POPULATION HEALTH AND THE HEALTH CARE SYSTEM IN STATEN ISLAND: A PRELIMINARY ASSESSMENT

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The health status of New York City residents is characterized by great inequalities across boroughs and neighborhoods. Moreover, there appears to be evidence of "excess and deprivation" in use of services across these areas. Some of us receive excessive levels of state-of-the-art health care in some of the best academic medical centers in the world while many others do not have access to timely and appropriate health services. Such inequalities, more commonly known as "disparities," also apply to gaps in population health status and use among socio-economic groups.

In Staten Island, all cause mortality (825 deaths/100,000 in 2004) was only slightly lower than the Bronx (833) and much higher than the NYC average (707). Moreover, mortality, in Staten Island, from heart disease and cancer was 25% higher than the NYC average and mortality from influenza/pneumonia was 75% higher than the NYC average. Evidence of higher mortality in Staten Island is consistent with hospitalization data indicating that admissions for heart disease in Staten Island were 15% higher, in 2004, than the NYC average. These findings are puzzling because, on the whole, residents of Staten Island have higher incomes and higher levels of education than residents of the other boroughs of NYC. How should we interpret these findings?

Many elected officials and community leaders blame the NYC Health and Hospitals Corporation (HHC) for Staten Island's "health care crisis."[1] New York State Senator Andrew Lanza said the "HHC is the root cause of the problem because they have not lived up to their obligations. Look at the first clinics to go: Those that serve the poorest. Who has the responsibility to step in and serve that community? HHC."[2] There have even been threats to sue the HHC for its failure to provide a public hospital.[3]

We conclude that it is unlikely that the health problems we describe above are primarily the result of poor access to hospital care. Overall, access to primary and specialty health care services is not substantially worse in Staten Island than in the city as whole. There are, however, large disparities in access within Staten Island, which deserve greater attention – and concerns that residents of the poorest communities within the borough do not have adequate access to primary or specialty care is supported by our evidence.

How do we measure access to health care on Staten Island?

One challenge in studying disparities in health status lies in disentangling social determinants of health from the performance of the health care system. For example, do higher rates of mortality and hospitalization in Staten Island, compared with the NYC average for cancer, heart disease and pneumonia reflect differences in behavior (higher smoking and obesity rates), greater exposure to environmental pollutants, problems with the performance of the health care system - or some combination of these and other factors? A full investigation of these questions is beyond the scope of this report. We therefore focus on whether access to disease prevention, primary and specialty health care services is significantly lower among residents of Staten Island than the rest of New York City.

Our assessment of inequalities in access to health care among the boroughs of NYC focuses on an important aspect of health system performance -- the capacity to assure access to timely disease prevention, primary care, and specialty health services. We rely on three performance indicators: 1) mortality amenable to health care; 2) revascularizations adjusted for disease burden; and 3) avoidable hospitalizations.. Each of these indicators

captures an important dimension of inequities in access to timely and effective disease prevention, primary care or specialty services. None of them are new; they have all been validated -- albeit to different degrees -- in the literature. But they are rarely used together, in a systematic way, to measure health system inequities.

Mortality amenable to health care is a summary measure of the extent to which access to disease prevention, primary care, as well as specialty services, contribute to the reduction of premature mortality. Hospital discharges for so-called “avoidable hospital conditions” reflect the extent to which there are access barriers to timely and effective primary care services. Hospital discharges for revascularizations, adjusted for the burden of ischemic heart disease, reflect the extent to which patients are appropriately referred, and actually receive, specialty services known to be effective for the treatment of ischemic heart disease. In addition to these indicators of health system performance, we draw on findings from the NYC *Community Health Survey* to provide information on self-reported health status and health behaviors. The survey also provides self-reported information about access to health care services.

Our assessment compares health system inequities across the boroughs of NYC, as well as among United Hospital Fund neighborhoods and zip codes of Staten Island. To provide some perspective (or “benchmarks”) against which to evaluate our findings, we compare each of the boroughs to the average for NYC and each of the Staten Island zip codes to the average for Staten Island.

