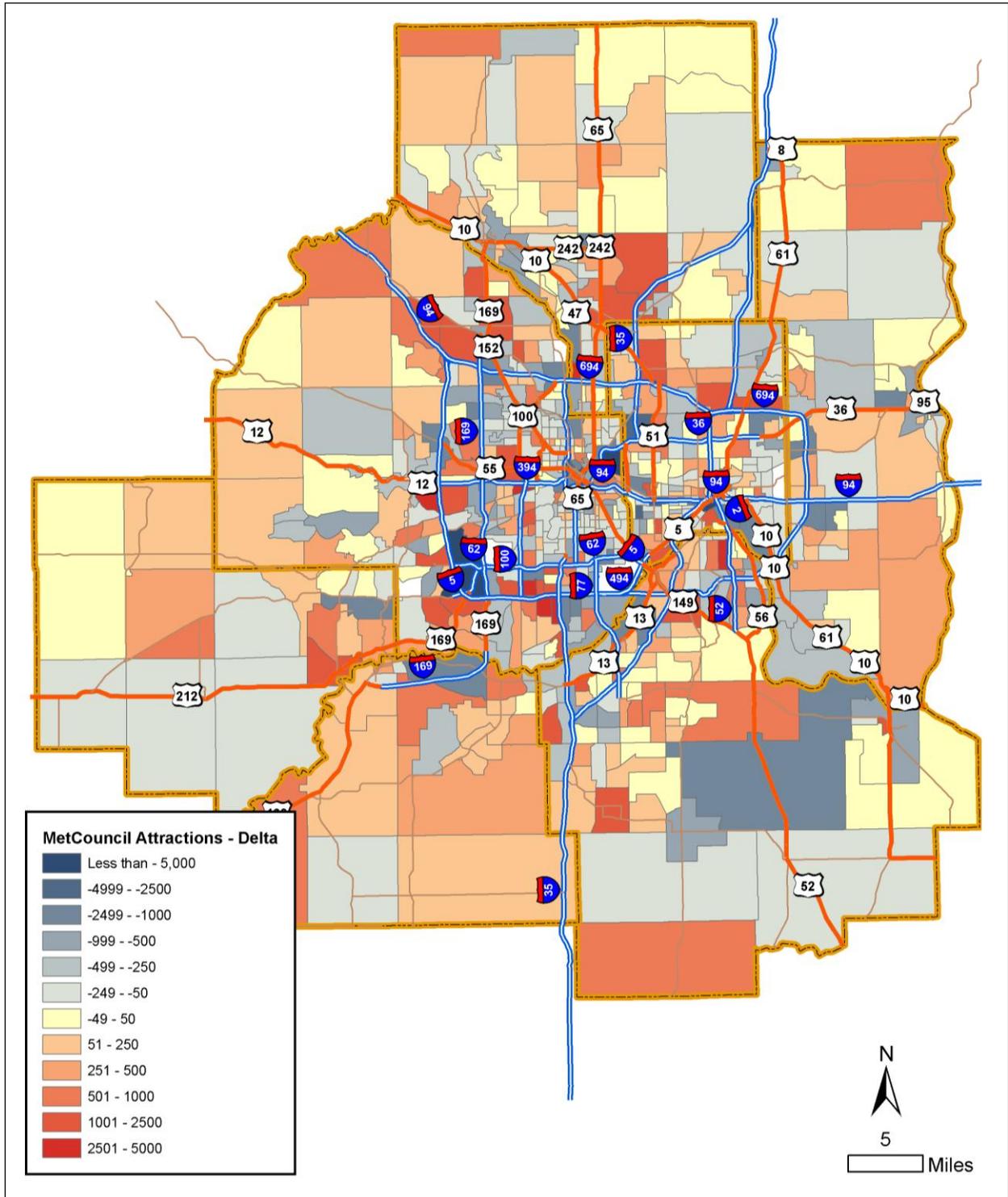
### *Geographic Distribution of Workplace Attractions*

Figure 3.20 presents a map of the seven county Twin Cities metropolitan area showing the difference in number of work flow destinations between the LEHD-OTM and the CTPP 2000 by Census Tract. Tracts that are colored blue-gray indicate where the number of work flow destinations in the CTPP 2000 are higher than in the LEHD-OTM. Tracts that are colored red-orange indicate where the number of work flow destinations in the LEHD-OTM are higher than in the CTPP 2000.

There are several noteworthy observations that can be made from the map:

- Tracts containing corporate headquarters for major corporations generally showed similar destination volumes for both the LEHD-OTM and the CTPP 2000. LEHD-OTM destination volumes were significantly higher at the current Best Buy site, which moved its headquarters between 2000 and 2006.
- Work flow destinations to Tracts representing the University of Minnesota campus and the state capital in St. Paul are slightly higher in the LEHD-OTM than in the CTPP 2000.

Figure 3.20 Difference in Work Flow Destinations (LEHD-OTM – CTPP 2000)  
for the Twin Cities Metro Area



- LEHD-OTM work flow destinations are significantly higher in specific Tracts bordering major Interstate highways where substantial new commercial development seems to have recently taken place.
- LEHD-OTM work flow destinations are significantly lower in an area north of the University and south of I-35W, and in specific Tracts inside I-435 in the southwest metro area. Both of these appear to be heavily industrial in character.

## **Kansas City, MO-KS**

The Kansas City metropolitan area consists of three counties in Kansas and one county plus parts of three other counties in Missouri. It was selected as a site for comparing the LEHD-OTM and CTPP 2000 databases for the following reasons:

1. The metropolitan area spans two states, and provides an opportunity to examine how accurately the LEHD-OTM data accounts for work flows that cross state borders.
2. Kansas is a mandatory state for multiple worksite reports (MWRs), while Missouri is a voluntary state. If employers with multiple worksites have a significant impact on the accuracy of work flows, this impact should appear as larger differences relative to the CTPP 2000 in the Missouri Tracts compared to the Kansas Tracts.
3. The area includes several large military and federal installations. Tracts containing these facilities should show significantly higher work flows in the CTPP 2000 than in the LEHD-OTM.
4. The Kansas City area is home to several large employers, including Sprint, located in Overland Park, KS and Hallmark, located in downtown Kansas City, MO. It is also a major railroad center with several large rail yards located within the metropolitan area.

### *Comparison of OD Pairs and Work Flows*

The Kansas City metropolitan area contains a total of 464 Census Tracts, or 215,296 possible OD pairs of work flows. The actual number of OD pairs containing at least one home-to-work flow in either in the LEHD-OTM or the CTPP 2000 was 111,462, or approximately 52 percent of all possible OD pairs within the seven county area. An additional 88,127 Census Tracts, located outside the Kansas City metropolitan area, were identified in one or both of the two databases as either a residence location for a work flow into the Twin Cities area, or a workplace location for workers residing in the Twin Cities area.

Table 3.7 summarizes the number of OD pairs of Census Tracts and the total and average work flows reported from those OD pairs in the LEHD-OTM and the CTPP 2000 databases. Additionally, Table 3.7 stratifies flows between Census

**Table 3.7 Work Flow Summaries for Kansas City Metro Area**

	Number of OD Pairs	Total Worker Flow		Average OD Flow Rate
<b>Total Metro Area</b>				
LEHD-OTM	180,193		957,694	5.31
CTPP 2000	67,791		1,016,370	14.99
Common	48,395	LEHD-OTM	605,014	12.50
		CTPP 2000	872,535	18.03
<b>Metro-to-Outside</b>				
LEHD-OTM	32,677		69,826	2.14
CTPP 2000	3,157		27,451	8.70
Common	1,031	LEHD-OTM	7,156	6.94
		CTPP 2000	11,118	10.78
<b>Outside-to-Metro</b>				
LEHD-OTM	46,955		127,305	2.71
CTPP 2000	12,324		111,510	9.05
Common	5,955	LEHD-OTM	49,406	8.30
		CTPP 2000	75,881	12.74
<b>Metro-to-Metro</b>				
LEHD-OTM	100,561		760,563	7.56
CTPP 2000	52,310		877,409	16.77
Common	41,409	LEHD-OTM	548,452	13.24
		CTPP 2000	785,536	18.97
<b>MO-to-MO</b>				
LEHD-OTM	39,787		316,539	7.96
CTPP 2000	18,150		348,026	19.17
Common	15,341	LEHD-OTM	227,142	14.81
		CTPP 2000	324,207	21.13
<b>KS-to-KS</b>				
LEHD-OTM	21,134		243,513	11.52
CTPP 2000	11,178		245,590	21.97
Common	9,734	LEHD-OTM	186,072	19.12
		CTPP 2000	232,073	23.84
<b>MO-to-KS</b>				
LEHD-OTM	20,762		102,480	4.94
CTPP 2000	11,920		139,851	11.73
Common	8,532	LEHD-OTM	65,318	7.66
		CTPP 2000	112,843	13.23
<b>KS-to-MO</b>				
LEHD-OTM	18,878		98,031	5.19
CTPP 2000	11,062		143,943	13.01
Common	7,802	LEHD-OTM	69,920	8.96
		CTPP 2000	116,412	14.92

Tracts within the Kansas City metropolitan area into within-state and cross-state flows.

The distributions of work flows in Kansas City are similar to those observed in the Twin Cities. The LEHD-OTM appears to be capturing many more OD pairs with low frequency work flows than the CTPP 2000, and the OD pairs that are common to both databases typically represent those with higher flow rates.

Work flows between Census Tracts where both origin and destination are located within the Kansas City metro area have the highest average flow rates in both the LEHD-OTM and CTPP 2000 databases (7.56 and 16.77 trips/OD pair, respectively). Additionally, within the Kansas city metropolitan area, total work flows between Census Tracts within the same state (either Missouri or Kansas) average are more than double the work flows that cross state borders, and average flow rates are nearly 60 percent higher.

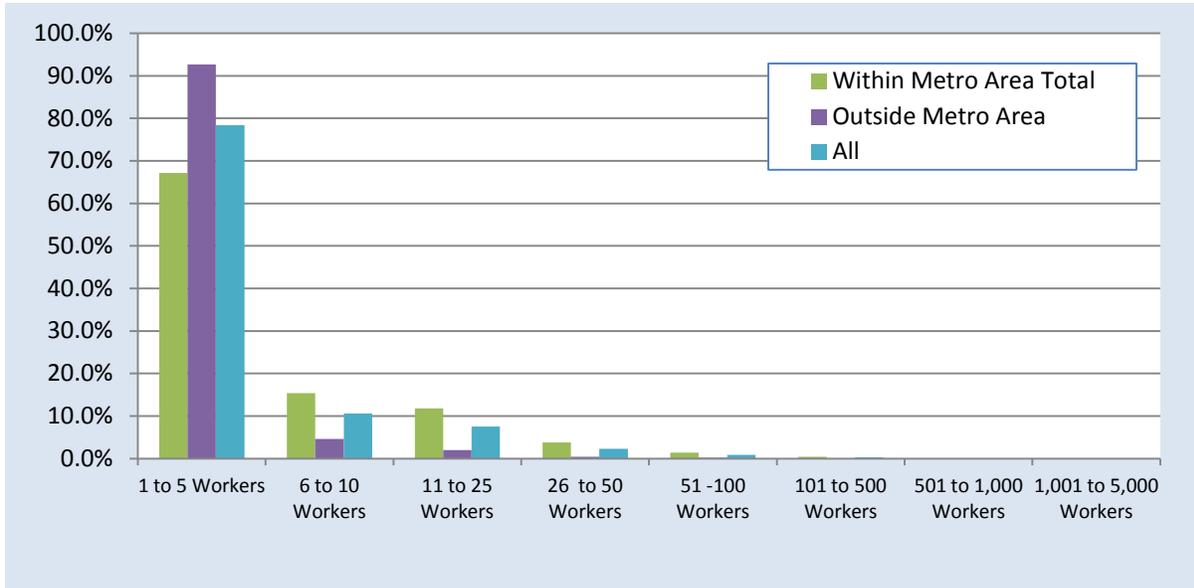
There is no evidence that the absence of mandatory multiple worksite reporting in Missouri significantly impacts the distribution of work flows reported in the LEHD-OTM database. If the absence of mandatory MWR reporting results in a significant decrease of secondary worksite locations, then the ratio of OD pairs with non-zero work flows in the LEHD-OTM versus the CTPP 2000 should be lower than that in a state with mandatory MWR reporting. In fact, the LEHD-OTM has 2.2 times as many non-zero OD pairs as the CTPP 2000 in Missouri (39,787 vs. 18,150), and only 1.9 times as many in Kansas (20,762 vs. 11,178).

Figures 3.21 and 3.22 graph the distribution of the magnitude of work flows between OD pairs for the LEHD-OTM and the CTPP 2000 databases for Kansas City. These distributions are nearly identical to the distributions found in the Twin Cities. Figures 3.23 and 3.24 graph the distribution of work flows for OD pairs within the same state and for flows between states. The distributions are similar to those for the entire Kansas City metropolitan area, with OD pairs between states showing somewhat higher shares of lower work flow volumes than for OD pairs within the same state. The only significant difference is that, in the CTPP 2000 database, the highest share of flows for OD pairs between states is in the 6-10 trip category, similar to the distribution of within metropolitan trips in figure 3.22.

