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TECHNICAL REPORT

Ambulatory Care Sensitive Hospitalizations and Emergency Department Visits in Baltimore City

Carole Roan Gresenz, Teague Ruder, Nicole Lurie

Supported by the Aaron and Lillie Straus Foundation

RAND HEALTH

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Preface

This report provides an in-depth analysis of ambulatory care sensitive (ACS) hospitalizations and emergency department visits among Baltimore City residents. ACS inpatient hospitalization (ACS-IP) rates and ACS emergency department visit (ACS-ED) rates are commonly used as markers for the availability and efficacy of primary care in an area. The study was conducted within RAND Health, a division of the RAND Corporation, and was funded by the Aaron and Lillie Straus Foundation. The report should be of interest to policymakers in Baltimore City as well as health policymakers in other urban areas. A profile of RAND Health, abstracts of its publications, and ordering information can be found at www.rand.org/health

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Executive Summary

This report provides an in-depth analysis of ambulatory care sensitive (ACS) hospitalizations and emergency department visits among Baltimore City residents. ACS inpatient hospitalization (ACS-IP) rates and ACS emergency department visit (ACS-ED) rates are commonly used as markers for the availability and efficacy of primary care in an area.

Recent trends in ACS-IP and ACS-ED rates vary by age group. Among youth, ACS-IP rates rose each year from 2004 to 2007 while ACS-ED rates rose from 2004 to 2006 but fell in 2007. ACS-IP rates and ACS-ED rates fell among adults from 2005 to 2007.

ACS-IP and ACS-ED rates in Baltimore City are substantially higher than those in other Maryland counties, in Maryland as a whole, and in the District of Columbia. ACS-IP and ACS-ED rates were more than 20 percent higher among youth in Baltimore than among youth in the District of Columbia, and rates in Baltimore City were nearly double the rates in the District for those ages 18–39.

Within Baltimore City, ACS-IP and ACS-ED rates varied substantially. ACS-IP and ACS-ED rates were highest among youth in the Eastern part of the city in an area containing the neighborhoods of Southeastern, Orangeville/E. Highlandtown, Claremont/Armistead, Highlandtown, Clifton-Berea, Greenmount East, and Canton. Among adults, ACS-IP and ACS-ED rates were highest in the area of the city containing the neighborhoods of Southwest Baltimore, Sandtown-Winchester/Harlem Park, Poppletown/The Terraces/Hollins Market, Greater Mondawmin, Greater Rosement, and Penn North/Reservoir Hill.

Among adults 40 and over, ACS hospitalization rates increased for many of the most common diagnoses, including asthma, hypertension, and diabetes. Cellulitis-associated hospitalizations increased from 2004 to 2006 among adults of all ages but fell in 2007. Among children ages 0–17, ACS-IP hospitalization rates for cellulitis increased steadily between 2002 and 2005, dipped in 2006, and rose again in 2007.

While a range of factors contributes to ACS rates, evidence suggests that a key determinant is the availability of primary care. Baltimore City appears to need additional primary care and may also need to focus on the quality and effectiveness of care in order to lower ACS rates, including ensuring the availability of adequate urgent care and better coordination of care.

Acknowledgments

We gratefully acknowledge financial support from the Aaron and Lillie Straus Foundation. We thank Jeffrey Wasserman at RAND for his review of the report and are grateful to Michael Dalesio for his help preparing the final document. We also thank Cindy Saunders at the Maryland Health Services Cost Review Commission (HSCRC) for assistance with the data.

Abbreviations

ACS	ambulatory care sensitive
ACS-IP	ambulatory care sensitive–inpatient hospitalization
ACS-ED	ambulatory care sensitive–emergency department
HSCRC	Health Services Cost Review Commission
DCHA	District of Columbia Hospital Association
PUMA	public use microdata area
CSA	community statistical area
MUA	medically underserved area
HPSA	health provider shortage area

1. Overview

Monitoring and assurance are core public health department functions. A continual challenge is finding appropriate and comprehensive data for tracking indicators of health care access, health conditions, and health outcomes. Hospital discharge data can be a valuable tool in detecting trends in certain diagnoses as well as in monitoring access to and quality of outpatient care. In particular, inpatient hospitalizations and emergency department (ED) visits can be classified into those that are "ambulatory care sensitive" (ACS) or not. ACS hospitalizations and ED visits may be preventable with timely access to high quality primary care. For example, good management of asthma at the first sign of exacerbation can usually alleviate symptoms or keep them from progressing to the point that hospitalization is required. A large body of evidence suggests that ACS admissions are a reflection of access to and quality of primary care. As such, ACS rates have been used as indicators of the availability and effectiveness of the primary care system. This report provides the first in-depth analysis of ACS hospitalizations and ED visits in Baltimore City.

2. Data and Methods

2.1 Hospital Discharge Data

We analyze the Maryland Health Services Cost Review Commission (HSCRC) inpatient and emergency department discharge data that contain the universe of inpatient and ED discharges from Maryland hospitals. The inpatient data span 2000–2007 and the ED data span 2002–2007. The data contain hospital identifiers as well as information on the zip code of the patient's residence.

We also analyze inpatient and ED discharge data from the District of Columbia that were provided to us by the District of Columbia Hospital Association (DCHA). DCHA inpatient data are available from 2000 forward; ED data are from 2004 and later. We use these data primarily to develop estimates for the District to compare with Baltimore City. We also use these data to capture inpatient hospitalizations in District hospitals for Baltimore City residents. While there are relatively few, including them improves the accuracy of our results. We do not include ED visits by Baltimore City residents to District hospitals in our analysis of ACS-ED rates because we have information on District visits only from 2004 onward. If we were to include the District data for available years, ACS rates for those years would not be comparable to earlier years, and dropping the earlier years would give us only a narrow time frame over which to observe ACS-ED rates. We therefore exclude District ED visits from our analysis and analyze the full time frame allowable with the Baltimore data.

Standard, well-validated methods exist for classifying inpatient hospitalizations and ED visits into those that are ACS or not. These methods, which were first established by Billings et al. (2000) are used by the U.S. Agency for Healthcare Research and Quality and by several states in monitoring the progress of their health care system.[1] Examples of ACS-IP admissions include

[1] Billngs J, Parikh N, Mijanovich T. 2000. Emergency Department Use in New York City: A Substitute for Primary Care. The Commonwealth Fund Issue Brief. November, 2000.

diagnoses of asthma, dehydration, and hypertension, among others. Non-ACS hospitalizations consist of a mixture of those that are for urgent or emergent conditions, such as heart attacks or major trauma, obstetrical care, medical treatments and surgeries.

Algorithms for ED visits first classify them into four groups: (1) non-emergent (i.e., did not require immediate medical care); (2) emergent/primary care treatable (needed medical care urgently but such care could have been provided in a primary care setting); (3) emergent but preventable (the need for such visits could have been prevented if effective primary care had been available); and (4) emergent not preventable (such care needed urgently and could not be provided in a primary care setting). The first three categories of visits are considered ACS. Examples of diagnoses associated with ACS-ED visits include asthma, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), and diabetes, among others. In contrast to the ACS-IP algorithm which classifies ACS and non-ACS hospitalizations using diagnosis, the ACS-ED algorithm takes each diagnosis code and assigns a probability that the visit was in one of the categories. In the ACS-ED analyses, we only consider ED visits that did not result in a hospital admission. We do not consider whether ED visits associated with inpatient admissions were potentially avoidable. (Thus, the calculated ACS-ED rates are likely higher than they would be if all ED visits were included).

2.2 Population Data

To construct ACS-IP and ACS-ED rates, we divide the number of ACS hospitalizations or ED visits by the number of individuals in the appropriate population. For example, the ACS-IP rate for children would be the number of ACS-IP admissions among children divided by the number of children in Baltimore.

We use population estimates for various age groups (0–17, 18–39, 40–64, 65+) in Baltimore City from the County Characteristics Resident Population Estimates File produced by the U.S. Census Population Division.

Ideally, we would like to analyze trends in ACS hospitalizations and ED visits for different neighborhoods, or proxies for neighborhoods, such as those defined by zip code. But reliable population estimates at the neighborhood or zip code level, and particularly for various subpopulations defined by age within each neighborhood or zip code, are not available. Thus, at the zip code level we are able to examine only numbers of ACS hospitalizations and ED visits, not rates.

However, the American Community Survey, which collects data on samples of people each year between the decennial censuses, provides subcity population estimates for different age groups at the "public use microdata area" or PUMA level. A PUMA is a catchment area of about 100,000 people. Baltimore is made up of six PUMAs (see Figures 1 and 2). (Appendix Figure A.9 depicts the relationship between PUMAs and community statistical areas, or CSAs, which were used in recent health profiles produced by the Baltimore City Health Department). We use the American Community Survey for Baltimore City PUMA population estimates for 2007 and the 2000 U.S. Census for PUMA population estimates for that year. For 2001–2006, we linearly interpolate between the Census and American Community Survey estimates.

Figure 1: Baltimore City PUMAs

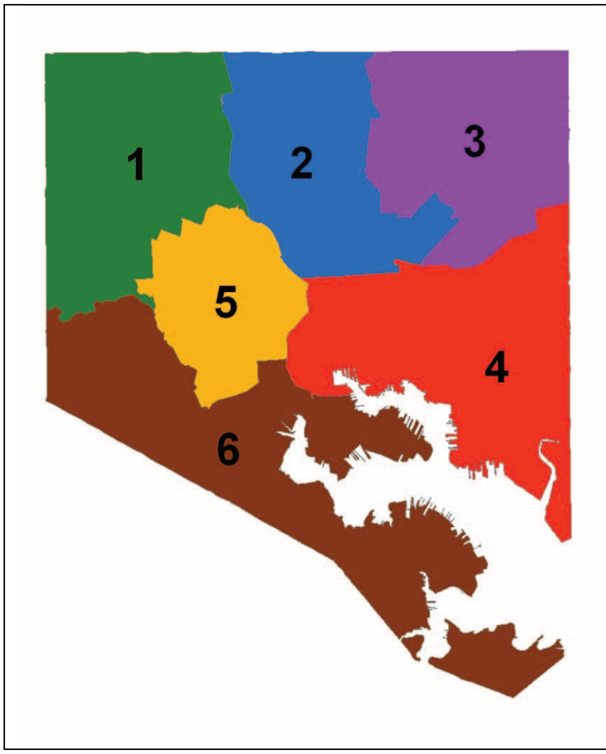
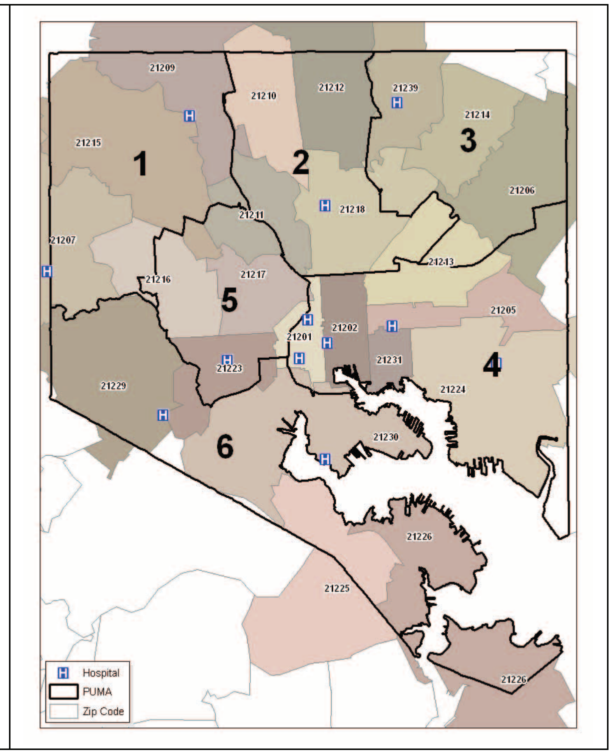


Figure 2: Baltimore City PUMA–Zip Code Crosswalk

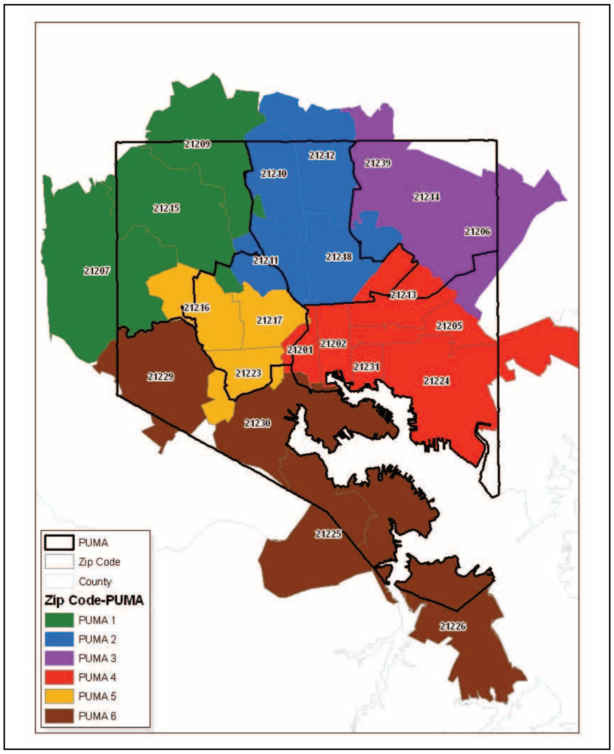


Appendix Table A.1 provides information on population changes over time by PUMA and age group for Baltimore City. Key changes include the following:

- Population estimates for the city as a whole show a decline from approximately 649,000 to 637,000 between 2000 and 2007.
- The population of people over age 65 fell in every PUMA within Baltimore. The largest decrease was in PUMA 5, followed by PUMAs 1 and 4.
- On the other hand, the number of people ages 40–64 increased in every PUMA; the most significant growth was in PUMA 3 (followed by PUMAs 1 and 6).
- Population growth was much greater among those ages 40–64 than among those ages 18–39. The size of the former group increased in PUMAs 2, 3, and 6 but fell in PUMAs 1, 4, and 5. The greatest increase occurred in PUMA 3; the greatest decrease occurred in PUMA 4.
- Population growth was mixed for youth as well, with increases in PUMAs 1, 3, and 6 (especially PUMA 1), and decreases in PUMAs 4, 2, and 5 (especially PUMA 4).

