**8 June 2016**

ZIP Code Travel Time File (ZTTF) and
MTF Travel Time File (MTTF)

(Version 1.00.00)

Current Specification

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# Revision History

| **Version** | **Date**  | **Originator** | **Para/Tbl/Fig** | **Description of Change** |
| --- | --- | --- | --- | --- |
| 1.00.00 | 06/08/2016 | S. Wang | * All
 | * Baseline
 |

# Travel Time Files

## Source

Table 1. Listing of Source Files

|  |  |  |
| --- | --- | --- |
| Source File | Source | Travel Time File |
| MHS beneficiary street address data of eligible primary records | DEERS/DHA Solutions Delivery Division (SDD) | ZTTF & MTTF |
| MTF Service Area CAD (for the list of MTF enrollment sites) | DHA/Decision Support Division (DSD) | MTTF |
| DHA Decision Support Routing file (for MTF latitudes and longitudes) | DHA/DSD | MTTF |
| Urban Mobility Study (for travel time congestion factors) | Texas A&M Transportation Institute[[1]](#footnote-1) | ZTTF & MTTF |
| ZIP Code Polygon & Point Feature Classes (for initial latitudes and longitudes of ZIP Code centroids and ZIP Code service areas) | ESRI | ZTTF & MTTF |
| StreetMap Dataset (for the Road Network input to provide routing information between ZIP Code centroids and MTF enrollment sites) | ESRI | ZTTF & MTTF |
| Enhanced Multi-Service Markets (eMSM) (for the list of ZIP Codes that represent the eMSM service areas) | DHA/DSD | ZTTF |
| eMSM Polygon Feature Classes (for determining the list of population-weighted ZIP Codes that lie within the eMSM service areas) | DHA/DSD | ZTTF |

## Transmission (Format and Frequency)

The ZTTF is currently provided on an ad hoc basis as a set of CSV flat files. The MTTF is currently provided on an ad hoc basis as an Excel spreadsheet. These files are generated as directed by the government sponsor.

Each record in the ZTTF represents travel time information from an origin ZIP Code to a destination ZIP Code for those ZIP Codes that are within 160 straight-line miles from each other.

The records in the MTTF represent travel time information from an origin ZIP Code to a destination MTF for those ZIP Codes that are within 50 straight-line miles of an MTF.

The ZIP Code locations used for the distance and travel time calculations are based on a weighted average of the MHS beneficiary address locations within each ZIP Code (where possible).

## Organization and batching

* MHS beneficiary street address data of eligible primary records is updated monthly.
* MTF Service Area CAD is updated monthly
* DHA DSD Routing file is updated monthly
* Urban Mobility Study is updated annually
* ZIP Code Polygon & Point Feature Classes are updated annually or as-needed to include data corrections and in-year updates
* StreetMap Dataset is updated annually.

## Receiving Filters

As noted previously:

* ZTTF ZIP Code pairs only include those within 160 straight-line miles of each other;
* MTTF ZIP Codes only include those within 50 straight-line miles of one or more MTFs included in the MTF Service Area CAD;
* Populations used to compute population-weighted ZIP Code centroids are MHS-eligible, primary records.

## Field Transformations and Deletions for MDR Database

N/A

## Updating the Master Tables

N/A

## File Layout and Content

### ZIP Code Travel Time File

The ZIP Code Travel Time File (ZTTF) is a reference file containing computed travel time and distances between MHS beneficiary population-weighted ZIP Code centroids, for ZIP Codes whose centroids are within 160 miles of each other.

Example uses are:

* Addressing national/policy-level questions quickly, such as the impact of Veterans Choice Act on DoD MTFs (i.e., Veterans outside 40 driving miles of VA medical facilities but who are proximate to DoD MTFs);
* Estimating average beneficiary travel-time to network providers to assess adequacy of contractor’s specialty network;
* Conducting proximity analysis to understand how many beneficiaries are within a given distance or drive-time of various ZIP Codes to support site-selection for new clinics; and
* Augmenting analytic datasets for regression and other types of analyses to better understand the influence of proximity to network providers on beneficiary behavior. (May be paired with MTTF to evaluate proximity to both MTF and network provider options simultaneously.)

Table 2 identifies each field in the ZTTF, its format, and the appendix containing the business rules for deriving the field (if needed). Most fields are from native data source inputs (i.e., “No transformation” to the field as it exists in its source system)

Table 2. ZTTF Format and Fields

| **Field** | **Format** | **Transformation** |
| --- | --- | --- |
| ObjectID | Long Integer | No transformation |
| From\_ZIP\_Code | Text(5) | No transformation |
| From\_State\_Abbreviation | Text(2) | No transformation |
| To\_ZIP\_Code | Text(5) | No transformation |
| To\_State\_Abbreviation | Text(2) | No transformation |
| Straightline\_Distance | Double | See Appendix A, Section A.2 for derivation rules |
| Drive\_Distance | Double | No transformation |
| Uncongested\_Drive\_Time | Double | No transformation |
| Congested\_Drive\_Time\_Small\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |
| Congested\_Drive\_Time\_Medium\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |
| Congested\_Drive\_Time\_Large\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |
| Congested\_Drive\_Time\_Very\_Large\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |

### MTF Travel Time File (MTTF)

The MTF Travel Time File (MTTF) is a reference file containing travel-times and distances from MHS beneficiary population-weighted ZIP Code centroids to MTF enrollment sites.