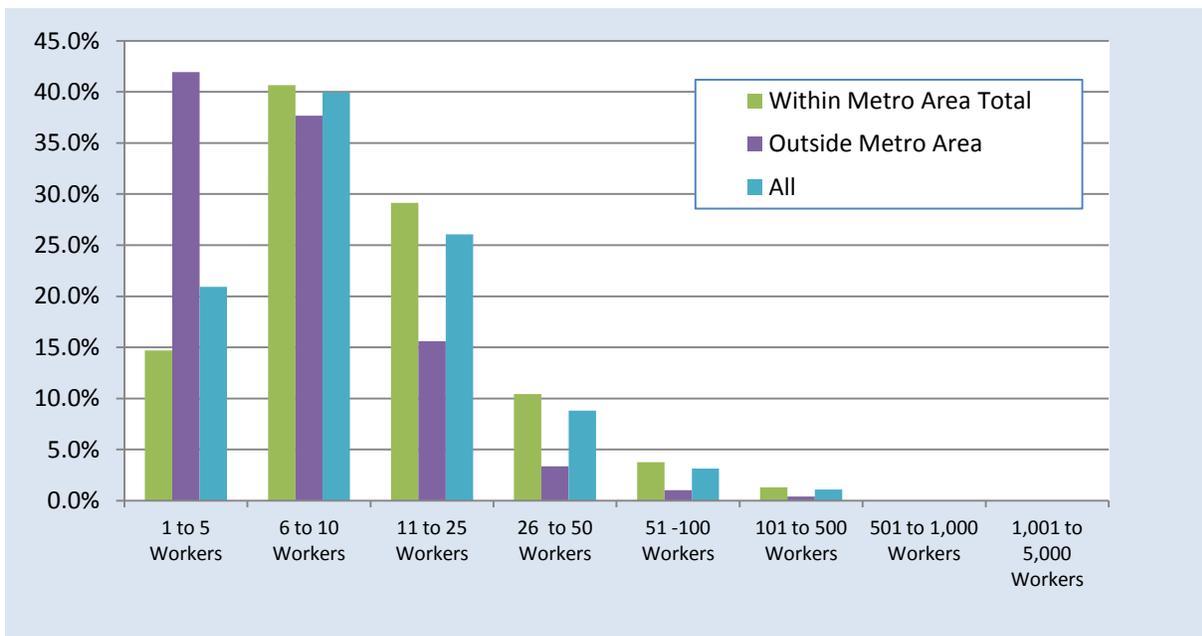
### *Trip Length Distribution*

Figure 3.25 graphs the trip length frequency distributions for work flows between all OD pairs within the Kansas City metropolitan area for both the LEHD-OTM and CTPP 2000 databases. The distances represent straight-line distances between Census Tract centroids, and for intra-Tract flows, an estimated internal distance was calculated by taking three quarters of the average distance to the three nearest Tracts (a typical assumption in modeling).

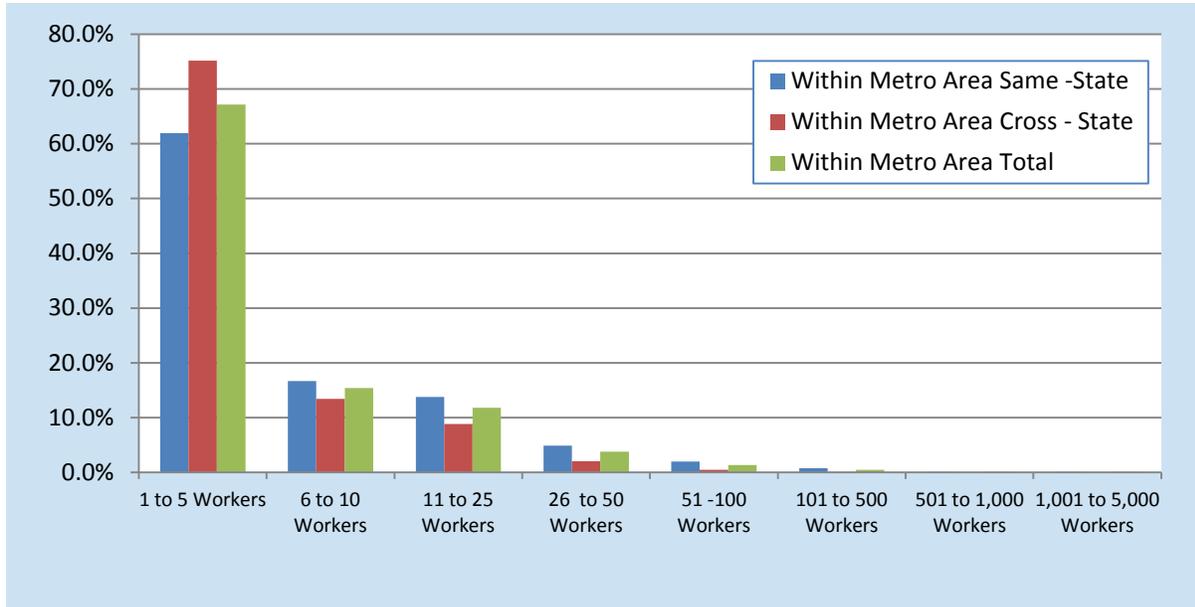
**Figure 3.21 Distribution of the Magnitude of Work Flows in the LEHD-OTM for the Kansas City Metro Area**



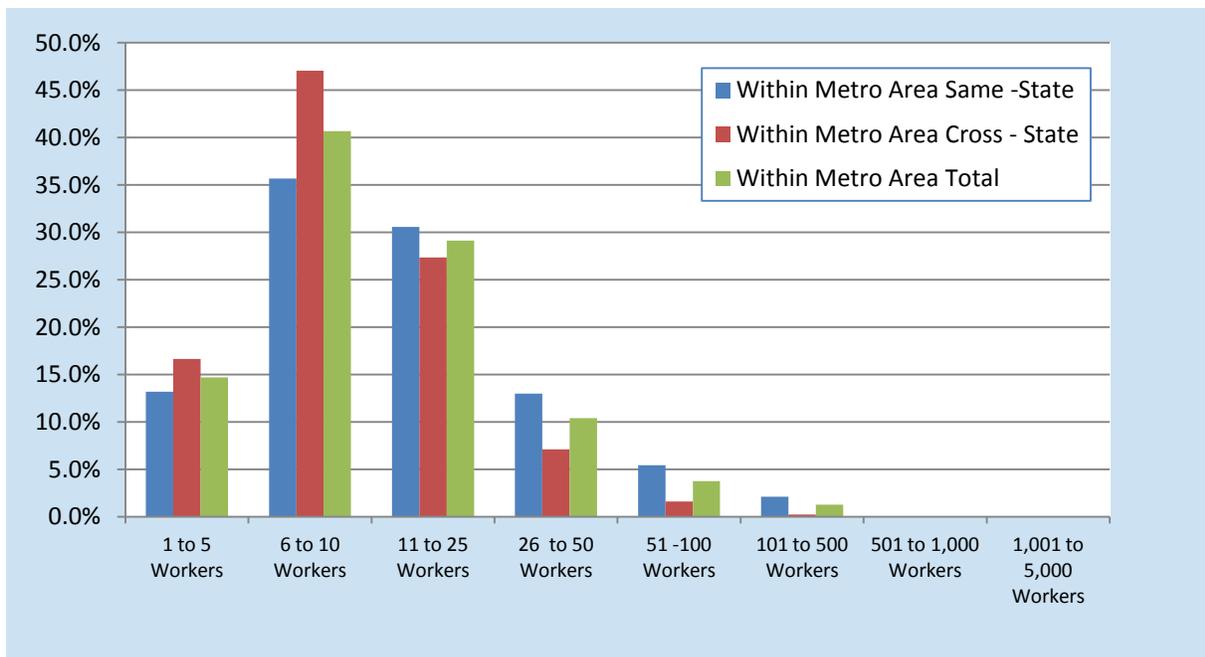
**Figure 3.22 Distribution of the Magnitude of Work Flows in the CTPP 2000 for the Kansas City Metro Area**



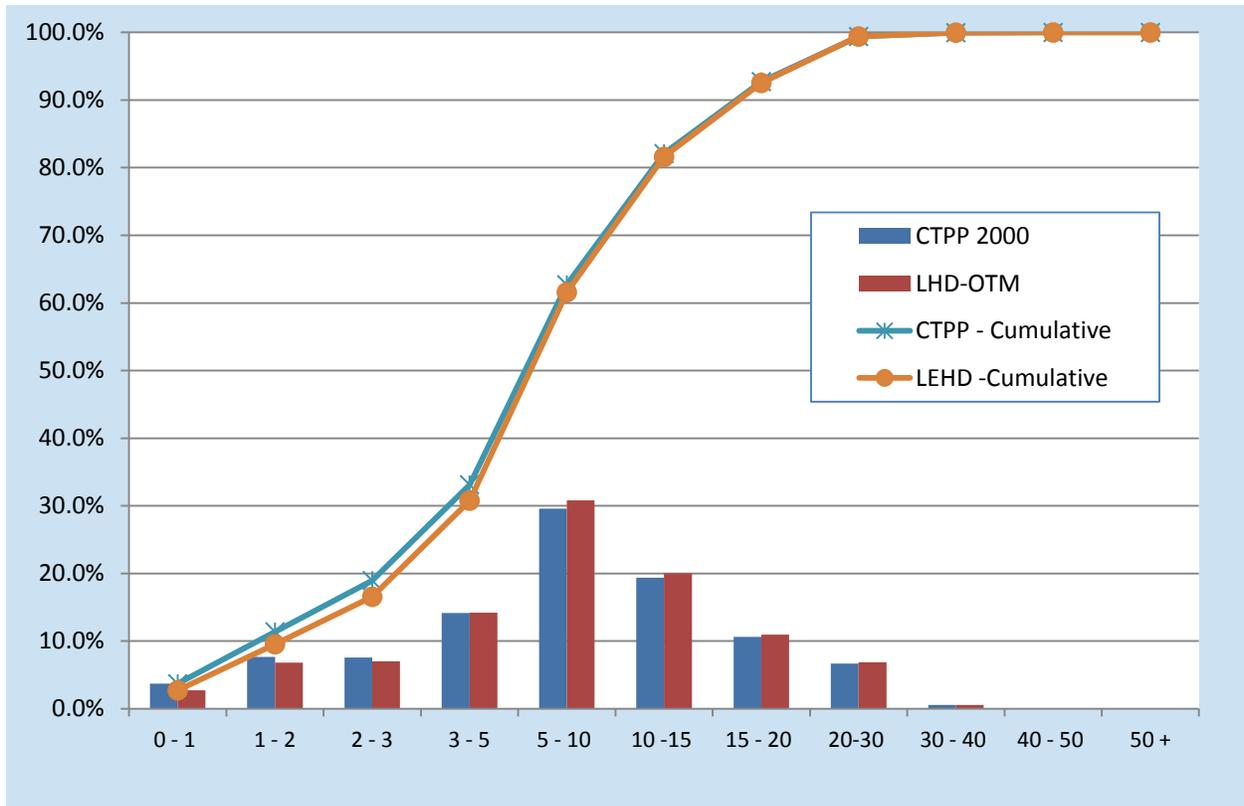
**Figure 3.23 Distribution of Within-State vs. Cross-State Work Flows in the LEHD-OTM for the Kansas City Metro Area**



**Figure 3.24 Distribution of Within-State vs. Cross-State Work Flows in the CTPP 2000 for the Kansas City Metro Area**



**Figure 3.25 Trip Length Distribution for Work Flows within Kansas City**



The trip length distribution patterns are even more similar for Kansas City than for the Twin Cities. This suggests that the LEHD-OTM data are not significantly impacted by work flows that cross state borders, or by whether a state has mandatory or voluntary reporting requirements for multi-worksites employers.

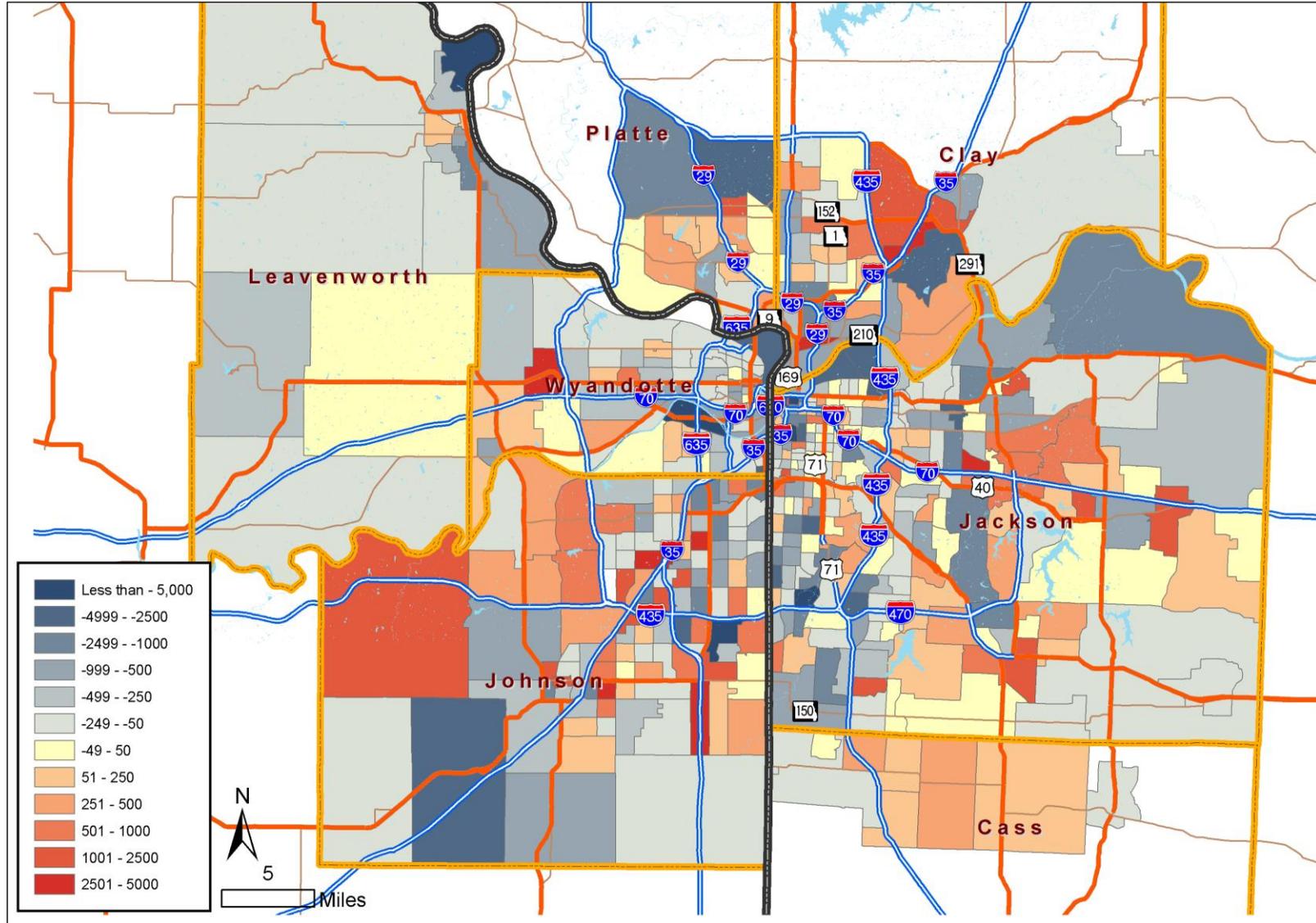
### *Geographic Distribution of Workplace Attractions*