The PUMA rates we construct are approximate because zip codes do not map perfectly onto PUMAs (see Figure 2). For zip codes that fall into more than one PUMA, we assign the zip code to the PUMA in which the largest percentage of the population resides (see Figure 3). By using information on individuals' county of residence, we are able to exclude observations from individuals whose zip code is partially in Baltimore City but who live in the part of the zip code that falls outside of the city limits.

Figure 3: Zip Code–Defined PUMAs



Note: Although the entire zip code is colored for zip codes that cross Baltimore City limits, we exclude observations from individuals living in parts of zip codes that are not within city limits.

3. ACS-IP and ACS-ED Rates in Baltimore City

The first subsection describes ACS-IP and ACS-ED rates for Baltimore City over time. In the subsequent subsection, we compare ACS-IP and ACS-ED rates in Baltimore with those in selected Maryland counties and the District of Columbia, and we compare the payer mix for ACS-IP hospitalizations and ED visits.

3.1 Changes over Time in ACS-IP and ACS-ED Rates

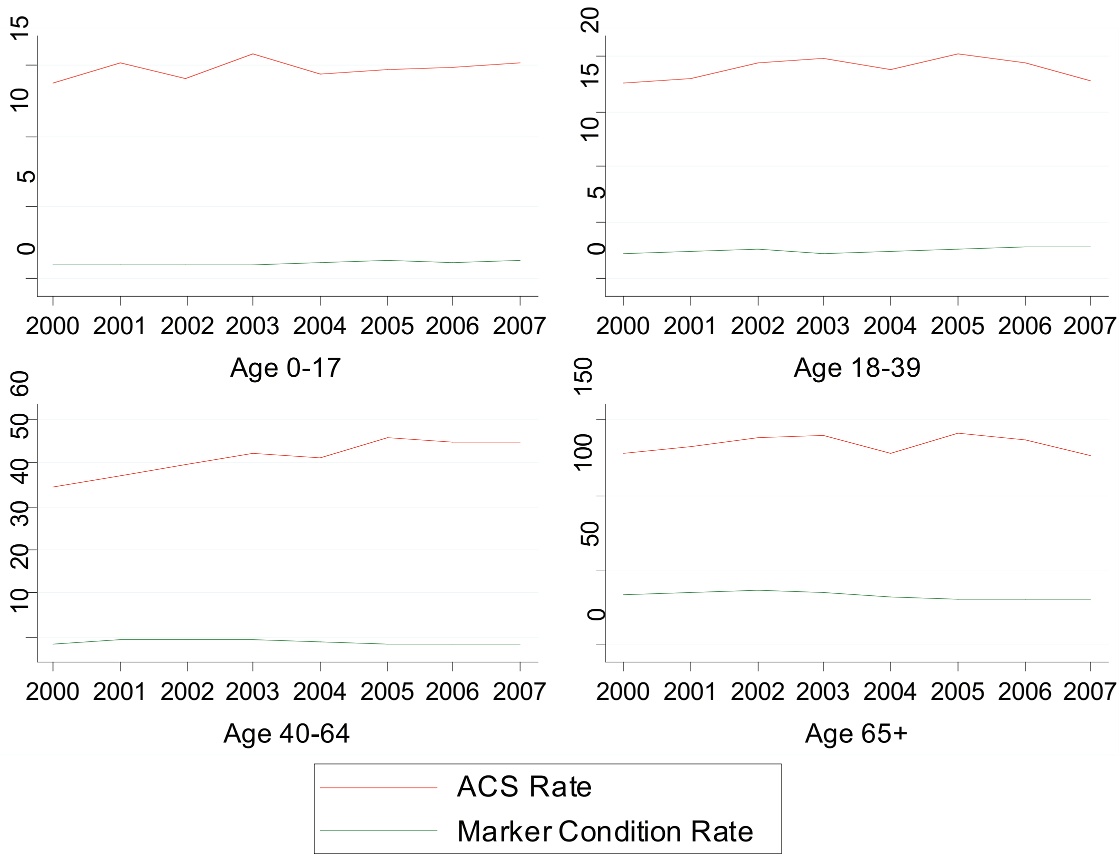
Table 1 and Figure 4 profile ACS-IP rates among Baltimore City residents over time from 2000 to 2007 by age group (0–17, 18–39, 40–64 and 65+). In addition, Table 1 shows age-specific rates over time for "marker" conditions—conditions that are conceptually not sensitive to the quality and availability of outpatient care. Comparing patterns in ACS-IP rates with patterns in marker rates is potentially useful because changes in marker rates may reflect changes in the underlying population that we are not able observe. Marker rates, however, may include some random variability or "noise."

Table 1: ACS-IP Rates Among Baltimore City Residents over Time, 2000–2007 (per thousand)

Age	2000	2001	2002	2003	2004	2005	2006	2007
0–17	13.7	15.1	14.0	15.8	14.3	14.7	14.8	15.1
Marker (0–17)	*1.0*	*0.9*	*1.0*	*0.9*	*1.1*	*1.3*	*1.1*	*1.2*
18–39	17.6	17.9	19.4	19.8	18.8	20.1	19.3	17.6
Marker (18–39)	*2.3*	*2.4*	*2.7*	*2.3*	*2.5*	*2.6*	*2.8*	*2.8*
40–64	44.7	47.3	49.8	52.5	51.5	56.0	55.1	55.0
Marker (40–64)	*8.4*	*9.1*	*9.1*	*9.1*	*8.6*	*8.5*	*8.2*	*8.5*
65 +	128.0	132.5	137.9	139.0	128.2	140.6	136.2	126.3
Marker (65+)	*33.7*	*34.5*	*36.2*	*35.5*	*31.2*	*30.4*	*29.7*	*30.4*

Note: ACS-IP rates reflect inpatient discharges from either Maryland or District hospitals.

Figure 4: ACS-IP Rates Among Baltimore City Residents over Time (2000–2007)



Not unexpectedly, as shown by the scale of the x-axis on the figures, ACS-IP rates are higher among those age 65 and over than in other age groups. Long-term trends in ACS-IP rates (2000–2007) are relatively flat for adults ages 18–39. Notably, however, ACS-IP rates rose 23 percent from 2000 to 2007 among those ages 40–64—from 44.7 to 55.0 ACS-IP hospitalizations per thousand people per year. Over the same period, ACS-IP rates among Baltimore youth rose 10 percent (from 13.7 to 15.1 hospitalizations per thousand people per year).[2]

From 2004 to 2007, ACS-IP rates climbed 6 percent among children. Among adults 40–64, ACS rates rose 9 percent between 2004 and 2005 but have remained relatively steady since then. For adults ages 18–39 and age 65 and over, ACS-IP rates trended downward in 2005–2007, from 20.1 to 17.6 ACS hospitalizations per thousand people per year among those 18–39 and from 140.6 to 126.3 among those 65 and over.

Appendix Figures A.1–A.4 depict the time trends in ACS-IP rates separately for each age group and show related trends in overall hospitalizations, as well as the percentage of all hospitalizations that are ACS.

Table 2 and Figure 5 summarize ACS-ED rates over time by age group.

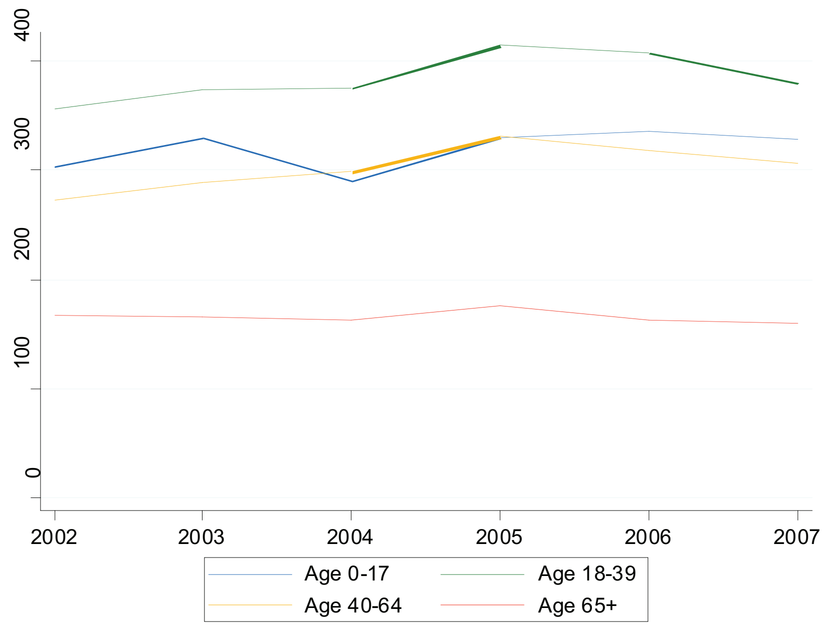
Table 2: ACS-ED Rates Among Baltimore City Residents over Time, 2002–2007 (per thousand)

Age	2002	2003	2004	2005	2006	2007
0–17	303.5	330.3	290.3	330.4	336.6	328.9
18–39	356.8	374.9	375.7	414.6	408.5	380.1
40–64	272.5	289.0	298.9	331.2	318.0	306.6
65+	166.5	165.5	162.6	176.1	163.3	159.7
All	293.8	311.2	304.5	338.6	332.8	318.0

Notes: The county indicator that we use to select Baltimore City residents is available only for the ED discharge data from 2002 on. Because DC ED discharge data are available only from 2004, the ACS-ED rates reflect discharges of Baltimore City residents from Maryland hospitals only.

[2] Because these rates are based on the full universe of inpatient discharges, there are no standard errors associated with them. Thus, whether the differences are significant is a conceptual as opposed to statistical issue.

Figure 5: ACS-ED Rates Among Baltimore City Residents over Time, 2002–2007



Between 2002 and 2007, ACS-ED rates in Baltimore grew most substantially among adults ages 40–64, rising 13 percent during that period. In comparison, from 2002 to 2007, ACS-ED rates grew 7 percent among adults ages 18–39 and 8 percent among youth ages 0–17.
Despite the long-term upward trend, ACS-ED rates have declined more recently. From 2005 to 2007, ACS-ED rates fell continually for adults 18–39, 40–64, and 65 and over, decreasing between 7 and 9 percent during those years. Among youth, ACS-ED rates rose from 2005 to 2006 but fell slightly from 2006 to 2007.

Appendix Figures A.5–A.8 depict the time trends in ACS-ED rates separately for each age group, and show related trends in overall ED discharges as well as the percentage of all ED discharges that are ACS.

3.2 Comparison with Other Maryland Counties

We compare ACS-IP and ACS-ED rates among Baltimore City residents with the rates for residents of the District of Columbia, Maryland, and selected Maryland counties (proximate and relatively large—Anne Arundel, Baltimore, and Harford—see Figure 6).

Figure 6: Baltimore City and Comparison Counties

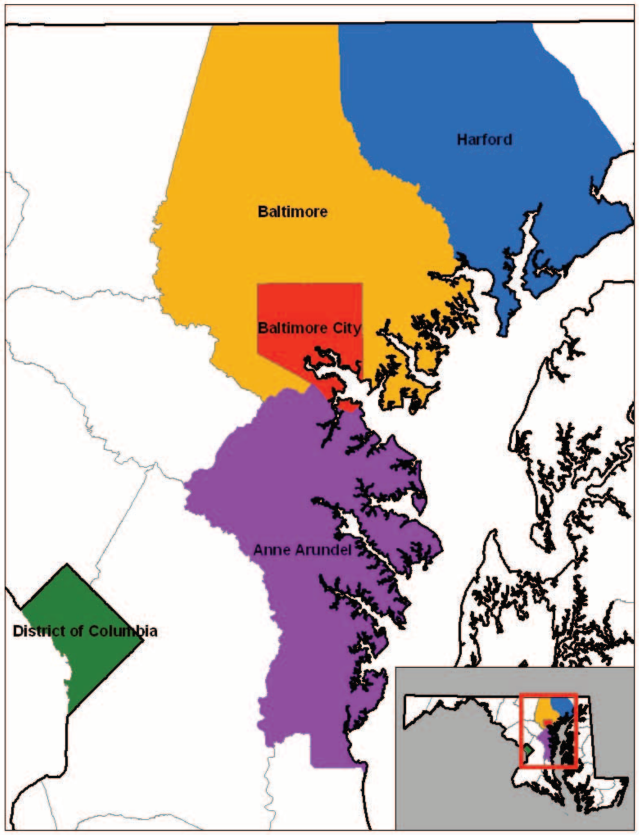


Figure 7 shows the same comparison for ACS-IP rates by age group; Figure 8 does the same for ACS-ED rates.