The MTTF, in conjunction with data from central systems such the MDR and M2, can be used to explore a host of management questions related to issues of proximity to MTF enrollment sites, such as:

* Understanding how many network enrollees reside within 30 minutes of MTF enrollment sites to aid in recapture planning of network enrollees;
* Understanding travel-time from ZIP Codes to multiple enrollment sites in eMSMs and other areas with multiple MHS facilities to help in optimizing enrollment strategies that minimize beneficiary travel-time, or maximize population within a given travel time of the new site;
* Estimating the percentage of direct care enrollees receiving care at MTFs that are within and outside the primary care and specialty care access standards; and
* Augmenting analytic datasets for regression and other types of analyses to better understand the influence of proximity to a MTF on beneficiary behavior.

Table 3 identifies each field in the MTTF, its format, and the appendix containing the business rules for deriving the field (if needed). Most fields are from native data source inputs (i.e., “No transformation” to the field as it exists in its source system).

Table 3. MTTF Format and Fields

| **Field** | **Format** | **Transformation** |
| --- | --- | --- |
| ObjectID | Long Integer | No transformation |
| From\_ZIP\_Code | Text(5) | No transformation |
| To\_DMISID | Text(4) | No transformation |
| To\_DMISID\_Name | Text(50) | No transformation |
| Straightline\_Distance | Double | See Appendix A, Section A.2 for derivation rules |
| Drive\_Distance | Double | No transformation |
| Uncongested\_Drive\_Time | Double | No transformation |
| Congested\_Drive\_Time\_Small\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |
| Congested\_Drive\_Time\_Medium\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |
| Congested\_Drive\_Time\_Large\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |
| Congested\_Drive\_Time\_Very\_Large\_Metro\_Area | Double | See Appendix A, Section A.3 for derivation rules |

## Refresh Frequency

TBD

## Special Outputs

The full ZTTF is used to create many other subset files.

These are:

* *Full drive time table: All\_States\_DC\_PR\_VI.exe.*
This is the complete ZTTF drive time matrix (all 67,463,989 records). Note that while the “From” and “To” ZIP Codes include Guam (GU) ZIP Codes and the straight line distances between them, supporting road network information was not available to compute travel times and distances. Puerto Rico and the Virgin Islands ZIP Codes, on the other hand, include travel time and distances, as information was available to support these calculations.
* *State/Territory-level tables: <State/Territory Abbreviation>.exe*
These files contain information for ZIP Codes within the given State, whether Origin (From) or Destination (To) ZIP Code. Therefore, routes include not only those within the state but also those crossing the border out of the State (to any ZIP Code within 160 straight-line miles).
* *Enhanced Multi-Service Markets (eMSM)-level tables*There are multiple ZTTFs related to each of the six eMSMs:
	+ One represents just the compilation of the individual Zip Codes in each CAD/PRISM of the MTFs considered in the eMSM;
	+ The second is a refinement of the first set, to include just those drove time records within 30 minutes uncongested drive time (filenames include “\_LTE30Min” tag);
	+ The third represents the combined output of the states that are represented in the eMSM area (file names contains the “\_States” tag); and
	+ The fourth set is a refinement of the third set, to include only those drive time records that are <= 30 minutes uncongested drive time (filenames includes “\_States” and “\_LTE30Min” tags)

The six eMSMs for which these files are created are:

* + Colorado Springs
	+ Hawaii
	+ National Capital Area
	+ Puget Sound
	+ San Antonio
	+ Tidewater
* *TRICARE Region-level tables (Full States)*The TRICARE Region-level tables contain all of the drive time records associated with the full States that are in a given Region.
Note: While each of the Regions has exceptions where certain portions of a certain State(s) are excluded from the Region (and included in another Region), these exceptions are not refelected in these files. That is, all state ZIP Codes are included in the file if a state (complete or partial) is in the Region. The three regions for which files are created are:
	+ TRICARE North;
	+ TRICARE South; and
	+ TRICARE West.

**Note:** There will be duplicate drive time records if any of the smaller level tables are combined (e.g. combining neighboring state level tables). Users should identify and remove duplicate records before performing an analysis.

