



**APPENDIX AVAILABLE ON REQUEST**

**Special Report**

**Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Mortality**

**Part II: Sensitivity Analyses**

**Appendix F. Definition of Metropolitan Areas in the ACS Study**

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**UNIVERSITY OF OTTAWA**

**Faculty of Medicine**

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**Re-analysis of the Harvard Six-Cities Study  
and the American Cancer Society Study  
of Air Pollution and Mortality,  
Phase II: Sensitivity Analysis**

**Appendix A, B, C, D, E, F, G, H, and I**

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## **CENSUS METROPOLITAN AREAS**

Before describing the process by which the geographic units for the ecologic-level covariates were determined, it is necessary to define certain terms used by the US Census Bureau. The term “standard metropolitan statistical area” (SMSA), historically used to characterize metropolitan areas in the United States, is no longer used by the Bureau. It was supplanted in 1983 by the terms “metropolitan statistical area” (MSA), “consolidated metropolitan statistical areas” (CMSAs), and their component “primary metropolitan statistical areas” (PMSAs). An MSA must have at least one city with 50,000 or more inhabitants, and a metropolitan region which contains a total of at least 100,000. MSAs are comprised of the county which includes the largest city, as well as any adjacent counties in which at least 50% of the population is in an urbanized region contiguous with that city. If an MSA contains a minimum of one million inhabitants or more and can be broken into recognizable component areas (using statistical criteria as well as local opinion), it may be designated as a CMSA, with the components becoming PMSAs. Together, CMSAs, PMSAs and MSAs are referred to as “metropolitan areas” (MA).

## **THE ORIGINAL INVESTIGATOR’S APPROACH**

The Original Investigators provided the Reanalysis Team with a copy of the file which was used to link the ZIP codes of the Cancer Prevention Study II respondents to 159 metropolitan areas in the United States. No documentation was available regarding the construction of this file. The file matched the first three digits of ZIP codes to “SMSA” ID numbers, a four-letter code for the city, and a two-letter code for the state (see Table F.1). As discussed below, the use of the obsolete term SMSA instead of the more specific terms MSA, PMSA or CMSA presented some difficulty in reconstructing the ACS file. The ZIP codes were obtained from the questionnaires which the ACS CPS II respondents filled out in the fall of 1982 (Pope et al 1995). The Original Investigators used MA boundaries, as defined on June 30, 1983, and ZIP code maps provided in the 1989 National Five Digit ZIP Code and Post Office Directory (Pope, personal correspondence).

In the process of obtaining air pollution data from the AIRS database using the SMSA codes provided by the Original Investigators (see Table F.1), it became apparent that the geographic areas to which these codes referred did not match, in all cases, the areas covered by the ZIP codes of participants in the CPS II study.

Taking the ACS location “SLOU, MO” as an example, the SMSA number it was assigned (7040) only refers to St Louis proper—the PMSA on the Missouri side of the border. The ZIP codes assigned to SLOU, MO, however, are from both sides of the border, as indicated by the differences in the first two digits of the three-digit forward sortation codes (620, 622, 630, 631). Moreover, ACS obtained air pollution data for SLOU, MO at a time when the state of Illinois Original Investigators monitored air pollution but the state of Missouri did not. Although there is no air pollution data available for the PMSA of “St Louis” (7040), the larger CMSA of “St Louis-East St Louis-Alton MO-IL” (7042) includes counties in Illinois for which AIRS data are available. Therefore it seems likely that the Original Investigators were

referring to the CMSA, 7042 rather than to the PMSA 7040.

It could not be assumed, however, that all of the metropolitan areas used by ACS were at the level of CMSAs. Three California metropolitan areas included by ACS—Los Angeles, Anaheim and Riverside—are of necessity PMSAs that comprise the larger CMSA of Los Angeles-Anaheim-Riverside. The ID codes provided by the Original Investigators for these three places are all PMSA codes, as they should be. Given these discrepancies, it became necessary to attempt some sort of validation of the mapping of ZIP codes onto MA identification numbers.

## **ZIP CODES AND THE CENSUS**

The following information regarding ZIP codes was obtained through consultation with Rose Quatero, the ZIP code expert in the Geography Division, Bureau of the Census; although similar issues are documented by Dr Michael Frank Goodchild at the National Center for Geographic Information and Analysis ([www.ncgia.ucsb.edu/~good/176b/p04.html#SEC29.3.1](http://www.ncgia.ucsb.edu/~good/176b/p04.html#SEC29.3.1)).

A ZIP code is essentially a postal carrier's route. ZIP codes and their boundaries are the purview of local Post Masters who may change the local boundaries at any time in order to provide more efficient service. For the most part, these changes affect only the last two digits of a ZIP code; however, a local Post Master may have jurisdiction over an area which crosses state boundaries in which case changes in the first three digits may occur. As well, since 1980, three-digit codes which were previously reserved for the United States military were added to civilian ZIP codes.

Because of this fragmented jurisdiction, it would have been necessary to contact each local Post Master and obtain his/her archives for 1982 in order to compile a comprehensive file of ZIP codes. This was obviously outside the scope of the reanalysis. Alternatively, there are products available which are based on the 1980 census and which contain ZIP codes. These ZIP codes were taken directly from the census questionnaires. Unfortunately, although there were approximately 40,000 ZIP codes in existence at the time, the census only published information for about 20,000.