Figure 7: ACS- IP Rates in Baltimore City and Selected Comparison Locations

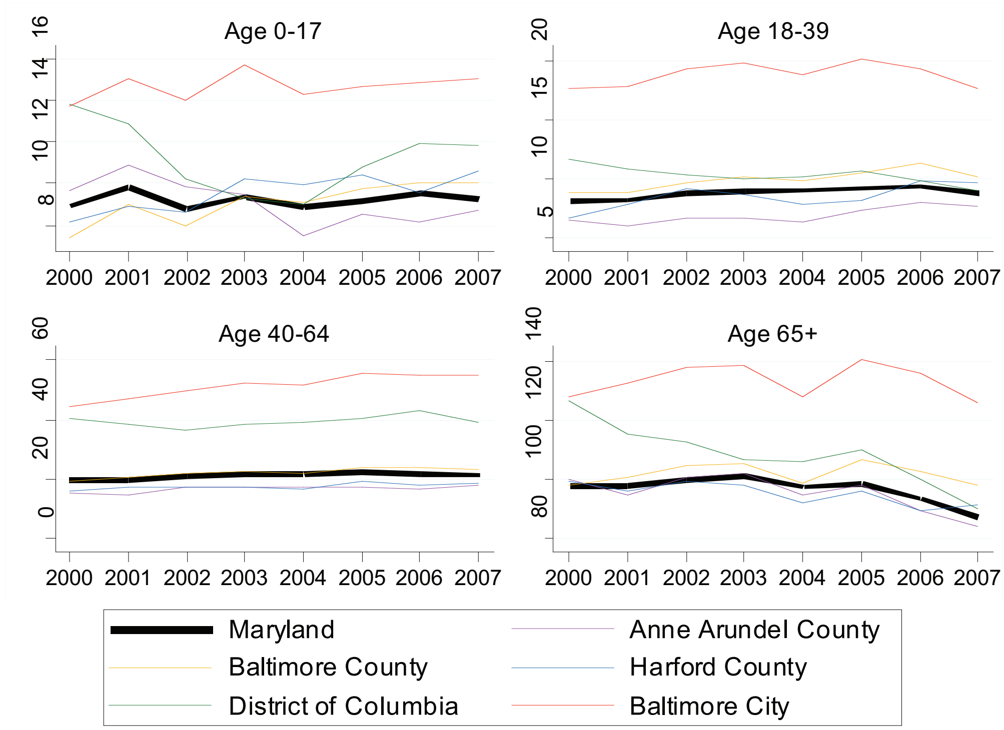
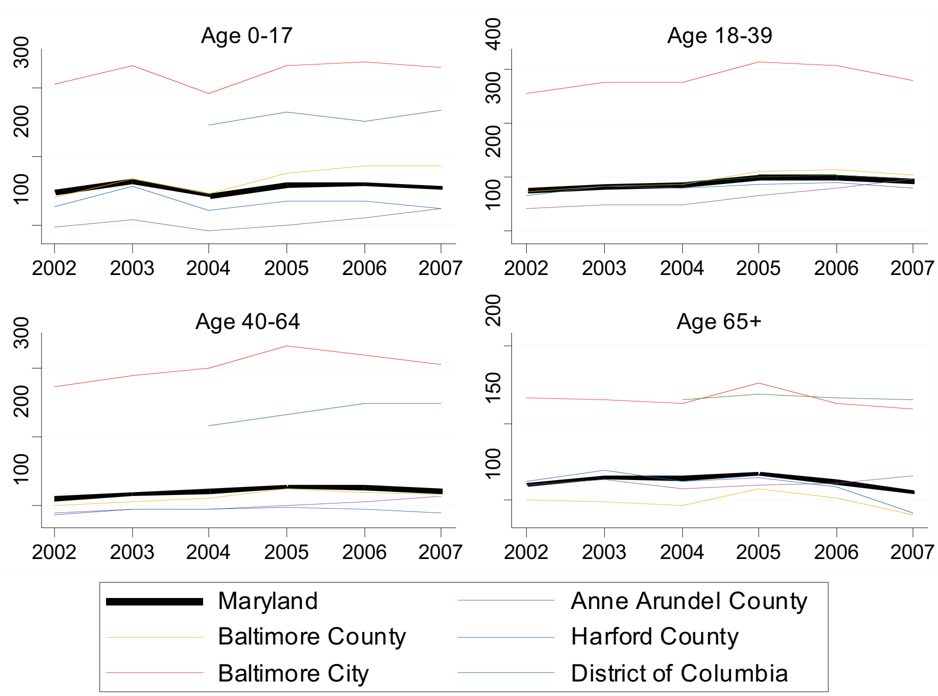


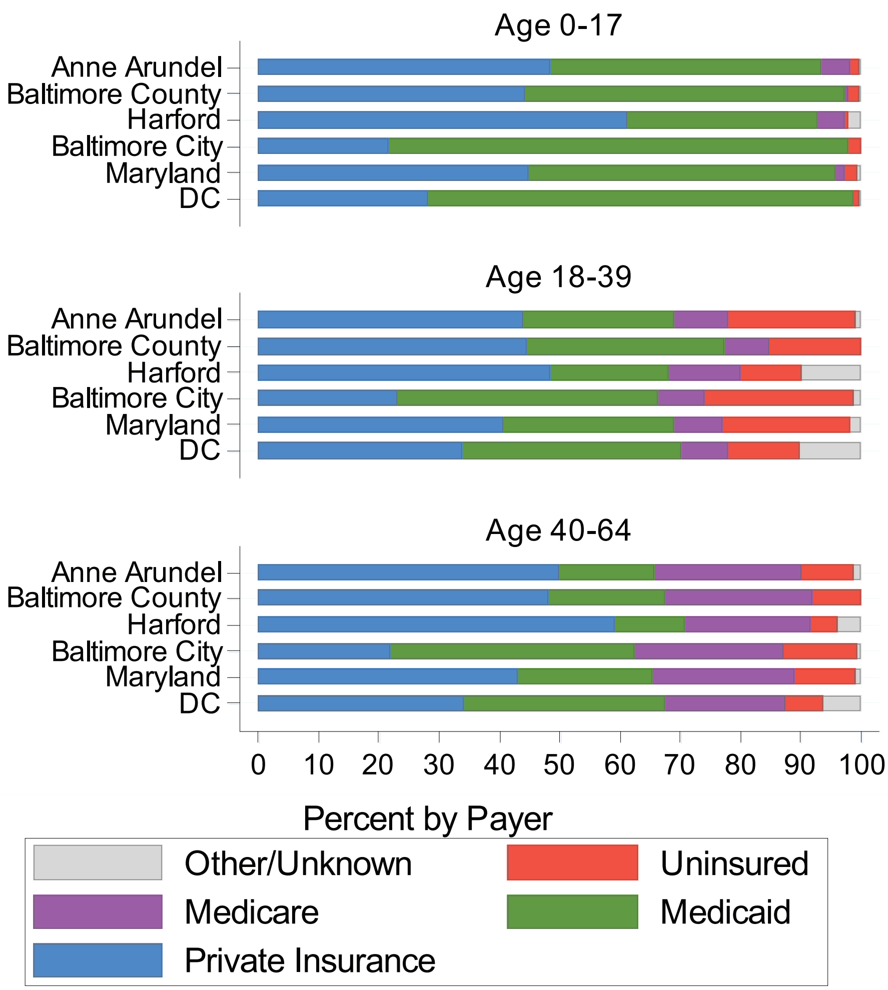
Figure 8: ACS- ED Rates in Baltimore City and Selected Comparison Locations



Not surprisingly, given Baltimore City's urban setting, its ACS-IP rates are higher than those in other counties and in Maryland as a whole. However, rates are also higher in Baltimore City than in the District of Columbia across all age groups. For example, ACS-IP rates in 2007 for children were 22 percent higher in Baltimore than in the District, and the ACS-IP rate in Baltimore among those ages 18–39 was nearly double that in the District. In 2007, ACS-IP rates among those 40–64 and 65 and over were 41 percent higher in Baltimore than in the District. Similarly, ACS-ED rates are higher in Baltimore City than in the District. Compared with the District, Baltimore City's ACS-ED rates in 2007 were about 25 percent higher among those 0–17 and 40–64, and nearly twice as high among those 18–39.

Figures 9 and 10 profile the payer mix for ACS-IP and ACS-ED discharges among residents of Baltimore City and comparison areas. (We omit charts for adults over 65 for whom Medicare is the payer in the vast majority of instances.)

Figure 9: Payer Distribution for ACS Hospitalizations, Baltimore City Versus Comparison Locations, 2007



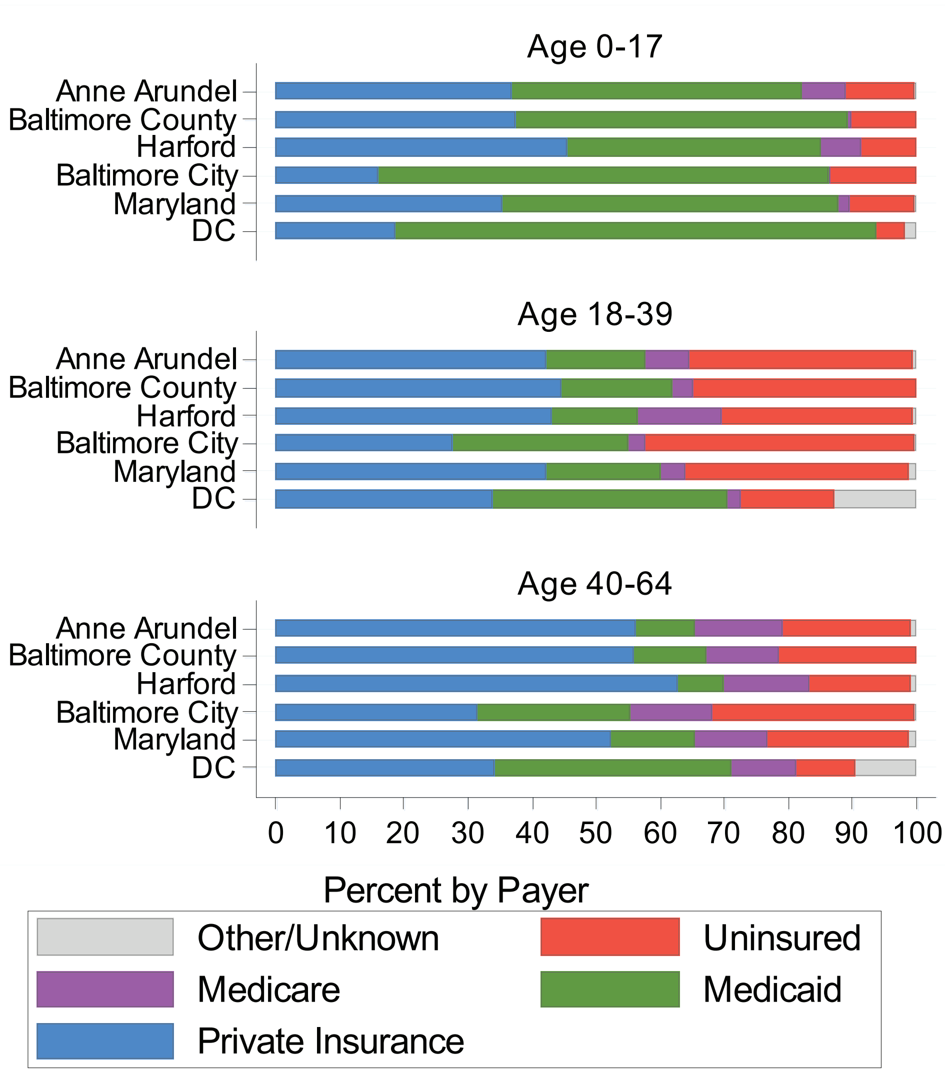
Medicaid plays a comparatively greater role in paying for ACS hospitalizations in Baltimore than in other Maryland counties, but it is comparable to that of the District.[3] Further, a larger proportion of ACS hospitalizations (among the uninsured) are self-pay (i.e., uninsured) in Baltimore than in Maryland as a whole and in the District.

- In Baltimore City, Medicaid pays for approximately 40 percent of ACS-IP discharges among adults 18–64, and for three-fourths of ACS-IP discharges among Baltimore youth.

[3] The Medicaid category for the District captures both Medicaid and a supplemental program known as the DC Alliance, which provides access to care for individuals with income levels too high for Medicaid.

- In comparison, Medicaid pays for 22 percent of ACS hospitalizations among all Maryland residents ages 40–64, 28 percent of ACS discharges among Maryland residents ages 18–39, and 51 percent of ACS discharges among Maryland youth.
- In the District, the figures are similar to Baltimore: Medicaid (or the Alliance) pays for between 33 and 36 percent of ACS hospitalizations among those 18–64 and for 71 percent of ACS hospitalizations among District youth.
- Approximately one-fourth of ACS discharges among Baltimore residents ages 18–39 are self-pay, as are about 12 percent of ACS discharges among those 40–64. These figures are higher than for Maryland as a whole (21 percent and 10 percent respectively) and for the District (12 percent and 6 percent respectively).

Figure 10: Payer Distribution for ACS-ED Visits, Baltimore City Versus Comparison Locations, 2007



As with ACS hospitalizations, Medicaid plays a substantial payer role for ACS-ED visits in both Baltimore City and the District, while self-pay patients constitute a larger category of payer for Baltimore City than for the District or all of Maryland.

- Medicaid is the primary payer for the majority of ACS-ED discharges among Baltimore City youth (70 percent) and pays for approximately one-quarter of ACS-ED visits among adults. In the District, Medicaid (and the Alliance) pay for an even greater proportion of visits (75 percent of children's ACS-ED visits and 37 percent of adult ACS-ED visits). Medicaid's role in paying for ACS-ED visits is greater in Baltimore and DC than it is in Maryland, where Medicaid pays for half of ACS-ED visits among youth and between 13 and 18 percent of adult ACS-ED visits.
- In Baltimore, ACS-ED visits are paid for by the uninsured in 13, 42, and 32 percent of cases among those ages 0–17, 18–39 and 40–64, respectively. In the District, those percentages are 4, 15 and 9. The uninsured pay for fewer ACS-ED visits in Maryland as a whole than do the uninsured in Baltimore, where 10, 35, and 22 percent of ACS-ED visits are self-paid among those ages 0–17, 18–39 and 40–64.
- The greater proportion of ED visits paid for by the uninsured in Baltimore than in the District reflects both a lower proportion of ED visits paid for by Medicaid and a lower proportion of ED visits paid for by private insurance.

4. Variation in ACS-IP and ACS-ED Rates Within Baltimore City

4.1 ACS-IP and ACS-ED Rates by PUMA

Figure 11 and Figure 12 depict, respectively, ACS-IP and ACS-ED rates for various age groups by PUMA within Baltimore.

