Disclosure Risk Review of ACS Transportation Planning Tables

Final Report

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Introduction and Summary

For 3-year American Community Survey (ACS) Census Transportation Planning Products (CTPP) tables, under the auspices of Title XIII, the Census Bureau plans to suppress cells with unweighted cell counts of 1 or 2 in crosstabs (Rule of 3) involving Means of Transportation (MOT). This is a newly specified disclosure rule, which reduces the disclosure risk, however, it results in suppressed data in an estimated 33% of places with more than 20,000 residents (FHWA 2008) under a six-level MOT variable (MOT(6)), and 80% under MOT(10). Ironically, there were no constraints on the CTPP generated from the 2000 Census Long Form, which had a higher sampling rate than the ACS, and was for one-year only.

Elliot (2001) discusses several disclosure risk factors, including sampling fraction, level of detail on variables, level of geographic detail, and the size of the key (number of key variables). A key is a concatenation of the known variables and can serve as an ID when matching to other files. Elliot discusses the reduction of risk through data divergence, which includes response error, data coding error, data entry error, data aging, coding regimes, variable constructs, missing data imputed, and effects of disclosure control techniques (e.g., swapping). Further, he discusses the safety provided by constructing tabulations in lieu of microdata, which benefits from a smaller key size, as well as concerns about table linkage.

In this document, we attempt to quantify many of the issues mentioned above while conducting a data driven analysis of ACS Public Use Microdata Sample (PUMS) data to help measure the disclosure risk associated with the planned CTPP tables from the 3-year ACS, while measuring the remaining utility of the data.

In our analysis, we find low levels of disclosure risk in the CTPP tabulations of 3-year ACS data. The levels of risk for the set of tabulations range from 0.00% to a worst case scenario of 0.09%. The largest impact among seven components of data protection is from tabulations (in lieu of microdata) and sampling. Individual-level values of risk, i.e., assuming that the intruder has the pseudo-microdata record in hand, range from 0.97% to 3.43%. The analysis results noted in this document show the need to balance the low risk of the CTPP tabulations based on the 3-year ACS, with the large amount of data suppressed due to the Rule of 3. In summary, we conclude that the CTPP tabulations are at a low level of risk and the Rule of 3 is not warranted.

Inherent Protection

This section discusses the inherent protection of the CTPP tabulations.

Non-Matchability to ACS PUMS (Safe1)

External files are generally considered the largest threat to disclosure. Winkler (2004) describes the highest standard for estimating the proportion of records that can be re-identified. He describes that record linkage can be used to determine the level of confidentiality of a file, by matching the masked file to the original file. Winkler also discusses a scenario where it may be possible to match 0.5-2.0% of the records, which is stated as being at a non-confidential level, and that additional protection would need to be applied.

We apply a similar concept by creating an intruder scenario for CTPP variables, initially assuming the CTPP were microdata (for the moment). The scenario is to use the CTPP variables and link to the ACS PUMS data, gain much more information, and then use that additional information, and lower level of geography, to match to external sources to gain one's name, address, phone number, etc. Overall, the ACS PUMS includes well over 150 housing and person variables, while the number of housing and person variables crossed with Means of Transportation in the CTPP tables is less than 20. The ACS data is available for Public Use Microdata Areas (PUMAs) with a population of 100,000. The 3-year CTPP is for places with a population of 20,000 or more. The information about the ACS and CTPP variables is shown in Table A-1 in Appendix A. If matched, the additional data at a lower population could possibly be used to match to a real estate information file, disabled veterans file, or ancestry list, for example.

Data Driven Analysis (Safe1)

The following analysis attempts to simulate an intruder using a pseudo-microdata file of CTPP coarsened variables as a key, and matching to the ACS PUMS.

Data source: ACS PUMS 2006 Maryland.

Number of PUMAs: 44
Simulated Place: Within each PUMA, records were randomly selected at a rate of about 1/5 to create a place with a population of 20,000 (and 2/5 for 40,000).

Sampling Rate: The annual ACS PUMS sampling rate is 1%, which is 2/3 that of the full ACS sample (1.5%) for which the CTPP data are tabulated. Therefore, 2/3 of the ACS records were retained at random to emulate the ACS PUMS in relation to the CTPP.

Keys: The keys were set up as follows. KEY1 has a reduced set of variables (chosen fairly arbitrarily with identifiable characteristics). KEY2 contains all CTPP variables available on the ACS PUMS using MOT(6). KEY3 contains all CTPP variables available on the ACS PUMS using MOT(10). We note that the file does not include the CTPP variables' relating to the number of vehicles, and the number of workers in the household, so they are excluded from this analysis. We also note that the levels of the age of youngest child are slightly different than the CTPP variable. These idiosyncrasies are expected to have minimal or negligible impact on our analysis. Table 1 shows the list of keys.

Table 1. List of Keys

Key	List of variables (levels)
KEY1	**MOT (6),** Age (7), Disability (2), Minority (2), Occupation (7), Sex (2)
KEY2	**MOT (6),** Age (7), Class of Worker (8), Disability (2), Earnings (4), Industry (15), Years in US (3), Minority (2), Occupation (7), Sex (2), Time Leave (8), Travel Time (10), Age Youngest (4), Income (8), Poverty (3)
KEY3	**MOT (10),** Age (7), Class of Worker (8), Disability (2), Earnings (4), Industry (15), Years in US (3), Minority (2), Occupation (7), Sex (2), Time Leave (8), Travel Time (10), Age Youngest (4), Income (8), Poverty (3)

Example: Suppose there are 150 ACS PUMS records, then there are about 30 CTPP records among the 150 records, and there are about 100 ACS records. When matching between the 30 CTPP records (treating them as pseudo-microdata records) to the 100 ACS records using the key, if 20 ACS records match exactly, then there is a disclosure problem. If 50 match, then the intruder is only 20/50 chance of a correct match. An exact matching criteria is used, however, other probabilitistic matching approaches can be applied as well.

Let the value of a safe file, adjusted for the level of geography, be as follows:

P(Safe1) = (1-P(ExactMatch))*(CTPP place population/100,000).

Where,

P(ExactMatch) = Expected number of matches / Actual number of ACS records that matched.

