

"Distance to Nearest FQHC Delivery Site" Files

NAMCS and NHAMCS (1999 to 2009)

**Data Available from the National Center for Health Statistics Research Data Center
(<http://www.cdc.gov/rdc/>)**

Purpose

The purpose of this file is to provide the straight line distance, in statutory miles, to the nearest eligible Federally Qualified Health Center (FQHC) healthcare delivery site for each patient visit in the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS) for the years 1999 through 2009.

Methods

Distances were calculated using the patient ZIP code variable (PATZIP) from the internal NAMCS/NHAMCS visit files and the street address of each FQHC delivery site from the 2010 Centers for Medicare and Medicaid Services Provider of Services file¹.

Since FQHC delivery sites can open or close in a given year, distances were calculated only for those centers that existed for at least some part of the year of the survey. The existence of a FQHC delivery site in a given year was determined using the dates for when a site is approved to provide Medicare/Medicaid services (the variable PROV1565 in the POS file) and when the approval is terminated (PROV4500). In 1999, 1,942 FQHC delivery sites were in operation. The number of FQHC sites had increased to 4,557 in 2009.

The distance between patient ZIP code coordinates and the FQHC delivery site coordinates was calculated using the great circle distance formula:

$$d = 3963 \times \arccos \left[\sin \left(\frac{\textit{latitude}_1}{57.2958} \right) \times \sin \left(\frac{\textit{latitude}_2}{57.2958} \right) + \cos \left(\frac{\textit{latitude}_1}{57.2958} \right) \times \cos \left(\frac{\textit{latitude}_2}{57.2958} \right) \right. \\ \left. \times \cos \left(\frac{\textit{longitude}_1}{57.2958} - \frac{\textit{longitude}_2}{57.2958} \right) \right]$$

where d is distance and *latitude* and *longitude* are in decimal form. A distance was calculated for each unique, valid patient ZIP code for that survey year and each of the FQHC sites in existence during that year. The minimum distance was then selected from the set of all calculated distances for each unique ZIP code.

For visits, latitude and longitude coordinates were identified using the centroid of the patient's ZIP code. The coordinates from these centroids are from the SAS ZIP file Version 9.2 (Cary, NC). For the years 1999

¹ More information of the Provider of Services file can be found at https://www.cms.gov/nonidentifiabledatafiles/04_providerofservicesfile.asp.

to 2009, 4.8 % of the patient zip codes were found to be missing or invalid and distances were not available. In total, 37,853 of 1,029,486 unweighted observations (3.7 %) do not have distance data. Table 1 provides unweighted distance missingness by year.

Geocoding of the CMS Provider of Services file was performed by the Department of Housing and Urban Development. Street address validation and coding was done using Pitney Bowes Group 1 Code-1 Plus Version 3.4 (Stamford, CT). Geocoding was performed using Pitney Bowes Group 1 Geographic Coding Plus Version 5.2 (Stamford, CT). In some cases, the latitude and longitude of the street address for the FQHC delivery site could not be ascertained. For these sites, the latitude and longitude of the FQHC site was determined using either the 9-digit or 5-digit ZIP code centroid². Table 2 lists the the percentage of distances calculated using the ZIP code versus street-level distances by year. A centroid variable called 'quality' is included in the file to indicate whether the street address or the 9-digit or 5-digit ZIP code centroid was used. Table 3 provides weighted summary statistics for the distance to the nearest FQHC site by year.

² The ZIP+4 centroid provides a latitude and longitude for the assigned street segment of the ZIP code. While less accurate than a 'rooftop'-based latitude and longitude, it is considered more accurate than the centroid of the 5 digit ZIP code.

Table 1. Missing Distance Values Due to Missing or Invalid Patient ZIP codes by Year (Unweighted)

Year	Survey	Total Observations	Number Missing	Percent Missing
1999	NAMCS	20,760	959	4.62
	NHAMCS – ED	21,103	1,192	5.65
	NHAMCS – OPD	29,487	934	3.17
2000	NAMCS	27,369	1,232	4.50
	NHAMCS – ED	25,622	1,111	4.34
	NHAMCS – OPD	27,510	1,093	3.97
2001	NAMCS	24,281	865	3.56
	NHAMCS – ED	34,546	1,426	4.13
	NHAMCS – OPD	33,567	1,373	4.09
2002	NAMCS	28,738	1,194	4.15
	NHAMCS – ED	37,337	1,621	4.34
	NHAMCS – OPD	35,586	1,563	4.39
2003	NAMCS	25,288	1,212	4.79
	NHAMCS – ED	40,253	1,267	3.15
	NHAMCS – OPD	34,492	869	2.52
2004	NAMCS	25,286	785	3.10
	NHAMCS – ED	36,589	1,101	3.01
	NHAMCS – OPD	31,783	924	2.91
2005	NAMCS	25,665	1,046	4.08
	NHAMCS – ED	33,605	1,329	3.95
	NHAMCS – OPD	29,975	905	3.02
2006	NAMCS	29,392	1,449	4.93
	NHAMCS – ED	35,849	1,214	3.39
	NHAMCS – OPD	35,105	1,527	4.35
2007	NAMCS	32,778	1,590	4.85
	NHAMCS – ED	35,490	1,474	4.15
	NHAMCS – OPD	34,473	991	2.87
2008	NAMCS	28,741	1,006	3.50
	NHAMCS – ED	34,134	1,356	3.97
	NHAMCS – OPD	33,908	693	2.04
2009	NAMCS	32,281	857	2.65
	NHAMCS – ED	34,942	1,045	2.99
	NHAMCS – OPD	33,551	650	1.94

