Derived Variables

December 10, 2017

Submitted to:
Federal Highway Administration
Office of Policy Information
1200 New Jersey Avenue, SE
Washington, DC  20590

Contract # GS23F8144H
Order # DTFH6114F00113

Submitted by:
Westat
1600 Research Boulevard
Rockville, Maryland 20850-3129
(301) 251-1500
VEHICLE Variables

ANNMILES
Description: Self-reported annualized mile estimate
Logic: IF VEHOWNED = (-7,-8) OR VEHMILES = (-7,-8,-77,-88) OR ESTMILES = (-7,-8,-77,-88) THEN -1
       IF VEHOWNED = 1 THEN VEHMILES
       IF VEHOWNED = 2 THEN ROUND((12 * ESTMILES) / OWNUNIT)

HYBRID
Description: Hybrid vehicle
Logic: IF FUEL = 3 THEN 1
       IF FUEL != 3 THEN 2

VEHAGE
Description: Age of vehicle, based on model year
Logic: IF VEHYEAR = (-8,-7) THEN VEHYEAR
       IF VEHYEAR = (2016,2017,2018) THEN 1
       ELSE 2017-VEHYEAR

PERSON Variables

AWAYHOME
Description: Reason respondent did not start their travel day with a home-based activity
Logic: IF TDTRPNUM = 1 AND O_WHYTO = (1,2) THEN -1
       IF TDTRPNUM = 1 AND O_WHYTO != (1,2) THEN O_WHYTO

AWAYHOME17
Description: Reason respondent was not at their home location at the start of their travel day
Logic: IF TDTRPNUM = 1 AND LOCNO = 100 THEN -1
       IF TDTRPNUM = 1 AND LOCNO != 100 THEN O_WHYTO

CNTTDTR
Description: Count of person trips on travel day
Logic: COUNT(TDTRPNUM)

DIARY
Description: Travel Diary completion status
Logic: \[ \text{IF } \text{DIARYHAV} = 1 \text{ AND } \text{DIARYCMP} = 1 \text{ THEN } 1 \text{ ELSE } 2 \]

**DRIVER**
Description: Driver status, derived
Logic: \[
\text{IF } R\_\text{AGE} > 0 \text{ AND } R\_\text{AGE} < 15 \text{ THEN } 2 \\
\text{IF } \text{AGERANGE} = (1, 2) \text{ THEN } 2 \\
\text{IF } \text{DRVR} = 1 \text{ THEN } 1 \\
\text{IF } \text{COUNT(TDTRPNUM WHERE WHODROVE = PERSONID)} > 0 \text{ THEN } 1 \\
\text{IF } \text{COUNT(TDTRPNUM WHERE WHODROVE = PERSONID)} = 0 \text{ THEN } 2
\]

**FRSTHM**
Description: Travel day began with a home-based activity
Logic: \[
\text{IF } O\_\text{WHYTO} = (-9, -8, -7) \text{ THEN } O\_\text{WHYTO} \\
\text{IF } \text{COUNT(TDTRPNUM) = 0 AND SAMEPLC != 9 \text{ THEN } 1} \\
\text{IF } \text{COUNT(TDTRPNUM) != 0 AND O\_\text{WHYTO} = (1, 2) \text{ THEN } 1} \\
\text{ELSE } 2
\]

**FRSTHM17**
Description: Travel day began at home location
Logic: \[
\text{IF } \text{LOCNO} = 100 \text{ WHERE TDTRPNUM = 1 \text{ THEN } 1} \\
\text{IF } \text{LOCNO} != 100 \text{ WHERE TDTRPNUM = 1 \text{ THEN } 2}
\]

**GCDWORK**
Description: Minimum geodesic (Great Circle) distance between home location and work location in meters, using WGS84 coordinate system
Logic: \[
\text{[HOME\_LOCATION] = (LONGITUDE, LATITUDE) WHERE LOCATION.LOCTYPE = 1} \\
\text{[WORK\_LOCATION] = (LONGITUDE, LATITUDE) WHERE PERSON.PERSONID = LOCATION.PERSONID AND LOCATION.LOCTYPE = 2} \\
\text{https://geographiclib.sourceforge.io/html/C/geodesic_8h.html#a19bc3d000428010ad9d8509174e672c9}
\]

**OUTOFTWN**
Description: Away from home for entire travel day
Logic: \[
\text{IF } \text{COUNT(TDTRPNUM WHERE LOCNO = 100) = 0 \text{ THEN } 1} \\
\text{ELSE } 2
\]

**R\_RACE**
Description: Race
Logic: \[
\text{IF } \text{COUNT (RACE\_*)} > 1 \text{ THEN } 6 \\
\text{IF } \text{COUNT (RACE\_*)} = 1 \text{ THEN } \text{RACE}
\]

**USEPUBTR**
Description: Public Transit Usage on Travel Date, derived
Logic: \[
\text{IF } \text{COUNT(TRPTRANS17 WHERE TRPTRANS17 = (11, 15, 16) > 0 \text{ THEN } 1} \\
\text{ELSE } 2
\]
WKSTFIPS
Description: The state FIPS code for the respondent's geocoded work address. The state FIPS codes were identified using United States Census Bureau 2016 TIGER/Line Shapefiles.
Logic: NA

WORKER
Description: Worker status
Logic:

IF (R_AGE >= 0 AND < 16 OR AGERANGE = (1,2)) THEN -1
IF (PRMACT = (-8,-7) AND PAYPROF = (-8,-7)) OR (PRMACT IS NULL AND (R_AGE > 15 OR AGERANGE = (3,4,5,6))) THEN -9
IF PRMACT = (1,2) OR PAYPROF = 1 THEN 1
ELSE 2

HOUSEHOLD Variables

CDIVMSAR
Description: Grouping of household by combination of census division, MSA status, and presence of a subway system when population greater than 1 million
Logic: CENSUS_D & MSACAT

CENSUS_D
Description: 2010 Census division classification for the respondent's home address
Logic:


IF HHSTATE = ("ME", "NH", "VT", "CT", "MA", "RI") THEN 1
IF HHSTATE = ("NY", "NJ", "PA") THEN 2
IF HHSTATE = ("IL", "IN", "MI", "OH", "WI") THEN 3
IF HHSTATE = ("IA", "KS", "MO", "MN", "ND", "NE", "SD") THEN 4
IF HHSTATE = ("DC", "DE", "FL", "GA", "MD", "NC", "SC", "WV", "VA") THEN 5
IF HHSTATE = ("AL", "KY", "MS", "TN") THEN 6
IF HHSTATE = ("AR", "LA", "OK", "TX") THEN 7
IF HHSTATE = ("AZ", "CO", "ID", "MT", "NM", "NV", "UT", "WY") THEN 8
IF HHSTATE = ("AK", "CA", "HI", "OR", "WA") THEN 9

CENSUS_R
Description: Census region classification for home address
Logic:


IF CENSUS_D = (1,2) THEN 1
IF CENSUS_D = (3,4) THEN 2
**CNTTDHH**
Description: Count of household trips on travel day
Logic: \( \text{COUNT(TDTRPNUM)} \)

**DRVRCNT**
Description: Number of drivers in household
Logic: \( \text{COUNT(WHERE DRIVER = 1)} \)

**FLAG100**
Description: Whether all household members completed interview
Logic: \( \begin{align*}
\text{IF RESP_CNT = HHSIZE THEN 1} \\
\text{IF RESP_CNT < HHSIZE THEN 2}
\end{align*} \)

**GASPRICE**
Description: Price of gasoline, in cents, on respondent's travel day
Logic:
\[
\text{PADDD\_REGION} =
\begin{align*}
\text{IF HHSTATE = ("CT", "ME", "MA", "NH", "RI", "VT") THEN "PADDD1A"} \\
\text{IF HHSTATE = ("DE", "DC", "MD", "NJ", "NY", "PA") THEN "PADDD1B"} \\
\text{IF HHSTATE = ("FL", "GA", "NC", "SC", "VA", "WV") THEN "PADDD1C"} \\
\text{IF HHSTATE = ("IL", "IN", "IA", "KS", "KY", "MI", "MN", "MO", "NE", "ND", "SD", "OH", "OK", "TN", "WI") THEN "PADDD2"} \\
\text{IF HHSTATE = ("AL", "AR", "LA", "MS", "NM", "TX") THEN "PADDD3"} \\
\text{IF HHSTATE = ("CO", "ID", "MT", "UT", "WY") THEN "PADDD4"} \\
\text{IF HHSTATE = ("AK", "AZ", "CA", "HI", "NV", "OR", "WA") THEN "PADDD5"}
\end{align*}
\]

**HBHTNRNT**
Description: Category of the percent of renter-occupied housing in the census block group of the household's home location.
Logic:
\[
\begin{align*}
\text{IF [PROPORTION RENTER OCCUPIED] >= 0 AND [PROPORTION RENTER OCCUPIED] < 0.05 THEN 0} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.15 THEN 5} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.25 THEN 20} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.35 THEN 30} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.45 THEN 40} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.55 THEN 50} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.65 THEN 60} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.75 THEN 70} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.85 THEN 80} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] < 0.95 THEN 90} \\
\text{ELSE IF [PROPORTION RENTER OCCUPIED] <= 1.00 THEN 95} \\
\text{ELSE -9}
\end{align*}
\]

**HBHTNRNT17**
Description: Percent of renter-occupied housing in the census block group of the household's home location.
Logic: [RENTER OCCUPIED] / [TOTAL OCCUPIED HOUSING UNITS] GROUP BY [BLOCK GROUP]

[RENTER OCCUPIED] = B25003_003E
[TOTAL OCCUPIED HOUSING UNITS] = B25003_001E
[HOUSING UNITS] = B25001_001E
[TOTAL POPULATION] = B01003_001E
[EMPLOYED IN CIVILIAN LABOR FORCE] = B23025_004E

Extracted from United States Census Bureau 2014 TIGER/Line Shapefiles:
[BLOCK GROUP] = [BLOCK GROUP] WHERE LOCNO = 100
[TRACT] = [TRACT] WHERE LOCNO = 100
[LANDAREA] = [LAND AREA OF CENSUS GEOGRAPHY] WHERE LOCNO = 100

HBPOPDN
Description: Category of population density (persons per square mile) in the census block group of the household’s home location.
Logic: IF [PERSONS PER SQ MILE] >= 0 AND [PERSONS PER SQ MILE] < 100 THEN 50 ELSE IF [PERSONS PER SQ MILE] < 500 THEN 300 ELSE IF [PERSONS PER SQ MILE] < 1,000 THEN 750 ELSE IF [PERSONS PER SQ MILE] < 2,000 THEN 1,500 ELSE IF [PERSONS PER SQ MILE] < 4,000 THEN 3,000 ELSE IF [PERSONS PER SQ MILE] < 1,000 THEN 7,000 ELSE IF [PERSONS PER SQ MILE] < 25,000 THEN 17,000 ELSE IF [PERSONS PER SQ MILE] >= 25,000 and [PERSONS PER SQ MILE] < 999,999 THEN 3,0000 ELSE -9

HBPOPDN17
Description: Population density (persons per square mile) in the census block group of the household’s home location.
Logic: [TOTAL POPULATION] / [LANDAREA] GROUP BY [BLOCK GROUP]
See HBHTNRNT17 for Claritas details.