The P(Safe1) measure accounts for benefits of coarsening and suppression of CTPP variables, and also accounts for disclosure risk due to lower levels of geography. Tables 2 and 3 provide the average match rate across the 44 PUMAs, and the values of P(Safe1) by place size and key. The keys involve highly coarsened versions of the CTPP variables. We are not proposing these versions of CTPP variables; rather they are formed to gain understanding of this component of disclosure risk.

Table 2. Values of P(ExactMatch)

	Key		
Place Size	**KEY1**	**KEY2**	**KEY3**
20000	0.238	0.988	0.990
40000	0.390	0.988	0.989

Table 3. Values of P(Safe1)

	Key		
Place Size	**KEY1**	**KEY2**	**KEY3**
20000	0.152	0.002	0.002
40000	0.156	0.005	0.004

The above analysis shows that even the highly coarsened variables give a high probability of an exact match (can't get much higher) when the full set of CTPP variables are available as a key, however, a reduced set of key variables lends itself to more data protection. Also, the difference between the match rates for KEY2 that uses MOT(6) and KEY3 that uses MOT(10) is negligible.

Since CTPP variables are coarsened, the disclosure risk due to outliers is reduced from that attributable in microdata. Table A-1 provides the lists the CTPP demographic variables along with the number of levels used in the CTPP tabulations. In addition, the corresponding PUMS variables are displayed along with the corresponding number of levels. As can be seen, virtually all the variables have been coarsened for the CTPP tabulations. For several variables, the level of coarsening is substantial and particularly for some key variables with higher levels of disclosure risk, such as, age (collapsed from 84 to 7 levels).

Tabulations (Safe2)

The analysis in the preceding section assumed that the CTPP file is a pseudo-microdata file for a place of 20,000 (and 40,000) that includes about 20 variables. Providing tables, as for the CTPP[1], instead of microdata, is a form of reducing the risk of disclosure. Unlimited cross-tabulations (n-way) can, in effect, eliminate the benefit of publishing tables to reduce the risk of disclosure. However, for CTPP, only 2-way (sometimes 3-way) cross-tabulations are created, therefore, reducing the chance of successful identification by an intruder. Therefore, the matchability disclosure risk -- inherent in microdata files -- is greatly reduced due to 2-way or 3-way tabulations.

Sample Uniques

For CTPP, table linking possibilities seems most prevalent for sample uniques (an unweighted cell count equal to 1) in the marginal of MOT. When this occurs, the cell estimate will be the same for the cell in each table, and so one will assume the cell is a sample unique, and consequently through table linkage, know the respondents' MOT, age category, gender, income category, and other categorical variables involved in the CTPP tables. The following two tables (Tables 4 and 5) provide a very simplified illustration where CTPP variables can be strung together to identify a Female Minority Biker/Walker.

Table 4. Unweighted cell count illustration, MOT(2)*Minority(2)

	Minority Status (2)		
MOT(2)	Minority	Non-Minority	Total
Biker/Walker	1	0	1
Other	200	179	379
Total	201	179	380

Table 5. Unweighted cell count illustration, MOT(2)*Gender(2)

	Gender		
MOT	Male	Female	Total
Biker/Walker	0	1	1
Other	300	79	379
Total	300	80	380

[1] There are three sets of CTPP tables: Residence, Workplace, and Flow.

If the cell count for an internal cell is equal to 1, and the MOT marginal is greater than 1, then due to CTPP tables being limited to 2-way or 3-way crosstabs (all crossed with MOT), the table linking possibilities are reduced or eliminated as the MOT marginal counts increase.

Two Unweighted Cases

Suppressing cells that contain an unweighted cell count with less than or equal to 2 cases is a common rule applied in tabular releases. The only reason to do so is if a person in the sample finds his/her own cell in each table, and it is a cell count of 2, and then that respondent can identify his/her cell partner as a pseudo-microdata record. Such a rule can be viewed as additional protection beyond what is provided through a microdata file.

For cell counts of 2 in marginals of MOT, it is likely that the 2 respondents will be in different cells in other tables. Furthermore, if the 2 respondents have different weights, then it becomes a table linking scenario and it is plausible that one can string together the tables to form a pseudo-microdata record. The same can be said for counts of 3, 4, and so on, with the likelihood of creating a pseudo-microdata record being reduced as the cell counts increase. However, when the marginal is greater then two, the disclosure risk becomes greatly reduced or eliminated.

Data Driven Analysis (Safe2)

The following analysis attempts to measure the impact on disclosure risk from doing CTPP tabulations, in lieu of releasing microdata. The analysis set up similar to the analysis for the Safe1 measure. The analysis only addresses small cells in terms of counts of 1 or 2, and does not address the impact of thresholds on weighted cell counts.

Data source: ACS PUMS 2006 Maryland.

Number of PUMAs: 44

Simulated Place: Within each PUMA, records were randomly selected at a rate of about 3/5 to create a place with a population of 20,000. A rate of 3/5 was used to account for the 3-year ACS, and to account for places being 1/5 the size of a PUMA.

Tables: 15

Consistent with the planned 2-way and 3-way crosstabs with MOT shown in Appendix A Tables, the following crosstabs with MOT (6-levels and 10-levels) were performed: Age (7), Class of Worker (8), Disability (2), Earnings (4), Industry (15), Years in US (3), Minority (2), Occupation (7), Sex (2), Time Leave (8), Travel Time (10), Age Youngest (4), Income (8), Poverty (3), Poverty*Minority (6). This set of crosstabs is a slightly reduced set of tables due to the unavailability of a small number of variables. Also, other more detailed versions of variables are planned, which could have some limited impact on the analysis of these results. The conclusions from the analysis results should be limited to the versions of variables used. However, the effect of having a slightly reduced set of tables is expected to be offset by the CTPP tabulations having a higher sampling rate than in the analysis set up using ACS PUMS data.

For each place in each PUMA, the percentage of records contributing to cell counts equal to 1 across the 15 tables was computed, as well as for cell counts less than or equal to 2. The average percentage was computed across the PUMAs.

Let the value of P(Safe2) equal the following:

P(Safe2) = 1 – proportion of records linkable to all tables to find KEY2 (or KEY3)

Table 6 shows that for places of 20,000, when MOT(6) is used in crosstabs, only 0.1% of records are linkable throughout all tables to find KEY2 due to being sample unique (i.e., P(Safe2) = 1-0.009). The percentage of records needed to find KEY1 (reduced set of variables) is equal to 0.1% as well, since once you link up 5 tables, one can likely link up all tables. The percentage increases to 0.7% if one conservatively views cell counts of 2 being linkable to find KEY2 (0.4% to find KEY1). About 12% of the records were sample uniques in at least one table. For larger places, the percentage linkable is expected to be reduced further. When MOT(10) is used in crosstabs, the corresponding percentage linkable due to sample uniques to find the KEY3 is 0.4%, and 2.5% when considering cell counts of 2 or less. Therefore, the risk increases when there are more categories of MOT(10), however, it is minimal in terms of its impact on the magnitude of overall risk discussed later in this document.