Figure 11: ACS-IP Rates by PUMA

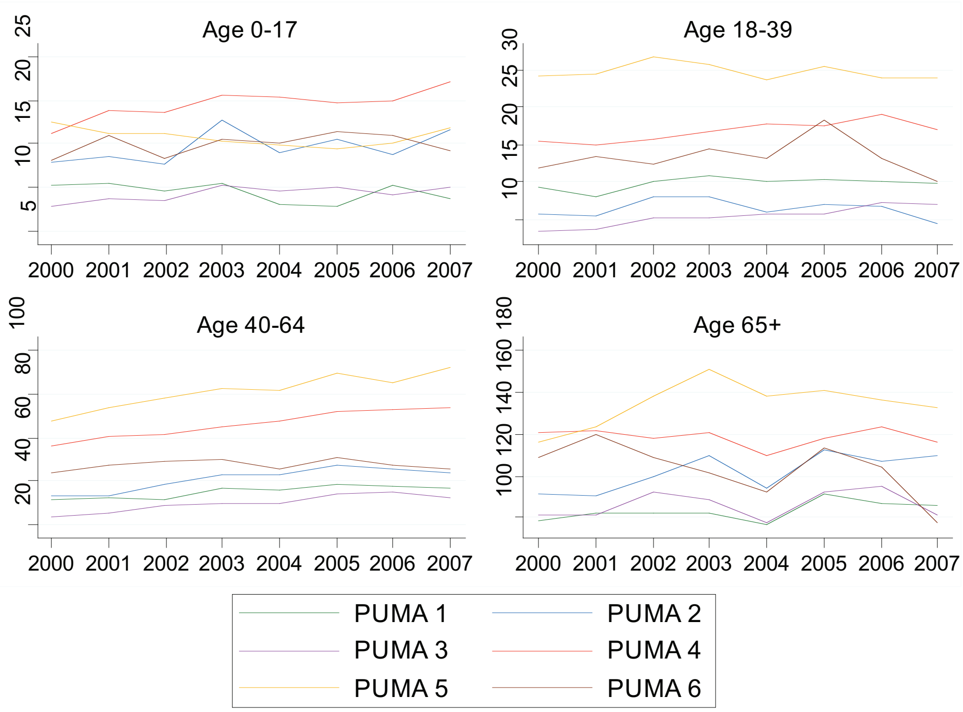
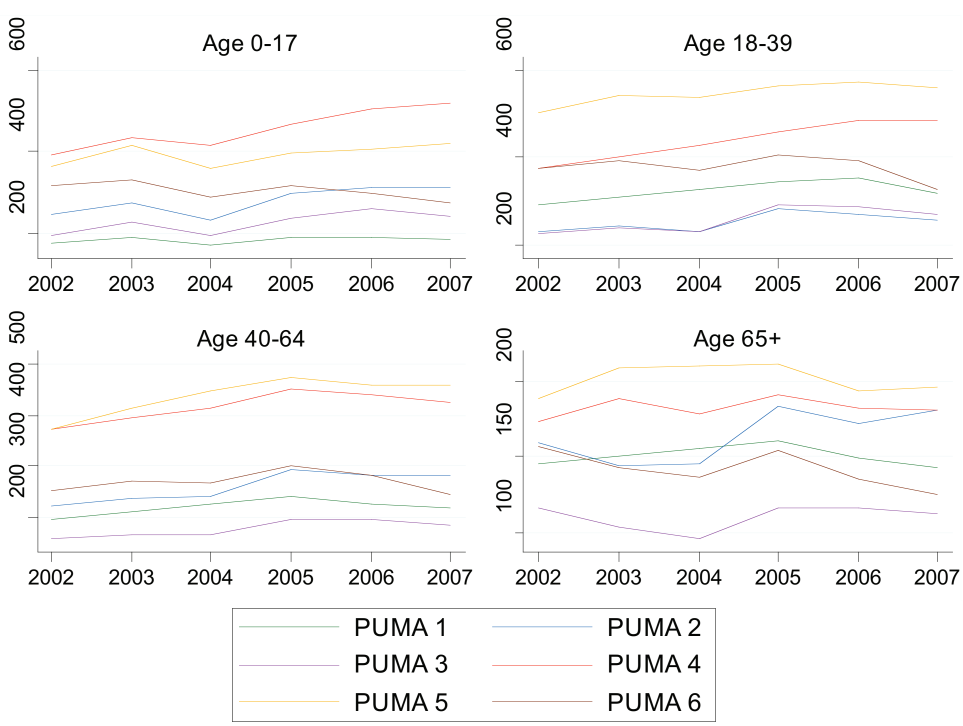


Figure 12: ACS-ED Rates by PUMA



For Baltimore youth, ACS-IP and ACS-ED rates were highest in 2007 in PUMA 4. ACS-IP rates were also relatively high in PUMAs 5 and 2, and ACS-ED rates were relatively high in PUMA 5.

For adults, ACS-IP and ACS-ED rates were highest in 2007 in PUMAs 5 and 4. Among youth, ACS-IP rates and ACS-ED rates in PUMA 4 were more than double those in PUMAs 1 and 3. In addition, among those 18-39, ACS-IP rates in PUMAs 4 and 5 were more than double that in PUMA 2, and ACS-ED rates in PUMA 5 were more than double rates in PUMAs 2 and 3. Further, among those 40–64, ACS-IP rates and ACS-ED rates in PUMAs 4 and 5 were double those in PUMAs 1 and 3.

Growth in ACS-IP rates between 2002 and 2007 was particularly steep in PUMAs 4 and 5 across all age groups. Among youth, ACS-IP rates rose between 2006 and 2007 in PUMAS 2, 3, 4, and 5; they fell in PUMAs 1 and 6. However, among adults 18–39, ACS-IP rates fell or remained steady in every PUMA between 2006 and 2007. Rates also fell among adults 40–64 in all PUMAs except 4 and 5, where rates rose.

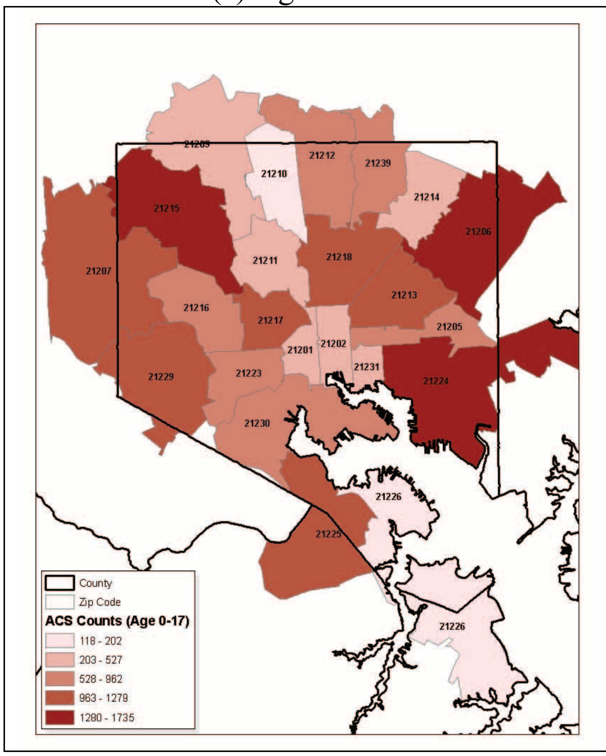
ACS-ED rates among Baltimore youth fell in some PUMAs (1, 3, 6) but rose in others (2, 4, 5) between 2005 and 2006. Rates fell across the board among adults 18–39 between 2006 and 2007. Among adults 40 and over, rates fell in some PUMAs and rose in others. For adults 40-64, ACS-ED rates rose from 2006 to 2007 in PUMAs 2 and 6; among adults over 65 rates rose in PUMA 2 and PUMA 5.

4.2 ACS Hospitalizations and ED Visits by Zip Code

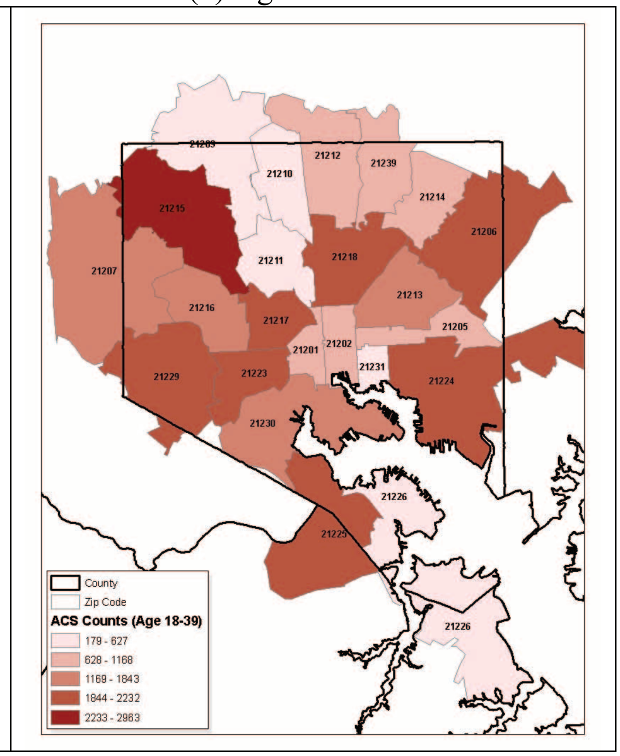
Figure 13 shows the number of ACS hospitalizations by zip code (not adjusted for population size), with darker shaded areas signifying more such hospitalizations. Figure 14 does the same for ACS-ED visits.

Figure 13: Number of ACS Hospitalizations in 2007

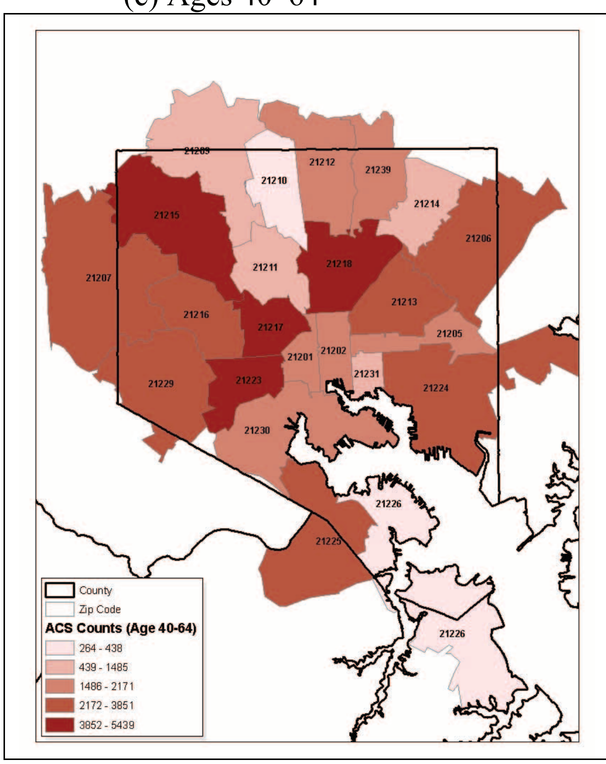
(a) Ages 0–17



(b) Ages 18–39



(c) Ages 40–64



(d) Ages 65 and over

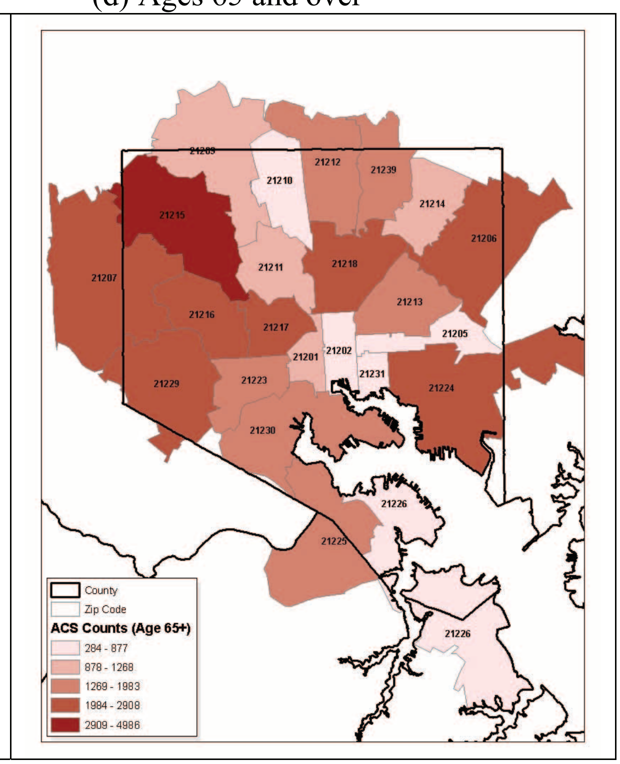
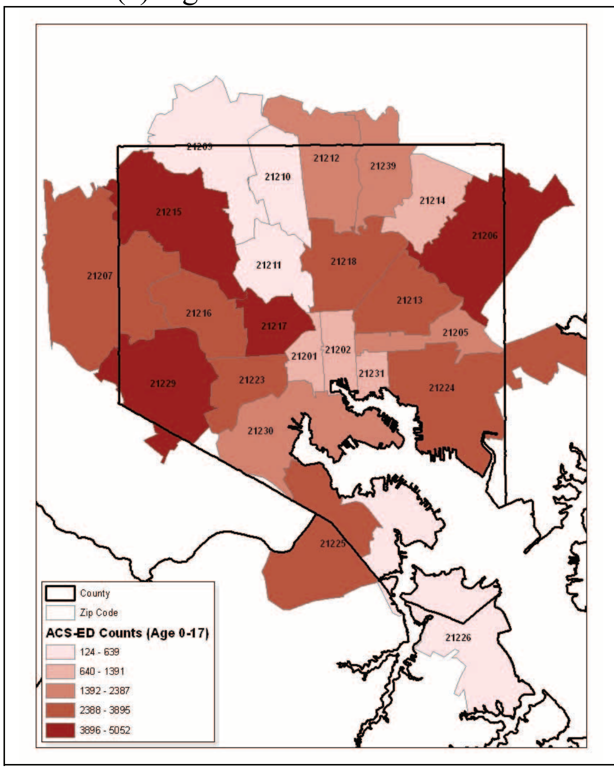
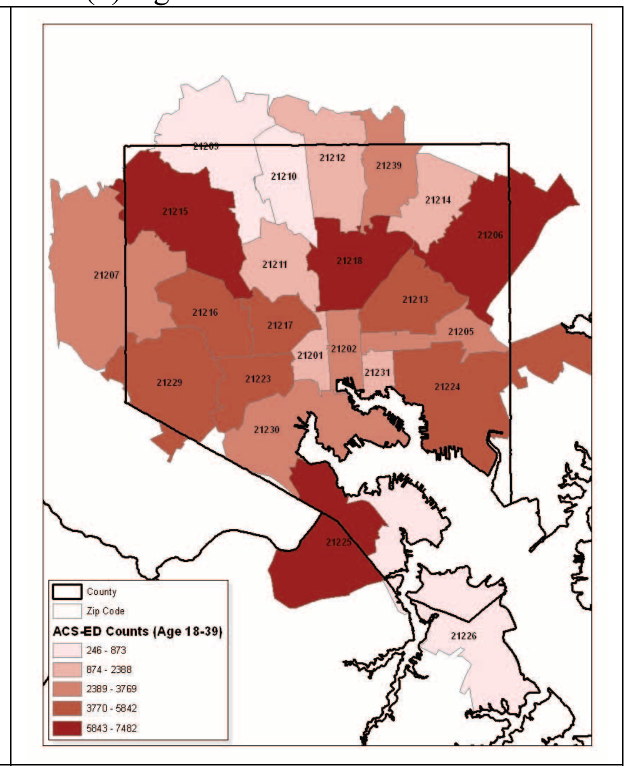