HBRESDN
Description: Category of housing units per square mile in the census block group of the household’s home location.
Logic: IF [HOUSING UNITS PER SQ MILE] >= 0 AND [HOUSING UNITS PER SQ MILE] < 100 THEN 50 ELSE IF [HOUSING UNITS PER SQ MILE] < 500 THEN 300 ELSE IF [HOUSING UNITS PER SQ MILE] < 1,000 THEN 750 ELSE IF [HOUSING UNITS PER SQ MILE] < 2,000 THEN 1,500 ELSE IF [HOUSING UNITS PER SQ MILE] < 4,000 THEN 3,000 ELSE IF [HOUSING UNITS PER SQ MILE] < 1,000 THEN 7,000 ELSE IF [HOUSING UNITS PER SQ MILE] < 25,000 THEN 17,000 ELSE IF [HOUSING UNITS PER SQ MILE] >= 25,000 and [HOUSING UNITS PER SQ MILE] < 999,999 THEN 3,0000 ELSE -9
HBRESDN17
Description: Housing units per square mile in the census block group of the household's home location.
Logic: [HOUSING UNITS] / [LANDAREA] GROUP BY [BLOCK GROUP]
See HBHTNRNT17 for Claritas details.

HH_CBSA
Description: Core Based Statistical Area (CBSA) FIPS code for the respondent's home address
Logic: CBSA based on the household's home geocode and TIGER/Line® Shapefile geometries.
Source: https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2014&layergroup/Core+Based+Statistical+Areas

HH_HISP
Description: Hispanic status of household respondent
Logic: R_HISP WHERE PERSONID = 1

HH_RACE
Description: Race of household respondent
Logic: R_RACE WHERE PERSONID = 1

HHRELATD
Description: At least two household persons are related
Logic: IF COUNT(R_RELAT) WHERE R_RELAT = (2,3,4,5,6) > 0 THEN 1 ELSE 2

HHRESP
Description: Person identifier of household respondent
Logic: SELECTPERSON1

HHSIZE
Description: Count of household members
Logic: COUNT(PERSONID)

HHSTATE
Description: Household state
Logic: STATE WHERE LOCNO = 100

HHSTFIPS
Description: State FIPS for household address
Logic: STATEFIPS WHERE LOCNO = 100
**HHVEHCNT**
Description: Count of household vehicles
Logic: \( \text{COUNT(VEHID WHERE} \text{VEHTYPE} = 1,2,3,4,5,6,7) \)

**HTEEMPDN**
Description: Category of workers per square mile in the census tract of the household's home location.
Logic:  
\[
\begin{align*}
\text{IF} & \ [\text{WORKERS PER SQ MILE}] \geq 0 \text{ AND } [\text{WORKERS PER SQ MILE}] < 49 \text{ THEN } 25 \\
\text{ELSE IF} & \ [\text{WORKERS PER SQ MILE}] < 100 \text{ THEN } 75 \\
\text{ELSE IF} & \ [\text{WORKERS PER SQ MILE}] < 250 \text{ THEN } 750 \\
\text{ELSE IF} & \ [\text{WORKERS PER SQ MILE}] < 500 \text{ THEN } 1,500 \\
\text{ELSE IF} & \ [\text{WORKERS PER SQ MILE}] < 1,000 \text{ THEN } 3,000 \\
\text{ELSE IF} & \ [\text{WORKERS PER SQ MILE}] < 2,000 \text{ THEN } 7,000 \\
\text{ELSE IF} & \ [\text{WORKERS PER SQ MILE}] < 4,000 \text{ THEN } 17,000 \\
\text{ELSE IF} & \ [\text{WORKERS PER SQ MILE}] < 25,000 \text{ and } [\text{WORKERS PER SQ MILE}] < 999,999 \text{ THEN } 3,0000 \\
\text{ELSE} & -9
\end{align*}
\]

**HTEEMPDN17**
Description: Workers per square mile in the census tract of the household's home location.
Logic:  
\[
\frac{\text{EMPLOYED IN CIVILIAN LABOR FORCE}}{\text{LANDAREA}} \text{ GROUP BY [TRACT]}
\]
See HBHTNRNT17 for Claritas details.