Data Sources

For mortality data we used diagnosis codes from the tenth revision of the *International Classification of Diseases*, Office of Vital Statistics, NYC DOHMH. We

obtained hospital discharge and procedure data from the NY Statewide Planning and Research Cooperative System (SPARCS). Since case rates can vary considerably from year to year, we averaged mortality data (in ICD-10 codes) over the five-year period (1998-2002) and hospital discharge data (in ICD-9 codes) over 1998-2000. We age-adjusted these rates by the direct method using the 2000 US standard population.

Population estimates, distributions by race and ethnicity and socio-economic characteristics such as poverty, education are from the 2000 US Census. Estimates of the physician workforce are from the NYS Physician Licensure Re-registration Survey 1997-1999, as reported by the Center for Health Workforce Studies.

The New York City *Community Health Survey* (CHS), conducted annually since 2002 by the DOHMH, Division of Epidemiology, Bureau of Epidemiology Services, provides data on the health of New Yorkers, including both neighborhood and citywide estimates on a broad range of chronic diseases and behavioral risk factors.

Demographic and Socioeconomic Status of Staten Island

Prior to 1964, Staten Island was "truly a place apart from the rest of New York City." [4] With a population just over 200,000, Staten Island was an isolated enclave within the New York City borough system – but this isolation was shattered with the opening of the Verrazano Bridge. With affordable housing and easier access to the rest of the city, Staten Island's population grew rapidly and is now home to approximately 443,000 residents (Table 1). The percentage of Staten Island's population 65 years and older is almost identical to the average for the city, but the percentage of the population that is Non-Hispanic White is substantially higher than in the city as a whole.

Table 1. Population Characteristics in New York City by Borough of Residence, 2000

	Total Population	Percent Female	Percent 65+	Percent Non-Hispanic White	Percent Black	Percent Hispanic	Percent Other Ethnicity
NYC	8,008,278	53.1%	11.5%	34.7%	36.4%	19.8%	9.1%
Staten Island	**443,728**	**51.7%**	**11.6%**	**71.3%**	**10.5%**	**12.1%**	**6.1%**
Bronx	1,332,650	53.5%	10.1%	14.5%	29.9%	48.4%	7.2%
Brooklyn	2,465,326	53.1%	11.5%	34.7%	38.1%	19.8%	7.4%
Manhattan	1,537,195	52.5%	12.2%	45.8%	19.0%	27.2%	8.0%
Queens	2,229,379	51.8%	12.7%	32.9%	21.8%	25.0%	20.3%

Source: U.S. Census, 2000

While still the city's least populated borough, it is also its most affluent, surpassing Manhattan's median income by more than $8000.[5] Only 10% of Staten Island's population falls below the poverty line, compared to about 21% overall in NYC (Table 2). In addition, a lower percentage of borough's population is linguistically isolated and a higher percentage of the population has at least a High School diploma than the entire city.

Table 2. Socioeconomic Status in New York City by Borough of Residence, Years

	Median Household Income	Percent below poverty	Percent linguistically isolated	Percent over 25 without at least HS diploma
NYC	$38,293	21.2%	12%	28%
Staten Island	**$55,039**	**10.05%**	**3.5%**	**17%**
Bronx	$27,611	30.68%	15%	41%
Brooklyn	$32,135	25.07%	12%	36%
Manhattan	$47,030	20.00%	11%	29%
Queens	$42,439	14.57%	13%	25%

Source: U.S. Census, 2000

UHF Neighborhood comparison: Overall, the residents of Staten Island are disproportionately Non-Hispanic White, well educated with high incomes – but these averages mask substantial diversity. In Port Richmond and St. Georges, a much higher percentage of the population is Non-White. The residents of these neighborhoods have

lower incomes, less education, and there are a greater number of people living in poverty than in the rest of the borough (Tables 3 and 4).