In the late 1980s, commercial companies such as Rand McNally began to provide atlases of ZIP codes. The Original Investigators used ZIP code maps from this era: the 1989 National Five Digit ZIP Code and Post Office Directory. However, these products were not always reliable. For the purpose of verifying the mapping of ZIP codes to SMSAs, the Reanalysis Team used the contemporary, 1999, ZIP codes available on-line ([www.usps.com/ncsc/lookups/lookup\\_zip+4.html](http://www.usps.com/ncsc/lookups/lookup_zip+4.html)).

Using this web site, the acceptable ZIP codes for cities and towns falling within the MSA boundaries as shown in the County City Data Book (Bureau of the Census 1988) were obtained. The first three digits of these ZIP codes were compared with those provided by the Original Investigators. The results of this examination are included on the right half of Table F.1 below. It was determined that the ZIP codes provided for STLO MO did include the PMSAs in Illinois. Thirty-nine other discrepancies were found between the SMSA code used and the ZIP codes. STLO MO was not the only area for which a PMSA code was used when the ZIP codes actually applied to an entire CMSA (see for example, DALL,

TX). In other cases, ZIP codes which applied to one or some counties in an MA were left out (see for example, OKLA, OK). (This may be due to the addition of ZIP codes which had been reserved for the military.) In other cases, the ZIP codes listed actually applied to counties outside of the boundaries to which the ID code referred. Occasionally these counties were in other MAs (see, for example, CRAP IO); in other cases the ZIP codes referred to rural counties adjacent to metropolitan areas (see for example, CHAR WV).

## **AGGREGATION OF ECOLOGIC COVARIATES**

The United States Postal Service web site was used to determine the counties which were predominantly made up of ZIP codes used to assign ACS cohort members to places (see Table F.1). It was decided to use the largest relevant geographic area to represent each metropolitan region in the ACS Study. Thus, if the ZIP boundaries encompassed two adjacent MAs, data for both MAs was aggregated into one value. On the other hand, if the ZIP codes for one of the counties in the central MA were missing (such as OKLA OK), that county was still included because it is known that new three-digit codes have been added to the United States since 1980.

Depending upon the type of data provided (see Table E.1), weighted averages (according to the number of residents in each county) or simple aggregations were calculated from component counties for each metropolitan area. In some of the Eastern Seaboard States (CT, ME, MA and NH), metropolitan areas are aggregated from towns and cities, not from counties. The list of component places contained in the 1983 US Census Bureau definition of metropolitan areas (<http://www.census.gov/population/estimates/metro-city/83mfips.txt>) was used to aggregate data for metropolitan areas in these states.

The Reanalysis Team considered the possibility of using 1982 ZIP code boundaries to determine the geographic statistical areas represented by the ACS cohort. As noted above, however, a complete ZIP code file does not appear to exist for that time. Further, the MA boundaries used by the Original Investigators remain unclear. Consequently, it may be difficult to significantly improve upon the approach taken here to decide likely geographic boundaries for the 154 cities included in the ACS Study.

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## REFERENCES

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Pope CA, Thun MJ, Namboodiri MM, Dockery DW, Evans JS, Speizer FE, Heath CW. 1995. Particulate air pollution as a predictor of mortality in a prospective study of US adults. *Am J Respir & Crit Care Med* 151:669–674.

US Bureau of the Census. 1988. *County and City Data Book*, US Government Printing Office, Washington DC.

**Table F.1. Selection of Counties Used in Aggregation of Ecologic Covariates for Use in the Sensitivity Analysis of the ACS Study**

Original Analysis						Re-analysis	
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
1000	BIRM	AL	350, 351, 352	1000	MSA		01009 Blount County, 01073 Jefferson County 01117 Shelby County 01115 St. Clair County 01127 Walker County
3440	HUNT	AL	357, 358	3440	MSA		01089 Madison County
5160	MOBI	AL	365, 366	5160	MSA		01003 Baldwin County 01097 Mobile County
4400	LROC	AR	720, 721, 722	4400	MSA		05045 Faulkner County 05085 Lonoke County 05119 Pulaski County 05125 Saline County
6200	PHOE	AZ	850, 852, 853	6200	MSA		04013 Maricopa County
8520	TUCS	AZ	856, 857	8520	MSA		04019 Pima County,
360	ANAH	CA	926, 927, 928	360	PMSA		06059 Orange County
2840	FRES	CA	936, 937, 938	2840	MSA		06019 Fresno County
4480	LANG	CA	900, 901, 902, 903, 904, 905, 906, 907, 908, 910, 911, 912, 913, 914, 915, 916, 917 918	4480	PMSA		06037 Los Angeles County
6780	RIVE	CA	923, 924, 925	6780	PMSA		06065 Riverside County 06071 San Bernardino County

Original Analysis					Re-analysis		
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
6920	SACR	CA	942, 956, 957, 958	6920	MSA		06017 El Dorado County 06061 Placer County 06067 Sacramento County 06113 Yolo County
7320	SDIE	CA	920, 921	7320	MSA		06073 San Diego County
7360	SFRA	CA	940, 941, 943, 944	7360	PMSA		06041 Marin County 06075 San Francisco County 06081 San Mateo County
7400	SJOS	CA	950, 951	7400	PMSA		06085 Santa Clara County
1720	COLO	CO	808, 809	1720	MSA		08041 El Paso County
2080	DENV	CO	800, 801, 802	2080	PMSA		08001 Adams County 08005 Arapahoe County 08031 Denver County 08035 Douglas County 08059 Jefferson County
2670	FCOL	CO	805	2670	MSA		08069 Larimer County
3060	GREE	CO	806	3060	MSA		08123 Weld County
6560	PUJB	CO	810	6560	MSA		08101 Pueblo County
1163	BRID	CT	66	1160	PMSA	The MA number "1163" does not exist in the 1983 MSA definitions. The ZIP code appears to refer to PMSA 1160.	09001 Fairfield County (pt.) 09009 New Haven County (pt.) 09001 Fairfield County (pt.), 09009 New Haven County (pt.)



Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
3283	HART	CT	060, 061	3282 (excluding 5020)	CMSA, (Excluding a PMSA)	Includes the PMSAs of Hartford (3280) Bristol (1170), and New Britain (5440). Middletown (5020) which is also in this CMSA has a ZIP code of 064 which is in NHAV	<i>Bristol, CT PMSA</i> 09003 Hartford County (pt.) 09005 Litchfield County (pt.) <i>Hartford, CT PMSA</i> 09003 Hartford County (pt.) 09005 Litchfield County (pt.) 09007 Middlesex County (pt.) 09011 New London County (pt.) 09013 Tolland County (pt.) <i>New Britain, CT PMSA</i> 09003 Hartford County (pt.)
5483	NHAV	CT	064, 065	5480	MSA	Only a small portion of this MSA has a ZIP of 064	<i>New Haven, CT MSA</i> 09007 Middlesex County (pt.) 09009 New Haven County (pt.) <i>Middletown, CT PMSA</i> 09007 Middlesex County (pt.)
8840	WASH	DC	200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 220, 221, 222, 223	8840	MSA	The county of Frederick MD is in the MSA but has a ZIP code of 217.	11001 District of Columbia 24009 Calvert County, MD 24017 Charles County, MD 24021 Frederick County, MD 24031 Montgomery County, MD 24033 Prince George's County, MD 51510 Alexandria city, VA 51013 Arlington County, VA 51059 Fairfax County, VA 51600 Fairfax city, VA 51610 Falls Church city, VA 51107 Loudoun County, VA 51683 Manassas city, VA 51685 Manassas Park city, VA 51153 Prince William County, VA 51179 Stafford County, VA

Original Analysis						Re-analysis	
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
9160	WILM	DE	197, 198, 219	9160	PMSA	The New Jersey portion has a ZIP code of 080 which is not included.	1003 New Castle County, DE 24015 Cecil County, MD 34033 Salem County, NJ
2680	FLAU	FL	330, 331, 332, 333	4992	CMSA	These ZIP codes apply to the PMSAs: Fort Lauderdale-Hollywood-Pompano Beach (2680) and Miami-Hialeah (5000)	<i>Fort Lauderdale-Hollywood-Pompano Beach, FL PMSA</i> 12011 Broward County <i>Miami-Hialeah, FL PMSA</i> 12025 Dade County
3600	JACK	FL	320, 322	3600	MSA		12019 Clay County 12031 Duval County 12089 Nassau County 12109 St. Johns County
5960	ORLA	FL	327, 328	5960	MSA	Osceola County is in this MSA but has a ZIP code of 347.	12095 Orange County 12117 Seminole County 12097 Osceola County
8280	TAMP	FL	335, 336, 337, 342, 346	8280, 1140 & 7510	MSA	Bradenton (1140) and Sarasota (7510) have ZIPs of 342 and are their own MSAs.	<i>Tampa-St. Petersburg-Clearwater, FL MSA</i> 12053 Hernando County 12057 Hillsborough County 12101 Pasco County 12103 Pinellas County <i>Bradenton, FL MSA</i> 12081 Manatee County <i>Sarasota, FL MSA</i> 12115 Sarasota County

Original Analysis					Re-analysis		
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
520	ATLA	GA	300, 301, 302, 303, 311, 399	520	MSA		13031 Barrow County 13035 Butts County 13057 Cherokee County 13063 Clayton County 13067 Cobb County 13077 Coweta County 13089 De Kalb County 13097 Douglas County 13113 Fayette County 13117 Forsyth County 13121 Fulton County 13135 Gwinnett County 13151 Henry County 13217 Newton County 13223 Paulding County 13247 Rockdale County 13255 Spalding County 13297 Walton County
1800	COLU	GA	318, 319, 368	1800	MSA		01113 Russell County, AL 13053 Chattahoochee County, GA 13215 Muscogee County, GA
1080	BCIT	ID	837	1080	MSA		16001 Ada County