Figure 3.26 presents a map of the Kansas City metropolitan area showing the difference in number of work flow destinations between the LEHD-OTM and the CTPP 2000 by Census Tract. Tracts that are colored blue-gray indicate where the number of work flow destinations in the CTPP 2000 are higher than in the LEHD-OTM. Tracts that are colored red-orange indicate where the number of work flow destinations in the LEHD-OTM are higher than in the CTPP 2000.

There are several noteworthy observations that can be made from the map:

- Several of the Tracts where LEHD-OTM work flows are significantly lower contain large federal or military employment, including Ft. Leavenworth, Bannister Federal Complex, and Kansas City International Airport.

Figure 3.26 Difference in Work Flow Destinations (LEHD-OTM – CTPP 2000) for the Kansas City Metro Area



LEHD-OTM work flows are also significantly lower in Tracts that contain major railroad yards.

- LEHD-OTM work flows are significantly higher in several Tracts where major development has occurred since 2000, such as the Kansas City Speedway.
- Tracts housing both the Hallmark Crown Center and Sprint's new headquarters in Overland Park, KS, the LEHD-OTM work flows are significantly lower than in the CTPP 2000. However, Sprint moved to its new headquarters location in 2008, and was not captured in either database.
- Several of Tracts where LEHD-OTM work flows are significantly higher than the CTPP 2000 include major regional shopping centers or large hospital complexes.

Looking at the geographic distribution of differences in work flow destinations for both the Twin Cities and Kansas City case studies, the following general observations can be made:

- LEHD-OTM and CTPP 2000 databases appear to be closer in those Census Tracts with large amounts of employment, and are more likely to be dissimilar in Tracts with relatively little employment.
- LEHD-OTM generally reports much lower work flows than the CTPP 2000 in those Tracts with major federal, military, or railroad employment. All of these employment categories are currently missing from the LEHD-OTM database.
- LEHD-OTM appears to report lower work flows than the CTPP 2000 in those Tracts with high levels of industrial development. It is not clear whether this is attributable to a systematic underreporting by the LEHD-OTM, an over-reporting by the CTPP 2000, or simply changes in workforce locations between 2000 and 2006.
- LEHD-OTM generally reports higher work flows to those Tracts containing major regional shopping centers and hospital complexes.
- LEHD-OTM appears to report slightly higher work flows than the CTPP 2000 in those Tracts with higher share of state government workers.
- LEHD-OTM captures work flows in those Tracts with recent development that did not exist when the CTPP 2000 data was collected.
- There is insufficient evidence to draw any definitive conclusions regarding the impact of multi-site employers on the locational accuracy of LEHD-OTM workplace locations.

## 4.0 Summary, Conclusions and Recommendations

### 4.1 OVERVIEW OF EMPLOYMENT DATABASES

This study investigated three alternative, publicly available sources of employment data that may be useful for transportation planning applications. These databases are the Quarterly Census of Employment and Wages (QCEW) collected by the Bureau of Labor Statistics (BLS), and two databases produced by the Census Bureau's Longitudinal Employment Household Dynamics (LEHD) program - the Quarterly Workforce Indicators (QWI) and OnTheMap (OTM).

#### **Quarterly Census of Employment and Wages**

The QCEW is a joint federal/state cooperative arrangement between the BLS and state ESAs. The state ESAs are responsible for collecting quarterly data on employment and wages from employers covered under state UI laws. BLS provides statistical methodology and direction to the ESAs to insure accuracy and comparability across states. BLS also provides funding to the states for quality assurance and data editing, and the conduct of the MWR and ARS surveys.

The QCEW database contains information on all firms that have paid employees and are subject to federal and state UI laws. This represents approximately 93 percent of all civilian employment in the United States, but excludes self-employed individuals, uniformed military personnel, and certain groups specifically excluded from UI laws. Relevant employment data contained in the QCEW that is of potential interest to transportation planners include number of establishments, total monthly employment, industry type, ownership type, and total wages paid by quarter. QCEW data are published quarterly, within six months of each reference quarter. Due to disclosure restrictions, publicly accessible QCEW data are available only at a level of geographic resolution that includes counties, MSAs or entire states. Some states and MPOs have successfully negotiated agreements with their state ESAs to obtain QCEW data files at more detailed levels of geographical resolution, but these agreements vary considerably from state to state with respect to access, permitted uses, and levels of geographic detail for which the data are provided.

## **Longitudinal Employer Household Dynamics**

The LEHD Program is based on a negotiated partnership arrangement between the Census Bureau and each state ESA. This partnership has evolved over a period of more than a decade, with the last few states joining as recently as 2010. Under the LEHD Program, the Census Bureau obtains a copy of the same enhanced microdata files that used to produce the QCEW, and merges these data with additional administrative data on individual workers that the Census Bureau collects from other federal agencies. The data are merged internally within the Census Bureau and subjected to a series of “disclosure proofing” procedures to prevent release of confidential information that would identify an individual worker or employer. The integrated employer-worker data is then published through two different databases – the QWI and OTM.

The QWI database is published quarterly, like the QCEW, but contains more extensive information on changes in labor force during the quarter, including number of new hires, layoffs, stable jobs, and changes in monthly earnings. Publicly accessible data is available at detailed levels of industry type (i.e., 4-digit NAICS), but only at a level of geographic resolution that includes counties, MSAs, and states.

The LEHD-OTM is a unique database that combines information on both the residence and workplace locations of workers at a level of geographic resolution (Census Block) that is most useful for transportation planning and travel demand modeling applications. Unlike the QCEW and QWI, which are employer-based, the LEHD-OTM is more worker-based, providing information on where workers in specific socio-demographic categories (i.e., age, income) and industry sectors live and work. LEHD-OTM is published annually, approximately one year following the reference year for which the data are collected.

## **4.2 RECOMMENDATIONS AND CONSIDERATIONS IN THE USE OF EMPLOYMENT DATABASES FOR TRANSPORTATION PLANNING**

This study has produced a number of useful insights into the strengths, weaknesses and applicability of the three employment databases for transportation planning and modeling. The following sections summarize these insights for each database.

## LEHD - OnTheMap

### *Applicability for Transportation Planning*

The LEHD-OTM should not be viewed as an alternative to either household travel surveys (including the CTPP) or to employer-based surveys (such as the QCEW), but rather as a complement to both types of data. The LEHD-OTM database does not contain information about the work trip itself; there are no attributes describing the choice of mode, route, travel and departure time, or costs for the trip to work. However, the LEHD-OTM is an excellent source of data for constructing or validating a detailed OD table of home-to-work flows between geographic areas that can range from individual Census Blocks to entire states.

Unlike sample-based surveys (such as the CTPP) the LEHD-OTM provides a (nearly) complete enumeration of home-to-work flows covering over 90 percent of all workers and employers in the United States. As such, it includes many more OD pairs containing low frequency residence-to-workplace flows than are collected through sampled data.

The LEHD-OTM data records provide information on the residence, workplace, and home-to-work flows between residence and workplace at the Census Block level of geographic resolution. Census Block information can be aggregated to Census Tracts, transportation analysis zones (TAZs), or any other geographic area that is appropriate for a specific transportation planning or modeling application. Attribute information available in each data record includes number of workers stratified by industry type (NAICS 2-digit sectors), age, income, education, ethnicity, and race.

### *Data Limitations and Gaps*

To comply with federal privacy restrictions, the LEHD-OTM is subjected to several “disclosure proofing” procedures. The most significant is that the distributions of worker attributes are perturbed slightly, creating a synthetic population for each Census Block. The changes made to worker characteristics do not change observed OD flows, and the synthetic distributions converge to actual observed distributions at more aggregate geographic areas, such as Census Tracts and counties.

The LEHD-OTM database currently does not include employment data for federal workers, self-employed individuals, uniformed military personnel, railroad workers, and certain other employment groups not covered under federal or state unemployment insurance laws. State DOTs or MPOs with significant concentrations of these excluded employment categories should supplement the LEHD-OTM with targeted data from surveys or other data sources.

LEHD-OTM data is currently not available for two states (MA and NH) and the District of Columbia. Data for these states is currently being processed, and should become available within the next year.

Concerns expressed by transportation researchers regarding inaccurate or missing secondary worksite locations for multi-worksite employers who refuse to file MWRs appear to be less serious than first thought. An analyses of the most recent MWR submissions conducted by the BLS indicates that less than 2 percent of all covered employment, nationwide, may be assigned to an incorrect worksite location due to employer noncompliance with MWR submissions. However, the analysis also showed that noncompliance rates vary significantly from state to state and by employer ownership category. For small geographic areas, such as Census Tracts or TAZs, even a relatively small discrepancy in workplace location could have significant impacts, by assigning too many workers to the primary worksite and no workers to secondary worksites.

To assess the severity of this problem and mitigate its impacts for specific applications, transportation planners and modelers could take the following actions:

- Use Appendix Table A-1 to determine, at a state level, what percentage of multi-worksite employers do not file MWRs, and how many employees they represent. States with higher noncompliance rates are more likely to have problems with misallocation of employment to secondary worksites, at least in some areas.
- Examine Census Blocks that contain large concentrations of employment for specific industry or ownership categories, like school district headquarters, corporate headquarters, hospitals, state capitals, universities, and regional shopping centers to see if the employment totals are unusually large, or if it looks like employment has not been distributed to secondary worksites.
- Where specific discrepancies are identified, use alternative data sources to help reallocate employment to secondary worksites. For example, The Department of Education maintains databases on all public schools in the United States, that include information on school locations, associated school district, and number of teachers assigned to each school.<sup>29</sup> These databases can be used to distribute employment that is reported only at the school district level to individual schools within the district.

A related issue concerns the way in which individual workers are matched to employers with multiple worksite locations. Only Minnesota requires employers

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<sup>29</sup> Department of Education, Common Core of Data, <http://nces.ed.gov/ccd/>

to file separate quarterly wage records (listing each employee by name and SSN) for each worksite, rather than single wage record for all sites. The allocation of individual workers to employment sites for multi-site employers for all other states is based on the Minnesota distribution.

LEHD-OTM data were compared to CTPP databases with respect to both workplace locations and residence-to-workplace flows, both at the county and Census Tract levels of geography. The findings from these comparisons were inconclusive as to whether differences in MWR reporting or use of Minnesota data to allocate workers to multi-site employer workplaces leads to serious inaccuracies in employment site locations. While significant differences in home-to-work flows were clearly observed between the two databases, many of these differences could be attributed to either missing employment categories in the LEHD-OTM data, the absence of low frequency flows between OD pairs in the CTPP data, or temporal differences in when the data were collected (i.e., 2000 CTPP vs. 2006 LEHD-OTM).

## **LEHD - Quarterly Workforce Indicators**

### *Applicability for Transportation Planning*

The LEHD-QWI is described as the “flagship” of the LEHD program. However, this database is designed primarily for analyses of workforce dynamics. Most of the additional attribute data that it includes pertain to changes in employment and wages, stratified by worker demographics and industry type, and are not particularly relevant to most transportation planning or travel demand modeling applications. Furthermore, LEHD-QWI data are only published for counties, MSAs, or states, making the available level of geographic resolution too coarse for most transportation applications.

## **QCEW**

### *Applicability for Transportation Planning*

The QCEW is the principal source of administrative record data on employer location, total employment and wages collected on a nationwide basis. It is an essential input to the LEHD Program and therefore shares many of the strengths and limitations of the LEHD-OTM database. Unlike the LEHD-OTM database, however, the QCEW contains only employer-based data; there is no information on worker related characteristics, such as residence location, demographic characteristics, or home-to-work flows.

The primary application of the QCEW in transportation planning is as a source of employer location and characteristics such as total employment, ownership, and industry type. This same information is also contained in the LEHD-OTM database, with the following differences:

- Publicly available QCEW data are only published for geographic areas that include counties, MSA's, and states; LEHD-OTM data is available at the level of the Census Block.
- QCEW data include industry codes down to the 6-digit NAICS level; LEHD-OTM data is only available at the 2-digit NAICS Sector level.
- QCEW data includes attribute data on both total employment, number of establishments, and employer size; LEHD-OTM only includes attribute data on total employment.
- QCEW data is published quarterly and is available within 6 months of the reference quarter; LEHD-OTM data is published annually, approximately one year after the reference year.