**HTHTNRNT**
Description: Category of the percent of renter-occupied housing in the census tract of the household's home location.
Logic:  
\[
\begin{align*}
\text{IF} & \ [\text{PROPORTION RENTER OCCUPIED}] \geq 0 \text{ AND } [\text{PROPORTION RENTER OCCUPIED}] < 0.05 \text{ THEN } 0 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.15 \text{ then } 5 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.25 \text{ then } 20 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.35 \text{ then } 30 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.45 \text{ then } 40 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.55 \text{ then } 50 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.65 \text{ then } 60 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.75 \text{ then } 70 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.85 \text{ then } 80 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] < 0.95 \text{ then } 90 \\
\text{ELSE IF} & \ [\text{PROPORTION RENTER OCCUPIED}] \leq 1.00 \text{ then } 95 \\
\text{ELSE} & -9
\end{align*}
\]

**HTHTNRNT17**
Description: Percent of renter-occupied housing in the census tract of the household's home location.
Logic:  
\[
\frac{\text{RENTER OCCUPIED}}{\text{TOTAL OCCUPIED HOUSING UNITS}} \text{ GROUP BY [TRACT]}
\]
See HBHTNRNT17 for Claritas details.
HTPPOPDN
Description: Category of population density (persons per square mile) in the census tract of the household's home location.
Logic:
\[
\text{IF } [\text{PERSONS PER SQ MILE}] \geq 0 \text{ AND } [\text{PERSONS PER SQ MILE}] < 100 \text{ THEN } 50 \\
\text{ELSE IF } [\text{PERSONS PER SQ MILE}] < 500 \text{ THEN } 300 \\
\text{ELSE IF } [\text{PERSONS PER SQ MILE}] < 1,000 \text{ THEN } 750 \\
\text{ELSE IF } [\text{PERSONS PER SQ MILE}] < 2,000 \text{ THEN } 1,500 \\
\text{ELSE IF } [\text{PERSONS PER SQ MILE}] < 4,000 \text{ THEN } 3,000 \\
\text{ELSE IF } [\text{PERSONS PER SQ MILE}] < 1,000 \text{ THEN } 7,000 \\
\text{ELSE IF } [\text{PERSONS PER SQ MILE}] < 25,000 \text{ THEN } 17,000 \\
\text{ELSE IF } [\text{PERSONS PER SQ MILE}] < 25,000 \text{ and } [\text{PERSONS PER SQ MILE}] < 999,999 \text{ THEN } 3,0000 \\
\text{ELSE } -9
\]

HTPPOPDN17
Description: Population density (persons per square mile) in the census tract of the household's home location.
Logic: 
\[
[\text{TOTAL POPULATION}] / [\text{LANDAREA}] \text{ GROUP BY } [\text{TRACT}]
\]
See HBHTNRNT17 for Claritas details.

HTRESDN
Description: Category of housing units per square mile in the census tract of the household's home location.
Logic: 
\[
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] \geq 0 \text{ AND } [\text{HOUSING UNITS PER SQ MILE}] < 100 \text{ THEN } 50 \\
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] < 500 \text{ THEN } 300 \\
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] < 1,000 \text{ THEN } 750 \\
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] < 2,000 \text{ THEN } 1,500 \\
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] < 4,000 \text{ THEN } 3,000 \\
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] < 1,000 \text{ THEN } 7,000 \\
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] < 25,000 \text{ THEN } 17,000 \\
\text{IF } [\text{HOUSING UNITS PER SQ MILE}] < 25,000 \text{ and } [\text{HOUSING UNITS PER SQ MILE}] < 999,999 \text{ THEN } 3,0000 \\
\text{ELSE } -9
\]

HTRESDN17
Description: Housing units per square mile in the census tract of the household's home location.
Logic: 
\[
[\text{HOUSING UNITS}] / [\text{LANDAREA}] \text{ GROUP BY } [\text{TRACT}]
\]
See HBHTNRNT17 for Claritas details.

LD_DIST
Description: Road network distance, in miles, between respondent's home location and geographical center of most frequently visited long distance city. Network distance and city's geographical center sourced using Google Distance Matrix API.
Logic: 
\[
[\text{HOME LOCATION}]= \text{ WHERE LOCTYPE} = 1
\]
Logic:

**Description:** Life Cycle classification for the household, derived by attributes pertaining to age, relationship, and work status.

**Logic:**

\[
\text{IMPUTED\_AGE} =
\begin{align*}
\text{IF} & \text{ AGE IS MISSING OR AGE = (-7,-8) THEN} \\
\text{IF} & \text{ AAGE IS MISSING OR AAGE = (-7,-8) THEN 41} \\
\text{IF} & \text{ AAGE = 1 THEN 2} \\
\text{IF} & \text{ AAGE = 2 THEN 10} \\
\text{IF} & \text{ AAGE = 3 THEN 16} \\
\text{IF} & \text{ AAGE = 4 THEN 41} \\
\text{IF} & \text{ AAGE = 5 THEN 70} \\
\text{IF} & \text{ AAGE = 6 THEN 77} \\
\text{ELSE} & \text{ AAGE}
\end{align*}
\]