Table 3. Population Characteristics in Staten Island by UHF Neighborhood of Residence, Years

	Total Population	Percent Female	Percent 65+	Percent Non-Hispanic White	Percent Black	Percent Hispanic	Percent Other Ethnicity
Staten Island	443,728	51.7%	11.6%	71.3%	10.5%	12.1%	6.1%
Port Richmond	62,279	51.04%	10.17%	45.13%	25.39%	24.37%	5.11%
Willowbrook	85,332	51.55%	12.60%	81.84%	2.90%	8.42%	6.84%
St. Georges	116,346	51.78%	12.43%	63.69%	19.12%	16.76%	0.35%
South Beach	179,771	51.43%	11.1%	87.96%	1.20%	6.56	4.28%

Source: U.S. Census, 2000

A 2003 front page article on the rising racial tension throughout Staten Island noted that neighborhoods had been “roiled” by explosive growth, which, coupled with frenzied construction and clogged roads, has “unsettled residents and stroked tensions”. The piece notes that while in the 1990s the Island’s black population rose by 39.7%, and its Hispanic population by 75%.

Table 4. Socioeconomic Status in Staten Island by UHF Neighborhood of Residence, Years

	Median Household Income	Percent below poverty	Percent linguistically isolated	Percent over 25 without at least a HS diploma
Staten Island	$55,039	9.2%	3.5%	17%
Port Richmond	$43,902	16.68%	3.7%	22%
Willowbrook	$59,560	6.59%	3.9%	14%
St. Georges	$45,288	16.22%	5.1%	22%
South Beach	$62,.250	5.48%	2.0%	14%

Source: U.S. Census, 2000

Health Status on Staten Island

Consistent with the observed higher socioeconomic status, rates of infant mortality are lower on Staten Island than the city as a whole (Table 5). Particular areas, however,

such as St Georges and Stapleton, which account for more than a quarter of the Island's population, have an infant mortality nearly 60% higher and an all-cause mortality more than 21% higher than that of New York City. Also, as noted above, death rates from heart disease, cancer, influenza and pneumonia as well as chronic lower respiratory diseases were all higher on Staten Island, as evidenced by the higher age-adjusted death rate (Table 5). Adult hospitalization rates for alcohol dependence syndrome, ischemic heart disease, pneumonia and cerebrovascular diseases were also higher.

Table 5. Infant Mortality and Age-Adjusted Death Rates, 1999-2003

	New York City	Staten Island	Port Richmond	Willowbrook	St. Georges/ Stapleton	The South Shore
Infant Mortality Rate per 1000 live births	6.7	6.1	6.1	4.0	10.7	3.6
Age-Adjusted Death Rate per 100,000	737	805	868	826	937	682

Source: New York City Department of Health and Mental Hygiene, Birth and Death Files, 1999-2003.

Based on the questions asked in the Community Health Survey, Staten Islanders consider themselves to be healthier than other New Yorkers and have better access to primary care. Although the rate of asthma is lower, more asthmatics went to the emergency department on Staten Island (Table 6).

Table 6. Self-reported Health Status (NY Community Health Survey 2003-2005)

	New York City	Staten Island	North Staten Island (Port Richmond + Stapleton/St. George)	South Staten Island (Willowbrook + South Beach)
Health Status Questions				
Percent of population reporting good health	73.5	85.5	81.8	87.6
Diagnosis of Asthma/1000 pop	171.8	124.4	121.9	126.9
Percent of Asthmatics with Emergency Dept. Visit	12.9	18.1	24.6	13.1
Diagnosis of Diabetes/1000 pop	92.3	82.9	83.4	82.9
Health Behavior Questions				
Percent of population that is obese	18.9	20.8	24	18.7
Percent of population that ***never*** smoked	60.7	48.8	48.6	48.9
Percent of population that are "heavy drinkers"	45.5	45.9	45.1	46.3

Source: New York City Community Health Survey, Department of Health and Mental Hygiene, 2003-2005.

Although a high percentage of residents report being in good health, a much larger percentage of Staten Island residents report being obese and smoking than in other boroughs (Table 6). Despite the overall efficacy of New York City antismoking campaigns, in the period between 2002 and 2007, the percentage of Staten Islander's who smoked remained constant, while the rates "plummeted" in the rest of the city[6]. According to a 2004-2005 survey, a startling 20% of pregnant Staten Islanders reported smoking in their third trimester.[7]