In lieu of using the publicly available QCEW database, some state DOTs (and even some MPOs) have entered into formal agreements with their state ESAs to obtain access to the enhanced QCEW microdata files that are used by BLS to develop the QCEW.<sup>30</sup> These enhanced microdata files contain data on individual employers, including addresses and geocoding of primary and secondary workplaces, additional contact information, monthly employment and quarterly wages by workplace, and current status. Due to the confidential information contained in these files, all agreements include restrictions on disclosure and use of the data. Because there is currently no formal, nationwide standard or prototype agreement, each agreement must be negotiated separately, and is subject to variations in interpretation by each state ESA regarding permitted uses of the data, requirements for data security and access, and even what data items are released.

## **CTPP**

### *Applicability for Transportation Planning*

Although formal evaluation of the CTPP database was not, strictly speaking, the subject of this study of employment databases, analyses that compared the CTPP and LEHD-OTM database inevitably raise questions on whether one database is “better” than the other for specific transportation planning and modeling applications.

As mentioned previously in this section, the LEHD-OTM database should not be viewed as an alternative for the CTPP, but rather as a complementary source of additional information. The CTPP contains information on journey-to-work

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<sup>30</sup> These files are more commonly known in the transportation community as ES-202 data, but this terminology is no longer used by BLS.

trips, based on a nationwide survey of sampled households conducted as part of the American Community Survey (ACS). It includes trip-related attributes (travel time, mode, departure time), that are not available in the LEHD-OTM. It also includes origin and destination locations for each sample journey to work trip, geocoded to counties in the 3-year sample, and potentially to Census Tracts in the 5-year sample, subject to disclosure restrictions promulgated by the Census Bureau (i.e., even at the county level, the 3-year CTPP excludes data for counties with less than 20,000 population).

Because the CTPP is a sample-based dataset, it must use an expansion process based on sample weighting to estimate the universe of home-to-work trips within a transportation study area. Sample weighting is a well known and accepted statistical procedure that is used extensively in transportation analysis and modeling. It relies on the assumption that the attributes in the sample data accurately reflect that distribution of those attributes in the entire study area. However, if the sample fails to capture information on an attribute or event with a low frequency of occurrence (e.g., a work trip via bicycle, or a trip between two distant zones), then that event is assumed to have a zero probability of occurrence, and all other sampled events are weighted slightly higher.

Use of sample-based data collection is especially problematic when the number of possible events is very large, and the frequency of occurrence for many of those events is very low, as is the case with developing an OD trip table. Because of its relatively small sample, the CTPP is not very effective at estimating the geographic distribution of home-to-work trips within a transportation study area such as an MPO or state. As shown in both the county-level and Census Tract level analyses, the geographic distribution of work trips from the CTPP is much “lumpier” with higher flows between OD pairs that were captured in the sample, and large numbers of OD pairs with no flows at all.

By contrast, the LEHD-OTM provides a nearly complete enumeration of flows between worker residences and workplaces that even includes flows between low frequency OD pairs. As such, it provides a distribution of home to work flows that is much closer to reality than can possibly be obtained from any sampled-based data collection method.

LEHD-OTM data can, and should be used in conjunction with sample-based travel survey data, like the CTPP, to smooth out the geographic distribution of home-to-work trips, and to develop more complete areawide OD matrices for home-based work trips that could be used in travel modeling applications.

## **4.3 RECOMMENDATIONS FOR ADDITIONAL RESEARCH AND ACTIONS**

### **Follow-on Analyses of LEHD-OTM Data**

Preliminary investigation of LEHD-OTM data at the Census Tract level has provided considerable insight into the accuracy and completeness of the database, and its potential applicability for transportation planning and travel behavior research. However, time and available resources only allowed us to “scratch the surface” in this study. Additional research, focused specifically on more detailed geographic comparisons of LEHD-OTM data with other data sources, and at other case study sites, is clearly warranted. Potential analyses should include:

- Mapping both the absolute number and share of work destinations by geographic area (i.e., Census Tract or Block Group) to identify areas with unusually high or low employment.
- Comparing LEHD-OTM work destinations against a more comprehensive employment database than the CTPP (i.e., commercial employment data) to identify areas with large discrepancies.
- Examining areas with large discrepancies in greater detail for possible causes, including missing employment categories (e.g., federal workers), new commercial development, or incorrectly assigned worker categories (e.g., no education employees in an area with several schools, or no health care workers in an area with a large hospital).
- Comparing differences in discrepancies across case study sites, including voluntary vs. mandatory reporting states, single vs. multi-state metropolitan areas, and large vs. small metropolitan areas.

The overall objective of this follow-on research should be to determine the overall accuracy and completeness of the LEHD-OTM relative to the best available sources of employment data, and to determine the magnitude of error introduced by known data gaps and processing methods in the LEHD-OTM. Better understanding of the type and severity of potential errors will give the transportation community more confidence in using the LEHD-OTM, and will provide direction for needed enhancements to the current data.

### **Better Documentation of Key LEHD-OTM Processing Steps**

Several of the processing steps used by the Census Bureau to develop the LEHD-OTM database are lacking sufficient or easily readable documentation to enable transportation researchers to understand underlying theories, assumptions and methodologies. These procedures include:

- The process by which federal databases on personal characteristics are integrated within StARS;
- The process by which employer locations are geocoded in the QCEW and LEHD (i.e., is geocoding done by state ESAs, BLS, Census Bureau, or all three agencies, and are edits shared and incorporated into all databases?)
- The model and procedure used to assign individual workers to worksites for multi-worksite employers, based on Minnesota data
- Disclosure proofing procedures used in developing the LEHD-OTM database, particularly the creation of synthesized distributions of worker attributes,

By developing documentation that is both understandable to transportation planners and that specifically addresses questions on how these procedures impact data applicability for transportation planning purposes, much of the current apprehension in using these data can be mitigated.

### **Improving Access to QCEW Enhanced Microdata**

While many of the potential transportation benefits associated with QCEW enhanced microdata files are already available in the LEHD-OTM data, better coordination between transportation agencies and state ESAs could help improve the quality and accuracy of employer location information, and provide access to even more detailed employment data for specific transportation applications. Currently, data sharing agreements are negotiated between transportation agencies and state ESAs on a case by case basis, with little or no general guidance on levels of access, allowable uses, or data security.

As part of this study, a sample of state ESA QCEW and LEHD data coordinators were surveyed on a variety of topics including data processing and quality control, data sharing agreements with other agencies, and categories of employment that are exempted from the state UI coverage. The results of this survey are presented in Appendix B. While several state ESAs have negotiated general data sharing agreements with other state agencies, some ESAs provide access to enhanced QCEW microdata only on a case-by-case basis and prohibit use of the data beyond that specific study for which it was granted.

One potentially useful research project would be to survey existing agreements between transportation agencies and state ESAs, and in coordination with AASHTO and BLS, develop a model agreement for sharing QCEW microdata that could be used universally by state and local transportation agencies.

## **Improved Coordination with the Census Bureau on LEHD-OTM Data**

To the extent that the LEHD-OTM data becomes recognized as a valuable resource for transportation planning, additional coordination will likely be needed between the transportation planning community and Census Bureau staff related to future data enhancements to the LEHD-OTM. Such enhancements might include:

- Inclusion of additional employment groups, particularly self-employed workers, sole proprietors, and small businesses with no paid employees.
- Adjustments in the stratification categories to improve compatibility with other transportation demographic data sources (e.g., income or age ranges).



# **A. Appendix**

**Table A.1 Multi-Worksite Employer Statistics by State**

Description			Total Establishments (Single-Unit and Multi-Unit)		Total Multi-Unit Employer				Multi Unit Employer that is providing data at the Worksite Level				Multi-Unit Employer that refuses to provide a breakout. Reporting as a Single Unit				Multi that is below BLS threshold for filing an MWR. Reporting as a Single Unit			
State	FIPS	MWR is Mandatory	Units	Employees	Units	% Total	Employees	% Total	Units	% Total	Employees	% Total	Units	% Total	Employees	% Total	Units	% Total	Employees	% Total
AL	01	YES	87,262	1,807,929	5,326	6.10%	887,407	49.08%	3,072	57.68%	848,390	95.60%	1	0.02%	629	0.07%	2,253	42.30%	38,388	4.33%
AK	02	NO	17,694	310,187	1,315	7.43%	178,188	57.45%	471	35.82%	136,337	76.51%	107	8.14%	24,784	13.91%	737	56.05%	17,067	9.58%
AZ	04	NO	127,901	2,392,165	1,800	1.41%	803,452	33.59%	1,127	62.61%	669,460	83.32%	402	22.33%	120,998	15.06%	271	15.06%	12,994	1.62%
AR	05	NO	70,524	1,133,523	1,887	2.68%	503,108	44.38%	1,886	99.95%	503,080	99.99%	1	0.05%	28	0.01%	0	0.00%	0	0.00%
CA	06	YES	1,229,551	14,453,198	14,311	1.16%	6,503,461	45.00%	8,587	60.00%	6,151,249	94.58%	491	3.43%	153,052	2.35%	5,233	36.57%	199,160	3.06%
CO	08	YES	145,183	2,179,579	3,418	2.35%	823,355	37.78%	2,229	65.21%	778,302	94.53%	145	4.24%	17,553	2.13%	1,044	30.54%	27,500	3.34%
CT	09	NO	95,794	1,588,360	3,284	3.43%	702,184	44.21%	1,804	54.93%	593,662	84.55%	206	6.27%	81,463	11.60%	1,274	38.79%	27,059	3.85%
DE	10	NO	25,931	396,005	431	1.66%	131,837	33.29%	390	90.49%	114,853	87.12%	25	5.80%	16,153	12.25%	16	3.71%	831	0.63%
DC	11	NO	33,224	701,044	248	0.75%	136,657	19.49%	248	100.00%	136,657	100.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
FL	12	YES	475,514	7,232,850	10,158	2.14%	3,224,435	44.58%	5,466	53.81%	3,025,154	93.82%	854	8.41%	142,681	4.42%	3,838	37.78%	56,600	1.76%
GA	13	YES	216,697	3,770,403	4,359	2.01%	1,810,984	48.03%	2,886	66.21%	1,736,302	95.88%	92	2.11%	29,545	1.63%	1,381	31.68%	45,137	2.49%
HI	15	NO	30,490	593,707	1,862	6.11%	345,621	58.21%	852	45.76%	304,236	88.03%	141	7.57%	27,349	7.91%	869	46.67%	14,036	4.06%
ID	16	NO	47,272	590,606	1,538	3.25%	247,377	41.89%	1,029	66.91%	226,819	91.69%	206	13.39%	14,033	5.67%	303	19.70%	6,525	2.64%
IL	17	NO	344,674	5,471,907	12,179	3.53%	2,341,834	42.80%	2,903	23.84%	1,718,207	73.37%	3,418	28.06%	510,973	21.82%	5,858	48.10%	112,654	4.81%
IN	18	NO	129,915	2,718,335	6,482	4.99%	1,278,534	47.03%	2,817	43.46%	1,109,935	86.81%	482	7.44%	108,225	8.46%	3,183	49.11%	60,374	4.72%
IA	19	YES	70,254	1,419,357	5,039	7.17%	759,180	53.49%	4,355	86.43%	746,705	98.36%	1	0.02%	19	0.00%	683	13.55%	12,456	1.64%
KS	20	YES	74,525	1,290,939	1,867	2.51%	378,663	29.33%	1,618	86.66%	366,781	96.86%	17	0.91%	6,460	1.71%	232	12.43%	5,422	1.43%
KY	21	NO	89,144	1,715,672	3,640	4.08%	745,086	43.43%	2,499	68.65%	721,409	96.82%	40	1.10%	2,526	0.34%	1,101	30.25%	21,151	2.84%
LA	22	YES	103,567	1,840,455	5,113	4.94%	744,112	40.43%	2,539	49.66%	677,755	91.08%	76	1.49%	18,079	2.43%	2,498	48.86%	48,278	6.49%
ME	23	YES	41,681	558,670	1,562	3.75%	245,545	43.95%	1,140	72.98%	233,270	95.00%	14	0.90%	5,592	2.28%	408	26.12%	6,683	2.72%
MD	24	YES	139,917	2,451,542	2,315	1.65%	1,029,732	42.00%	2,146	92.70%	1,023,985	99.44%	153	6.61%	5,369	0.52%	16	0.69%	378	0.04%
MA	25	NO	196,747	3,117,185	3,511	1.78%	1,371,312	43.99%	3,343	95.22%	1,341,442	97.82%	168	4.78%	29,870	2.18%	0	0.00%	0	0.00%
MI	26	NO	214,407	3,762,864	2,175	1.01%	1,202,895	31.97%	2,156	99.13%	1,202,042	99.93%	12	0.55%	638	0.05%	7	0.32%	215	0.02%
MN	27	YES	135,504	2,525,338	3,963	2.92%	1,143,380	45.28%	3,963	100.00%	1,143,380	100.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
MS	28	NO	55,175	1,074,637	2,720	4.93%	504,206	46.92%	1,667	61.29%	439,004	87.07%	133	4.89%	48,784	9.68%	920	33.82%	16,418	3.26%
MO	29	NO	140,717	2,561,976	4,301	3.06%	1,250,074	48.79%	4,297	99.91%	1,249,935	99.99%	4	0.09%	139	0.01%	0	0.00%	0	0.00%
MT	30	YES	36,467	412,173	847	2.32%	151,794	36.83%	847	100.00%	151,794	100.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
NE	31	YES	48,084	886,195	3,264	6.79%	458,286	51.71%	1,698	52.02%	362,479	79.09%	131	4.01%	66,633	14.54%	1,435	43.96%	29,174	6.37%
NV	32	YES	58,178	1,102,651	3,619	6.22%	514,803	46.69%	1,866	51.56%	391,755	76.10%	100	2.76%	95,516	18.55%	1,653	45.68%	27,532	5.35%
NH	33	YES	39,305	596,257	1,143	2.91%	255,838	42.91%	1,099	96.15%	253,098	98.93%	9	0.79%	1,550	0.61%	35	3.06%	1,190	0.47%
NJ	34	YES	233,275	3,698,988	2,706	1.16%	1,386,496	37.48%	2,296	84.85%	1,338,306	96.52%	93	3.44%	38,849	2.80%	317	11.71%	9,341	0.67%
NM	35	NO	45,715	776,519	1,876	4.10%	312,580	40.25%	1,217	64.87%	280,264	89.66%	104	5.54%	18,999	6.08%	555	29.58%	13,317	4.26%
NY	36	YES	520,171	8,333,756	11,838	2.28%	3,411,169	40.93%	6,109	51.61%	3,202,504	93.88%	420	3.55%	117,859	3.46%	5,309	44.85%	90,806	2.66%
NC	37	YES	202,060	3,808,596	11,144	5.52%	2,094,555	55.00%	3,882	34.83%	1,813,643	86.59%	503	4.51%	104,179	4.97%	6,759	60.65%	176,733	8.44%
ND	38	YES	22,112	364,437	1,857	8.40%	172,568	47.35%	894	48.14%	135,798	78.69%	54	2.91%	3,567	2.07%	909	48.95%	33,203	19.24%
OH	39	YES	222,043	4,869,110	6,135	2.76%	2,426,598	49.84%	5,619	91.59%	2,404,164	99.08%	65	1.06%	11,456	0.47%	451	7.35%	10,978	0.45%
OK	40	YES	84,106	1,490,002	2,780	3.31%	595,114	39.94%	2,092	75.25%	562,501	94.52%	329	11.83%	26,373	4.43%	359	12.91%	6,240	1.05%
OR	41	YES	109,993	1,590,047	5,237	4.76%	817,189	51.39%	2,233	42.64%	696,029	85.17%	365	6.97%	71,567	8.76%	2,639	50.39%	49,593	6.07%
PA	42	NO	276,170	5,461,799	12,739	4.61%	2,930,322	53.65%	8,389	65.85%	2,857,604	97.52%	55	0.43%	2,702	0.09%	4,295	33.72%	70,016	2.39%
RI	44	NO	32,030	438,120	477	1.49%	128,423	29.31%	469	98.32%	128,025	99.69%	4	0.84%	293	0.23%	4	0.84%	105	0.08%