\[
\text{ADULT\_CHILD\_STATUS} =
\begin{align*}
\text{IF} & \text{ IMPUTED\_AGE < 18 THEN "CHILD"} \\
\text{IF} & \text{ IMPUTED\_AGE > 21 THEN "ADULT"} \\
\text{IF} & \text{ IMPUTED\_AGE BETWEEN 18 AND 21 THEN} \\
\text{IF} & \text{ R\_RELAT = 3 THEN "CHILD"} \\
\text{IF} & \text{ R\_RELAT = (1,5,6) AND [ANY OTHER HH MEMBER] R\_RELAT = 4 THEN "CHILD"} \\
\text{IF} & \text{ R\_RELAT = (1,5,6) AND !=[ANY OTHER HH MEMBER] R\_RELAT = 4 THEN "ADULT"} \\
\text{IF} & \text{ R\_RELAT = 8 AND [ANY OTHER HH MEMBER] \( R\_RELAT = (2,7) \) AND IMPUTED\_AGE > 21 THEN "CHILD"} \\
\text{IF} & \text{ R\_RELAT = 8 AND !=[ANY OTHER HH MEMBER] \( R\_RELAT = (2,7) \) AND IMPUTED\_AGE > 21 THEN "ADULT"} \\
\text{IF} & \text{ R\_RELAT = (-7,-8) AND [ANY OTHER HH MEMBER] R\_RELAT = 4 THEN "CHILD"} \\
\text{IF} & \text{ R\_RELAT = (-7,-8) AND !=[ANY OTHER HH MEMBER] R\_RELAT = 4 THEN "ADULT"}
\end{align*}
\]

\[
\text{HOUSEHOLD\_ADULT\_COUNT} = \text{COUNT} (\text{WHERE ADULT\_CHILD\_STATUS = "ADULT"})
\]

\[
\text{HOUSEHOLD\_CHILD\_COUNT} = \text{COUNT} (\text{WHERE ADULT\_CHILD\_STATUS = "CHILD"})
\]

\[
\text{HOUSEHOLD\_RETIRED\_COUNT} = \text{COUNT} (\text{WHERE PRMACT = 6 OR ((PRMACT IS MISSING OR PRMACT = (-7,-8) AND AGE >= 65))}
\]

\[
\text{MIN\_AGE} = \text{MINIMUM (AGE)}
\]

\[
\text{LIF\_CYC} =
\begin{align*}
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT = 1 AND HOUSEHOLD\_CHILD\_COUNT = 0 AND} \\
\text{HOUSEHOLD\_RETIRED\_COUNT = 0 THEN 1} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT >= 2 AND HOUSEHOLD\_CHILD\_COUNT = 0 AND} \\
\text{HOUSEHOLD\_RETIRED\_COUNT = 0 THEN 2} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT = 1 AND HOUSEHOLD\_CHILD\_COUNT >= 1 AND} \\
\text{MIN\_AGE BETWEEN 0 AND 5 THEN 3} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT >= 2 AND HOUSEHOLD\_CHILD\_COUNT >= 1 AND} \\
\text{MIN\_AGE BETWEEN 0 AND 5 THEN 4} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT = 1 AND HOUSEHOLD\_CHILD\_COUNT >= 1 AND} \\
\text{MIN\_AGE BETWEEN 6 AND 15 THEN 5} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT >= 2 AND HOUSEHOLD\_CHILD\_COUNT >= 1 AND} \\
\text{MIN\_AGE BETWEEN 6 AND 15 THEN 6} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT = 1 AND HOUSEHOLD\_CHILD\_COUNT >= 1 AND} \\
\text{MIN\_AGE BETWEEN 16 AND 21 THEN 7} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT >= 2 AND HOUSEHOLD\_CHILD\_COUNT >= 1 AND} \\
\text{MIN\_AGE BETWEEN 16 AND 21 THEN 8} \\
\text{IF} & \text{ HOUSEHOLD\_ADULT\_COUNT = 1 AND HOUSEHOLD\_CHILD\_COUNT = 0 AND} \\
\text{HOUSEHOLD\_RETIRED\_COUNT = 1 THEN 9}
\end{align*}
\]

[LONG DISTANCE CITY] = [LD\_CITY]
IF HOUSEHOLD_ADULT_COUNT >= 2 AND HOUSEHOLD_CHILD_COUNT = 0 AND HOUSEHOLD_RETIRED_COUNT >= 1 THEN 10

MSACAT
Description: Metropolitan Statistical Area (MSA) category for the household's home address, based on household's home geocode and TIGER/Line Shapefiles.
Logic: IF MSASIZE = (4,5) THEN
      IF RAIL = 1 THEN 1
      IF RAIL = 2 THEN 2
      IF MSASIZE = (1,2,3) THEN 3
      IF CBSA IS MISSING THEN 4

MSASIZE
Description: Population size category of the Metropolitan Statistical Area (MSA), from the 2010-2014 five-year American Community Survey (ACS) API.
Logic: IF [POPULATION OF MSA] < 250,000 THEN "01"
      IF [POPULATION OF MSA] >= 250,000 AND <= 499,999 THEN "02"
      IF [POPULATION OF MSA] >= 500,000 AND <= 999,999 THEN "03"
      IF [POPULATION OF MSA] >= 1,000,000 AND <= 2,999,999 THEN "04"
      IF [POPULATION OF MSA] >= 3,000,000 THEN "05"
      IF MSA IS MISSING THEN "06"

NUMADLT
Description: Count of adult household members at least 18 years old
Logic: [PERSON_IS_18_OVER] =
      IF R_AGE >= 18 THEN TRUE
      IF AGERANGE = (4,5,6) THEN TRUE
      COUNT(WHERE PERSON_IS_18_OVER = TRUE)

RAIL
Description: MSA heavy rail status for household
Logic: IF CBSA =
        ("12060","12580","14460","39300","16980","17460","31080","37100","40140","33100","35300","14860","37980","41860","41940","47900","35620") THEN "01"
        ELSE "02"

RESP_CNT
Description: Count of responding persons per household
Logic: HHSIZE

SCRESP
Description: Person identifier of mail screener respondent, always 1 to roster self first
SPONSCHG
Description: Flag indicating SPONSOR variable changed during retrieval
Logic: [COUNTY_FIPS] = CNTYFIPS WHERE LOCNO = 100