Figure 14: Number of ACS-ED Visits in 2007

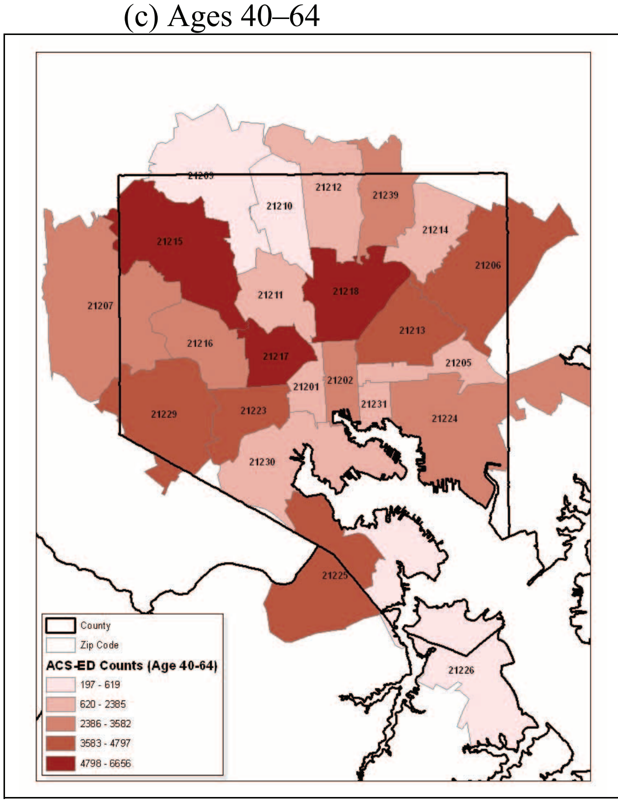
(a) Ages 0–17



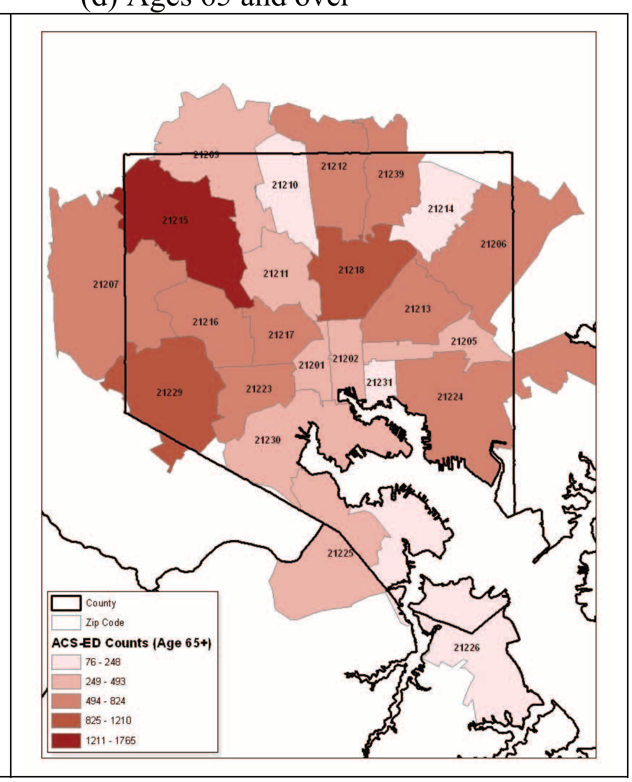
(b) Ages 18–39



(c) Ages 40–64



(d) Ages 65 and over



5. Common Diagnoses Among ACS Hospitalizations and ED Visits

Table 3 profiles common diagnoses associated with ACS-IP hospitalizations among youth and adult residents of Baltimore. Table A.3 in the Appendix provides ACS-IP rates for these diagnoses.

Among youth, ACS-IP hospitalization rates for cellulitis increased significantly between 2000 and 2007, including an increase in the number and rate of cases between 2006 and 2007. Among nonelderly adults, cellulitis hospitalizations and hospitalization rates increased from 2000 to 2006, with a decline in 2007. Rates of cellulitis-related ACS-IP discharges among those 65 and over trended upward from 2004 to 2006 and then declined from 2006 to 2007.

Among adults ages 40–64, hospitalization rates increased for nearly every diagnosis shown between 2006 and 2007, with particularly large increases for asthma, hypertension, and diabetes. For adults over 65, diagnoses with the most significant upward trends included asthma and hypertension for both 2000–2007 and 2006–2007.

Table 3: Number of ACS Hospitalizations Associated with Common Diagnoses by Age Group, 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007
Ages 0–17								
Asthma	802	884	829	959	840	695	699	830
Dehydration	412	502	418	523	432	472	460	357
Bacterial pneumonia	279	293	234	227	225	334	415	349
Cellulitis	118	137	120	175	238	270	237	272
Seizures	35	32	36	48	43	38	27	73
Ages 18–39								
Cellulitis	405	413	457	596	577	719	714	667
Dehydration	702	692	779	792	787	800	741	635
Diabetes	390	408	421	394	420	416	400	399
Asthma	553	452	486	518	437	437	427	381
Bacterial pneumonia	522	530	521	540	371	403	360	306
Kidney infection	273	258	272	220	227	254	232	217
CHF*	157	175	193	210	234	219	224	211
PID	191	204	209	153	140	144	110	90
Hypertension	48	68	70	62	77	88	98	72
Ages 40–64								
CHF*	1,488	1,722	1,735	1,956	1,908	1,984	2,032	1,974
Bacterial pneumonia	1,250	1,303	1,392	1,469	1,336	1,497	1,293	1,282
Asthma	647	641	726	894	,855	1,116	1,120	1,275
Dehydration	1,487	1,714	1,859	1,874	1947	1,774	1,587	1,250
Cellulitis	612	614	697	918	931	1,137	1,187	1,144
Diabetes	740	740	846	836	817	923	877	980
COPD*	605	599	578	626	525	647	785	838
Hypertension	209	263	272	296	387	449	388	484
Kidney infection	315	354	317	331	357	412	392	411
Gastroenteritis	98	97	133	129	136	143	156	161
Angina	185	205	187	130	149	146	114	144
Ages 65 and over								
CHF*	2,749	2,928	2,625	2,841	2,490	2,636	2,595	2,392
Dehydration	2,953	3,073	3,329	3,139	3,046	2,843	2,424	1,929
COPD*	1,012	943	952	928	769	995	1066	1,092
Kidney infection	837	791	759	841	775	864	902	905
Bacterial pneumonia	1,669	1,542	1,692	1593	1331	1,445	1010	878
Diabetes	365	419	429	457	383	432	541	497
Asthma	186	216	252	253	264	394	383	393
Cellulitis	321	331	314	312	295	366	401	366
Hypertension	132	146	181	189	185	206	223	236

*Diagnoses are selected for each age group separately. CHF is congestive heart failure; COPD is chronic obstructive pulmonary disorder.

6. Interpreting ACS Rates in Baltimore City

As described, ACS rates have been used as an indirect measure of the functioning of the primary care system, including the accessibility and effectiveness of primary care. Conceptually, ACS rates may be influenced by a range of factors related to primary care, including (see, e.g., Institute of Medicine, 1993):[4]

- the availability of primary care and hospital-based care
- the price that patients pay for hospital care compared with the price they would pay for office-based care (i.e., the out-of-pocket costs of care)
- "nonpecuniary" or indirect costs of obtaining hospital care relative to those for obtaining primary care (such as the costs of transportation, the time spent travelling to and from the location of care, and time spent waiting to be seen)
- individuals' preference for hospital care compared with primary care
- the quality of primary care and hospital-based care
- the underlying burden of illness in the community
- perceptions of access, cost and quality—which may or may not reflect the true levels of each.

Various studies have confirmed the link between aspects of the availability and effectiveness of primary care and ACS rates. For example, Bindman et al. (1995)[5] and Ansari, Laditka and Laditka (2006)[6] provide evidence of an inverse relationship between self-rated access to health care and ACS rates for urban areas (the better self-rated access is, the lower ACS rates are). Results from Ansari et al. (2006) support the hypotheses of negative relationships between ACS rates and both primary care visits and the supply of primary care physicians. Further, Epstein et al. (2001)[7] show that populations in medically underserved areas (MUAs) served by a federally qualified health center had significantly lower avoidable hospitalization rates than did other MUA populations. In addition, Laditka, Laditka, and Probst (2005)[8] find that physician supply is inversely associated with ACS rates at the county level and that physician supply had the greatest magnitude of effect compared with other variables. However, not all studies have found a robust inverse relationship between physician supply and ACS rates. For example, Krakauer et al. (1996)[9] find this inverse association only for areas with lower to moderate levels of physician supply.

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[4] Institute of Medicine, *Access to Health Care in America*, edited by M. Millman, Washington, DC: National Academy Press, 1993.

[5] Bindman, A B, Grumbach K, Osmond D, Komaromy M, Vranizan K, Lurie N, Billings J, and Stewart A. Preventable hospitalization and access to health care. *JAMA.* 1995; 274 (4): 305–11.

[6] Ansari, Z, Laditka JN, Laditka SB. Access to health care and hospitalizations for ambulatory care sensitive conditions. *Med Care Res Rev.* 2006; 63(6); 719–741.

[7] Epstein AJ. The role of public clinics in preventable hospitalizations among vulnerable populations, *Health Serv Res*. 2001; 36(2): 405–419.

[8] Laditka JN, Laditka SB, Probst J. 2005. More may be better: Evidence that a greater supply of primary care physicians reduces hospitalization for ambulatory care sensitive conditions. *Health Serv Res.* 2005; 40(4): 1148–66.

[9] Krakauer, H, Jacoby I, Millman M, and Lukomnik JE. Physician impact on hospital admission and on mortality rates in the Medicare population. *Health Serv Res.* 1996: 31(2): 191–211.

Beyond physician supply and self-rated access to care, studies confirm that ACS rates are higher in areas with lower levels of income and lower levels of education, which may reflect different preferences for primary and hospital care compared with other population groups; different costs—in terms of money, time or convenience—associated with primary and hospital care for lower income/lower education groups (i.e., primary care may involve long waiting times for an appointment); differences in the quality of care; and/or different perceptions of availability, cost, or quality. In addition, some evidence suggests that the supply of hospitals and specialists in an area may also contribute to hospitalization rates (Dartmouth Atlas, 2007).[10]

Teasing out the influence of each contributing factor on the level of ACS hospitalizations in an area is a challenge. Some studies have conducted regression analysis of the effects of socio-economic and health care market characteristics on ACS rates (Laditka, Laditka, and Probst, 2005).[8] An alternative approach is to survey those who experience an ACS hospitalization concerning the underlying factors. These data suggest that the perceptions of patients and providers differ. Flores et al (2003)[11] found that patients attributed about a third of ACS hospitalizations to themselves—e.g., failure to obtain and keep on hand an adequate supply of medication, failure to take a child to a follow-up appointment or contact a primary care provider in a timely manner—and a little less than half to providers (mainly quality of care issues). At the same time, providers attributed 71 percent of ACS hospitalizations to patient factors and 18 percent to provider factors—primarily failing to adequately educate their patients. Both patient and provider factors could be related to the availability of care: Providers might provide lower quality of care if they are overwhelmed with too many patients; patients might not get a prescription refill or have a follow-up appointment if obtaining an appointment is difficult.

Thus, given the range of factors that influence ACS rates, policy levers to reduce ACS rates could include interventions to reduce the burden of chronic disease or to improve self-management; changes to increase the availability of primary care and/or to reduce the costs associated with primary care (including direct out-of-pocket costs for health care services as well as transportation costs or time spent waiting for an appointment); and changes designed to alter misperceptions of cost, quality, or accessibility of care. How much to use one policy lever over another depends on the relative role of the factor on ACS rates in the area. A complete accounting of the factors that bear on ACS rates in Baltimore City is beyond the scope of this project, but in the following paragraphs, we describe the potential role of one lever: investing in the availability of primary care.

Whether investing in the availability of primary care makes sense depends first on whether supply is constrained. We explored available measures of physician supply for Baltimore City and found that many areas within the city are considered MUAs or health provider shortage areas (HPSAs). Although we do not have information on utilization rates for Baltimore residents—insured, uninsured, or otherwise—the supply constraints, together with the relatively high ACS rates in Baltimore, suggest a need to develop primary care capacity in the city. How much

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[10] Dartmouth Atlas Project, Center for Evaluative Clinical Sciences. 2007. "Supply Sensitive Care," Project Topic Brief, January 15, 2007.
[11] Flores G, Abreu M, Chaisson CE, Sun D. Keeping children out of hospitals: Parents' and physicians' perspectives on how pediatric hospitalizations for ambulatory care-sensitive conditions can be avoided. *Pediatrics*. 2003; 112(5); 1021–1030.

depends on the relative role of capacity compared with other factors. Below, we provide some broad parameters.