In 2007, the Health Department announced a targeted campaign to combat smoking on Staten Island, including a five-day nicotine-replacement giveaway, a targeted media

campaign and a qualitative study. [8] Mayor Bloomberg announced that Staten Island smoking rate fell 25% in 2007, with particularly dramatic reductions among Staten Island men. Although still higher than the rest of the city, the smoking rate among men fell dramatically from 29.3% in 2006 to 19.9% in 2007.[9] In March of 2008, the Daily News reported that the city Health Department would be launching new television ads directed at Staten Island[10]. The American Cancer Society teamed with the New York City Coalition for a Smoke-free City to remove tobacco advertisements near schools.[11] Fewer than half of store owners agreed to sign the policy, although more agreed to remove advertisements.[12]

Officials from DOHMH suggest that Staten Island's high smoking rate is affecting other aspects of the population's health. For example, the flu may be more deadly in Staten Island because of high rates of smoking. In 2005, Staten Island's flu death rate was nearly double that of the rest of the city, despite having adequate vaccination rates and average numbers of elderly residents.[13]

Staten Island's Health Care System

Staten Island has two private hospital systems.[14] Both, Staten Island University Hospital and Richmond University Medical Center, have faced financial difficulty, forcing them to have a history of significant restructuring, changes in ownership and repeated mergers with larger health systems.[15]

Staten Island University Hospital was founded in 1861 as the Samuel R. Smith infirmary to serve the Island's "medically-indigent." In 2001, the hospital partnered with the Saint Vincent's Medical Centers of New York and opened the Heart Institute of Staten Island, bringing its total number of beds to 813.[16] In 2008, Staten Island University

Hospital began construction of a trauma facility in Ocean Breeze which is intended to double its emergency room capacity, adding a new trauma and emergency center and an educational center[17] designed to include medical education for the community.[18] Though the facility includes residency programs for doctors and a medical library in addition to community medical education, over $10 million dollars was invested in the facility.

Richmond University Medical Center (RUMC) is the borough's other hospital system. Previously known as St. Vincent's Catholic Medical Centers, the hospital system has struggled financially and in August 2008, New York State announced that it would provide the facility with a $5 million loan in order to promote health care on Staten Island.

In early 2008, RUMC announced that one of its main facilities, Bayley Seton Hospital, would be closing its adult, pediatric and HIV/AIDS clinics for financial reasons.[19] Though some officials claimed residents would be able to find these services elsewhere, [20] the Staten Island Advance noted, "community leaders have pointed to the strains that already overburden the Island's fraying network of health care services. Those who stand to lose most in the hospital's reorganization are poor clients who will have to travel to alternative sites by public transportation."[21] City Councilman Michael McMahon called the proposition that there were a plethora of clinics "ridiculous", noting that the only adult clinic was on Port Richmond Avenue, "which might as well be in Chicago, given the distance and the lack of mass transportation."[22]

Staten Island University Hospital expressed interest in stepping in to keep the Bayley Seton clinics running. A councilman called that plan "ill fated", as the entirety of Bayley Seton is "slated to be closed in the near future;"[23] ultimately, SIUH instead added

hours to their own clinic, operating just a mile away from the Bayley Seton clinics, to try to accommodate Bayley patients[24].

Table 7. Staten Island Health System Indicators

	Number of Physicians/ 10,000	Number of hospitals	Number of hospital beds/1000[1]	Hospital Discharges/ 1000 pop	Percent uninsured*	Percent of population with personal care practitioner
New York City	30.16	75	3.9	134.2	16.1%	77.1%
Staten Island	23.20	2	3.2	140.3	9.3%	84.2%

* According to the U.S. Census Bureau's 2007 Current Population Survey, 19% of the population of New York City and 12% of the population of Staten Island were uninsured.

Compared to averages for NYC, Staten Island has a lower physician and hospital density. Despite having few physicians and hospital beds, the hospital discharge rate of Staten Island is actually higher than the rate for NYC. In addition, fewer Staten Islanders go outside their home borough for hospital care higher than the Bronx, Brooklyn or Queens – but is comparable to Manhattan.

Table 8. Percentage of People Who Go to a Hospital in Their Home Borough for Care, 1998-2002

	Staten Island	**Manhattan**	**Queens**	**Brooklyn**	**Bronx**
1998	86	87	64	77	73
1999	86	89	75	79	77
2000	85	90	80	79	77
2001	87	88	67	78	74
2002	88	88	67	78	75
Average	86	88	71	78	75

Despite the limitations in supply of hospitals and doctors, a substantially higher percentage of Staten Islanders report having health insurance and a personal care practitioner than residents of the city as a whole.