As a secondary point, the table also provides estimates of the risk level of each variable. For example, 12.7% of records contributing to the MOT(10)* Industry (15) crosstabs in the pseudo-places of size 20,000 across the 44 PUMAs have cell counts of 2 or less. Relative to the other

variables, Industry is the most problematic. To reduce risk levels, collapsing categories of Industry may help to a limited extent.

Table 6. Estimated Percentage of Records Contributing to Small Cells: 2006

	Place Size = 20,000			
	MOT(6)		MOT(10)	
Crosstabs with MOT(6)	Cell Count Equal to 1	Cell Count Less Than or Equal to 2	Cell Count Equal to 1	Cell Count Less Than or Equal to 2
Age (7)	2.3%	5.3%	3.6%	7.5%
Class of Worker (8)	2.5%	4.9%	4.1%	7.0%
Disability (2)	0.6%	1.5%	1.1%	2.6%
Earnings (4)	1.4%	3.0%	2.8%	5.6%
Industry (15)	4.9%	9.3%	7.1%	12.7%
Years in US (3)	0.9%	1.7%	1.5%	3.4%
Minority (2)	0.4%	0.8%	0.8%	2.0%
Occupation (7)	2.0%	4.1%	3.3%	6.8%
Sex (2)	0.5%	1.3%	1.3%	2.9%
Time Leave (8)	1.9%	4.2%	3.8%	7.1%
Travel Time (10)	2.4%	4.6%	4.1%	7.6%
Age Youngest (4)	1.5%	3.4%	2.7%	5.5%
Income (8)	3.0%	6.2%	5.0%	9.4%
Poverty (3)	1.0%	2.0%	1.4%	3.2%
Poverty*Minority (6)	1.5%	2.8%	2.2%	4.2%
Percentage of Records Linkable to all Tables to find KEY2 or KEY3 (1-P(Safe2))	0.1%	0.7%	0.4%	2.5%
Percentage of Records Linkable to find KEY1	0.1%	0.4%	0.4%	1.2%
Percentage of Records in at Least One Small Cell	11.7%	39.4%	15.5%	46.6%

Source: 2006 American Community Survey PUMS for Maryland

Sampling Fraction (Safe3)

Sampling reduces the risk of disclosure as compared to a census of individuals. The Census Bureau provided a weight distribution for workers 16 and older, residing in Maryland, from the 2006 ACS. The average weight was about 79. For 3-year estimates, the weights can be estimated through division by 3, and therefore the average is about 26. The weights take into account differential sampling rates, nonresponse, and a calibration adjustment. Taking the inverse, the average proportion represented by the ACS participants over the course of 3 years for places with 20,000 or more in Maryland is about 3.8% (compared to about 17% from the 2000 Census Long Form). The

maximum rate is about 10% -- however, this is highly unlikely since sub-areas would have had to have the highest sampling rates, which is only applied to very small areas.

The relationship between disclosure risk and sampling fractions has been well documented. The *mu-Argus* 4.1 manual provides a discussion of how disclosure risk is measured by an approximation to the hypergeometric function in the software for their microdata using the sampling fraction when an intruder knows the unweighted cell count is 1 (sample unique). Under the assumptions that the intruder has a full, high quality, registry of individuals to match pseudo-microdata variables for CTPP, the probability of a correct match, given a cell count equal to 1 for cell *k*, is expressed as:

$- \log(p_k)(p_k/(1- p_k)$

where $p_k =$ sampling fraction = 0.038.

Then, $P(Safe3) =1-(- \log(p_k)(p_k/(1- p_k))$

The sampling fraction is estimated as the number of respondents in cell k, divided by the estimated population size in cell k (sum of weights across respondents).

For the CTPP, P(Safe3) = 1- 0.056 = 0.944. The value of P(Safe3) is larger than the sampling fraction, and provides an upper bound of the risk. This is because of the uncertainty in the denominator of the sampling fraction due to the estimate of the cell population size by the sum of the weights. Skinner and Shlomo (2008) discuss alternative risk measures using log-linear models.

Disclosure Risk Measure

Framework

The initial evaluation measure for a safe file due to inherent protection (InitSafe) can be expressed as:

P(InitSafe) = 1-(1-P(Safe1))(1-P(Safe2))(1-P(Safe3)).

Additional protection from disclosure is due to the following events:

- Perturbation or data swapping (Safe4)
- Moving or change of jobs over a 3-year period (Safe5)
- Imputation (Safe6)
- Uncertainty or divergence of variable (Safe7)

The impact of the additional measures on the overall value of a safe record is captured as follows:

P(Safe) = P(InitSafe) + (1-P(InitSafe))*(1-(1-P(Safe4))(1-P(Safe5))(1-P(Safe6)(1-P(Safe7)).

Additional Sources of Protection

Swapping (Safe4)

Swapping is used to reduce the risk of disclosure in ACS data products. The swapping rate is confidential to the DRB. Without any other information available, we assume that about 5% of the records (perturbation rate) have been perturbed (changed) and that it is constant across variables, although we realize that swapping is likely applied to higher risk variables.

With a 5% perturbation rate, we set a safe value as P(Safe4) = 0.05, which is a conservative measure of the impact of swapping. With data swapping there is an immeasurable, but not negligible psychological impact, so that the intruder, knowing that the data has been masked, can never be certain what values in a given record have been changed (Winkler 2004). Others recognize that further protection is gained through perturbation approaches and can be recognized as providing

adequate protection allowing cell counts less than 3. For example, the National Center for Education Statistics (NCES) Standards[2] 4-10-2 address the Rule of 3 by applying the Rule of 3 to tabulations on restricted use files only if confidentiality edits (e.g., perturbation methods such as data swapping) are not used in masking the restricted use files. Regardless of the perturbations, NCES requires matching against an external file (Standard 4-8-2) with the Rule of 3, if such a file can be used for identification. The NCES confidentiality program has recently been through a thorough review by an independent task force. The task force consisted of disclosure avoidance experts from academia and the Federal government and was convened by the National Institute of Statistical Sciences. There were no changes to Standard 4-10-2 as a result of the review.