IF SAMPAREA = 1 AND HHSTFIPS != '04') THEN 1
IF SAMPAREA = 2 AND HHSTFIPS != '06') THEN 1
IF SAMPAREA = 3 AND (HHSTFIPS != '19' OR (HHSTFIPS = '19' AND [COUNTY_FIPS] != ('049','153','181'))) THEN 1
IF SAMPAREA = 4 AND HHSTFIPS != '13') THEN 1
IF SAMPAREA = 5 AND (HHSTFIPS != '40' OR (HHSTFIPS = '40' AND [COUNTY_FIPS] != ('037','113','131','143','145'))) THEN 1
IF SAMPAREA = 6 AND (HHSTFIPS != '19' OR (HHSTFIPS = '19' AND [COUNTY_FIPS] != ('013','037','023','075','019','017'))) THEN 1
IF SAMPAREA = 7 AND HHSTFIPS != '24') THEN 1
IF SAMPAREA = 8 AND HHSTFIPS != '37') THEN 1
IF SAMPAREA = 9 AND HHSTFIPS != '48') THEN 1
IF SAMPAREA = 10 AND HHSTFIPS != '36') THEN 1
IF SAMPAREA = 11 AND HHSTFIPS != '45') THEN 1
IF SAMPAREA = 13 AND HHSTFIPS != '55') THEN 1
ELSE 2

TDAYDATE
Description: Date of travel day (YYYYMM)
Logic: EXTRACT(YYYYMM FROM TDAYDAT2)

TRAVDAY
Description: Travel day - day of week
Logic: [DAY OF WEEK] = EXTRACT(DAY OF WEEK FROM TDAYDAT2)

IF [DAY OF WEEK] = SUNDAY THEN 1
IF [DAY OF WEEK] = MONDAY THEN 2
IF [DAY OF WEEK] = TUESDAY THEN 3
IF [DAY OF WEEK] = WEDNESDAY THEN 4
IF [DAY OF WEEK] = THURSDAY THEN 5
IF [DAY OF WEEK] = FRIDAY THEN 6
IF [DAY OF WEEK] = SATURDAY THEN 7

URBAN
Description: Household's urban area classification, based on home address and 2014 TIGER/Line Shapefile
Logic: IF [URBAN AREA TYPE] = "URBANIZED AREA" THEN "01"
IF [URBAN AREA TYPE] = "URBAN CLUSTER" THEN "02"
IF [GEOMETRY] SURROUNDED BY ([GEOMETRY] WHERE [URBAN AREA TYPE] = "URBANIZED AREA") THEN "03"
ELSE "04"

URBANSIZE
Description: Urban area size where home address is located
Logic: IF [POPULATION OF URBAN AREA] BETWEEN 50,000 AND 199,999 THEN 1
IF [POPULATION OF URBAN AREA] BETWEEN 200,000 AND 499,999 THEN 2
IF [POPULATION OF URBAN AREA] BETWEEN 500,000 AND 999,999 THEN 3
IF [POPULATION OF URBAN AREA] >= 1,000,000 THEN
IF RAIL = "01" THEN 4
IF RAIL = "02" THEN 5
ELSE 6

URBRUR
Description: Household in urban/rural area
Logic: IF URBAN = (01,02) THEN 1
ELSE 2

WEBUSE17
Description: Frequency of internet use
Logic: MINIMUM (PC WHERE PC != (-7,-8),
SPHONE WHERE SPHONE != (-7,-8),
TAB WHERE TAB != (-7,-8),
ODEVICE WHERE ODEVICE != (-7,-8))

WRKCOUNT
Description: Number of workers in household
Logic: COUNT (WHERE WORKER = 1)

YOUNGCHILD
Description: Count of persons with an age between 0 and 4 in household
Logic: IF _IS_0_TO_4 =
IF R_AGE = (0,1,2,3,4) THEN TRUE
IF AGERANGE = (1) THEN TRUE
COUNT(WHERE PERSON_IS_0_TO_4 = TRUE)

TRIP Variables

DRVR_FLG
Description: Respondent drove on trip
Logic: IF PERSONID = WHODROVE AND TRPTRANS17 = (3,4,5,6,7,8,9,18) THEN 1
IF PERSONID != WHODROVE AND TRPTRANS17 = (3,4,5,6,7,8,9,18) THEN 2
IF TRPTRANS17 != (3,4,5,6,7,8,9,18) THEN -1
DWELTIME
Description: Time at destination
Logic: DEPTIME - ENDTIME

ENDTIME
Description: Trip End Time (HHMM)
Logic: Trip end time in military format.