Original Analysis Re-analysis

SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
1600	CHIC	IL	600, 601, 602, 603, 604, 605, 606.	1602 (excluding 2920 and 3800)	CMSA (excluding PMSAs)	The CMSA includes the PMSAs: Aurora-Elgin (0620), Chicago (1600) which also includes the ZIP codes 607 and 608 (which may have replace 602 and 603 ), Gary-Hammond (2960) which is a separate city in the ACS study, Joliet (3690), Kenosha (3800), Lake County (3965). However, Gary-mmmond and Kenosha are included as separate places in the ACS study (see below).	<i>Chicago, IL PMSA</i> 17031 Cook County 17043 Du Page County 17111 McHenry County <i>Aurora-Elgin, IL PMSA</i> 17089 Kane County 17093 Kendall County <i>Joliet, IL PMSA</i> 17063 Grundy County 17197 Will County <i>Lake County, IL PMSA</i> 17097 Lake County
1020	BLOO	IN	474	1020	MSA		18105 Monroe County
2440	EVAN	IN	424, 476, 477	2440	MSA		18129 Posey County, IN 18163 Vanderburgh County, IN 18173 Warrick County, IN 21101 Henderson County, KY
2960	GARY	IN	463, 464	2960	PMSA	Part of the CMSA of Chicago	18089 Lake County 18127 Porter County
3480	INDI	IN	460, 461, 462	3480 & 0400	MSAs	The adjacent MSA of Anderson (0400) includes the ZIP 460	<i>Indianapolis, IN MSA</i> 18011 Boone County 18057 Hamilton County 18059 Hancock County 18063 Hendricks County 18081 Johnson County 18097 Marion County 18109 Morgan County 18145 Shelby County <i>Anderson, IN MSA</i> 18095 Madison County

Original Analysis						Re-analysis	
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
7800	SBEN	IN	465, 466	7800 & 2330	MSAs	The adjacent MSA of Elkhart-Goshen (2330) also has a ZIP of 465	<i>South Bend, IN MSA</i> 18141 St. Joseph County <i>Elkhart-Goshen, IN MSA</i> 18039 Elkhart County
8320	THAU	IN	478	8320	MSA		18021 Clay County 18167 Vigo County
1360	CRAP	IO	522, 523, 524	1360 & 3500	MSAs	The adjacent MSA of Iowa City (3500) also has the ZIP codes 522 and 523. The state abbreviation should be IA	<i>Cedar Rapids, IO MSA</i> 19113 Linn County <i>Iowa City, IA MSA</i> 19103 Johnson County
2120	DMOI	IO	503	2120	MSA	ZIP code 509 is also in Des Moines (Polk County). The state abbreviation should be IA	19049 Dallas County 19153 Polk County 19181 Warren County
2200	DUBU	IO	520	2200	MSA	The state abbreviation should be IA	19061 Dubuque County
8920	WATE	IO	507	8920	MSA	The state abbreviation should be IA	19013 Black Hawk County 19017 Bremer County
8440	TOPE	KS	664, 665, 666	8440	MSA		20177 Shawnee County
9040	WICH	KS	670, 671, 672	9040	MSA		20015 Butler County 20173 Sedgewick County
4280	LEXI	KY	403, 404, 405	4280	MSA		21017 Bourbon County 21049 Clark County 21067 Fayette County 21113 Jessamine County 21209 Scott County 21239 Woodford County

Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
760	BATO	LA	707, 708	760	MSA		22005 Ascension Parish 22033 East Baton Rouge Parish 22063 Livingston Parish 22121 West Baton Rouge Parish
5560	NORL	LA	700, 701	5560	MSA	St. Tammany county is in this MSA but has a ZIP code of 704	22051 Jefferson Parish 22071 Orleans Parish 22087 St Bernard Parish 22089 St. Charles Parish 22095 St. John the Baptist Parish
7680	SHRE	LA	711	7680	MSA	The majority of the county of Caddo which is in this MSA has a ZIP code of 710	22015 Bossier Parish 22017 Caddo Parish
1123	BOST	MA	017, 020, 021, 022	1120	PMSA	The SMSA number "1123" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 1120.	25005 Bristol County (pt.) 25009 Essex County (pt.) 25017 Middlesex County (pt.) 25021 Norfolk County (pt.) 25023 Plymouth County (pt.) 25025 Suffolk County (pt.) 25027 Worcester County (pt.)
5403	NBED	MA	25	5400	MSA	Now has the ZIP code 027. The ZIP code 025 appears to apply to part of Plymouth city, Barnstable City and Dukes Cty.	<i>New Bedford, MA MSA</i> 25005 Bristol County (pt.) 25023 Plymouth County (pt.) <i>Rural Counties in MA</i> 25 001 Barnstable County 25 007 Dukes County
8003	SPRI	MA	010, 011	8000	MSA	The SMSA number "8003" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 8000.	25013 Hampden County (pt.) 25015 Hampshire County (pt.)

Original Analysis						Re-analysis	
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
9243	WORC	MA	015, 016	9240	MSA	The SMSA number "9243" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 9240.	25027 Worcester County (pt.)
720	BALT	MD	210, 211, 212	720	MSA		24003 Anne Arundel County 24510 Baltimore city 24005 Baltimore County 24013 Carroll County 24025 Harford County 24027 Howard County 24035 Queen Anne's County
733	BANG	ME	44	730	MSA	The SMSA number "0733" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 0730.	23019 Penobscot County (pt.) 23027 Waldo County
4243	LEWI	ME	42	4240	MSA	The SMSA number "1123" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 1120.	23001 Androscoggin County (pt.)
6403	PORT	ME	041, 040	6400	MSA	The SMSA number "6403" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 6400.	23005 Cumberland County (pt.) 23031 York County (pt.)

Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
2160	DETR	MI	480, 481, 482, 483	2162	CMSA	Includes the PMSAs: Ann Arbor (0440) and Detroit (2160).	<i>Detroit, MI PMSA</i> 26087 Lapeer County 26093 Livingston County 26099 Macomb County 26115 Monroe County 26125 Oakland County 26147 St. Clair County 26163 Wayne County <i>Ann Arbor, MI PMSA</i> 26161 Washtenaw County
2640	FLIN	MI	484, 485	2640	MSA		26049 Genesee County
4040	LANS	MI	488, 489	4040	MSA		26037 Clinton County 26045 Eaton County 26065 Ingham County
6960	SAGI	MI	486, 487	6960	MSA		26017 Bay County 26111 Midland County 26145 Saginaw County
2240	DULU	MN	586, 587, 588	2240	MSA	Douglas County, WI is part of this MSA but has the ZIP code 548. The ZIP code 586 appears to pertain to Slope, Hettinger, Bowman, Adams, Billings, Golden Valley and Stark counties in south west ND	27137 St. Louis County, MN 55031 Douglas County, WI



Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
5120	MINN	MN	550, 551, 553, 554	5120	MSA		27003 Anoka County, MN 27019 Carver County, MN 27025 Chisago County, MN 27037 Dakota County, MN 27053 Hennepin County, MN 27059 Isanti County, MN 27123 Ramsey County, MN 27139 Scott County, MN 27163 Washington County, MN 27171 Wright County, MN 55109 St. Croix County, WI
3760	KANS	MO	640, 641, 660, 661	3762	CMSA	Includes the PMSAs: Kansas City, KS (3755) and Kansas City, MO (3760).	<i>Kansas City, MO PMSA</i> 29037 Cass County, MO 29047 Clay County, MO 29095 Jackson County, MO 29107 Lafayette County, MO 29165 Platte County, MO 29177 Ray County, MO <i>Kansas City, KS PMSA</i> 20091 Johnson County, KS 20103 Leavenworth County, KS 20121 Miami County, KS 20209 Wyandotte County, KS

Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
7040	SLOU	MO	620, 622, 630, 631	7042	CMSA	Includes the PMSAs: Alton-Granite City (0275); East St. Louis-Belleville (2285); and St. Louis (7040).	<i>St. Louis, MO PMSA</i> 17133 Monroe County, IL 29071 Franklin County, MO 29099 Jefferson County, MO 29183 St. Charles County, MO 29189 St. Louis County, MO 29510 St. Louis city, MO <i>Alton-Granite City, IL PMSA</i> 17083 Jersey County, IL 17119 Madison County, IL <i>East St. Louis-Belleville, IL PMSA</i> 17027 Clinton County, IL 17163 St. Clair County, IL
3560	JACK	MS	390, 391, 392	3560	MSA		28049 Hinds County 28089 Madison County 28121 Rankin County
880	BILL	MT	590, 591	880	MSA		30111 Yellowstone County
3040	GFAL	MT	594	3040	MSA		30013 Cascade County
4360	LINC	NB	683, 684, 685	4360	MSA	The state abbreviation should be NE	31109 Lancaster County
5920	OMAH	NB	680, 681, 515	5920	MSA	The state abbreviation should be NE	19155 Pottawattamie County, IN 31055 Douglas County, NE 31153 Sarpy County, NE 31177 Washington County, NE
1520	CHAR	NC	280, 281, 282, 297	1520	MSA		37025 Cabarrus County, NC 37071 Gaston County, NC 37109 Lincoln County, NC 37119 Mecklenburg County, NC 37159 Rowan County, NC 37179 Union County, NC 45091 York County, SC

Original Analysis							Re-analysis	
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis	
3120	GREE	NC	270, 271, 272, 273, 274	3120 & 1300	MSA	The majority of the adjacent MSA of Burlington (1300) also has the ZIP code 272.	<i>Greensboro-Winston-Salem-High Point, NC</i> MSA 37057 Davidson County 37059 Davie County 37067 Forsyth County 37081 Guilford County 37151 Randolph County 37169 Stokes County 37197 Yadkin County <i>Burlington NC MSA</i> 37001 Alamance County	
6640	RALE	NC	275, 276, 277	6640	MSA		37063 Durham County 37069 Franklin County 37135 Orange County 37183 Wake County	
1010	BISM	ND	585	1010	MSA		38015 Burleigh County 38059 Morton County	
2985	GFOR	ND	582	2985	MSA		38035 Grand Forks County	
2520	FARG	ND	580, 581	2520	MSA	Clay county MN is in the MSA but has a ZIP code of 565.	27027 Clay County, MN 38017 Cass County, ND	
4763	MANC	NH	030, 031	4760 & 5350	MSA	The SMSA number "4763" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 4760. The adjacent MSA of Nashua also has the ZIP code 031.	<i>Manchester, NH MSA</i> 33011 Hillsborough County (pt.) 33013 Merrimack County (pt.) 33015 Rockingham County (pt.) <i>Nashua, NH PMSA</i> 33011 Hillsborough County 33015 Rockingham County (pt.)	

Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
6453	PORT	NH	038, 039	6450	MSA	The SMSA number "6453" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 6450.	23031 York County, ME (pt.) 33015 Rockingham County, NH (pt.) 33017 Stafford County, NH (pt.)
3640	JCIT	NJ	073, 076	3640	PMSA	The ZIP code 070 is also contained in this PMSA; 076 is in Bergen-Passaic PMSA (see PATE)	34017 Hudson County
5640	NEWA	NJ	070, 071, 072, 078, 079	5640	PMSA		34013 Essex County 34027 Morris County 34037 Sussex County 34039 Union County
6040	PATE	NJ	075, 074	875	PMSA	Bergen-Passaic PMSA; Several cities in Bergen County have 076 ZIP codes	34003 Bergen County 34031 Passaic County
8480	TREN	NJ	085, 086	8480	PMSA		34021 Mercer County
200	ALBU	NM	870, 871, 872	200	MSA		35001 Bernalillo County
4120	LVEG	NV	889, 890, 891	4120	MSA		32003 Clark County
6720	RENO	NV	894, 895	6720	MSA		32031 Washoe County
160	ALBA	NY	120, 121, 122, 123	160	MSA		36001 Albany County 36039 Greene County 36057 Montgomery County 36083 Rensselaer County 36091 Saratoga County 36093 Schenectady County
1280	BUFF	NY	140, 141, 142, 143	1280	PMSA		36029 Erie County
2335	ELMI	NY	148, 149	2335	MSA		36015 Chemung County

Original Analysis						Re-analysis	
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
5380	NASS	NY	115, 117, 118, 119	5380	PMSA		36059 Nassau County 36103 Suffolk County
5600	NYOR	NY	100, 101, 102, 103, 104, 105, 106, 107, 108, 110, 111, 112, 113, 114, 116	5600	PMSA	Rockland County is also in the CMSA but has the ZIP code 109	36005 Bronx County 36047 Kings County 36061 New York County 36079 Putnam County 36081 Queens County 36085 Richmond County 36087 Rockland County 36119 Westchester County
6460	POUG	NY	125, 126	6460	MSA		36027 Dutchess County
6840	ROCH	NY	144, 145, 146	6840	MSA		36051 Livingston County 36055 Monroe County 36069 Ontario County 36073 Orleans County 36117 Wayne County
8160	SYRA	NY	130, 131, 132	8160	MSA		36053 Madison County 36067 Onondaga County 36075 Oswego County
8680	UTIC	NY	133, 134, 135	8680	MSA		36043 Herkimer County 36065 Oneida County
80	AKRO	OH	442, 443	80	PMSA		39133 Portage County 39153 Summit County
1320	CANT	OH	446, 447	1320	MSA		39019 Carroll County 39151 Stark County

Original Analysis					Re-analysis		
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
1640	CINC	OH	451, 452, 470, 410	1640	PMSA		18029 Dearborn County, IN 21015 Boone County, KY 21037 Campbell County, KY 21117 Kenton County, KY 39025 Clermont County, OH 39061 Hamilton County, OH 39165 Warren County, OH
1680	CLEV	OH	440, 441	1680 & 4440	PMSAs	The ZIP code 440 includes Lorain County in adjacent PMSA of Lorain-yrria (4440).	<i>Cleveland, OH PMSA</i> 39035 Cuyahoga County 39055 Geauga County 39085 Lake County 39103 Medina County <i>Lorain-Ebyria, OH PMSA</i> 39093 Lorain County
1840	COLU	OH	430, 431, 432	1840	MSA		39041 Delaware County 39045 Fairfield County 39049 Franklin County 39089 Licking County 39097 Madison County 39129 Pickaway County 39159 Union County
2000	DAYT	OH	453, 454, 455	2000	MSA		39023 Clark County 39057 Greene County 39109 Miami County 39113 Montgomery County
3200	HAMI	OH	450	3200	PMSA		39017 Butler County
4800	MANS	OH	448, 449	4800	MSA		39139 Richland County
	SPRI	OH				Not included in the study since no ZIP codes were assigned.	

Original Analysis						Re-analysis	
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
8080	STEU	OH	439, 260	8080	MSA		39081 Jefferson County, OH 54009 Brooke County, WV 54029 Hancock County, WV
8400	TOLE	OH	434, 435, 436	8400	MSA		39051 Fulton County 39095 Lucas County 39173 Wood County
9320	YOUN	OH	444, 445	9320	MSA		39099 Mahoning County 39155 Trumbull County
5880	OKLA	OK	730, 731	5880	MSA	Pottawatomie county is in this MSA but has a ZIP code of 748.	40017 Canadian County 40027 Cleveland County 40083 Logan County 40087 McClain County 40109 Oklahoma County 40125 Pottawatomie County
6440	PORT	OR	970, 971, 972	6440	PMSA		41005 Clackamas County 41051 Multnomah County 41067 Washington County 41071 Yamhill County
240	ALLE	PA	180, 181, 182, 183	240	MSA		34041 Warren County, NJ 42025 Carbon County, PA 42077 Lehigh County, PA 42095 Northampton County, PA
280	ALTO	PA	166	280	MSA		42013 Blair County
2360	ERIE	PA	164, 165	2360	MSA		42049 Erie County
3240	HARR	PA	170, 171	3240	MSA		42041 Cumberland County 42043 Dauphin County 42075 Lebanon County 42099 Perry County

Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
3680	JOHN	PA	155, 159	3680	MSA		42021 Cambrian County 42111 Somerset County
4000	LANC	PA	173, 175, 176	4000	MSA		42071 Lancaster County
5745	NORT	PA	184, 185	42069	County	There is no MA called Northampton, PA; The MSA Scranton-Wilkes-Barre includes the ZIP codes 184 and 185 (both in Lackawanna county) but also includes 178 and 182, 183, and 187	42069 Lackawanna County
6160	PHIL	PA	189, 190, 191, 193, 194	6160	PMSA	The cities on the NJ side of this PMSA have the ZIP codes 080 and 081 which are not included here.	34005 Burlington County, NJ 34007 Camden County, NJ 34015 Gloucester County, NJ 42017 Bucks County, PA 42029 Chester County, PA 42045 Delaware County, PA 42091 Montgomery County, PA 42101 Philadelphia County, PA
6280	PITT	PA	150, 151, 152, 153, 154, 156	6282	CMSA	Includes the PMSAs: Beaver County (0845) with a ZIP code of 150 and Pittsburgh (6280).	<i>Pittsburgh, PA PMSA</i> 42003 Allegheny County 42051 Fayette County 42125 Washington County 42129 Westmoreland County <i>Beaver County, PA PMSA</i> 42007 Beaver County
6680	READ	PA	195, 196	6680	MSA		42011 Berks County
8050	SCOL	PA	168	8050	MSA		42027 Center County
7610	SHAR	PA	161	7610	MSA		42085 Mercer County
9140	WILL	PA	177	9140	MSA		42081 Lycoming County



Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
9280	YORK	PA	174	9280	MSA		42001 Adams County 42133 York County
6483	PROV	RI	027, 028, 029	6482	CMSA	The SMSA number "6483" does not exist in the 1983 definitions, however the ZIP codes appear to refer to PMSA 6480. Includes the PMSAs: Providence (6480: ZIP 028 and 029); Pawtucket-Woonsocket-Attleboro (6060: ZIP 027); and Fall River (2480: ZIP 027)	<i>Providence, RI PMSA</i> 44001 Bristol County (pt.) 44003 Kent County (pt.) 44005 Newport County (pt.) 44007 Providence County (pt.) 44009 Washington County (pt.) <i>Fall River, MA-RI PMSA</i> 25005 Bristol County, MA (pt.) 44005 Newport County, RI (pt.) <i>Pawtucket-Woonsocket-Attleboro, RI-MA PMSA</i> 25005 Bristol County, MA (pt.) 25021 Norfolk County, MA (pt.) 25027 Worcester County, MA (pt.) 44007 Providence County, RI (pt.)
1440	CHAR	SC	294	1440	MSA		45015 Berkeley County 45019 Charleston County 45035 Dorchester County
1760	COLU	SC	290, 291, 292	1760	MSA		45063 Lexington County 45079 Richland County
3160	GREE	SC	296	3160 & 0405	MSAs	Spartanburg County is also in this MSA but has a ZIP of 293. The ZIP code 296 includes the adjacent MSA of Anderson (0405).	<i>Greenville, SC MSA</i> 45045 Greenville County 45077 Pickens County 45083 Spartanburg County <i>Anderson, SC MSA</i> 45007 Anderson County

Original Analysis					Re-analysis		
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
1560	CHAT	TN	373, 374, 307	1560	MSA		13047 Catoosa County, GA 13083 Dade County, GA 13295 Walker County, GA 47065 Hamilton County, TN 47115 Marion County, TN 47153 Sequatchie County, TN
3840	KNOX	TN	377, 378, 379	3840	MSA		47001 Anderson County 47009 Blount County 47057 Grainger County 47089 Jefferson County 47093 Knox County 47155 Sevier County 47173 Union County
4920	MEMP	TN	380, 381, 386, 723	4920	MSA		05035 Crittenden County, AR 28033 De Soto County, MS 47157 Shelby County, TN 47167 Tipton County, TN
5360	NASH	TN	370, 371, 372	5360	MSA	ZIP codes 370 and 371 include Montgomery County in the adjacent MSA of Clarksville-Hopkinsville (1660) but the other city in that MSA, Hopkinsville KY has a ZIP code of 422.	<i>Nashville, TN MSA</i> 47021 Cheatham County 47037 Davidson County 47043 Dickson County 47147 Robertson County 47149 Rutherford County 47165 Sumner County 47187 Williamson County 47189 Wilson County <i>Clarksville-Hopkinsville, TN-KY MSA</i> 47125 Montgomery County, TN
840	BPAR	TX	776, 777	840	MSA		48199 Hardin County 48245 Jefferson County 48361 Orange County

Original Analysis					Re-analysis		
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
1880	CCHR	TX	783, 784	1880	MSA		48355 Nueces County 48409 San Patricio County
1920	DALL	TX	750, 751, 752, 753, 760, 761	1922 & 7640	CMSA & MSA	Denton county is in this CMSA but its ZIP code is 762. The majority of the adjacent MSA of Sherman-Denison (7640) also has the ZIP code 750. This CMSA includes the PMSAs: Dallas (1920) and Fort Worth-rlington (2800)	<i>Dallas, TX PMSA</i> 48085 Collin County 48113 Dallas County 48139 Ellis County 48257 Kaufman County 48397 Rockwall County <i>Fort Worth-Arlington, TX PMSA</i> 48251 Johnson County 48367 Parker County 48439 Tarrant County <i>Sherman-Denison, TX MSA</i> 48181 Grayson County
2320	EPAS	TX	798, 799	2320	MSA	The ZIP code 885 is also used for El Paso but was left out in this study.	48141 El Paso County
2920	GALV	TX	775	2920 & 1145	PMSAs	The ZIP code covers the PMSA Galveston-Texas City (2920) as well as the PMSA Brazoria (1145). It does not include the other PMSA in this CMSA, Houston	<i>Galveston-Texas City, TX PMSA</i> 48167 Galveston County <i>Brazoria, TX PMSA</i> 48039 Brazoria County
3360	HOUS	TX	770, 771, 772	3360	PMSA	The following counties are in the PMSA but are missing ZIP codes: Montgomery (773), Fort Bend and Waller (774). Most of Liberty City and part of Harris County are included in GALV (775)	48157 Fort Bend County 48201 Harris County 48291 Liberty County 48339 Montgomery County 48473 Waller County
4600	LUBB	TX	793, 794	4600	MSA		48303 Lubbock County
7200	SANG	TX	769	7200	MSA		48451 Tom Green County