Moving Residence or Changing Workplace over Time (Safe5)

For the CTPP residence tables, we estimate P(Safe5) = 0.34, that is about 34% of householders have moved within the past three years. This is an interpolation of the movement within 1 year (20%) and within 5 year (49%) change in residence, as shown in Table 7.

Table 7. Year householder moved into unit: 2000

Year Moved	%
Moved in 1999 to March 2000	20
Moved in 1995 to 1998	29
Moved prior to 1995	51

Source: Decennial Census 2000. US Census Bureau

For the Workplace tables, we assign P(Safe5) = 0.42, as a conservative estimate, based on McWethy (2008). That is, 42% of persons changed employers during a 3-year period according to data from the Survey of Income and Program Participation. This is a conservative estimate since it is recognized that changing locations under the same employer is not included in the estimate.

Imputation (Safe6)

Imputation flags will be available on the ACS PUMS for larger geographic areas. However, imputation flags will not be available with the CTPP tables, therefore, these values can be considered masked. Imputation rates were computed from the ACS 2006 and are shown from the PUMS for

[2] Nces.ed.gov/statprog/2002/std4_2.asp

the state of Maryland in Table 8 since rates were available for more variables. Imputation rates for the nation are also shown where available from the Census Bureau website from the full file.

Table 8. Imputation Rates: 2006

Variable(s)	Maryland PUMS Imputation rate	National Imputation Rate	P(Safe6) National Adjusted Imputation Rate using CrossTabs with Means of Transportation[1]
Age, Age of youngest child	0.01	0.01	0.03
Class of worker	0.03	0.05	0.07
Disability status	0.05	0.03-0.04	0.04
Earnings, income, pov	0.10	0.13	0.16
Industry	0.04	0.06	0.07
Occupation	0.04	0.06	0.07
Year of arrival	0.01		0.03
Minority status	0.03	0.01 (race) 0.02 (Ethnicity)	0.03
Time leaving home, travel time	0.05	0.09 (leaving home), 0.07 travel time)	0.09
Vehicle availability	0.02		0.02
Workers in hh	0.02		0.03
Sex	#	#	0.02
Means of Transportation	0.02	0.04	NA
Place of Work – State	0.02	0.05 (state) 0.06 (place)	0.06

Rounds to zero

[1] The adjustment factor was computed as the Maryland PUMS imputation rate on a crosstab of each item with Means of Transportation divided by the univariate item imputation. This adjustment was applied to the national univariate item rates available on the Census Bureau website.

Source: 2006 American Community Survey PUMS

Uncertainty or Divergence in Variables (Safe7)

The uncertainty or divergence of a variable is a subjective assessment of the factual (re-identifiable) nature of the variable and how sensitive it is to change over time. For the overall protection measure, we set P(Safe7) =0. However, in the sensitivity analysis (discussed later), a small additional protection is added, varying by variable. The assessment of the level of uncertainty or divergence can be found in the right-hand columns of Table A-1.

Overall Risk Results

Overall values that incorporate the seven components of disclosure protection are provided in Tables 9 and 10. The measures were computed under the following scenarios.

- Type of risk (file, individual). File risk includes all protection components and is for the set of CTPP tables, while individual risk excludes the benefits of tabulation (Safe2) since it assumes that the intruder has the pseudo-microdata record in hand.
- Bound (lower, upper). The overall values were computed for all CTPP variables under upper bound scenarios (conservative) and lower bound scenarios. The results are shown as a summary of the individual variables values. The upper bound considers protection when suppressing cells with 2 or less records. The lower bound considers protection when suppressing cells with 1 record. Other differences can be viewed in the table.
- Place size (20,000).
- Key (KEY1, KEY2, KEY3).

For the set of CTPP variables in the analysis, for the CTPP Residence tables, as shown in Table 9, the file-level values of risk range from 0.00% to 0.09%. For the CTPP Workplace tables, as shown in Table 10, the file-level values of risk range from 0.00% to 0.08%. The file-level risk levels are below levels mentioned as non-confidential in Winkler (2004). The largest impact on risk levels are from the effect of tabulations and the sampling fraction. The Residence tables individual-level values of risk range from 1.29% to 3.43%. For the Workplace tables, the individual-level values of risk range from 0.97% to 3.02%. Without the matchability (Safe1), tabulation (Safe2), moving/changing (Safe4) and imputation effects (Safe5), the individual risk for the ACS annual PUMS is about 1.90%, which is at about the same level as the CTPP.

For Flow tables, risk increases since the flow from residence to workplace basically adds an additional variable to the set variables crossed with MOT, and therefore reduces the value of P(Safe2). However some reduction is seen from the changes to both residence and workplace, and therefore increasing P(Safe5). For the file to rise to unsafe standards under the worst case scenario, the percentage of records linkable to all tables to find the KEY needs to increase substantially, which is unlikely. The ACS PUMS file that we obtained did not have the Workplace Place that was needed to compute the P(Safe2) values for the Flow tables. In effect, the unavailability of the Workplace Place on the ACS PUMS file reduces the match rate to the ACS PUMS.

Table 9. Safe and Risk Values for Residence Tables (Place Size = 20,000)

Type of Risk	Bound	Key	Safe1	Safe2	Safe3	Safe4	Safe5	Safe6	Safe7	InitSafe	Safe	Risk
File	Upper	KEY1	0.152	0.996	0.944	0.05	0.34	0.02	0	99.98%	99.99%	0.01%
File	Upper	KEY2	0.002	0.993	0.944	0.05	0.34	0.02	0	99.96%	99.98%	0.02%
File	Upper	KEY3	0.002	0.975	0.944	0.05	0.34	0.02	0	99.86%	99.91%	0.09%
File	Lower	KEY1	0.152	0.999	0.962	0.1	0.34	0.16	0.2	100.00%	100.00%	0.00%
File	Lower	KEY2	0.002	0.999	0.962	0.1	0.34	0.16	0.2	100.00%	100.00%	0.00%
File	Lower	KEY3	0.002	0.993	0.962	0.1	0.34	0.16	0.2	99.97%	99.99%	0.01%
Individual	Upper	KEY1	0.152	0	0.944	0.05	0.34	0.02	0	95.25%	97.08%	2.92%
Individual	Upper	KEY2	0.002	0	0.944	0.05	0.34	0.02	0	94.41%	96.57%	3.43%
Individual	Upper	KEY3	0.002	0	0.944	0.05	0.34	0.02	0	94.41%	96.57%	3.43%
Individual	Lower	KEY1	0.152	0	0.962	0.1	0.34	0.16	0.2	96.78%	98.71%	1.29%
Individual	Lower	KEY2	0.002	0	0.962	0.1	0.34	0.16	0.2	96.21%	98.49%	1.51%
Individual	Lower	KEY3	0.002	0	0.962	0.1	0.34	0.16	0.2	96.21%	98.49%	1.51%