Table A.1 (Continued)

Description			Total Establishments (Single-Unit and Multi-Unit)		Total Multi-Unit Employer				Multi Unit Employer that is providing data at the Worksite Level				Multi-Unit Employer that refuses to provide a breakout. Reporting as a Single Unit				Multi that is below BLS threshold for filing an MWR. Reporting as a Single Unit			
State	FIPS	MWR is Mandatory	Units	Employees	Units	% Total	Employees	% Total	Units	% Total	Employees	% Total	Units	% Total	Employees	% Total	Units	% Total	Employees	% Total
SC	45	YES	92,368	1,767,440	1,553	1.68%	671,424	37.99%	1,471	94.72%	653,415	97.32%	39	2.51%	14,998	2.23%	43	2.77%	3,011	0.45%
SD	46	NO	25,428	382,285	1,911	7.52%	171,199	44.78%	972	50.86%	148,922	86.99%	17	0.89%	1,856	1.08%	922	48.25%	20,421	11.93%
TN	47	NO	117,214	2,577,210	3,535	3.02%	953,857	37.01%	2,117	59.89%	832,034	87.23%	360	10.18%	93,228	9.77%	1,058	29.93%	28,595	3.00%
TX	48	NO	448,921	10,324,657	16,788	3.74%	4,972,758	48.16%	10,063	59.94%	4,753,546	95.59%	798	4.75%	104,853	2.11%	5,927	35.30%	114,359	2.30%
UT	49	NO	67,255	1,155,946	2,711	4.03%	587,349	50.81%	2,069	76.32%	573,025	97.56%	38	1.40%	3,303	0.56%	604	22.28%	11,021	1.88%
VT	50	YES	21,268	291,821	1,693	7.96%	125,627	43.05%	408	24.10%	86,497	68.85%	45	2.66%	8,816	7.02%	1,240	73.24%	30,314	24.13%
VA	51	YES	189,251	3,540,219	9,641	5.09%	1,820,465	51.42%	3,338	34.62%	1,573,593	86.44%	362	3.75%	83,466	4.58%	5,941	61.62%	163,406	8.98%
WA	53	NO	210,705	2,784,617	5,609	2.66%	1,130,134	40.58%	2,265	40.38%	984,587	87.12%	603	10.75%	96,659	8.55%	2,741	48.87%	48,888	4.33%
WV	54	YES	36,090	689,175	1,954	5.41%	350,071	50.80%	1,825	93.40%	347,731	99.33%	115	5.89%	2,221	0.63%	14	0.72%	119	0.03%
WI	55	NO	129,607	2,609,112	10,508	8.11%	1,403,326	53.79%	3,744	35.63%	1,113,869	79.37%	798	7.59%	180,710	12.88%	5,966	56.78%	108,747	7.75%
WY	56	NO	21,697	265,216	1,507	6.95%	132,247	49.86%	615	40.81%	83,832	63.39%	178	11.81%	37,323	28.22%	714	47.38%	11,092	8.39%
PR	72	YES	42,695	922,607	647	1.52%	391,826	42.47%	595	91.96%	379,924	96.96%	52	8.04%	11,902	3.04%	0	0.00%	0	0.00%
VI	78	YES	3,260	45,107	109	3.34%	17,540	38.89%	109	100.00%	17,540	100.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
<b>National Total</b>			<b>7,674,732</b>	<b>128,842,495</b>	<b>228,632</b>	<b>2.98%</b>	<b>57,676,177</b>	<b>44.76%</b>	<b>133,791</b>	<b>58.52%</b>	<b>53,324,830</b>	<b>92.46%</b>	<b>12,826</b>	<b>5.61%</b>	<b>2,563,820</b>	<b>4.45%</b>	<b>82,015</b>	<b>35.87%</b>	<b>1,787,527</b>	<b>3.10%</b>

Note: Data compiled by The Bureau of Labor Statistics from 1<sup>st</sup> Quarter 2011 QCEW submissions

- Highlight 1: 80 – 90 percent of employees of multi worksite employers are included in MWR
- Highlight 2: 70 – 80 percent of employees of multi worksite employers are included in MWR
- Highlight 3: Less than 70 percent of employees of multi worksite employers are included in MWR

**Table A.2 State Differences in Definition of Employment**

	Non-Agricultural Employment			Agricultural Employment		
State	Minimum Total Wages Paid	Minimum Time Period	Alternative Conditions	Minimum Total Wages Paid	Minimum Time Period	Alternative Conditions
<b>Federal Statute</b>	<b>\$1,500</b>	<b>in any Quarter</b>	<b>20 different weeks</b>	<b>\$20,000</b>	<b>in any Quarter</b>	<b>10 workers for 20 weeks</b>
AK	\$1,500	Anytime				
AR	No Minimum	10 days in a CY				
CA	\$100			\$100	in any Quarter	
DC	\$1,500	Anytime		No Minimum	Anytime	
FL				\$10,000	in any Quarter	5 workers for 20 weeks
HI	\$1,500	Anytime				
MD	\$1,500	Anytime				
MA			13 different weeks			
MI	\$1,000	in a CY				
MN	\$1,500	Anytime				4 workers for 20 weeks
MT	\$1,000	in a CY				
NV	\$225	in any Quarter				
NJ	\$1,000	in a CY				
NM	\$450	in any Quarter				
NY	\$300	in any Quarter		\$500	in any Quarter	
OR	\$225	in any Quarter				
PA	\$1,500	Anytime				
PR	\$1,500	Anytime		No Minimum	Anytime	
RI	\$1,500	Anytime		No Minimum	Anytime	
UT	\$1,500	Anytime				
TX				\$6,250	in any Quarter	3 workers for 20 weeks
VI	\$1,500	Anytime		No Minimum	Anytime	
WA	\$1,500	Anytime				
WY	\$1,500	Anytime				

**Note: Blank cells indicate no difference from federal statute**

**Figure A.1 Employment Exempted from Unemployment Insurance Coverage under the Federal Unemployment Tax Act<sup>31</sup>**

1. Agricultural labor performed for an employer that doesn't meet the minimum employer criteria of paying more than \$20,000 or employing labor on 20 or more days during any quarter in the current or previous calendar year;
2. Domestic service performed in a private home, college club, or fraternity/sorority unless total remuneration was more than \$1000 during any quarter in the current or the previous calendar year;
3. Work performed by an employee for an employer outside of the employer's normal trade or business for which remuneration was less than \$50;
4. Work performed aboard a non-U.S. vessel or aircraft operating outside U.S. territory;
5. Work performed by a family member in the employ of another family member;
6. Work performed by a U.S. government employee (civilian federal employees are covered under the UCFE Program, which is administered by state ESAs. Employment data is reported to state ESAs by most federal installations, except for certain national security agencies, which are omitted for security reasons);
7. Work performed in the employ of a state or municipal government or Indian tribe (although exempt under federal law, nearly all states have included services performed by state and municipal employees as covered employment. However, certain categories of employment, such as elected officials, temporary workers during a declared emergency, and political or policy-making advisors, are exempt from UI in many states);
8. Work performed in the employ of a religious, charitable, educational, or other organization described in section [501\(c\)\(3\)](#) which is exempt from income tax under section [501\(a\)](#) (state UI laws vary in their treatment of this exemption. Many states continue to exempt church employees, clergy, or members of religious orders, but do include employees of church-affiliated schools and employees of non-profit charitable organizations);
9. Work performed by railroad employees covered under the Railroad Unemployment Insurance Act (unlike federal employees, data on railroad employees are not typically reported to states ESAs);
10. Work performed in the employ of an academic institution by a student or spouse of a student as part of a financial aid package or as part of the academic curriculum, or in the employ of a hospital by a patient;

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<sup>31</sup> [26 USC TITLE 26, Subtitle C, CHAPTER 23, Sec. 3306](#)

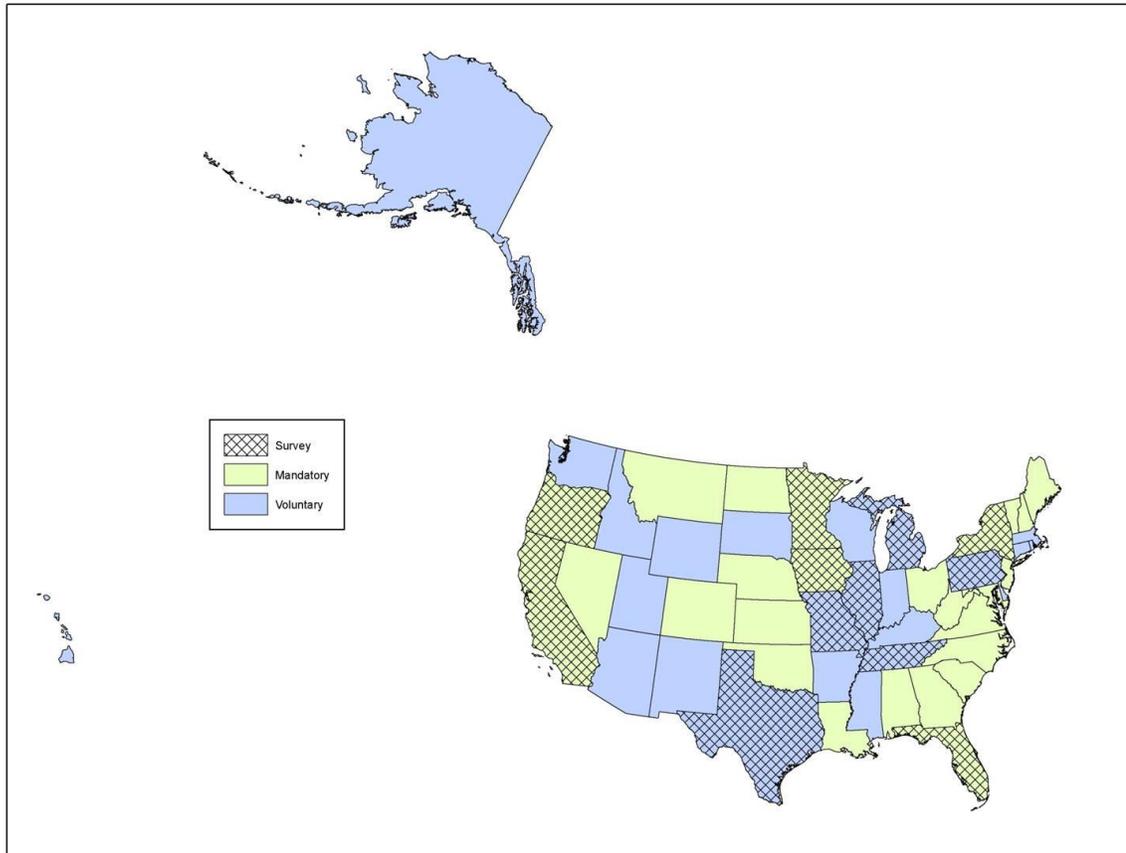
**Figure A-1. (continued)**

11. Work performed as an employee of a foreign government;
12. Work performed in the employ of an instrumentality that is wholly owned by a foreign government;
13. Work performed in the employ of a hospital or medical school by an intern or student nurse as part of the academic curriculum;
14. Work performed by an individual for a person as an insurance agent if remuneration is solely based on commission;
15. Work performed by an individual under the age of 18 in delivering newspapers, or in the sale of newspapers or magazines to customers;
16. Work performed as an employee of an international organization;
17. Work generally performed by the officers and crew of a fishing vessel (with certain specific exceptions);
18. Work performed by a non-resident alien, temporarily residing in the U.S. on a nonimmigrant visa as a student, teacher, researcher or consultant;
19. Work performed by a full-time student in the employ of an organized camp;
20. Work performed by an inmate in a penal institution.