Access to Health Care on Staten Island

Mortality Amenable to Health Care

Amenable mortality (AM) is a broad indicator that measures the extent to which a health care system controls premature mortality amenable to health care interventions. Successful reduction of premature mortality reflects a range of health system interventions, from disease prevention services to primary care, as well as to specialty services. Use of AM depends on vital statistics publications derived from death certificates to determine cause of death. As Nolte and McKee explain, “for many conditions, death is the final event in a complex chain of processes that involve issues related to underlying social and economic factors, lifestyles, and preventive and curative health care.”[25] AM is more closely related to the health care system, but our capacity to identify the precise contribution of medical services is limited.

We calculated avoidable and total mortality based on birth and death files from the New York City DOHMH and analyzed them for the following age cohorts: 1-4, 5-14, 15-24; 25-34; 35-44; 45-54; 55-64; and 65-74. We include ischemic heart disease (IHD) in our definition,[26] but because this diagnosis affects such large numbers of people, it may obscure the contribution of some other causes of AM. We therefore adopt the approach suggested by Nolte and McKee and calculate AM counting only half of the deaths from IHD.[27]

We use the "main cause of death" in our rate calculations, which is consistent with the approach of others who analyze AM. We acknowledge that only one "cause" can be given, even for persons with multiple health problems. In some circumstances it is difficult to know the precise cause of death. Using vital statistics data always carries the risk that

information may be unreliable for certain conditions where the cause of death is poorly known, for multiple conditions, or where conditions carry a social stigma. In addition, our ability to compare the assignment of causes of death is always a concern. If deaths are misclassified more commonly in one geographic area than another, the results could be biased. However, the inclusion of a large group of causes of death makes this problem less likely.

These limitations must be compared to the advantages of using mortality statistics in assessing population health -- their widespread availability and the fact that death is a clearly defined event. Although physician diagnostic habits and preferences could represent another source of bias, differences in avoidable deaths do persist among regions even after controlling for disease incidence.[28]

Borough-level comparison: Based on this broader measure of health system performance, Staten Islanders enjoy better access to health care services, on average, than New Yorkers, as a whole.. Only residents of Queens, with a rate of 0.95, have a lower rate of AM than their counterparts among other boroughs of NYC (Table 9).

Table 9. Age-Adjusted Rates of Amenable Mortality per 1000 in New York City by Borough of Residence, 1999-2003

New York City	Staten Island	Bronx	Brooklyn	Manhattan	Queens
1.28	1.18	1.80	1.43	1.21	0.95

Source: New York City Department of Health and Mental Hygiene, Birth and Death Files, 1999-2003.

Neighborhood comparison: Port Richmond has an age-adjusted rate of AM of 1.63 (27% higher than New York City), while South Beach has an age-adjusted rate of only 1.16 (9.4% lower) (Table 10). The age-adjusted rate of AM in zip code 10303 is 1.91 (49% higher than New York City), while the age-adjusted rate of AM in zip code 10308 is only

1.14 (11% lower) (Map 1; Table 15; Chart 1). These data suggest a lack of access to primary and/or subspecialty care in these areas.

Table 10. Age-Adjusted Rates of Amenable Mortality per 100,000 in Staten Island by UHF Neighborhood of Residence, 1999-2003

Staten Island	Port Richmond	Willowbrook	St. Georges	South Beach
1.18	1.63	1.23	1.47	1.16

Source: New York City Department of Health and Mental Hygiene, Birth and Death Files, 1999-2003