Table 10. Safe and Risk Values for Workplace Tables (Place Size = 20,000)

Type of Risk	Bound	Key	Safe1	Safe2	Safe3	Safe4	Safe5	Safe6	Safe7	InitSafe	Safe	Risk
File	Upper	KEY1	0.152	0.996	0.944	0.05	0.42	0.02	0	99.98%	99.99%	0.01%
File	Upper	KEY2	0.002	0.993	0.944	0.05	0.42	0.02	0	99.96%	99.98%	0.02%
File	Upper	KEY3	0.002	0.975	0.944	0.05	0.42	0.02	0	99.86%	99.92%	0.08%
File	Lower	KEY1	0.152	0.999	0.962	0.1	0.5	0.16	0.2	100.00%	100.00%	0.00%
File	Lower	KEY2	0.002	0.999	0.962	0.1	0.5	0.16	0.2	100.00%	100.00%	0.00%
File	Lower	KEY3	0.002	0.993	0.962	0.1	0.5	0.16	0.2	99.97%	99.99%	0.01%
Individual	Upper	KEY1	0.152	0	0.944	0.05	0.42	0.02	0	95.25%	97.44%	2.56%
Individual	Upper	KEY2	0.002	0	0.944	0.05	0.42	0.02	0	94.41%	96.98%	3.02%
Individual	Upper	KEY3	0.002	0	0.944	0.05	0.42	0.02	0	94.41%	96.98%	3.02%
Individual	Lower	KEY1	0.152	0	0.962	0.1	0.5	0.16	0.2	96.78%	99.03%	0.97%
Individual	Lower	KEY2	0.002	0	0.962	0.1	0.5	0.16	0.2	96.21%	98.85%	1.15%
Individual	Lower	KEY3	0.002	0	0.962	0.1	0.5	0.16	0.2	96.21%	98.85%	1.15%

Disclosure Risk vs Data Utility

To gauge the impact of the Rule of 3 on the CTPP tables, a data driven analysis was conducted under the same conditions as the analysis for Safe2. The impact on data utility is measured by the proportion of small cells among all table cells, from pseudo-places of size 20,000 created for each of the 44 PUMAs. Results are shown in Table 11. It is our understanding the whole tables are collapsed when a cell contains an unweighted count of 1 or 2, and our analysis shows that there would be a substantial proportion of tables suppressed. As mentioned before, small cells do not typically lead to table linkage when 2-way or 3-way crosstabs are involved.

Table 11. Estimated Percentage of Table Cells that are Small Cells: 2006

	Place Size = 20,000			
	MOT(6)		MOT(10)	
Crosstabs with MOT(6)	Cell Count Equal to 1	Cell Count Less Than or Equal to 2	Cell Count Equal to 1	Cell Count Less Than or Equal to 2
Age (7)	28.2%	46.0%	34.7%	53.2%
Class of Worker (8)	28.8%	42.6%	38.1%	52.2%
Disability (2)	16.7%	31.0%	23.4%	39.8%
Earnings (4)	20.8%	33.1%	31.6%	47.1%
Industry (15)	33.7%	49.2%	41.7%	58.3%
Years in US (3)	21.3%	30.7%	26.4%	42.4%
Minority (2)	13.8%	21.8%	19.1%	33.3%
Occupation (7)	25.3%	39.1%	32.9%	50.2%
Sex (2)	13.1%	22.9%	23.0%	37.4%
Time Leave (8)	22.2%	35.2%	33.7%	48.5%
Travel Time (10)	25.7%	37.8%	35.5%	50.6%
Age Youngest (4)	22.6%	36.4%	30.9%	46.9%
Income (8)	27.8%	42.5%	37.8%	54.1%
Poverty (3)	23.4%	36.0%	26.9%	42.9%
Poverty*Minority (6)	30.1%	42.7%	33.6%	49.2%
Overall	23.6%	36.5%	31.3%	47.1%

Source: 2006 American Community Survey PUMS for Maryland

Recommendations

Data producers are challenged by the dual objective of maximizing data utility with reducing disclosure risks. Recently a National Science Foundation decision on data suppression for the 2006 Survey of Earned Doctorates was reversed in 2008 due to concerns expressed about reduced data utility. The analysis results noted in this document show the need to balance the low risk of the CTPP tabulations based on the 3-year ACS, with the large amount of data suppressed due to the Rule of 3. The following are recommendations to the AASHTO (where appropriate) and Census Bureau DRB for the 3-year CTPP tables.

1. Allow unweighted cell counts of less than 3 for crosstabs in CTPP tabulations from the 3-year ACS. We have demonstrated that the disclosure risk is low due to several components of data protection at the expense of data utility.

2. Further investigate the collapsing rules on the CTPP demographic variables (non-MOT variables), most notably industry, and their affect on the suppression of data for tables involving the MOT variables. Agree on collapsing rules for CTPP demographic variables. Fix the rules over time to allow for constant reporting categories over time.

References

Elliot, M. (2001) Disclosure Risk Assessment. Chapter 4. *Confidentiality, Disclosure, and Data Access: Theory and Practical Application for Statistical Agencies*. Pat Doyle, Julia Lane, Jules Theeuwes and Laura Zayatz.

FHWA (2008). The CTPP and Disclosure: A Research Paper: Why Collect Data and Throw it Away? Internal Memo – Federal Highway Administration.

McWethy, L. (2008). SIPP Employment Data Analysis. Memo from Laura McWethy to Elaine Murakami (FHWA), dated August 12, 2008.