HHMEMDRV
Description: Household member drove on trip
Logic:
- IF TRPTRANS17 != (3,4,5,6,7,8,9,18) THEN -1
- IF WHODROVE != 97 AND TRPTRANS17 = (3,4,5,6,7,8,9,18) THEN 1
- IF WHODROVE = 97 AND TRPTRANS17 = (3,4,5,6,7,8,9,18) THEN 2

HH_ONTD
Description: Number of household members on trip including respondent
Logic: TRPHHACC + 1

LOOP_TRIP
Description: Trip origin and destination at identical location
Logic:
- IF LOCNO = O_LOCNO THEN 1
- ELSE 2

NONHHCNT
Description: Number of non-household members on trip
Logic: TRPACCMP - TRPHHACC

NUMONTRP
Description: Number of people on trip including respondent
Logic: TRPACCMP + 1

PSGR_FLG
Description: Respondent was passenger on trip
Logic:
- IF WHODROVE != PERSONID AND TRPTRANS17 = (3,4,5,6,7,8,9,18) THEN 1
- IF WHODROVE = PERSONID AND TRPTRANS17 = (3,4,5,6,7,8,9,18) THEN 2
- IF TRPTRANS17 != (3,4,5,6,7,8,9,18) THEN -1

PUBTRANS
Description: Public transportation used on trip
Logic:
- IF TRPTRANS17 = (11,15,16) THEN 1
- ELSE 2
**STRTTIME**
Description: Trip Start Time (HHMM)
Logic: Trip start time in military format

**TDTRPNUM**
Description: Incrementing travel day trip number, starting at 1 for each person in the file
Logic: FOR EACH (HOUSEID, PERSONID) ORDERED BY STRTTIME (ROW NUMBER)

**TDWKND**
Description: Weekend trip
Logic: IF [TRAVDAY] = (1,7) OR ([TRAVDAY] = (6) AND STRTTIME >= 1800) THEN 1 ELSE 2

**TRIPPURP**
Description: Generalized purpose of trip, home-based and non-home based
Logic:
IF WHYFROM = -9 OR WHYTO = -9 THEN -9
IF WHYFROM = (1,2) AND WHYTO = (3,4) THEN HBW
IF WHYFROM = (3,4) AND WHYTO = (1,2) THEN HBW
IF WHYFROM = (1,2) AND WHYTO = (11,12,13) THEN HBSHP
IF WHYFROM = (11,12,13) AND WHYTO = (1,2) THEN HBSHP
IF WHYFROM = (1,2) AND WHYTO = (15,16,17) THEN HBSOC
IF WHYFROM = (15,16,17) AND WHYTO = (1,2) THEN HBSOC
IF WHYFROM = (1,2) AND WHYTO != (3,4,8,11,12,13,15,16,17) THEN HBO
IF WHYFROM != (3,4,8,11,12,13,15,16,17) AND WHYTO = (1,2) THEN HBO
ELSE NHB

**TRPHHACC**
Description: Count of Household Members on Trip
Logic: COUNT(ONTD_P* = 1)

**TRPMILES**
Description: Trip distance in miles, derived from route geometry returned by Google Maps API, or from reported loop-trip distance
Logic:
[START_LOCATION] = (LONGITUDE, LATITUDE) WHERE TRIP.O_LOCNO = LOCATION.LOCNO
[END_LOCATION] = (LONGITUDE, LATITUDE) WHERE TRIP.LOCNO = LOCATION.LOCNO
[GOOGLE_ROUTE_DISTANCE] = ([START_LOCATION] -> [END_LOCATION])

IF LOCNO != O_LOCNO THEN [GOOGLE_ROUTE_DISTANCE]
IF TRPTRANS17 IN (1,2,3,4,5,6,7,8,9,18) AND WKBK_UNIT = (1,2) THEN
IF WKBK_UNIT = 1 THEN WKBK_DIST * 0.1111
IF WKBK_UNIT = 2 THEN WKBK_DIST
ELSE [GOOGLE_ROUTE_DISTANCE]
TRPMILES17
Description: Trip distance in miles, derived from route geometry returned by Google Maps API
Logic: [START_LOCATION] = (LONGITUDE, LATITUDE) WHERE TRIP.O.LOCNO = LOCATION.LOCNO
[END_LOCATION] = (LONGITUDE, LATITUDE) WHERE TRIP.L.LOCNO = LOCATION.LOCNO
[GOOGLE_ROUTE_DISTANCE] = ([START_LOCATION] -> [END_LOCATION])
IF LOCNO = O.LOCNO THEN 0
ELSE [GOOGLE_ROUTE_DISTANCE]

TRPTRANS
Description: Trip Mode, derived
Logic: [VEHICLE TYPE] = VEHICLE.VEHID WHERE VEHICLE.VEHID = TRIP.VEHID
IF [VEHICLE TYPE] = 1 THEN 3
IF [VEHICLE TYPE] = 2 THEN 5
IF [VEHICLE TYPE] = 3 THEN 4
IF [VEHICLE TYPE] = 4 THEN 6
IF [VEHICLE TYPE] = 5 THEN 6
IF [VEHICLE TYPE] = 6 THEN 9
IF [VEHICLE TYPE] = 7 THEN 8
ELSE TRPTRANS17

TRVLCMIN
Description: Trip Duration in Minutes
Logic: [WKBK_DISTANCE] =
IF WKBK_UNIT = 2 THEN WKBK_DIST
IF WKBK_UNIT = 1 THEN WKBK_DIST * 0.111111

[SPEED] = TRPMILES/EXTRACT(MINUTES FROM ENDTIME - STRRTIME)*60
[WKBK_SPEED] = [WKBK_DISTANCE]/EXTRACT(MINUTES FROM ENDTIME - STRRTIME)*60

[ORIGIN LOCATION NAME] = LOCNAME WHERE TRIP.O.LOCNO = LOCATION.LOCNO
[DESTINATION LOCATION NAME] = LOCNAME WHERE TRIP.L.LOCNO = LOCATION.LOCNO
[ORIGIN LOCATION COUNTRY] = COUNTRY WHERE TRIP.O.LOCNO = LOCATION.LOCNO
[DESINATION LOCATION COUNTRY] = COUNTRY WHERE TRIP.L.LOCNO = LOCATION.LOCNO