If we assume that about one-third of ACS-ED visits and ACS-IP hospitalizations are related to availability of care (based on the finding that physician supply was the most significant factor influencing ACS rates in the Laditka, Laditka, and Probst study and the loose assumption that all patient-related factors in the Flores study are primarily accessibility issues) and that between one and four primary care visits could be traded for reach ED visit or hospitalization, Baltimore City would need an additional 130,000 to 159,000 primary care visits, with concentrations in areas where primary care capacity is particularly constrained and for populations where capacity is constrained—which may include Medicaid enrollees and the uninsured.[12]

A key limitation is that we have no data from which to develop additional estimates of the primary care shortfall that would serve to validate these estimates (such as utilization data or detailed data on physician supply). This is an important area for future work. Thus, these estimates represent an educated, but limited, conjecture about the size of the primary care shortfall in Baltimore. Naturally, in order to lower ACS rates, the city may also need to focus on the quality and effectiveness of care, including ensuring the availability of adequate urgent care (walk-in capacity during the day and evening/weekend capacity) and better coordination of care.

7. Conclusion

ACS hospitalizations and ED visits are commonly used as markers for the availability and efficacy of primary care in an area. This report provides the first in-depth analysis of ACS hospitalizations and ED visits for Baltimore City.

Key findings include the following:

- There was a long-term upward trend in ACS-IP rates between 2000 and 2007 among Baltimore City youth ages 0–17 and adults ages 40–64. Recent trends for those two groups diverge, however, with ACS-IP rates rising between 2006 and 2007 among youth but falling for adults.
- ACS-ED rates rose between 2002 and 2005 for all nonelderly residents of Baltimore City, but fell among adults between 2005 and 2007 and fell among youth from 2006 to 2007.
- ACS-IP rates and ACS-ED rates are, and historically have been, higher in Baltimore City than in selected Maryland counties, Maryland as a whole, and the District of Columbia. For example, ACS-IP and ACS-ED rates among those 18–39 in Baltimore City are double the rates in the District of Columbia.
- Medicaid pays for a greater proportion of ACS hospitalizations in Baltimore City than in selected Maryland counties and in Maryland as a whole, but the proportion is similar to

[12] Low range corresponds to a trade-off of two primary care visits for each ACS-IP visit, one primary care visit for each nonemergent ACS-ED visit, and two primary care visits for each emergent but primary care–treatable or preventable ED visit. High range corresponds to trade-offs of four primary care visits for each ACS hospitalization, one primary care visit for each nonemergent ACS-ED visit, two primary care visits for each emergent but primary care– treatable ED visit, and two primary care visits for each emergent but primary care–preventable ED visit.

that paid by Medicaid in the District. Similarly, Medicaid pays for a substantial portion of ACS-ED visits in Baltimore City and in the District.

- In Baltimore City, a greater proportion of ACS hospitalizations and ED visits are self-pay (i.e., uninsured) than in the District (where a supplemental program known as the DC Alliance provides access to care for uninsured individuals with incomes too high for Medicaid).
- Within Baltimore City, PUMAs 4 and 5 have the highest ACS-IP rates. ACS-ED rates are likewise highest in PUMAs 4 and 5. Among youth specifically, ACS-ED and ACS-IP rates for 2007 in PUMA 4 are double those in PUMAs 1 and 3.
- Among youth ages 0–17, ACS-IP rates rose between 2006 and 2007 in PUMAS 2, 3, 4, and 5; they fell in PUMAs 1 and 6. ACS-ED rates for the same group fell in some PUMAs (1, 3, 6) but rose in others (2, 4, 5) between 2005 and 2006.
- Among adults 18–39, ACS-IP rates fell or remained steady in every PUMA between 2006 and 2007. ACS-IP rates also fell among adults 40–64 in all PUMAs except 4 and 5, where rates rose.
- ACS-ED rates fell across the board among adults 18–39 between 2006 and 2007. For adults ages 40–64, ACS-ED rates rose from 2006 to 2007 in PUMAs 2 and 6; among adults over age 65, rates rose in PUMA 2 and PUMA 5.
- Among adults ages 40–64, ACS hospitalization rates increased for many of the most common diagnoses, including asthma, diabetes, and COPD, with the greatest increase for hypertension and angina. For adults over 65, upward trends were evident for asthma and hypertension.
- Among youth, ACS-IP hospitalization rates for cellulitis increased steadily between 2002 and 2005, dipped in 2006, and rose again in 2007. Among nonelderly adults, cellulitis hospitalizations and hospitalization rates increased steadily between 2000 and 2006. Among adults over 65, rates of cellulitis-associated ACS hospitalizations increased from 2004 to 2006. Cellulitis-associated ACS rates declined among all adults between 2006 and 2007.
- While a range of factors contributes to ACS rates, evidence suggests that a key determinant is the availability of primary care. Based on our findings related to ACS rates in Baltimore City and the evidence of constrained provider supply, we estimate that Baltimore City may need an additional 130,000 to 159,000 primary care visits, with concentrations in areas where primary care capacity is particularly constrained and for populations for which capacity is constrained—which may include Medicaid enrollees and the uninsured. However, a key limitation is that we have no data from which to develop additional estimates of the primary care shortfall that would serve to validate these estimates. In order to lower ACS rates, the city may also need to focus on the quality and effectiveness of care, including ensuring the availability of adequate urgent care (walk-in capacity during the day and evening/weekend capacity) and better coordination of care.

Appendix Tables

Table A.1: Population Data for Baltimore City and Baltimore City PUMAs

Age	Year	Baltimore City	PUMA 1	PUMA 2	PUMA 3	PUMA 4	PUMA 5	PUMA 6
0–17	**2000**	160,254	26,532	21,398	27,225	31,477	27,843	26,878
	2001	159,048	27,005	20,982	27,404	30,394	27,656	27,037
	2002	156,372	27,478	20,566	27,583	29,312	27,469	27,197
	2003	157,005	27,951	20,150	27,762	28,229	27,282	27,356
	2004	157,311	28,424	19,734	27,942	27,146	27,095	27,516
	2005	156,751	28,897	19,318	28,121	26,063	26,908	27,675
	2006	156,310	29,370	18,902	28,300	24,981	26,721	27,835
	2007	155,155	29,843	18,486	28,479	23,898	26,534	27,994
18–39	**2000**	214,264	27,645	38,188	35,988	50,902	30,304	32,292
	2001	210,128	27,377	38,249	36,217	49,349	30,103	32,376
	2002	205,883	27,109	38,310	36,445	47,796	29,903	32,459
	2003	206,746	26,841	38,371	36,674	46,243	29,702	32,543
	2004	204,304	26,573	38,431	36,903	44,689	29,502	32,627
	2005	203,000	26,305	38,492	37,132	43,136	29,301	32,711
	2006	204,130	26,037	38,553	37,360	41,583	29,101	32,794
	2007	203,093	25,769	38,614	37,589	40,030	28,900	32,878
40–64	**2000**	188,580	30,761	30,468	32,779	37,383	28,368	28,802
	2001	191,945	31,208	30,551	33,586	37,478	28,555	29,169
	2002	193,097	31,654	30,633	34,392	37,573	28,743	29,536
	2003	197,674	32,101	30,716	35,199	37,668	28,930	29,903
	2004	200,394	32,548	30,798	36,005	37,763	29,118	30,271
	2005	202,386	32,995	30,881	36,812	37,858	29,305	30,638
	2006	203,759	33,441	30,963	37,618	37,953	29,493	31,005
	2007	203,549	33,888	31,046	38,425	38,048	29,680	31,372
65+	**2000**	85,517	16,799	13,161	13,066	16,323	14,116	12,456
	2001	84,132	16,447	12,956	13,023	16,033	13,632	12,410
	2002	81,408	16,096	12,751	12,979	15,742	13,149	12,364
	2003	80,899	15,744	12,546	12,936	15,452	12,665	12,318
	2004	78,995	15,392	12,342	12,893	15,161	12,181	12,273
	2005	77,927	15,040	12,137	12,850	14,871	11,697	12,227
	2006	76,762	14,689	11,932	12,806	14,580	11,214	12,181
	2007	75,658	14,337	11,727	12,763	14,290	10,730	12,135
Total	**2000**	648,615	101,737	103,215	109,058	136,085	100,631	100,428
	2001	645,253	102,037	102,738	110,229	133,254	99,947	100,992
	2002	636,760	102,337	102,260	111,400	130,422	99,263	101,557
	2003	642,324	102,637	101,783	112,571	127,591	98,579	102,121
	2004	641,004	102,937	101,305	113,743	124,760	97,896	102,686
	2005	640,064	103,237	100,828	114,914	121,929	97,212	103,250
	2006	640,961	103,537	100,350	116,085	119,097	96,528	103,815
	2007	637,455	103,837	99,873	117,256	116,266	95,844	104,379

Sources: Baltimore City population estimates from 7/1/2007 County Characteristics Resident Population Estimates File, U.S. Census Population Division. PUMA estimates for 2000 from 2000 U.S. Census. 2007 PUMA estimates from the 2007 American Community Survey. 2001–2006 population estimates derived by linear interpolation between 2000 Census and 2007 American Community Survey estimates.

Table A.2: ACS-IP Rates by PUMA

Age	Year	PUMA 1	PUMA 2	PUMA 3	PUMA 4	PUMA 5	PUMA 6
0–17	2000	10.3	12.9	7.9	16.1	17.4	13.1
	2001	10.4	13.5	8.7	18.9	16.2	16.0
	2002	9.6	12.7	8.5	18.5	16.2	13.4
	2003	10.5	17.8	10.3	20.7	15.4	15.5
	2004	8.1	13.9	9.6	20.4	14.8	15.0
	2005	7.8	15.5	10.0	19.6	14.4	16.4
	2006	10.3	13.8	9.1	20.0	15.1	16.0
	2007	8.7	16.7	10.0	22.1	16.7	14.2
18–39	2000	14.1	10.6	8.4	20.5	29.1	16.7
	2001	13.0	10.5	8.7	20.0	29.5	18.4
	2002	15.0	12.9	10.2	20.5	31.7	17.4
	2003	15.7	13.0	10.2	21.8	30.6	19.3
	2004	14.9	10.9	10.7	22.7	28.7	18.0
	2005	15.2	12.0	10.7	22.4	30.4	23.2
	2006	15.1	11.8	12.2	24.1	29.0	18.1
	2007	14.8	9.5	11.9	21.9	29.0	15.0
40–64	2000	31.6	33.3	23.2	56.7	67.8	43.8
	2001	31.9	33.3	25.4	60.5	73.6	47.5
	2002	31.5	38.6	28.3	61.6	78.1	49.5
	2003	36.5	43.3	29.5	65.4	82.8	49.7
	2004	36.1	42.8	29.7	67.5	82.2	45.6
	2005	38.8	47.9	33.5	71.8	90.2	51.0
	2006	37.3	45.8	35.1	72.6	85.0	47.5
	2007	36.7	44.0	32.1	73.9	92.3	45.3
65+	2000	98.1	111.2	101.1	140.8	136.8	129.3
	2001	102.3	110.5	100.8	141.8	144.1	140.5
	2002	102.3	120.2	112.3	138.1	158.4	129.2
	2003	102.3	129.8	108.7	140.6	171.6	121.4
	2004	96.9	113.8	97.7	130.0	158.8	112.7
	2005	110.9	132.6	112.6	137.9	161.4	134.0
	2006	106.9	127.3	115.3	144.2	156.2	124.3
	2007	105.5	130.1	101.1	136.5	152.7	97.6
All ages	2000	32.3	30.6	23.8	43.9	51.9	37.5
	2001	32.5	30.5	24.7	45.8	54.1	41.2
	2002	32.4	34.0	27.3	46.1	57.6	39.3
	2003	34.1	37.5	27.5	48.8	59.8	39.5
	2004	32.0	33.7	26.3	48.8	57.0	36.7
	2005	34.6	38.2	29.2	51.2	59.8	42.7
	2006	33.9	36.4	30.2	53.4	57.0	38.8
	2007	32.7	35.7	27.8	53.1	59.1	33.5

Table A.3: ACS-IP Rates for Selected Common Diagnoses,* 2000–2007 (per thousand)

	2000	2001	2002	2003	2004	2005	2006	2007
Ages 0–17								
Asthma	5.0	5.6	5.3	6.1	5.3	4.4	4.5	5.3
Dehydration	2.6	3.2	2.7	3.3	2.7	3.0	2.9	2.3
Bacterial pneumonia	1.7	1.8	1.5	1.4	1.4	2.1	2.7	2.2
Cellulitis	0.7	0.9	0.8	1.1	1.5	1.7	1.5	1.8
Seizures	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.5
Ages 18–39								
Cellulitis	1.9	2.0	2.2	2.9	2.8	3.5	3.5	3.3
Dehydration	3.3	3.3	3.8	3.8	3.9	3.9	3.6	3.1
Diabetes	1.8	1.9	2.0	1.9	2.1	2.0	2.0	2.0
Asthma	2.6	2.2	2.4	2.5	2.1	2.2	2.1	1.9
Bacterial pneumonia	2.4	2.5	2.5	2.6	1.8	2.0	1.8	1.5
Kidney infection	1.3	1.2	1.3	1.1	1.1	1.3	1.1	1.1
CHF*	0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.0
PID	0.9	1.0	1.0	0.7	0.7	0.7	0.5	0.4
Hypertension	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.4
Ages 40–64								
CHF*	7.9	9.0	9.0	9.9	9.5	9.8	10.0	9.7
Bacterial pneumonia	6.6	6.8	7.2	7.4	6.7	7.4	6.3	6.3
Asthma	3.4	3.3	3.8	4.5	4.3	5.5	5.5	6.3
Dehydration	7.9	8.9	9.6	9.5	9.7	8.8	7.8	6.1
Cellulitis	3.2	3.2	3.6	4.6	4.6	5.6	5.8	5.6
Diabetes	3.9	3.9	4.4	4.2	4.1	4.6	4.3	4.8
COPD*	3.2	3.1	3.0	3.2	2.6	3.2	3.9	4.1
Hypertension	1.1	1.4	1.4	1.5	1.9	2.2	1.9	2.4
Kidney infection	1.7	1.8	1.6	1.7	1.8	2.0	1.9	2.0
Gastroenteritis	0.5	0.5	0.7	0.7	0.7	0.7	0.8	0.8
Angina	1.0	1.1	1.0	0.7	0.7	0.7	0.6	0.7
Ages 65 and over								
CHF*	32.1	34.8	32.2	35.1	31.5	33.8	33.8	31.6
Dehydration	34.5	36.5	40.9	38.8	38.6	36.5	31.6	25.5
COPD*	11.8	11.2	11.7	11.5	9.7	12.8	13.9	14.4
Kidney infection	9.8	9.4	9.3	10.4	9.8	11.1	11.8	12.0
Bacterial pneumonia	19.5	18.3	20.8	19.7	16.8	18.5	13.2	11.6
Diabetes	4.3	5.0	5.3	5.6	4.8	5.5	7.0	6.6
Asthma	2.2	2.6	3.1	3.1	3.3	5.1	5.0	5.2
Cellulitis	3.8	3.9	3.9	3.9	3.7	4.7	5.2	4.8
Hypertension	1.5	1.7	2.2	2.3	2.3	2.6	2.9	3.1

*Common diagnoses were identified for each age group.