Skinner, C. and Shlomo, N. (2008). Assessing the Identification Risk in Survey Micro-data Using Log-Linear Models. JASA Applications and Case Studies (forthcoming). See http://eprints.soton.ac.uk/41842/01/s3ri-workingpaper-m06-14.pdf

Winkler, W. (2004). Masking and Re-Identification Methods for Public-Use Microdata: Overview and Research Problems. U.S. Bureau of the Census. Statistical Research Division Research Report Series (Statistics #2004-06).

Appendix A

CTPP Variables and Tables

Table A-1. Comparison of Census 2000 1% and Census 2000 5%/ACS Annual Microdata File and CTPP

Census 2000 1% and Census 2000 5%/ACS Annual Microdata File Data Dictionary*			Census Transportation Planning Products				Variable Disclosure Risk Level	1-year to 3-year Change Sensitivity
Variable	Name	Levels	Levels	Variable	Name			
Means of transportation (21)	JWTR x JWRIP	21	6 10 17	Means of transportation (6) Means of transportation (10) Means of transportation (17)	MEANS7 MEANS11 MEANS18	24C 26 27	Medium	Medium
Age [workers] (84)	AGEP	84	7	Age [workers] (7)	AGEWKR8	3	High	Medium
Age of youngest child in household (19)	Derived	19	4	Age group of youngest child in the household (4)	HH_YNGEST	4	Medium	Medium
Class of worker (8)	COW	8	8	Class of worker (8)	COW	7	Medium	Low
Disability recode (2)	DS	2	7 2	Disability status [16 years of age and older] (7) Disability status [16 years of age and older] (2)	DISAB_GE16 DISAB_GE16_CLP	9 9C	High	Low
Total person's earnings (Continuous)	PERNP	Cont.	10 5	Earnings (10) Earnings (5)	EARNINGS EARNINGS_CLP	10 10C	Medium	Low
Household Income (Continuous)	HINCP	Cont.	4 8 25	Household Income (4) Household Income (8) Household income (25)	HH_INC5 HH_INC9 HH_INC26	15 16 17	Medium	Low
Industry (271)	INDP	271	15	Industry (15)	INDUSTRY	19	Medium	Medium
Length of US Residence (89 for 1% file, 78 for 5% file)	YOEP	89 (1%) 78 (5%)	5	Length of US residence (5)	YRS_IN_US	21	Medium	Low
Occupation (474)	OCCP	474	24 7	Occupation (24) Occupation (7)	OCCUPATION OCCUP8_CLP	31 31C	Medium	Medium
Person poverty status recode (502)	POVPIP	502	4	Poverty status (4)	POVERTY	33	Medium	Medium

Table A-1. Comparison of Census 2000 1% and Census 2000 5%/ACS Annual Microdata File and CTPP (Continued)

Census 2000 1% and Census 2000 5%/ACS Annual Microdata File Data Dictionary*			Census Transportation Planning Products				Variable Disclosure Risk Level	1-year to 3-year Change Sensitivity
Variable	Name	Levels	Levels	Variable	Name			
Recoded detailed race (116 for 1% file, 101 for 5% file)	RAC3P x RAC2P	116 (1%) 101 (5%)	4 2	Race of person (4) Minority status (2)	RACE MINORITY	34 28	High	Low
Sex (2)	SEX	2	2	Sex (2)	SEX	38	Low	Low
Time arriving (289)	JWAP	289	15 8 39	Time arriving (15) Time arriving (8) Time arriving (39)	TM_ARRVE16 TM_ARRVE9_CLP TM_ARRVE40	41 41C 42	Low	Low
Time leaving home (169 for 1% file, 151 for 5% file)	JWDP	169 (1%) 151 (5%)	3 15 8 39	Time leaving home (3) Time leaving home (15) Time leaving home (8) Time leaving home (39)	TM_LEAVE4 TM_LEAVE16 TM_LEAVE9_CLP TM_LEAVE40	43 44 44C 45	Low	Low
Travel time (200)	JWMNP	200	10 16	Travel time (10) Travel time (16)	TRAVEL_TM11 TRAVEL_TM	46 47	Low	Low
Vehicles (7)	VEH	7	3 4 5	Vehicles available (3) Vehicles available (4) Vehicles available (5)	VEHICLES4 VEHICLES5 VEHICLES6	51 53 54	Medium	Low
Vehicle Availability [ratio] (101 or Continuous)	Derived	101	3	Vehicle Availability [ratio] (3)	VEHRATIO4	52	Medium	Low
Workers in family past 12 months (4)	WIF	4	2 5	Workers in household (2) Workers in household (5)	HH_WRK3 HH_WRK6	55 56	Medium	Low

* 1% file corresponds to Super-PUMAs (400,000 population) and 5% file corresponds to PUMAs (100,000 population)

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Standard Tabulations – Part 1, Resident Based Tables

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
1	2	106	12106	NEW	Means of transportation (18)	Workers 16 years and over	17	21
1	2	201	12201	1-014	Age (8) by Means of transportation (11)	Workers 16 years and over	70	1764
1	2	203	12203	1-012	Class of worker (9) by Means of transportation (11)	Workers 16 years and over	80	168
1	8	204	12204	1-008	Any Disability (4) by Means of transportation (11)	Civilian noninstitutional workers 16 years and over	30	63
1	8		12204C		Any Disability (3) by Means of transportation (7)	Civilian noninstitutional workers 16 years and over	12	42
1	2	205	12205	1-013	Earnings in the past 12 months (2007$) (11) by Means of transportation (11)	Workers 16 years and over	100	Cont x 21
			12205C		Earnings in the past 12 months (2007$) (6) by Means of transportation (7)	Workers 16 years and over	30	
1	2	207	12207	1-116	Aggregate Earnings in the past 12 months (2007$) (1) by Means of transportation (11)	Workers 16 years and over	10	21
1	2	208	12208	1-096	Mean Earnings in the past 12 months (2007$) (1) by Means of transportation (11)	Workers 16 years and over	10	21
1	2	209	12209	1-094	Median Earnings in the past 12 months (2007$) (1) by Means of transportation (11)	Workers 16 years and over	10	21
1	2	212	12212	1-010	Industry (15) by Means of transportation (11)	Workers 16 years and over	140	5691
			12212C		Industry (15) by Means of transportation (7)	Workers 16 years and over	84	
1	2	215	12215	1-020	Length of US residence (6) by Means of transportation (11)	Workers 16 years and over	50	1869
			12215C		Length of US residence (4) by Means of transportation (7)	Workers 16 years and over	18	