Original Analysis				Re-analysis			
SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
7240	SANT	TX	780, 781, 782	7240	MSA		48029 Bexar County 48091 Comal County 48187 Guadalupe County
8800	WACO	TX	766, 767	8800	MSA		48309 McLennan County 48485 Wichita County
9080	WICH	TX	763	9080	MSA		49011 Davis County 49035 Salt Lake County 49057 Weber County
7160	SLAK	UT	840, 841, 842	7160	MSA		
1950	DANV	VA	245	1950 & 4640	MSAs	This ZIP code covers the adjacent MSAs of Danville (1950) and Lynchburg (4640), as well as Halifax County not included in an MSA.	<i>Danville, VA MSA</i> 51590 Danville city 51143 Pittsylvania County <i>Lynchburg, VA MSA</i> 51009 Amherst County 51031 Campbell County 51680 Lynchburg city <i>Rural, VA</i> 51 083 Halifax
5720	NORF	VA	233, 234, 235, 236	5720	MSA		51550 Chesapeake city 51073 Gloucester County 51650 Hampton city 51095 James City County 51700 Newport News city 51710 Norfolk city 51735 Poquoson city 51740 Portsmouth city 51800 Suffolk city 51810 Virginia Beach city 51830 Williamsburg city 51199 York County

## Original Analysis

## Re-analysis

SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
6760	RICH	VA	230, 231, 232	6760	MSA	Dinwiddie, Prince George and Chesterfield Counties in this MSA all have the ZIP code 238 which is not included.	51036 Charles City County 51041 Chesterfield County 51570 Colonial Heights city 51053 Dinwiddie County 51075 Goochland County 51085 Hanover County 51087 Henrico County 51670 Hopewell city 51127 New Kent County 51730 Petersburg city 51145 Powhatan County 51149 Prince George County 51760 Richmond city
6800	ROAN	VA	240, 241	6800	MSA		51023 Botetourt County 51161 Roanoke County 51770 Roanoke city 51775 Salem city
7600	SEAT	WA	980, 981	7600	PMSA	Everett and Snohomish which is also in this MSA has a ZIP of 982, other places in Snohomish County are accounted for.	53033 King County 53061 Snohomish County
7840	SPOK	WA	990, 991, 992	7840	MSA		53063 Spokane County
8200	TACO	WA	983, 984	8200 & 1150	PMSA & MSA	The ZIP code 983 includes both places within Tacoma PMSA as well as the adjacent MSA of Bremerton.	Tacoma, WA PMSA 53053 Pierce County Bremerton, WA MSA 53035 Kitsap County
2290	ECLA	WI	547	2290	MSA		55017 Chippewa County 55035 Eau Claire County
3800	KENO	WI	531	3800	PMSA	This PMSA is part of the CMSA of Chicago-Gary-Lake County	55059 Kenosha County

## Original Analysis

## Re-analysis

SMSA	CITY	ST	ZIP	MA	Level	Comments	Counties Included in Sensitivity Analysis
4720	MADI	WI	535, 537	4720 & 3620	MSAs	The ZIP code 535 includes both Madison (4720) and the adjacent MSA of Janesville-Beloit (3620).	<i>Madison, WI MSA</i> 55025 Dane County <i>Janesville-Beloit, WI MSA</i> 55105 Rock County
5080	MILW	WI	530, 532	5080 & 7620	PMSA & MSA	The ZIP code 530 includes both the PMSA of Milwaukee and the adjacent MSA of Sheboygan.	<i>Milwaukee, WI PMSA</i> 55079 Milwaukee County 55089 Ozaukee County 55131 Washington County 55133 Waukesha County <i>Sheboygan, WI MSA</i> 55117 Sheboygan County
6600	RACI	WI	534	6600	PMSA		55101 Racine County
1480	CHAR	WV	250, 251, 252, 253	1480	MSA	ZIP code 252 appears to only refer to counties Jackson and Roane, outside of the MSA.	<i>Charleston, WV MSA</i> 54039 Kanawha County 54079 Putnam County, Rural Counties 54 035 Jackson County 54 067 Roane County
3400	HUNT	WV	255, 256, 257, 411, 412	3400	MSA	ZIP code 412 appears to only refer to KY counties Lawrence, Johnson and Martin which are all outside of the MSA.	21019 Boyd County, KY 21043 Carter County, KY 21089 Greenup County, KY 39087 Lawrence County, OH 54011 Cabell County, WV 54099 Wayne County, WV Rural Counties in KY 21 127 Lawrence, KY 21 115 Johnson, KY 21 159 Martin, KY