# APPENDIX A: Travel Time File Data Processing Requirements and Methodologies

A.1 MHS Beneficiary Address Processing

A.1.1 Geocoding Individual Addresses

Process all MHS beneficiary records through a geocoder to determine a latitude and longitude coordinate that best describes the address location (if possible). Although most geocoders will return higher levels of geography for the basis of the returned coordinate if the street level address fails to provide a result (for example, returning coordinates for a ZIP Code centroid or even the state centroid), do not use these higher levels for the geocoded results.

A.1.2 Population-weighted Centroid (PWC) Calculations

After geocoding the address records, review the geocoding scores assigned by the geocoder. For each record, the geocoding score reflects a “goodness of fit” level with how closely the beneficiary address information on the record matches the geocoded road segment information (e.g., a higher value is better). Determine a minimum score cutoff value where any records values greater than or equal to the cutoff are used to calculate a population-weighted centroid (i.e., do not use records with lower values).

Some ZIP Codes represent post office boxes (“point” ZIP Codes) while others represent a mail service delivery area (“polygon” ZIP Codes). The population-weighted calculations are only applied to service delivery area ZIP Codes. For each of the polygon ZIP Codes, identify the set of enclosed geocoded beneficiary locations. Then based on these locations, calculate the median location: the population-weighted centroid (PWC). Median, rather than mean, is used because the median represents the shortest total distance to all other locations within the ZIP Code and is less influenced by data outliers than Mean Centers. (Mean centers represent the average x-coordinate value and the average y-coordinate value of all locations in a study area.) If a median point can be calculated, use it to update the ZIP Code geographic location – otherwise use the geographic centroid of the ZIP Code

A.2 Straight-Line Distance Calculations

Obtain straight-line distance calculations using GIS, geodesic-based, tools to determine the point-to-point measurements (in miles). A geodesic-based method takes into account the shape and curvature of the Earth and provides for the shortest route between two points on the Earth’s surface. This method provides for more accurate distances over large, national, or world areas. It also helps avoid large scale distance distortions that can happen when using a projected coordinate system and Euclidean based distance calculations.

A.3 Uncongested Travel-Time and Driving Distance Calculations

Where possible, place the final PWC coordinates on the closest “navigable” road segment. Sometimes this is not possible due limited road coverage areas in remote or isolated locations (e.g. Alaska): in such cases, assign the record a straight-line distance but no travel-related data. Calculate uncongested, shortest distance-based drive time and distance measures for the ZIP Code pairs identified in straight-line distance calculations. For some ZIP Code pairs, a drive-time and -distance calculation may not be made due to areas with limited or no road network connectivity (e.g. islands, limited road networks in Alaska).

A.4 Congested Travel Time Calculations

Because not all routes can be traveled along uncongested roadways, apply a travel delay or “congestion factor” to uncongested travel times to better reflect actual road conditions (related to “time of day” or overall congestion). The congestion factors used for the 2015 data are from the Texas A&M Transportation Institute's Urban Mobility Study[[2]](#footnote-2). The study provides national congestion factor Travel Time Indexes that are used as congestion weighting factors for the following general urban area definitions:

* Very Large Urban Areas—over 3 million population. (1.32)
* Large Urban Areas—over 1 million and less than 3 million population. (1.23)
* Medium Urban Areas—over 500,000 and less than 1 million population. (1.18)
* Small Urban Areas—less than 500,000 population. (1.14)

The Travel Time Index is multiplied by the uncongested travel time to obtain the congested travel time for the urban area definition.

# APPENDIX B: 2015 ZTTF and MTTF Generation Details

Table 4. Listing of Source Files For the 2015 ZTTF and MTTF

|  |  |
| --- | --- |
| Source File | Source |
| FY16 FM01 MHS beneficiary street address data of eligible primary records | DEERS/DHSS |
| August 2015 MTF Service Area CAD | DHA/Decision Support |
| August 2015 DHA Decision Support Routing file | DHA/Decision Support |
| August 2015 Urban Mobility Study | Texas A&M Transportation Institute |
| August 2015 ZIP Code Polygon & Point Feature Classes (for initial latitudes and longitudes of ZIP Code centroids and ZIP Code service areas) | ESRI |
| 2012 StreetMap Dataset (for the Road Network input to provide routing information between ZIP Code centroids and MTF enrollment sites) | ESRI |
| September 2014 Enhanced Multi-Service Markets | DHA/Decision Support |
| September 2014 Enhanced Multi-Service Markets Polygon Feature Class | DHA/Decision Support |

ESRI ArcGIS Desktop v10.3.1 software and geoprocessing tools were used: to geocode MHS beneficiary addresses, to calculate population-weighted centroids, and to calculate distances between ZIP Code centroids pairs and MTF enrollment sites.

ESRI Network Analyst extension, v10.3.1 was used to calculate drive-times and drive-distances.

1. http://mobility.tamu.edu/ums/ [↑](#footnote-ref-1)
2. http://mobility.tamu.edu/ums/ [↑](#footnote-ref-2)