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Standard Tabulations – Part 1, Resident Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
1	2	219	12219	1-027	Minority Status (3) by Means of transportation (11)	Workers 16 years and over	20	2436
1	2	223	12223	1-009	Occupation (25) by Means of transportation (11)	Workers 16 years and over	240	9954
			12223C		Occupation (8) by Means of transportation (7)	Workers 16 years and over	42	
1	2	225	12225	1-002	Sex (3) by Means of transportation (18)	Workers 16 years and over	34	42
1	2	226	12226	1-021	Time leaving home (16) by Means of transportation (11)	Workers 16 years and over	150	3171
			12226C		Time leaving home (9) by Means of transportation (7)	Workers 16 years and over	48	
1	2	227	12227	1-022	Travel time (11) by Means of transportation (11)	Workers 16 years and over	100	4200
			12227C		Travel time (11) by Means of transportation (7)	Workers 16 years and over	60	
1	6	228	12228	1-118	Aggregate Travel time (1) by Means of transportation (11)	Workers 16 years and over who did not work at home	10	21
1	6	229	12229	1-119	Aggregate Travel time (1) by Means of transportation (18)	Workers 16 years and over who did not work at home	17	
1	6	230	12230	1-102	Mean Travel time (1) by Means of transportation (11)	Workers 16 years and over who did not work at home	10	21
1	6	231	12231	1-103	Mean Travel time (1) by Means of transportation (18)	Workers 16 years and over who did not work at home	17	
1	6	232	12232	1-100	Median Travel time (1) by Means of transportation (11)	Workers 16 years and over who did not work at home	10	21
1	6	233	12233	1-101	Median Travel time (1) by Means of transportation (18)	Workers 16 years and over who did not work at home	17	

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Standard Tabulations – Part 1, Resident Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
1	6	300	12300	1-120	Aggregate Travel time (1) by Means of transportation (11) by Time leaving home (14)	Workers 16 years and over who did not work at home	130	5271
	6		12300C		Aggregate Travel time (1) by Means of transportation (7) by Time leaving home (9)	Workers 16 years and over who did not work at home	48	
1	6	301	12301	1-107	Mean Travel time (1) by Means of transportation (11) by Time leaving home (14)	Workers 16 years and over who did not work at home	130	3171
	6		12301C		Mean Travel time (1) by Means of transportation (7) by Time leaving home (9)	Workers 16 years and over who did not work at home	48	
1	6	302	12302	1-106	Median Travel time (1) by Means of transportation (11) by Time leaving home (14)	Workers 16 years and over who did not work at home	130	3171
	6		12302C		Median Travel time (1) by Means of transportation (7) by Time leaving home (8)	Workers 16 years and over who did not work at home	42	
1	3	200	13200	1-038	Age group of youngest child in the household (5) by Means of transportation (11)	Workers 16 years and over in households	40	84
1	3	201	13201	1-117	Aggregate Earnings in the past 12 months (2007$) (1) by Means of transportation (11)	Workers 16 years and over in households	10	21
1	3	202	13202	1-097	Mean Earnings in the past 12 months (2007$) (1) by Means of transportation (11)	Workers 16 years and over in households	10	21
1	3	203	13203	1-095	Median Earnings in the past 12 months (2007$) (1) by Means of transportation (11)	Workers 16 years and over in households	10	21

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Standard Tabulations – Part 1, Resident Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
1	3	204	13204	1-034	Household income in the past 12 months (2007$) (26) by Means of transportation (11)	Workers 16 years and over in households	250	Cont x 21
	3		13204C		Household income in the past 12 months (2007$) (9) by Means of transportation (7)	Workers 16 years and over in households	48	Cont x 21
1	4	206	13206	1-036	Poverty status (4) by Means of transportation (11)	Workers for whom poverty status is determined	30	10542
1	3	209	13209	NEW	Vehicle availability [ratio] (4) by Means of transportation (11)	Workers 16 years and over in households	30	101x21
1	3	211	13211	1-035	Vehicles available (6) by Means of transportation (11)	Workers 16 years and over in households	50	147
	3		13211C		Vehicles available (6) by Means of transportation (7)	Workers 16 years and over in households	30	
1	3	215	13215	1-037	Number of workers in household (6) by Means of transportation (11)	Workers 16 years and over in households	50	84
1	3	300	13300	1-044	Household income in the past 12 months (2007$) (5) by Minority Status (3) by Means of transportation (8)	Workers 16 years and over in households	56	Cont x 116 x 21
1	3	302	13302	1-042	Household income in the past 12 months (2007$) (5) by Vehicles available (5) by Means of transportation (8)	Workers 16 years and over in households	112	Cont x 7 x 21
			13302C		Household income in the past 12 months (2007$) (5) by Vehicles available (5) by Means of transportation (5)	Workers 16 years and over in households	64	

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Standard Tabulations – Part 1, Resident Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
1	4	303	13303	1-046	Poverty status (4) by Minority Status (3) by Means of transportation (8)	Workers for whom poverty status is determined	42	759024
	4		13303C		Poverty status (4) by Minority Status (3) by Means of transportation (5)	Workers for whom poverty status is determined	24	
1	3	304	13304	NEW	Vehicle availability [ratio] (4) by Minority Status (3) by Means of transportation (8)	Workers 16 years and over in households	42	101*116*21
			13304C		Vehicle availability [ratio] (4) by Minority Status (3) by Means of transportation (5)	Workers 16 years and over in households	24	
1	3	305	13305	1-045	Vehicles available (4) by Minority Status (3) by Means of transportation (8)	Workers 16 years and over in households	42	17052
			13305C		Vehicles available (4) by Minority Status (3) by Means of transportation (5)	Workers 16 years and over in households	24	

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Standard Tabulations – Part 2, Workplace Based Tables