Map 1

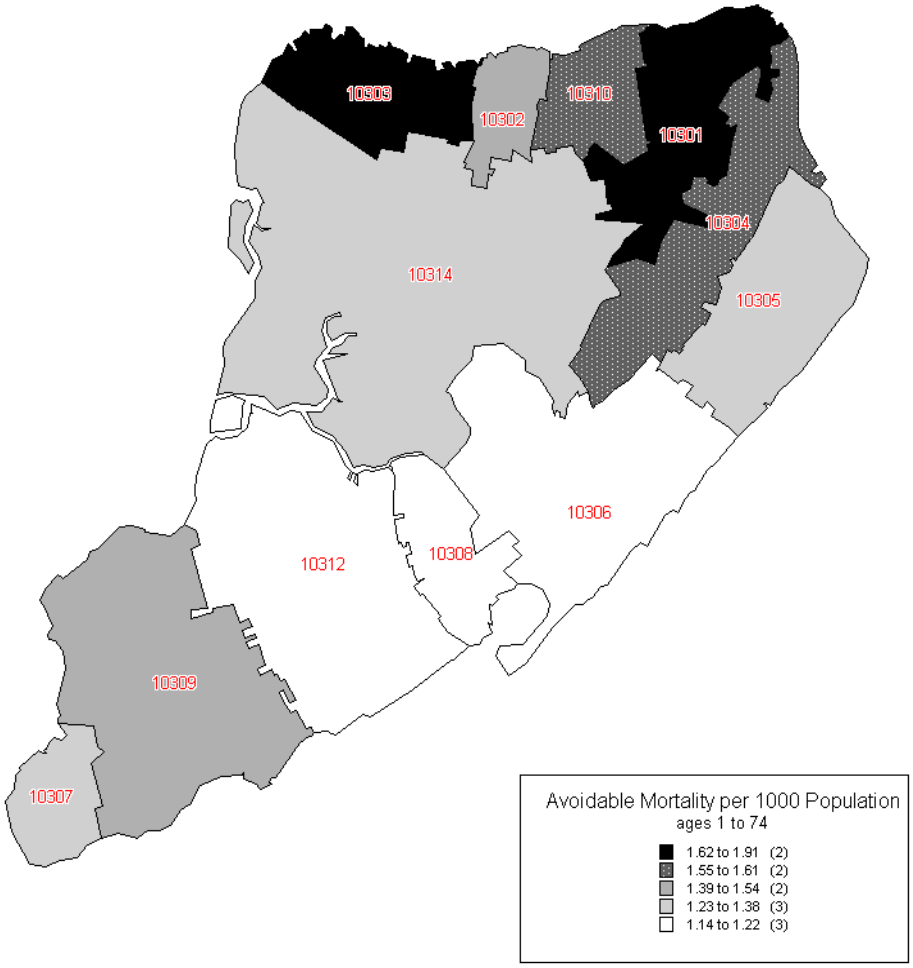
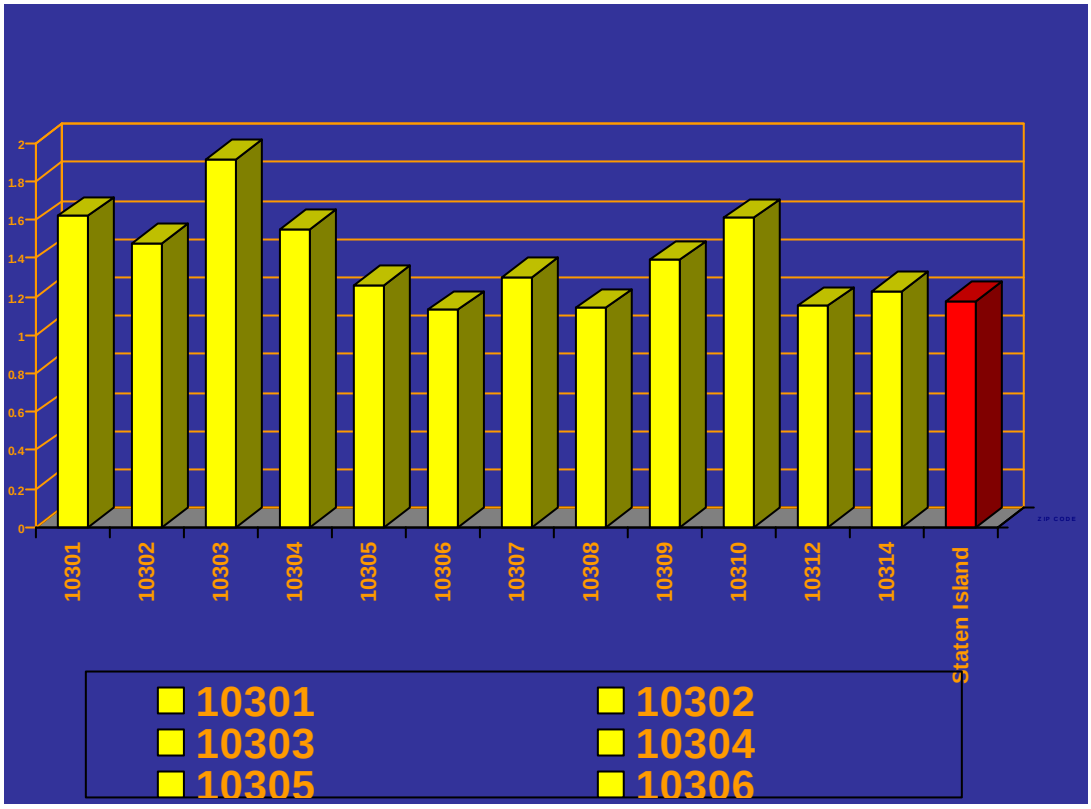