## **B. Appendix**

# **Survey of State Employment Security Agency QCEW Data Coordinators**

The NCHRP surveys were conducted during the one-month period between 5/18/2011 and 6/17/2011. Care was taken to contact the same number of Mandatory [reporting] and Voluntary states, and to have a broad geographic coverage across the country. The contacted Mandatory states included California, Florida, Iowa, Minnesota, New York, and Oregon; the Voluntary states were Illinois, Michigan, Missouri, Pennsylvania, Tennessee, and Texas. Wyoming (Voluntary) was contacted but the survey was not completed.



Contact information was found on the Bureau of Labor Statistics' website, at <http://www.bls.gov/bls/ofolist.htm>. This site generally listed names and phone numbers for labor market information directors of state agencies. The initial phone call explained the nature of the survey and asked for the person best suited to answer the questions. In many cases, this was the director of the agency. In other cases, phone calls to several people within one agency (or several departments) were required.

Each respondent was asked about the types of workers covered under their state's unemployment insurance laws. Most states reported that state and municipal government (civil service) employees, public school teachers, and faculty and staff at public colleges and universities were covered under their

state's UI laws. Few reported that elected and appointed public officials, insurance agents working solely on commission, and real estate agents working solely on commission were covered. Details on their responses are reported, below.

**States reporting UI coverage**

Employee Category	Mandatory	Voluntary	Total
State and Municipal government (civil service) employees	5	6	11
Elected and appointed public officials	0	3	3
Public school teachers	5	5	10
Faculty and staff at public colleges and universities	5	6	11
Insurance agents working solely on commission	1	1	2
Real estate agents working solely on commission	1	1	2

Some respondents (three states) also reported that employees in religious organizations were not covered. Similarly, four states said that students/graduate students/students on work-study were not covered. Other categories of workers not covered included railroad workers, certain agricultural workers, and corporate officers. One state specifically mentioned temporary workers who were there for emergency reasons (e.g., floods, natural disasters). Finally, two states said that certain workers are reimbursable: public school teachers and employees of tax-exempt, non-profit organizations.

When asked if their state allowed voluntary election of coverage by employers for excluded workers, only one state (voluntary) said no. Two additional respondents did not know. About two-thirds of respondents reported that their state allows voluntary coverage by employers for excluded workers.

**States allowing voluntary election of coverage by employers for excluded workers**

Response	Mandatory	Voluntary	Total
Yes, allows voluntary election of coverage	5	3	8

Few respondents could offer insight into specific industries or categories of employers who typically elect voluntary coverage for excluded workers in their state. Two respondents said that religious organizations did this. Other responses included owners and officers of companies and not-for-profit agencies. No respondent could estimate the approximate number of excluded workers who are provided coverage on a voluntary basis in their state.

About half of respondents reported that their states receive quarterly tax reports and wage records on a regular basis from federal government agencies and military and Department of Defense installations. When asked, respondents said that the Military and DOD installations were reporting on civilian workers only, not all military personnel. Nearly all states said they receive this information from state agencies, state colleges and universities, county and municipal agencies, and public school districts.

### States Receiving Quarterly Tax Reports on a Regular Basis

Employer Category	Mandatory	Voluntary	Total
Federal government agencies	5	2	7
Military and Department of Defense installations	4	2	6
State agencies	5	5	10
State colleges and universities	5	5	10
County and municipal agencies	5	6	11
Public School Districts	5	6	11

Only one (Voluntary) state said they did not attempt to collect employment data from another source when it was not received.

About half the states who reported that they did not receive these quarterly tax reports and wage records from employers said they got data on federal government agencies and Military and Department of Defense installations (civilian workers only) from BLS Central Collection / EDI. Most said the BLS / EDI data was either fairly complete or very complete.

One Voluntary state reported receiving data on state agencies and county and municipal agencies from the state comptroller, and that it wasn't very good.

All Mandatory states reported that employers with multiple workplace establishments were mandated to submit a Multiple Worksite Report (MWR). Of the six Voluntary states, only one said that their state mandated employers with multiple workplace establishments to submit MWRs.

The five states with voluntary MWRs were asked to estimate the approximate percentage of employers who submit an MWR. The responses varied wildly. One

respondent estimated only about one to two percent. Another thought 70 to 75 percent. This variation was explained, finally, by a third respondent, who said that he thought that slightly more than 50 percent of employers with multiple worksites submitted MWRs voluntarily, which was about two percent of all employers in his state. Two respondents did not know the percentage of employers who submit an MWR. Finally, two states with Mandatory MWR submittal requirements said that even though employers were required to submit the form, they did not know how good the coverage was (one estimated about 65 percent). One used an analogy of the speed limit—it is the law and everyone is supposed to obey it, but not everyone does.

When asked if there were any specific categories of employers who do not submit MWRs, respondents generally did not know. However, the following responses were of great interest:

- The interesting thing with Minnesota is this: employers are exempt from submitting an MWR. Multiple worksite data is gathered electronically via wage records that are submitted electronically. (So it is mandatory, but not required.)
- It is a threshold-based item generally. If there are a certain number of employees at a primary location then the employer might submit a MWR. Similarly, if there is a certain number of employees at secondary locations, then the same.
- Employers who transfer to payroll processing service typically do not submit MWR because this requires additional fees (paid to the payroll processing service). [This was said by a respondent of a Voluntary state who reported very high employer MWR submissions on a voluntary basis.]

Most states receive MWRs from all categories of employers asked about in the survey.

<b>Employer Category</b>	<b>Mandatory</b>	<b>Voluntary</b>	<b>Total</b>
Federal government agencies	6	5	11
Military and Defense installations	6	5	11
State agencies	5	5	10
State colleges and universities	6	4	10
County and municipal agencies	5	5	10
Public School Districts	5	6	11

Respondents also spontaneously provided information on where the data comes from. This included:

Employer Category	Data Source	Number of States
Federal government agencies	Central collection / EDI	7
Military and Department of Defense installations	Central collection / EDI (Most said civilian workers only)	7
State agencies	State Department of Revenue	1
	All from state interface. Not MWRs.	1
	Silver Service	1
	In master report from state comptroller	1
	Agency Controllers	1
	They receive monthly data from state agencies and compile their own in-house MWR form from them.	1

About a third of states reported receiving only some MWRs from state colleges and universities, County and municipal agencies, and Public School Districts, or that the information received was not consistent.

A few respondents were asked to submit sample MWR forms. All seem to use the same form, found at: <http://www.bls.gov/cew/mwrforms.htm>.

Most respondents reported that their states conduct independent verification of the data they receive from employers on establishment locations

Response	Mandatory	Voluntary	Total
Yes, Independent MWR Data Verification	5	5	10

When asked how they verify the data they receive from employers on establishment locations, most respondents reported using the annual refiling survey (in which one-third of employers are sent an annual questionnaire to verify location and industry; every three years the full list is surveyed), comparing historical data, and using GIS to verify location. The responses are listed below.

Mandatory:

- If the employer does not cooperate (via electronic submission) then this triggers an audit, requiring them to submit information. The reporting format is basically an MWR. It behooves the employers to submit the information electronically.
- Compare with tax returns and contribution reports, compare MWR with historical data, internet checks to see locations of employers.
- Contact employers directly. Also send one-third of employers annual survey on industry and geography.

- Through QCEW refiling survey every 3 years. Every year, 1/3 of surveys accounts receive survey for NAICS and location verification.
- Will talk to people (employers) if the data is incorrect.
- Annual refile survey. Cooperative agreement. Software parameters that flags data that is out of bounds. They then examine this data and make corrections.

Voluntary:

- Updated data leads to annual refinement survey. They also send this annual refinement survey to approximately one-third of their employers, so their database is updated continually on a three-year rotating cycle.
- Continuous address verification.
- Call them. Also, quarterly editing.
- Annual refiling survey. Use ArcGIS to geocode all addresses. Verify addresses and counties to make sure they agree with data entry (esp. ZIP code).
- Verify records using annual refile survey. Use tax records. Use Internet searches. Other directories.

Few respondents (two) said that they work specifically with their state and local planning agencies and correct the quarterly employment data they receive for obvious errors. Most said they preferred to work directly with employers due to confidentiality issues. Everyone said that data corrections get incorporated into the QCEW data file submitted to BLS.

Only two-thirds of respondents reported that they share QCEW 1060 EQUI data with other agencies such as DOT.

Response	Mandatory	Voluntary	Total
Yes, share QCEW 1060 EQUI data	5	3	8

All states who share data have restrictions in place regarding data sharing agreements that users must sign. Nearly all respondents were willing to provide the name and phone number of the contact person who provides data access. Frequently, these data are restricted to purposes like statistical analysis, research purposes, economic analysis, or job creation. Respondents' responses to data restrictions are listed below.

Mandatory:

- The purpose must be to produce summary statistics, not identifying information.
- Confidentially. Should be used for research purposes or for purposes that lead to job creation or economic development.

- Not many. Confidential data cannot be disclosed. Internal projects only (to the disclosure agreement). They must enter into a confidentiality data sharing agreement.
- Yes, Census, IWD. Trying to get laws changed. Share aggregated, customized reports. Generally for economic development.
- Oregon is mandated to share data with federal, state, and local agencies for the purposes of governmental planning, performance measures, program analysis, socio-economic analysis, and policy analysis.
- California UI Code 1095 restrictions, which basically say the data can be used at the discretion of the Director.

Voluntary:

- People/agencies who wish to use the data must submit an application that states the purpose of use and fill out a form. There are restrictions on who can use the data and for what purposes. Certain people and agencies are more likely to get approval (universities, planning agencies) and must use for research purposes only. Cannot ID individual employers. In special circumstances, the Michigan Attorney General may grant special use of the data.
- The data are fully scrubbed to meet SIPSI Standards, and as such, are generally fully shared upon request. Secondary disclosure rules apply.
- Stipulations for who, what, specific purpose. Share data agreements. Confidentiality version--different version of the data.
- Confidentiality requirement must be met. For example, no firm-level data may be displayed. If aggregated, the data in each cell must contain at least three employers and no one employer may make up 80% or more of the data.
- If data agreement is met. The data agreement needs to be approved by more than one agency in Missouri, like the UI agency, as well as the QCEW. Must be used for "statistical purposes" and have prior approval for re-release.
- Must be used for statistical purposes. Must sign confidentiality agreement.

When asked to provide examples of successful data sharing with other agencies, or for any reports that they could sharing, many respondents were willing to either send reports or to provide a general url for further information. Their responses included the following:

- On occasion, the MPO, ongoing, routine basis.
- One state sent their data sharing agreement (template).
- One state sent several examples (pdfs).
- No, this would be published by the entity who uses the data.
- SEMCOG, for transportation planning purposes. MDOT, Michigan State University for geocoding.

- Wage Records data are shared with higher education coordination board. Workforce Earnings. <http://www.theccb.state.tx.us/>
- Various Iowa studies, occasionally.
- Have shared with the University of Tennessee and Economic / Commercial Development.
- <http://www.missourieconomy.org/>

Respondent were then asked what data was shared, and at what level (e.g., firm-level data, at what geography, what level of NAICS codes, etc.). Responses varied widely. Some states seemed to be willing to provide data at the firm level if the data sharing agreement was met; other states seemed vehemently opposed to sharing anything below the 3-digit NAICS, for any geography. Their responses are below.

Mandatory:

- Micro data with appropriate entities. Have shared individual employer information as long as there is no breach of privacy. The website shows tables to the township level at the 6-digit NAICS, as long as no identifying information is present.
- Depends on requesting entity. Everything from detailed firm-level to NAICS6 to NAICS2. Depends on summary data.
- Totally dependent on what the requestor needs. Willing to provide detailed data to the 6-digit NAICS if necessary.
- Generally 2-digit. Depends on geography. Generally not below 3-digit.
- They would share data at NAICS6 or even firm-level data if that was specific in the user agreement / confidentiality agreement.
- Online data is suppressed. They have given data out at the 6-digit NAICS or even at the employer level if their application for the data request is approved.

Voluntary:

- Depending on geography, NAICS4 at state level, NAICS3 at county or MSA.
- Full data, like wages.
- <http://www.twc.state.tx.us/customers/rpm/rpmsub3.htm>
- Don't know
- Data are not publically available. Will share at NAICS6 if the confidentially agreement is met.
- They are willing to share all microdata in full, 2-digit to 6-digit, or firm-level data, whatever, as long as the data agreement is met.
- Specific firm or NAICS6 if for research purposes with the understanding that such information would never be revealed.