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
2	2	106	22106	NEW	Means of Transportation (18)	Workers 16 years and over	17	21
2	2	201	22201	2-014	Age (8) by Means of transportation (11)	Workers 16 years and over	70	1764
2	2	203	22203	2-012	Class of worker (9) by Means of transportation (11)	Workers 16 years and over	80	168
2	8	204	22204	2-008	Any Disability (4) by Means of transportation (11)	Civilian noninstitutional workers 16 years and over	30	63
	8		22204C		Any Disability (3) by Means of transportation (7)	Civilian noninstitutional workers 16 years and over	12	42
2	2	205	22205	2-013	Earnings in the past 12 months (2007$) (11) by Means of transportation (11)	Workers 16 years and over	100	Cont x 21
			22205C		Earnings in the past 12 months (2007$) (6) by Means of transportation (7)	Workers 16 years and over	30	Cont x 21
2	2	207	22207	2-063	Aggregate Earnings in the past 12 months (2007$) (1) by Means of transportation (11)	Workers 16 years and over	10	21
2	2	208	22208	2-048	Mean Earnings (1) by Means of transportation (11)	Workers 16 years and over	10	21
2	2	209	22209	2-047	Median Earnings (1) by Means of transportation (11)	Workers 16 years and over	10	21

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Standard Tabulations – Part 2, Workplace Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
2	2	212	22212	2-010	Industry (15) by Means of transportation to work (11)	Workers 16 years and over	140	5691
			22212C		Industry (15) by Means of transportation to work (7)	Workers 16 years and over	84	
2	2	215	22215	2-020	Length of US residence (6) by Means of transportation (11)	Workers 16 years and over	50	1869
			22215C		Length of US residence (4) by Means of transportation (8)	Workers 16 years and over	21	
2	2	219	22219	2-027	Minority Status (3) by Means of transportation (11)	Workers 16 years and over	20	1512
2	2	223	22223	2-009	Occupation (25) by Means of transportation (11)	Workers 16 years and over	240	9954
			22223C		Occupation (8) by Means of transportation (7)	Workers 16 years and over	42	
2	2	225	22225	2-002	Sex (3) by Means of transportation (18)	Workers 16 years and over	34	42
2	2	227	22227	2-022	Travel time (11) by Means of transportation (11)	Workers 16 years and over	100	4200
			22227C		Travel time (11) by Means of transportation (7)	Workers 16 years and over	60	
2	6	228	22228	2-064	Aggregate travel time (1) by Means of transportation (11)	Workers 16 years and over who did not work at home	10	21

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Standard Tabulations – Part 2, Workplace Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
2	6	229	22229	2-065	Aggregate travel time (1) by Means of transportation (18)	Workers 16 years and over who did not work at home	17	
2	6	230	22230	2-056	Mean travel time (1) by Means of transportation (11)	Workers 16 years and over who did not work at home	10	21
2	6	231	22231	2-057	Mean travel time (1) by Means of transportation (18)	Workers 16 years and over who did not work at home	10	
2	6	232	22232	2-054	Median travel time (1) by Means of transportation (11)	Workers 16 years and over who did not work at home	10	21
2	6	233	22233	2-055	Median travel time (1) by Means of transportation (18)	Workers 16 years and over who did not work at home	17	
2	2	238	22238	2-021	Time arriving (14) by Means of transportation (11)	Workers 16 years and over	130	6069
			22238C		Time arriving (9) by Means of Transportation (7)	Workers 16 years and over	48	
2	6	303	22303	2-066	Aggregate travel time (1) by Means of transportation (11) by Time arriving (14)	Workers 16 years and over who did not work at home	130	6069
2	6	304	22304	2-061	Mean travel time (1) by Means of transportation (11) by Time arriving (14)	Workers 16 years and over who did not work at home	130	6069

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Standard Tabulations – Part 2, Workplace Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
	6		22304C		Mean travel time (1) by Means of transportation (7) by Time arriving (9)	Workers 16 years and over who did not work at home	48	
2	6	305	22305	2-060	Median travel time (1) by Means of transportation (11) by Time arriving (14)	Workers 16 years and over who did not work at home	130	6069
	6		22305C		Median travel time (1) by Means of transportation (7) by Time arriving (9)	Workers 16 years and over who did not work at home	48	
2	3	200	23200	2-038	Age group of youngest child in the household (5) by Means of transportation (11)	Workers 16 years and over in households	40	84
2	3	204	23204	2-034	Household income in the past 12 months (2007$) (26) by Means of transportation (11)	Workers 16 years and over in households	250	Cont x 21
	3		23204C		Household income in the past 12 months (2007$) (9) by Means of transportation (7)	Workers 16 years and over in households	48	
2	4	206	23206	2-036	Poverty status (4) by Means of transportation (11)	Workers 16 years and over for whom poverty status is determined	30	10542
2	3	209	23209	NEW	Vehicle availability [ratio] (4) by Means of transportation (11)	Workers 16 years and over in households	30	101x21

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Standard Tabulations – Part 2, Workplace Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
2	3	211	23211	2-035	Vehicles available (6) by Means of transportation (11)	Workers 16 years and over in households	50	147
	3		23211C		Vehicles available (6) by Means of transportation (7)	Workers 16 years and over in households	30	
2	3	215	23215	2-037	Workers in household (6) by Means of transportation (11)	Workers 16 years and over in households	50	84
2	3	300	23300	2-044	Household income in the past 12 months (2007$) (5) by Minority Status (3) by Means of transportation (8)	Workers 16 years and over in households	56	Cont x 116 x 21
2	3	302	23302	2-042	Household income in the past 12 months (2007$) (5) by Vehicles available (5) by Means of transportation (8)	Workers 16 years and over in households	112	Cont x 7 x 21
	3		23302C		Household income in the past 12 months (2007$) (5) by Vehicles available (5) by Means of transportation (5)	Workers 16 years and over in households	64	
2	4	303	23303	2-046	Poverty status (4) by Minority Status(3) by Means of transportation (8)	Workers 16 years and over for whom poverty status is determined	42	759024

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Standard Tabulations – Part 2, Workplace Based Tables

(Continued)

CTPP Part	Univ	Number	New Table Number	2000 Table Number	Content	Universe	CTPP Interior Cells	ACS "Cells"
	4		23303C		Poverty status (4) by Minority Status(3) by Means of transportation (5)	Workers 16 years and over for whom poverty status is determined	24	
2	3	304	23304	NEW	Vehicles availability [ratio] (4) by Minority Status (3) by Means of transportation (8)	Workers 16 years and over in households	42	101*116*21
	3		23304C		Vehicles availability [ratio] (4) by Minority Status (3) by Means of transportation (5)	Workers 16 years and over in households	24	
2	3	305	23305	2-045	Vehicles available (4) by Minority Status (3) by Means of transportation (8)	Workers 16 years and over in households	42	17052
	3		23305C		Vehicles available (4) by Minority Status (3) by Means of transportation (5)	Workers 16 years and over in households	24	