[AIRPORT TRAVEL] =
IF [ORIGIN LOCATION NAME] OR [DESTINATION LOCATION NAME] LIKE ('airport', 'terminal') THEN 1
IF [ORIGIN LOCATION NAME] OR [DESTINATION LOCATION NAME] LIKE ('airport', 'terminal') THEN 1
IF [ORIGIN LOCATION COUNTRY] OR [DESTINATION LOCATION COUNTRY] NOT LIKE ('USA', 'United States') THEN 1
ELSE 0

IF STRRTIME > ENDTIME THEN -9
IF O.LOCNO = LOCNO AND [WKBK_DISTANCE] > 10 AND [WKBK_SPEED] > 20 AND
TRPTRANS = 1 THEN -9
IF O_LOCNO = LOCNO AND [WKBK_DISTANCE] > 10 AND [WKBK_SPEED] > 40 AND TRPTRANS = 2 THEN -9
IF O_LOCNO = LOCNO AND [WKBK_DISTANCE] > 10 AND [WKBK_SPEED] > 160 AND TRPTRANS IN (3,4,5,6,7,8,9,18) THEN -9
IF O_LOCNO != LOCNO AND TRPTRANS > 10 AND [SPEED] > 40 AND TRPTRANS = 1 THEN -9
IF O_LOCNO != LOCNO AND TRPTRANS > 10 AND [SPEED] > 160 AND TRPTRANS IN (3,4,5,6,7,8,9,18) THEN -9
ELSE EXTRACT(MINUTES FROM ENDTIME - STRTTIME)

VMT_MILE
Description: Trip distance in miles for personally driven vehicle trips, derived from route geometry returned by Google Maps API
Logic: IF TRPTRANS = (3,4,5,6,7,8,9,18) AND VEHTYPE = (1,2,3,4,5,6,7) AND DRVR_FLG = 1 THEN TRPMILES
ELSE -1

VMT_MILE17
Description: Trip distance in miles for personally driven vehicle trips, derived from route geometry returned by Google Maps API, or from reported loop-trip distance
Logic: IF TRPTRANS = (3,4,5,6,7,8,9,18) AND VEHTYPE = (1,2,3,4,5,6,7) AND DRVR_FLG = 1 THEN TRPMILES17
ELSE -1

WHYFROM
Description: Trip Origin Purpose
Logic: WHYTO WHERE TDTRPNUM = TDTRPNUM - 1

WHYTRP1S
Description: Trip purpose summary
Logic: IF WHYTO = (1,2) THEN 01
IF WHYTO = (3,4) THEN 10
IF WHYTO = (8,9,10,19) THEN 20
IF WHYTO = 18 THEN 30
IF WHYTO = (11,12,14) THEN 40
IF WHYTO = (15,16,17) THEN 50
IF WHYTO = 6 THEN 70
IF WHYTO = 13 THEN 80
ELSE 97

WHYTRP90
Description: Travel day trip purpose consistent with 1990 NPTS design.
Logic: [HOME TOUR WINDOW] = MINIMUM(TDTRPNUM) WHERE WHYTO IN (1,2) BETWEEN
MAXIMUM(TDTRPNUM) WHERE WHYTO IN (1, 2)
[WORK TOUR WINDOW] = MINIMUM(TDTRPNUM) WHERE WHYTO IN (3) BETWEEN
MAXIMUM(TDTRPNUM) WHERE WHYTO IN (3)

[WHYTRP90 STEP ONE] =
IF WHYTO IN (1,2) AND [HOME TOUR WINDOW] = 0 THEN O_WHYTO
IF WHYTO IN (1,2) AND [HOME TOUR WINDOW] >= 1 THEN WHYTO WHERE
DWELLTIME = MAXIMUM(DWELLTIME) OF [HOME TOUR WINDOW]
IF WHYTO IN (3) AND [WORK TOUR WINDOW] = 0 THEN WHYTO
IF WHYTO IN (3) AND [WORK TOUR WINDOW] >= 1 THEN WHYTO WHERE
DWELLTIME = MAXIMUM(DWELLTIME) OF [WORK TOUR WINDOW]
ELSE WHYTO

WHYTRP90 =
IF [WHYTRP90 STEP ONE] = (3) THEN 1
IF [WHYTRP90 STEP ONE] = (4) THEN 2
IF [WHYTRP90 STEP ONE] = (11) THEN 3
IF [WHYTRP90 STEP ONE] = (5,6,10,12,14) THEN 4
IF [WHYTRP90 STEP ONE] = (13) AND IN [WORK TOUR WINDOW] THEN 4
IF [WHYTRP90 STEP ONE] = (8,9,19) THEN 5
IF [WHYTRP90 STEP ONE] = (10,18) THEN 6
IF [WHYTRP90 STEP ONE] = (17) THEN 8
IF [WHYTRP90 STEP ONE] = (15,16) THEN 10
IF [WHYTRP90 STEP ONE] = (13) AND IN [HOME TOUR WINDOW] THEN 10
IF [WHYTRP90 STEP ONE] = (97) THEN 11
IF [WHYTRP90 STEP ONE] = (-8,-7) THEN 99
ELSE 11