Appendix Figures

Figure A.1: Inpatient Discharges and ACS-IP Rates Among Baltimore City Residents Ages 0–17

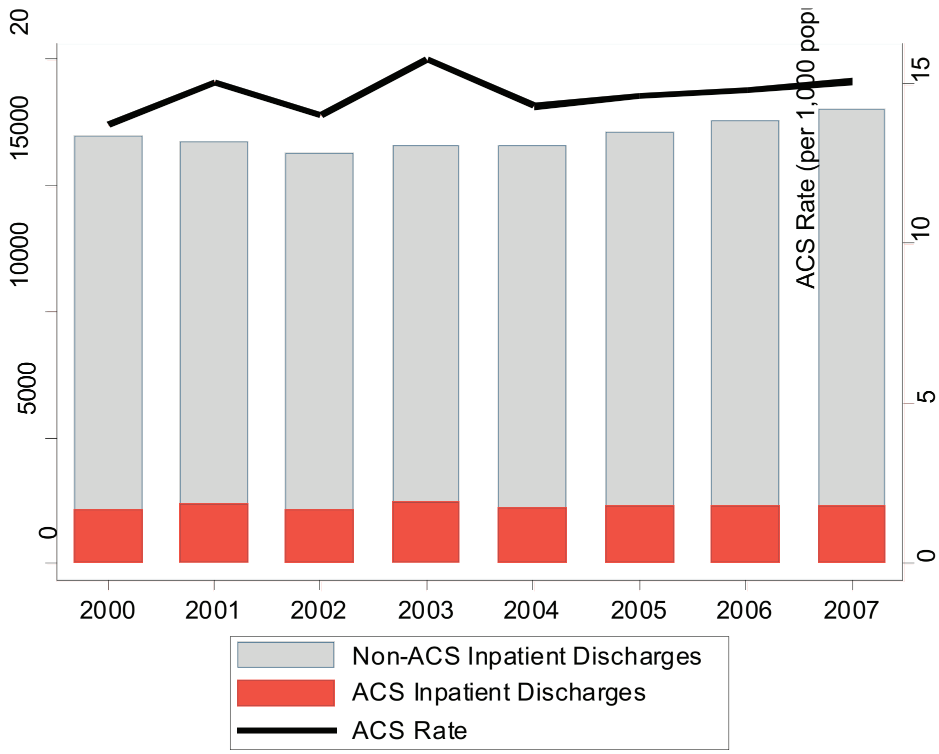


Figure A.2: Inpatient Discharges and ACS-IP Rates Among Baltimore City Residents Ages 18–39

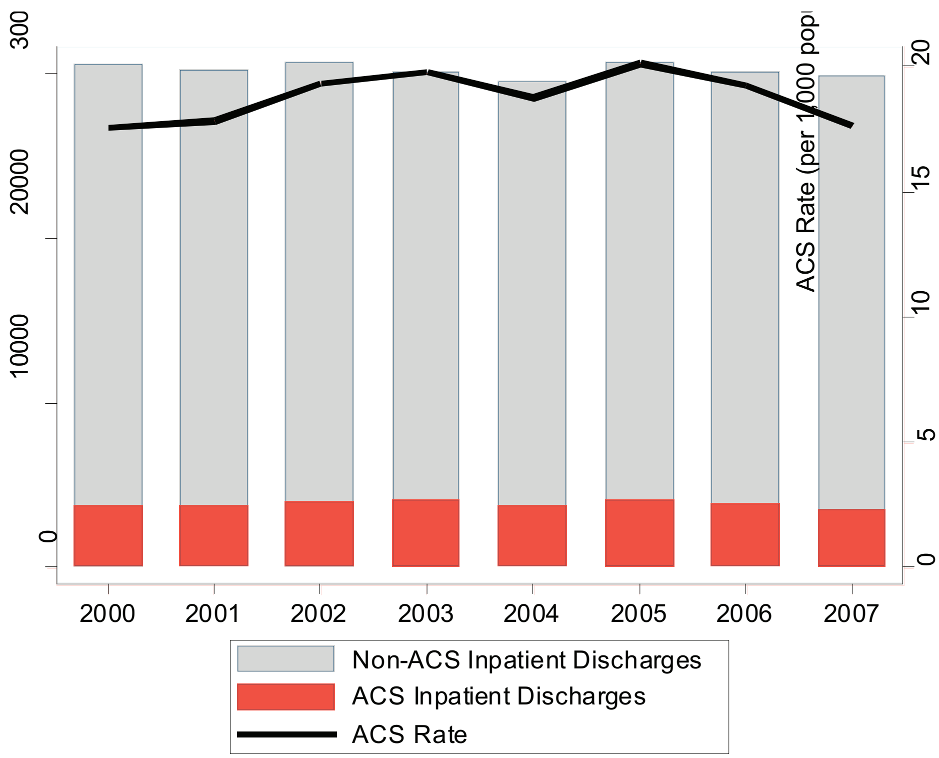


Figure A.3: Inpatient Discharges and ACS-IP Rates Among Baltimore City Residents Ages 40–64

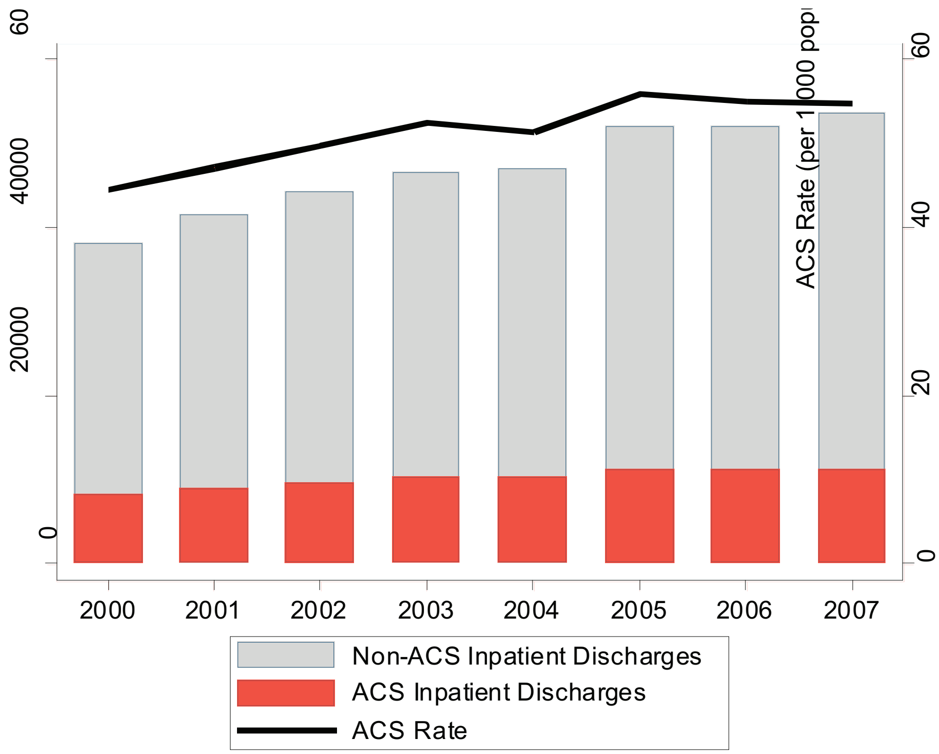


Figure A.4: Inpatient Discharges and ACS-IP Rates Among Baltimore City Residents Age 65+

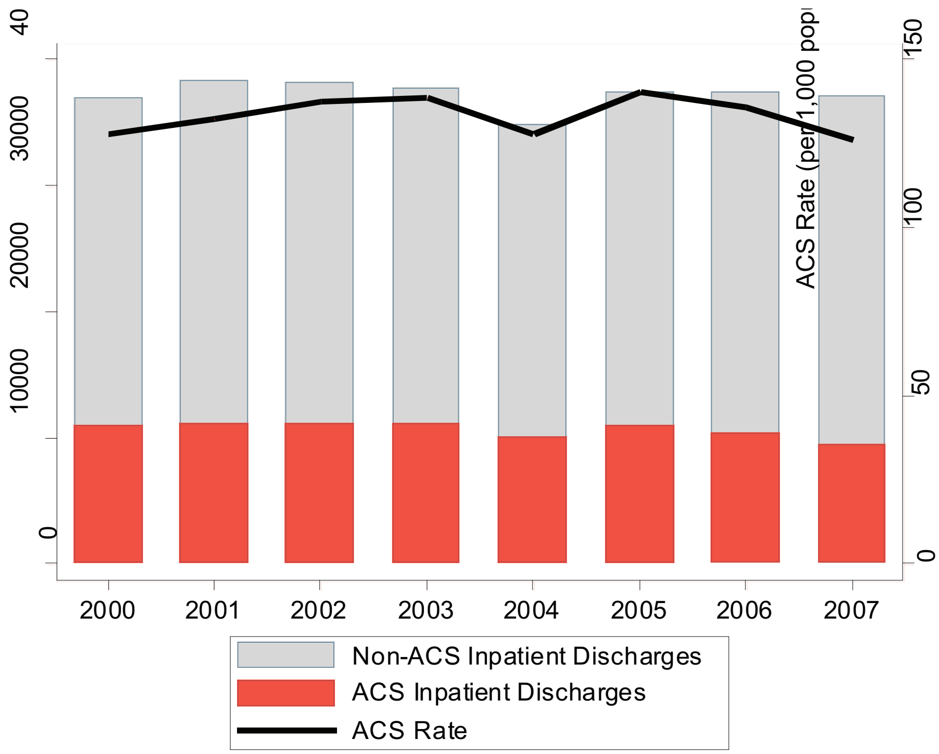


Figure A.5: ED Discharges and ACS-ED Rates Among Baltimore City Residents Ages 0–17

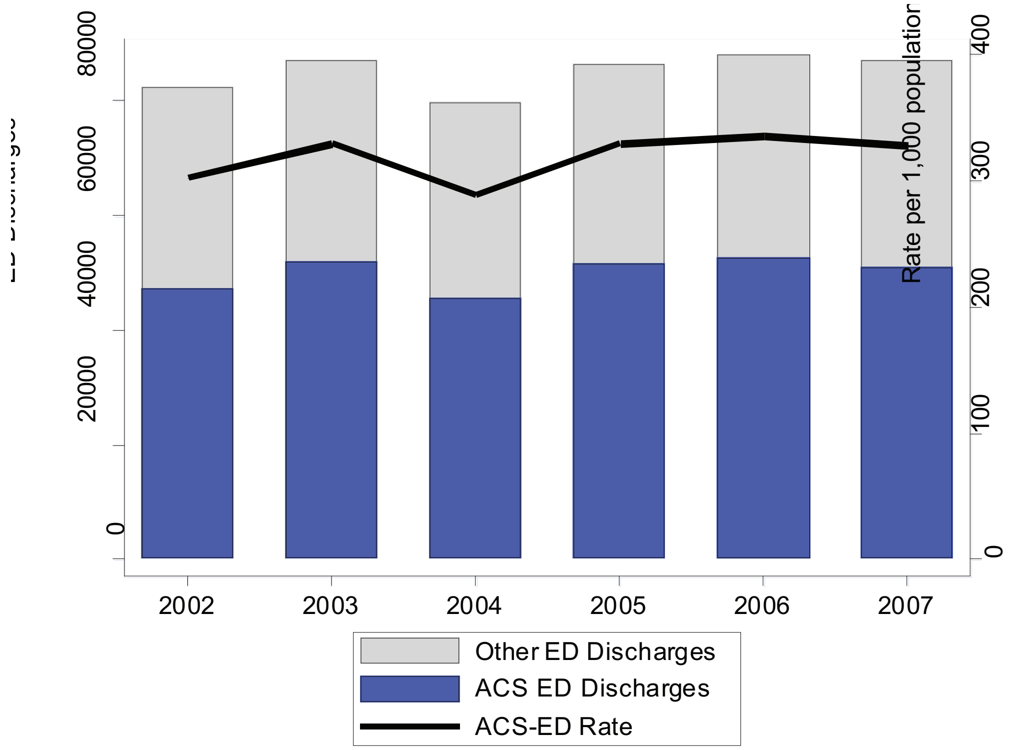


Figure A.6: ED Discharges and ACS-ED Rates Among Baltimore City Residents Ages 18–39