Table 2. Distance Calculations Performed Using the FQHC Healthcare Delivery Site ZIP Code Centroid by Year (Unweighted)

Year	Survey	Distance Frame Size	Percent calculated with ZIP+4 centroids	Percent calculated with ZIP centroids
1999	NAMCS	19,801	6.97	8.69
	NHAMCS – ED	19,911	6.17	8.59
	NHAMCS – OPD	28,553	5.73	7.58
2000	NAMCS	26,137	5.69	10.31
	NHAMCS – ED	24,511	6.34	8.39
	NHAMCS – OPD	26,417	4.89	8.80
2001	NAMCS	23,416	6.38	9.81
	NHAMCS – ED	33,120	5.85	8.65
	NHAMCS – OPD	32,194	6.60	7.12
2002	NAMCS	27,544	7.01	9.62
	NHAMCS – ED	35,716	6.39	6.50
	NHAMCS – OPD	34,023	5.84	6.23
2003	NAMCS	24,076	6.06	10.16
	NHAMCS – ED	38,986	6.94	9.09
	NHAMCS – OPD	33,623	4.41	5.66
2004	NAMCS	24,501	4.44	10.16
	NHAMCS – ED	35,488	5.79	6.82
	NHAMCS – OPD	30,859	5.02	6.06
2005	NAMCS	24,619	5.23	8.18
	NHAMCS – ED	32,276	5.21	6.37
	NHAMCS – OPD	29,070	4.56	6.87
2006	NAMCS	27,943	4.97	7.84
	NHAMCS – ED	34,635	4.54	5.29
	NHAMCS – OPD	33,578	4.25	5.55
2007	NAMCS	31,188	5.09	9.02
	NHAMCS – ED	34,016	5.11	5.68
	NHAMCS – OPD	33,482	4.18	5.49
2008	NAMCS	27,735	5.15	5.19
	NHAMCS – ED	32,778	4.75	6.69
	NHAMCS – OPD	33,215	3.68	7.47
2009	NAMCS	31,424	4.45	6.20
	NHAMCS – ED	33,897	5.14	6.40
	NHAMCS – OPD	32,901	4.36	6.52

Table 3. Distance in Miles to the Nearest FQHC Delivery Site by Year (Weighted)

Year	Quartile	NAMCS	NHAMCS-ED	NHAMCS-OPD
1999	25 th	3.871	3.270	2.349
	50 th	9.216	9.872	7.046
	75 th	20.144	24.597	18.396
2000	25 th	3.862	2.803	2.171
	50 th	9.780	9.749	6.723
	75 th	21.990	23.727	21.709
2001	25 th	3.809	2.643	2.043
	50 th	8.558	7.963	6.363
	75 th	19.767	20.991	19.757
2002	25 th	3.684	2.608	1.972
	50 th	8.818	8.026	6.163
	75 th	20.146	20.334	16.854
2003	25 th	3.028	2.241	1.877
	50 th	7.343	6.771	5.857
	75 th	17.074	18.675	16.854
2004	25 th	3.511	2.049	1.764
	50 th	7.900	6.746	5.447
	75 th	18.452	18.277	15.934
2005	25 th	2.950	1.964	1.728
	50 th	7.364	5.994	5.498
	75 th	16.199	16.738	13.582
2006	25 th	2.485	1.820	1.668
	50 th	6.410	5.234	4.813
	75 th	15.350	14.039	13.816
2007	25 th	2.540	1.764	1.482
	50 th	6.228	4.866	4.620
	75 th	14.093	13.797	14.078
2008	25 th	2.205	1.640	1.317
	50 th	5.366	4.629	4.583
	75 th	11.676	12.352	13.380
2009	25 th	2.222	1.394	1.255
	50 th	5.534	4.373	4.248
	75 th	11.702	11.933	11.651

Appendix

Distance to the Nearest FQHC Delivery Site File Description

Variable name	Description
patzip	Patient ZIP Code 5 character string variable with leading zeros
year	Year of Survey 1999 – 2009
quality	Indicator as to whether or not the FQHC site street address, 9 digit ZIP, or 5 digit ZIP code centroid was used to calculate distance 1 – Street-Level Latitude and Longitude 2 – 9 digit ZIP Code Centroid 3 – 5 digit ZIP Code Centroid
chc_mindist	Distance to the nearest FQHC delivery site(in miles)