All states surveyed reported participating in the U.S. Census Bureau's Local Employment Dynamics (LED) Program. When asked how long their state had

been a participant, most reported being part of the program for many years. Specifically:

Mandatory:

- From the very early stages. Signed data sharing agreement in 2000 or 2001.
- Unwilling to answer this. Said I could find all states' length of participation at the census web site LEHD page, "What's New" Link. I asked several times and she refused to provide the information. [I searched for, but could not find the data on the census LEHD web page.]
- She wasn't sure. "A long time"
- 10 years
- 10 years
- 10+ years

Voluntary:

- Since June 2006
- 5+ years
- From beginning. At least 7+ years (as long as he's been there)
- A long time. Soon after the LED program began
- Missouri was one of the first states to participate in the LED program
- 7 or 8 years

All respondents were asked to explain what additional data they collect or what additional processing they do to the QCEW and MWR files to support the LED program. According to the respondents, no state collects additional data or does additional processing to the QCEW data to support the LED program. Most states said they send the raw QCEW data and wage records to census via ftp. Many include current-quarter and prior-quarter data (with corrections) to census. One state (Pennsylvania) provides four data feeds to census for each quarter: End of Quarter + 2months, EOQ + 3 mos, +4 mos, and +8 mos. They already had this set up in-house and census asked for it, so it was not difficult to supply it.

When asked whether they provide one set of "official" QCEW and MWR files to BLS and a "modified" version to LEHD, about two-thirds of respondents said they do not.

	<b>Mandatory</b>	<b>Voluntary</b>	<b>Total</b>
Yes, BLS files sent differ from LEHD files	2	2	4
No, BLS files sent are the same as LEHD files	4	4	8

Respondents were asked to describe how the two files are different. They reported:

Mandatory:

- Some states are bound by a confidential data provision clause so they much provide separate data to BLS and census. MN uses the same level of confidentiality in both data sets, so they do not have to back out the sensitive data (that the BLS would have gotten) when they send the data to census. They use the same file for both.
- They send current-quarter (preliminary) and revised prior-quarter data. It is not substantively different than QCEW data.
- Two quarters of data: preliminary and final. Not substantively different than QCEW.
- They are the same – the LED comes from the QCEW. The census specifies which fields and types they need. He uses an archaic mainframe computer program to pull the data and upload it to census.
- Same official raw files.

Voluntary:

- Data is sent quarterly to the census. For each data upload, the previous quarter's data with its corrections is also sent.
- The data is the same, but the variables that census wants are different. LEHD is a subset of QCEW.
- BLS gets a slightly different file transmission than the census. The QCEW data is sent to BLS. BLS adds data and sends it back. This takes only a couple of weeks. Then, Illinois sends this to census.
- Each has their own set of confidentiality issues, but they are the same data set.
- The data is basically the same, but the QCEW data might have 5 or 6 quarters of data (that include corrections) while the census has only 1 quarter of data.
- They send the same fields. They may send preliminary and final quarters. Much is written into PA law (education, unemployment standards) so they cannot alter prior quarters' data.

No state reported conducting any independent verification of the data received from employers on establishment locations specifically for LEHD. In all cases, they said that this was handled by the QCEW data agency. Similarly, states reported that any errors found in the data were handled by the QCEW agency. Most said that if errors were found, that they (the QCEW agency) would contact the employers directly, not State or local planning agencies. In some cases, the person answering the LED portion of the survey was not the same as the person answering the QCEW part, so they tended to repeat information already learned from QCEW questions.



## **C. Appendix**

**Table C.1 Summary of Work Trip Flows for Atlanta, Georgia**

	County-to-County Home-to-Work Flows					County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation		OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>					<b>Region-to-Region</b>				
<i>LEHD 2006-2008</i>	100	1,479,453	14,794.53	30,640.39	<i>LEHD 2006-2008</i>	100	124,528	1,245.28	3,558.39
<i>CTPP 2000</i>	100	1,652,287	16,522.87	40,988.68	<i>CTPP 2000</i>	82	156,916	1,913.61	5,237.46
<i>CTPP 2006-2008</i>	100	1,927,750	19,277.50	50,277.36	<i>CTPP 2006-2008</i>	53	211,355	3,987.83	8,595.54
<b>Core-to-Rest of State</b>					<b>Region-to-Core</b>				
<i>LEHD 2006-2008</i>	617	82,104	133.07	337.99	<i>LEHD 2006-2008</i>	100	203,173	2,031.73	3,019.15
<i>CTPP 2000</i>	257	13,760	53.54	202.56	<i>CTPP 2000</i>	98	150,637	1,537.11	2,779.04
<i>CTPP 2006-2008</i>	140	20,374	145.53	428.49	<i>CTPP 2006-2008</i>	87	196,919	2,263.44	4,080.33
<b>Core-to-Out of State</b>					<b>Region-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	3,896	18,153	4.66	10.52	<i>LEHD 2006-2008</i>	606	36,126	59.61	175.27
<i>CTPP 2000</i>	621	14,140	22.77	24.48	<i>CTPP 2000</i>	154	13,311	86.44	238.10
<i>CTPP 2006-2008</i>	257	14,840	57.74	54.74	<i>CTPP 2006-2008</i>	65	19,994	307.60	514.98
<b>Rest of State-to-Core</b>					<b>Region-to-Out of State</b>				
<i>LEHD 2006-2008</i>	630	46,290	232.21	562.03	<i>LEHD 2006-2008</i>	2449	5,066	2.07	2.88
<i>CTPP 2000</i>	336	9,991	119.02	454.18	<i>CTPP 2000</i>	171	2,014	11.78	7.87
<i>CTPP 2006-2008</i>	194	4,297	228.34	857.56	<i>CTPP 2006-2008</i>	29	1,039	35.83	25.64
<b>Out of State-to-Core</b>					<b>Rest of State-to-Region</b>				
<i>LEHD 2006-2008</i>	5,302	5,557	4.82	12.86	<i>LEHD 2006-2008</i>	611	39,059	63.93	214.80
<i>CTPP 2000</i>	1,085	1,626	19.93	28.35	<i>CTPP 2000</i>	166	19,991	120.43	337.50
<i>CTPP 2006-2008</i>	351	8,484	52.66	58.32	<i>CTPP 2006-2008</i>	65	25,694	395.29	714.24
<b>Core-to-Rest of Region</b>					<b>Out of State-to-Region</b>				
<i>LEHD 2006-2008</i>	100	70,549	705.49	1,139.32	<i>LEHD 2006-2008</i>	2085	6,121	2.94	16.61
<i>CTPP 2000</i>	95	42,885	451.42	819.62	<i>CTPP 2000</i>	111	2,223	20.03	85.81
<i>CTPP 2006-2008</i>	74	53,015	716.42	1,176.27	<i>CTPP 2006-2008</i>	17	1,299	76.41	162.67

**Table C.2 Summary of Work Trip Flows for Quad Cities, Illinois/Iowa**

	County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>				
<i>LEHD 2006-2008</i>	9	125,138	13,904.22	15,833.46
<i>CTPP 2000</i>	9	163,582	18,175.78	21,254.00
<i>CTPP 2006-2008</i>	9	161,990	17,998.89	20,626.27
<b>Core-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	248	28,067	113.17	278.12
<i>CTPP 2000</i>	120	7,623	63.53	186.94
<i>CTPP 2006-2008</i>	63	8,725	138.49	262.26
<b>Core-to-Out of State</b>				
<i>LEHD 2006-2008</i>	659	1,535	2.33	2.89
<i>CTPP 2000</i>	59	531	9.00	7.68
<i>CTPP 2006-2008</i>	5	94	18.80	7.73
<b>Rest of State-to-Core</b>				
<i>LEHD 2006-2008</i>	233	27,404	117.61	337.01
<i>CTPP 2000</i>	107	9,917	92.68	310.91
<i>CTPP 2006-2008</i>	46	10,091	219.37	456.08
<b>Out of State-to-Core</b>				
<i>LEHD 2006-2008</i>	580	1,146	1.98	3.68
<i>CTPP 2000</i>	30	303	10.10	7.92
<i>CTPP 2006-2008</i>	2	50	25.00	5.00

**Table C.3 Summary of Work Trip Flows for Chicago, Illinois**

	County-to-County Home-to-Work Flows					County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation		OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>					<b>Region-to-Region</b>				
<i>LEHD 2006-2008</i>	36	3,227,923	89,664.53	258,795.59	<i>LEHD 2006-2008</i>	81	325,178	4,014.54	14,755.63
<i>CTPP 2000</i>	36	3,657,752	101,604.22	340,116.19	<i>CTPP 2000</i>	52	408,512	7,856.00	22,815.96
<i>CTPP 2006-2008</i>	36	3,886,850	107,968.06	346,647.60	<i>CTPP 2006-2008</i>	41	426,130	10,393.41	25,399.52
<b>Core-to-Rest of State</b>					<b>Region-to-Core</b>				
<i>LEHD 2006-2008</i>	278	70,885	254.98	700.83	<i>LEHD 2006-2008</i>	54	156,447	2,897.17	6,054.25
<i>CTPP 2000</i>	162	10,348	63.87	117.31	<i>CTPP 2000</i>	51	120,655	2,365.78	6,168.52
<i>CTPP 2006-2008</i>	102	12,879	126.26	169.24	<i>CTPP 2006-2008</i>	47	154,803	3,293.68	7,261.15
<b>Core-to-Out of State</b>					<b>Region-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	3,432	34,755	10.13	50.38	<i>LEHD 2006-2008</i>	336	12,913	38.43	110.46
<i>CTPP 2000</i>	671	18,918	28.19	57.47	<i>CTPP 2000</i>	77	4,325	56.17	135.22
<i>CTPP 2006-2008</i>	279	21,515	77.11	114.24	<i>CTPP 2006-2008</i>	31	4,071	131.32	172.10
<b>Rest of State-to-Core</b>					<b>Region-to-Out of State</b>				
<i>LEHD 2006-2008</i>	294	112,829	383.77	961.59	<i>LEHD 2006-2008</i>	2,500	60,951	24.38	234.46
<i>CTPP 2000</i>	192	23,022	119.91	336.93	<i>CTPP 2000</i>	266	20,225	76.03	471.64
<i>CTPP 2006-2008</i>	117	28,398	242.72	547.81	<i>CTPP 2006-2008</i>	69	22,252	322.49	1,050.24
<b>Out of State-to-Core</b>					<b>Rest of State-to-Region</b>				
<i>LEHD 2006-2008</i>	4,497	58,429	12.99	77.92	<i>LEHD 2006-2008</i>	374	17,225	46.06	184.34
<i>CTPP 2000</i>	1,293	39,832	30.81	119.18	<i>CTPP 2000</i>	79	11,291	142.92	432.86
<i>CTPP 2006-2008</i>	525	38,943	74.18	186.39	<i>CTPP 2006-2008</i>	35	13,498	385.66	719.89
<b>Core-to-Rest of Region</b>					<b>Out of State-to-Region</b>				
<i>LEHD 2006-2008</i>	54	44,846	830.48	1,607.56	<i>LEHD 2006-2008</i>	2,725	49,550	18.18	170.13
<i>CTPP 2000</i>	42	32,914	783.67	1,857.96	<i>CTPP 2000</i>	278	16,875	60.70	378.13
<i>CTPP 2006-2008</i>	38	41,210	1,084.47	2,217.63	<i>CTPP 2006-2008</i>	78	18,402	235.92	827.90

**Table C.4 Summary of Work Trip Flows for Dallas, Texas**

	County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>				
<i>LEHD 2006-2008</i>	225	2,406,113	10,693.84	58,044.99
<i>CTPP 2000</i>	190	2,520,639	13,266.52	77,824.88
<i>CTPP 2006-2008</i>	159	2,988,407	18,795.01	93,013.37
<b>Core-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	1308	191,992	146.78	996.15
<i>CTPP 2000</i>	433	18,199	42.03	107.03
<i>CTPP 2006-2008</i>	202	29,921	148.12	283.60
<b>Core-to-Out of State</b>				
<i>LEHD 2006-2008</i>	4106	16,754	4.08	11.75
<i>CTPP 2000</i>	617	12,304	19.94	25.36
<i>CTPP 2006-2008</i>	248	14,705	59.29	68.67
<b>Rest of State-to-Core</b>				
<i>LEHD 2006-2008</i>	1378	235,887	171.18	925.92
<i>CTPP 2000</i>	510	51,815	101.60	390.35
<i>CTPP 2006-2008</i>	246	55,422	225.29	571.95
<b>Out of State-to-Core</b>				
<i>LEHD 2006-2008</i>	5082	21,163	4.16	13.51
<i>CTPP 2000</i>	852	16,141	8.94	29.27
<i>CTPP 2006-2008</i>	261	12,613	48.33	48.28

**Table C.5 Summary of Work Trip Flows for Miami, Florida**

	County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>				
<i>LEHD 2006-2008</i>	9	1,903,650	211,516.67	220,023.15
<i>CTPP 2000</i>	9	2,086,205	231,800.56	281,654.13
<i>CTPP 2006-2008</i>	9	2,438,490	270,943.33	335,473.71
<b>Core-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	148	177,770	1,201.15	1,951.16
<i>CTPP 2000</i>	111	15,154	136.52	352.02
<i>CTPP 2006-2008</i>	86	21,245	247.03	591.44
<b>Core-to-Out of State</b>				
<i>LEHD 2006-2008</i>	1379	7,086	5.14	10.79
<i>CTPP 2000</i>	348	10,550	30.32	42.68
<i>CTPP 2006-2008</i>	157	11,538	72.49	90.40
<b>Rest of State-to-Core</b>				
<i>LEHD 2006-2008</i>	150	187,330	1,248.87	2,006.95
<i>CTPP 2000</i>	130	28,427	218.67	946.63
<i>CTPP 2006-2008</i>	106	44,286	417.79	1,426.59
<b>Out of State-to-Core</b>				
<i>LEHD 2006-2008</i>	2213	4,848	2.19	3.15
<i>CTPP 2000</i>	481	7,943	16.51	20.84
<i>CTPP 2006-2008</i>	165	7,503	45.47	42.61