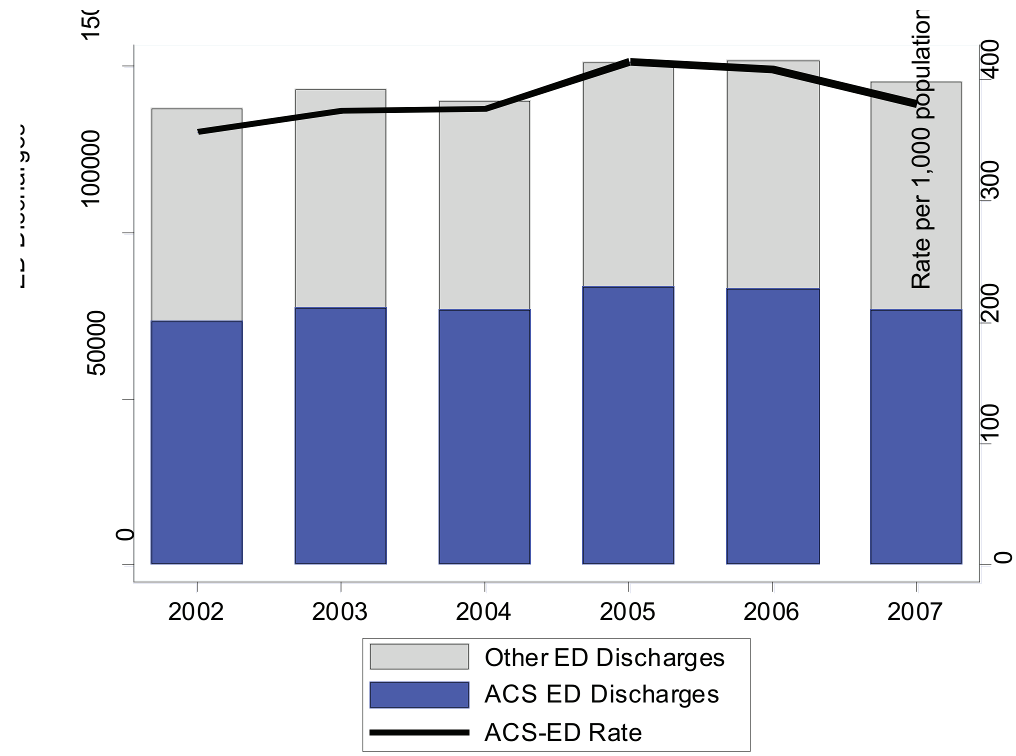


Figure A.7: ED Discharges and ACS-ED Rates Among Baltimore City Residents Ages 40–64

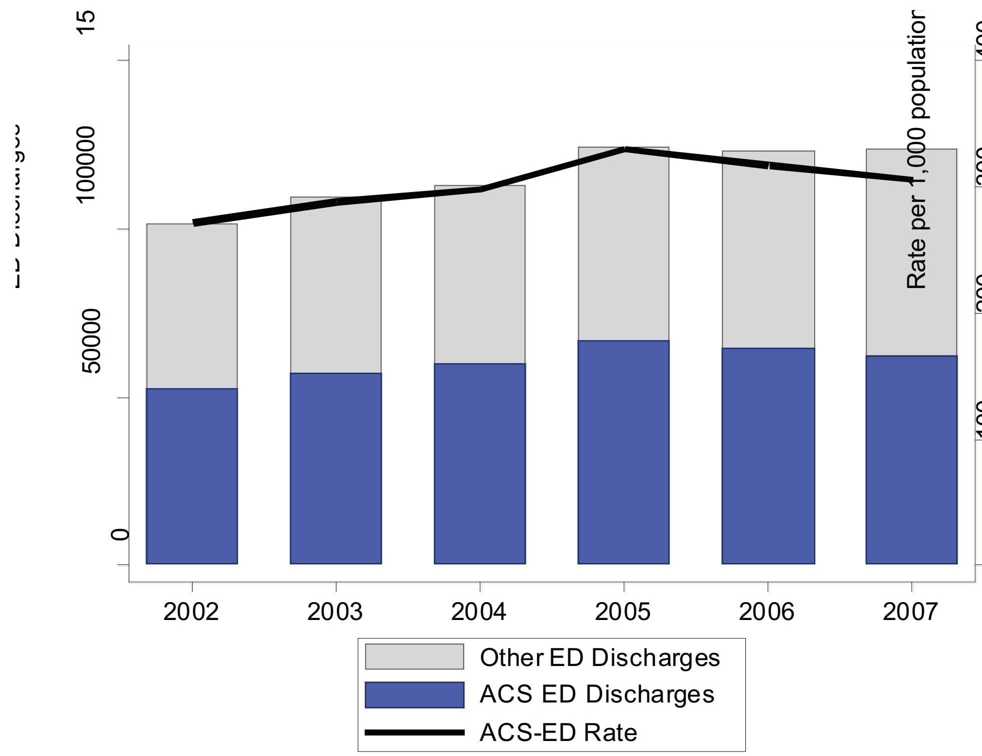


Figure A.8: ED Discharges and ACS-ED Rates Among Baltimore City Residents Age 65+

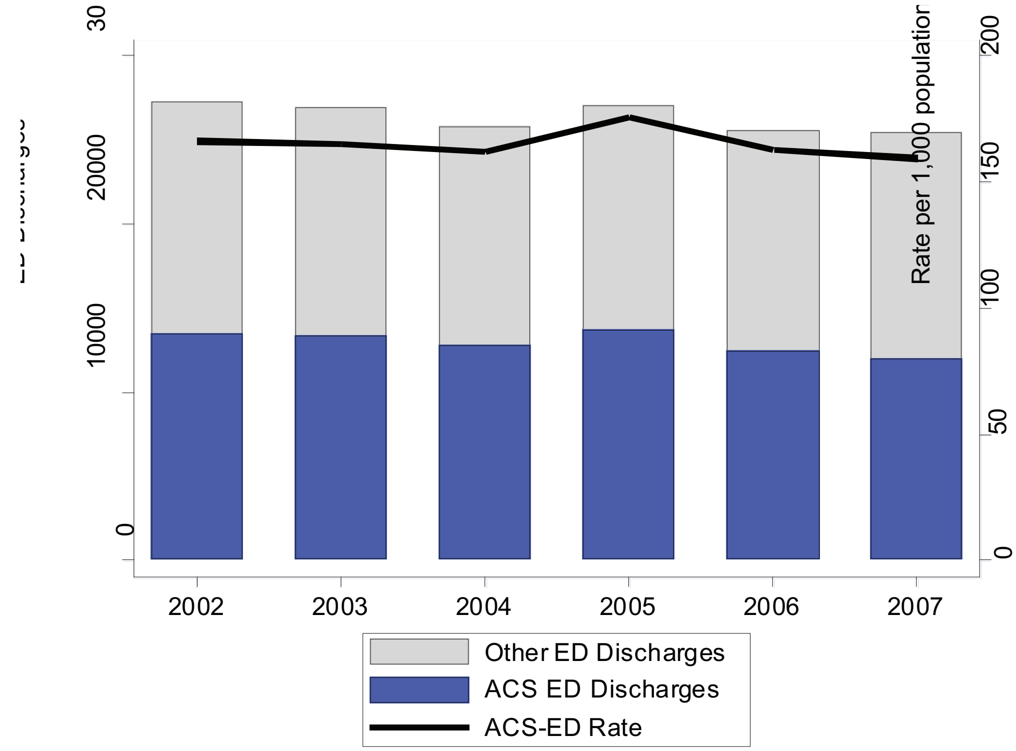
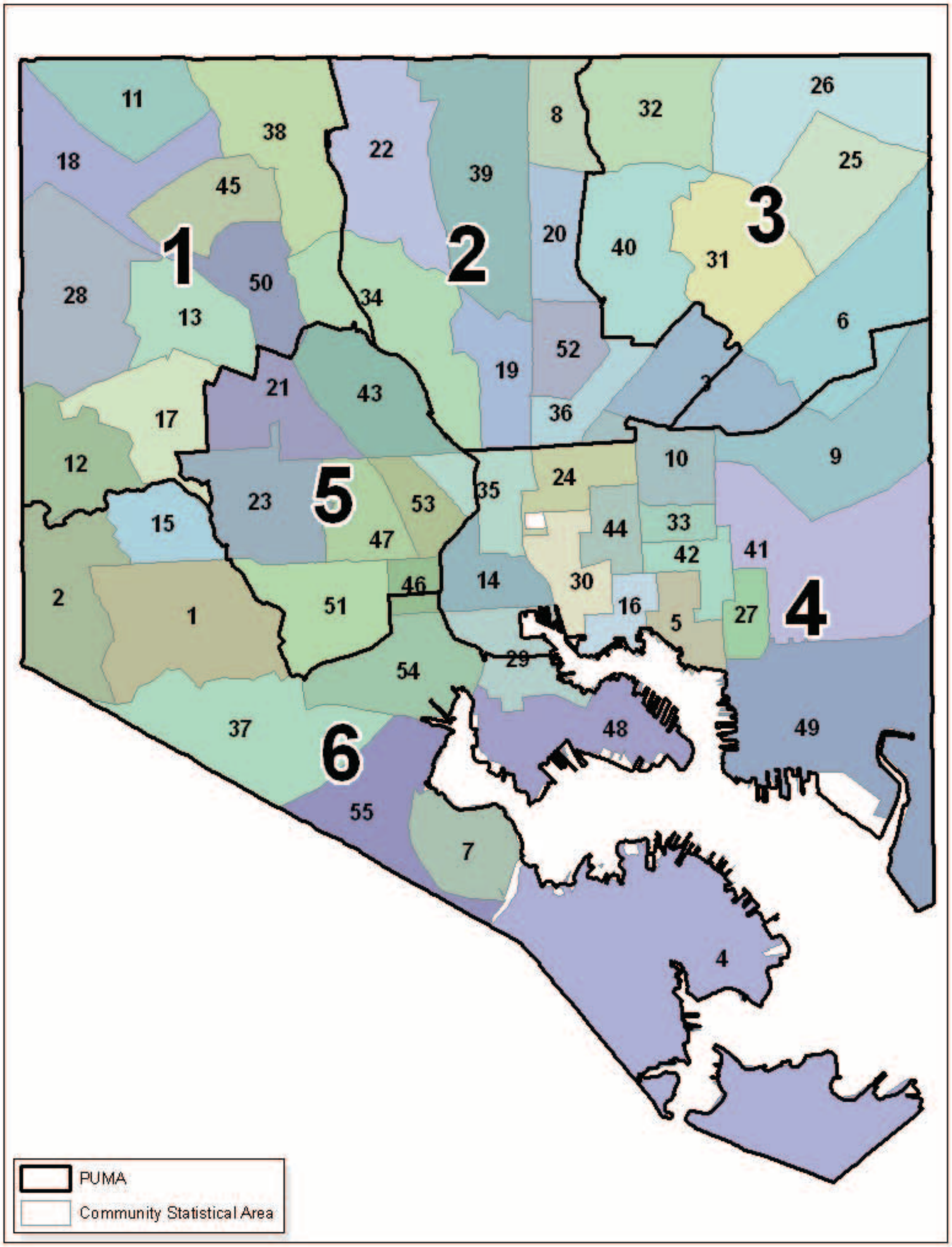


Figure A.9: Baltimore PUMAs and Community Statistical Areas



Key for CSAs

ID	NEIGHBORHOOD	ID	NEIGHBORHOOD
1	Allendale/Irvington/S. Hilton	46	Poppleton/The Terraces/Hollins Mkt
2	Beechfield/Ten Hills/West Hills	47	Sandtown-Winchester/Harlem Pk
3	Belair-Edison	48	South Baltimore
4	Brooklyn/Curtis Bay/Hawkins Pt	49	Southeastern
5	Canton	50	Southern Park Heights
6	Cedonia/Frankford	51	Southwest Baltimore
7	Cherry Hill	52	The Waverlies
8	Chinquapin Pk/Belvedere	53	Upton/Druid Hts
9	Claremont/Armistead	54	Washington Village
10	Clifton-Berea	55	Westport/Mt Winans/Lakeland
11	Cross-Country/Cheswolde		
12	Dickeyville/Franklintown		
13	Dorchester/Ashburton		
14	Downtown/Seton Hill		
15	Edmondson Village		
16	Fells Point		
17	Forest Pk/Walbrook		
18	Glen-Fallstaff		
19	Greater Charles Vill./Barclay		
20	Greater Govans		
21	Greater Mondawmin		
22	Greater Roland Pk/Poplar		
23	Greater Rosemont		
24	Greenmount East		
25	Hamilton		
26	Harford/Echodale		
27	Highlandtown		
28	Howard Pk/W.Arlington		
29	Inner Harbor/Federal Hill		
30	Jonestown/Oldtown		
31	Lauraville		
32	Loch Raven		
33	Madison/East End		
34	Medfield/Hampden/Woodberry/Remington		
35	Midtown		
36	Midway/Coldstream		
37	Morrell Pk/Violetville		
38	Mt Washington/Coldspring		
39	North Balto./Guilford/Homeland		
40	Northwood		
41	Orangeville/E. Highlandtown		
42	Patterson Pk N&E		
43	Penn North/Reservoir Hill		
44	Perkins/Middle East		
45	Pimlico/Arlington/Hilltop		

References

Ansari, Z Laditka JN Laditka SB. Access to health care and hospitalizations for ambulatory care sensitive conditions. *Med Care Res Rev.* December 1, 2006; 63(6): 719–741.

Billngs J, Parikh N, Mijanovich T. Emergency Department Use in New York City: A Substitute for Primary Care. The Commonwealth Fund Issue Brief. November, 2000.

Bindman, A B, Grumbach K, Osmond D, Komaromy M, Vranizan K, Lurie N, Billings J, and Stewart A. Preventable hospitalization and access to health care. *JAMA.* 1995; 274 (4): 305–11.

Dartmouth Atlas Project, Center for Evaluative Clinical Sciences, "Supply Sensitive Care," Project Topic Brief, January 15, 2007.

Epstein AJ. The role of public clinics in preventable hospitalizations among vulnerable populations. *Health Serv Res.* June 2001; 36(2): 405–419.

Flores G Abreu M Chaisson CE Sun D. Keeping children out of hospitals: parents' and physicians' perspectives on how pediatric hospitalizations for ambulatory care-sensitive conditions can be avoided. *Pediatrics.* November 2003; 112(5): 1021–1030.

Institute of Medicine. *Access to Health Care in America,* M. Millman, ed. Washington, DC: National Academy Press, 1993.

Krakauer H, Jacoby I, Millman M, Lukomnik, JE. Physician impact on hospital admission and on mortality rates in the Medicare population. *Health Serv Res.* June 1996; 31(2): 191–211.

Laditka, JN, Laditka SB, Probst J. More may be better: Evidence that a greater supply of primary care physicians reduces hospitalization for ambulatory care sensitive conditions. *Health Serv Res* August 2005; 40(4): 1148–66.