**Table C.6 Summary of Work Trip Flows for Minneapolis, MN**

	County-to-County Home-to-Work Flows						County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation			OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>						<b>Region-to-Region</b>				
<i>LEHD 2006-2008</i>	49	1,271,526	25,949.51	60,662.99		<i>LEHD 2006-2008</i>	36	67,336	1,870.44	3,869.99
<i>CTPP 2000</i>	49	1,390,054	28,368.45	74,550.56		<i>CTPP 2000</i>	34	81,307	2,391.38	4,858.94
<i>CTPP 2006-2008</i>	49	1,437,445	29,335.61	72,474.97		<i>CTPP 2006-2008</i>	30	101,999	3,399.97	6,515.63
<b>Core-to-Rest of State</b>						<b>Region-to-Core</b>				
<i>LEHD 2006-2008</i>	250	51,652	206.61	409.37		<i>LEHD 2006-2008</i>	42	86,853	2,067.93	3,698.12
<i>CTPP 2000</i>	175	11,026	63.01	145.27		<i>CTPP 2000</i>	42	77,160	1,837.14	3,300.04
<i>CTPP 2006-2008</i>	119	13,211	111.02	206.68		<i>CTPP 2006-2008</i>	41	99,320	2,422.44	4,310.65
<b>Core-to-Out of State</b>						<b>Region-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	2288	9,593	4.19	11.87		<i>LEHD 2006-2008</i>	195	17,054	87.46	322.63
<i>CTPP 2000</i>	354	5,589	15.79	23.62		<i>CTPP 2000</i>	105	11,726	111.68	433.54
<i>CTPP 2006-2008</i>	128	4,848	37.88	40.38		<i>CTPP 2006-2008</i>	57	12,941	227.04	607.21
<b>Rest of State-to-Core</b>						<b>Region-to-Out of State</b>				
<i>LEHD 2006-2008</i>	252	77,627	308.04	621.08		<i>LEHD 2006-2008</i>	910	9,892	10.87	61.35
<i>CTPP 2000</i>	220	30,577	138.99	348.74		<i>CTPP 2000</i>	91	2,328	25.58	84.28
<i>CTPP 2006-2008</i>	189	37,380	197.78	471.78		<i>CTPP 2006-2008</i>	31	2,699	87.06	179.90
<b>Out of State-to-Core</b>						<b>Rest of State-to-Out of State</b>				
<i>LEHD 2006-2008</i>	2269	16,771	7.04	48.60		<i>LEHD 2006-2008</i>	195	11,211	57.49	209.37
<i>CTPP 2000</i>	492	12,886	26.18	95.30		<i>CTPP 2000</i>	109	9,019	82.74	239.72
<i>CTPP 2006-2008</i>	199	12,170	61.16	165.34		<i>CTPP 2006-2008</i>	67	10,582	157.94	349.48
<b>Core-to-Rest of Region</b>						<b>Out of State-to-Region</b>				
<i>LEHD 2006-2008</i>	42	17,600	419.05	644.02		<i>LEHD 2006-2008</i>	437	7,561	17.31	115.17
<i>CTPP 2000</i>	41	11,935	291.10	378.14		<i>CTPP 2000</i>	48	4,481	93.35	299.15
<i>CTPP 2006-2008</i>	35	15,620	446.29	558.08		<i>CTPP 2006-2008</i>	30	5,307	176.90	144.48

**Table C.7 Summary of Work Trip Flows for New York City, New York**

	County-to-County Home-to-Work Flows					County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation		OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>					<b>Region-to-Region</b>				
<i>LEHD 2006-2008</i>	100	4,152,808	41,528.08	85,532.98	<i>LEHD 2006-2008</i>	256	2,422,754	9,463.88	22,381.74
<i>CTPP 2000</i>	100	4,898,225	48,982.25	113,342.07	<i>CTPP 2000</i>	230	2,732,319	11,879.65	32,515.94
<i>CTPP 2006-2008</i>	100	5,516,880	56,294.69	131,039.01	<i>CTPP 2006-2008</i>	205	2,903,345	14,162.66	36,056.36
<b>Core-to-Rest of State</b>					<b>Region-to-Core</b>				
<i>LEHD 2006-2008</i>	464	43,990	94.81	206.38	<i>LEHD 2006-2008</i>	160	386,054	2,412.84	6,801.57
<i>CTPP 2000</i>	280	10,486	36.41	73.20	<i>CTPP 2000</i>	153	385,080	2,516.86	7,831.88
<i>CTPP 2006-2008</i>	140	8,363	59.74	60.98	<i>CTPP 2006-2008</i>	144	429,630	2,983.54	9,097.36
<b>Core-to-Out of State</b>					<b>Region-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	5345	37,987	7.11	23.21	<i>LEHD 2006-2008</i>	665	26,087	39.23	148.55
<i>CTPP 2000</i>	677	15,896	23.48	34.95	<i>CTPP 2000</i>	183	6,851	37.44	113.28
<i>CTPP 2006-2008</i>	244	15,266	62.57	74.59	<i>CTPP 2006-2008</i>	53	7,060	133.21	281.23
<b>Rest of State-to-Core</b>					<b>Region-to-Out of State</b>				
<i>LEHD 2006-2008</i>	466	57,217	122.78	248.35	<i>LEHD 2006-2008</i>	5580	143,512	25.72	267.12
<i>CTPP 2000</i>	260	8,470	32.58	77.16	<i>CTPP 2000</i>	818	56,942	69.61	436.82
<i>CTPP 2006-2008</i>	143	9,842	68.83	116.42	<i>CTPP 2006-2008</i>	322	63,887	198.41	759.67
<b>Out of State-to-Core</b>					<b>Rest of State-to-Region</b>				
<i>LEHD 2006-2008</i>	4431	45,228	10.21	68.99	<i>LEHD 2006-2008</i>	648	29,040	44.81	193.34
<i>CTPP 2000</i>	1072	41,394	38.61	159.84	<i>CTPP 2000</i>	257	15,367	59.79	345.33
<i>CTPP 2006-2008</i>	480	57,168	119.10	352.67	<i>CTPP 2006-2008</i>	119	17,097	143.67	578.40
<b>Core-to-Rest of Region</b>					<b>Out of State-to-Region</b>				
<i>LEHD 2006-2008</i>	160	171,161	1,069.76	1,618.39	<i>LEHD 2006-2008</i>	5729	323,035	56.39	685.83
<i>CTPP 2000</i>	147	117,961	802.46	1,547.09	<i>CTPP 2000</i>	1137	204,973	180.28	1,494.01
<i>CTPP 2006-2008</i>	131	127,325	971.95	1,720.76	<i>CTPP 2006-2008</i>	459	235,738	513.59	2,675.74

**Table C.8 Summary of Work Trip Flows for Portland, Oregon**

	County-to-County Home-to-Work Flows					County-to-County Home-to-Work Flows				
	OD Pairs	Total Trips	Mean	Standard Deviation		OD Pairs	Total Trips	Mean	Standard Deviation	
<b>Core-to-Core</b>						<b>Region-to-Region</b>				
LEHD 2006-2008	9	631,593	70,177.00	56,855.05		LEHD 2006-2008	25	217,911	8,716.44	21,625.66
CTPP 2000	9	699,983	77,775.89	77,212.08		CTPP 2000	25	273,862	10,954.48	27,555.97
CTPP 2006-2008	9	761,325	84,591.67	82,472.83		CTPP 2006-2008	24	317,385	13,224.38	32,672.68
<b>Core-to-Rest of State</b>						<b>Region-to-Core</b>				
LEHD 2006-2008	54	22,850	423.15	559.97		LEHD 2006-2008	15	104,376	6,958.40	9,240.72
CTPP 2000	43	2,426	56.42	45.29		CTPP 2000	15	84,227	5,616.13	9,681.55
CTPP 2006-2008	35	3,815	109.00	70.80		CTPP 2006-2008	15	95,790	6,386.00	11,184.74
<b>Core-to-Out of State</b>						<b>Region-to-Rest of State</b>				
LEHD 2006-2008	1,077	9,367	8.70	48.37		LEHD 2006-2008	86	19,365	225.17	482.09
CTPP 2000	178	4,571	25.68	46.07		CTPP 2000	55	7,457	135.58	447.14
CTPP 2006-2008	76	5,334	70.18	86.45		CTPP 2006-2008	40	9,133	228.33	595.54
<b>Rest of State-to-Core</b>						<b>Region-to-Out of State</b>				
LEHD 2006-2008	54	35,024	648.59	739.65		LEHD 2006-2008	1,066	26,361	24.73	310.45
CTPP 2000	46	5,137	111.67	106.12		CTPP 2000	139	6,685	48.09	248.34
CTPP 2006-2008	36	4,126	114.61	146.62		CTPP 2006-2008	52	7,564	145.46	470.92
<b>Out of State-to-Core</b>						<b>Rest of State-to-Region</b>				
LEHD 2006-2008	897	8,428	9.40	68.38		LEHD 2006-2008	89	20,137	226.26	661.83
CTPP 2000	180	5,348	29.71	103.09		CTPP 2000	52	7,432	142.92	512.53
CTPP 2006-2008	60	6,122	102.03	290.93		CTPP 2006-2008	32	8,633	269.78	788.58
<b>Core-to-Rest of Region</b>						<b>Out of State-to-Region</b>				
LEHD 2006-2008	15	36,268	2,417.87	2,436.41		LEHD 2006-2008	682	20,270	29.72	250.61
CTPP 2000	15	23,381	1,558.73	1,844.03		CTPP 2000	82	3,990	48.66	233.21
CTPP 2006-2008	15	28,990	1,932.67	2,242.98		CTPP 2006-2008	18	5,165	286.94	793.14

**Table C.9 Summary of Work Trip Flows for Seattle, Washington**

	County-to-County Home-to-Work Flows						County-to-County Home-to-Work Flows			
	OD Pairs	Total Trips	Mean	Standard Deviation			OD Pairs	Total Trips	Mean	Standard Deviation
<b>Core-to-Core</b>						<b>Region-to-Region</b>				
<i>LEHD 2006-2008</i>	16	1,132,617	70,788.56	173,323.53		<i>LEHD 2006-2008</i>	16	221,814	13,863.38	33,989.08
<i>CTPP 2000</i>	16	1,322,912	82,682.00	206,141.50		<i>CTPP 2000</i>	15	305,965	20,397.67	48,549.01
<i>CTPP 2006-2008</i>	16	1,434,715	89,669.69	219,732.82		<i>CTPP 2006-2008</i>	14	349,654	24,975.29	56,959.09
<b>Core-to-Rest of State</b>						<b>Region-to-Core</b>				
<i>LEHD 2006-2008</i>	81	46,388	572.69	1,019.04		<i>LEHD 2006-2008</i>	16	171,891	10,743.19	28,268.30
<i>CTPP 2000</i>	60	5,198	86.63	240.51		<i>CTPP 2000</i>	16	136,654	8,540.88	24,712.11
<i>CTPP 2006-2008</i>	42	6,794	161.76	409.86		<i>CTPP 2006-2008</i>	16	157,045	9,815.31	27,797.58
<b>Core-to-Out of State</b>						<b>Region-to-Rest of State</b>				
<i>LEHD 2006-2008</i>	1476	8,611	5.83	23.90		<i>LEHD 2006-2008</i>	81	22,127	273.17	527.24
<i>CTPP 2000</i>	269	7,410	27.55	45.43		<i>CTPP 2000</i>	41	5,939	144.85	458.72
<i>CTPP 2006-2008</i>	109	6,201	56.89	73.72		<i>CTPP 2006-2008</i>	30	6,125	204.17	516.37
<b>Rest of State-to-Core</b>						<b>Region-to-Out of State</b>				
<i>LEHD 2006-2008</i>	84	71,006	845.31	1,585.17		<i>LEHD 2006-2008</i>	879	3,110	3.54	8.96
<i>CTPP 2000</i>	67	12,660	188.96	429.52		<i>CTPP 2000</i>	100	1,750	17.50	14.93
<i>CTPP 2006-2008</i>	52	14,463	278.13	555.38		<i>CTPP 2006-2008</i>	28	1,013	36.18	25.50
<b>Out of State-to-Core</b>						<b>Rest of State-to-Region</b>				
<i>LEHD 2006-2008</i>	1394	8,996	6.45	42.17		<i>LEHD 2006-2008</i>	84	23,895	284.46	596.78
<i>CTPP 2000</i>	304	7,795	25.64	48.20		<i>CTPP 2000</i>	48	6,616	137.83	417.16
<i>CTPP 2006-2008</i>	124	7,245	58.43	79.39		<i>CTPP 2006-2008</i>	31	9,538	307.68	726.67
<b>Core-to-Rest of Region</b>						<b>Out of State-to-Region</b>				
<i>LEHD 2006-2008</i>	16	85,054	5,315.88	11,473.68		<i>LEHD 2006-2008</i>	698	2,225	3.19	10.52
<i>CTPP 2000</i>	15	48,035	3,202.33	7,563.37		<i>CTPP 2000</i>	52	626	12.04	12.90
<i>CTPP 2006-2008</i>	15	55,375	3,691.67	8,818.42		<i>CTPP 2006-2008</i>	14	710	50.71	37.36