Chart 1
Age-Adjusted Rates of Avoidable Mortality By Staten Island Zip Code, 1999-2003



Amenable mortality is a useful summary measure of health system performance, reflecting a range of health care interventions, from primary and secondary prevention to tertiary care. Its breadth is both a strength and weakness. An exclusive focus on avoidable deaths does not identify the unique contributions of public health, primary health care or specialty medical services. To refine our analysis of access to care on Staten Island, we examine rates for “avoidable hospital conditions” (AHC). AHC - also known as “ambulatory care-sensitive conditions” - are a valid indicator of access to timely and effective primary care services that reduce the probability of hospitalization for medical conditions treated more effectively outside the hospital setting -- before flare-ups leading to

hospital admission. Such hospital admissions are often contrasted to so-called "marker conditions" for such diagnoses as hip fractures, GI obstruction, or appendicitis for which effective and timely primary care is known not to lower the probability of a hospital admission, and for which admission to a hospital is an appropriate course of action. Among adults, these conditions include hospitalizations for pneumonia, congestive heart failure, diabetes and asthma.

As in our previous work, we use the definition of AHC developed by Joel Weissman and colleagues, as validated in previous studies.[29] Some conditions included in this definition of AHC are completely avoidable through immunization. For example, we should not see any hospitalizations for polio. Other hospitalizations can be avoided if the condition is caught early and managed well. For many of the conditions included in our definition of AHC, however, it is unlikely that any health system would be able to eliminate all hospitalizations.

Borough-level comparison: The age-adjusted rate of AHC for Staten Island is slightly lower but nearly identical to the rate for NYC, overall. Residents of Queens and Manhattan have lower rates of AHC, but the rate among residents of Brooklyn is higher, and the rate among residents of the Bronx is substantially higher (Table 11).

Table 11. Age-Adjusted Rates of Avoidable Hospital Condition per 1000 Persons 20+ in New York City by Borough of Residence, Years

New York City	Staten Island	Bronx	Brooklyn	Manhattan	Queens
18.04 (99,216)	18.17 (5,488)	25.20 (20,734)	19.10 (31,326)	16.30 (18,239)	13.96 (22,490)

Source: SPARCS, 1998-2002

Neighborhood comparison: Rates of AHC in Port Richmond and St. Georges are nearly as high as the rates in the Bronx – yet the rates in Willowbrook and South Beach are only slightly higher than the rates in Manhattan and Queens, respectively (Table 12).

Table 12. Age-Adjusted Rates of Avoidable Hospital Condition per 1000 Persons 20+ in Staten Island by UHF Neighborhood of Residence, 1998-2002

Staten Island	Port Richmond	Willowbrook	St. Georges	South Beach
18.17 (5,488)	21.04 (806)	17.18 (1077)	22.52 (1877)	14.97 (1728)

Source: SPARCS, 1998-2002

Not surprisingly, the variation is even greater when we disaggregate the data to the zip code level. The rates of AHC, among the zip codes of Staten Island, range from a high of 24.87 in zip code 10301 (38% higher than New York City) to a low of 14.73 in zip code 10308 (18% less) (Map 2; Table 16; Chart 2).

Map 2

AVOIDABLE HOSPITAL CONDITIONS DISCHARGE RATE by ZIP CODE

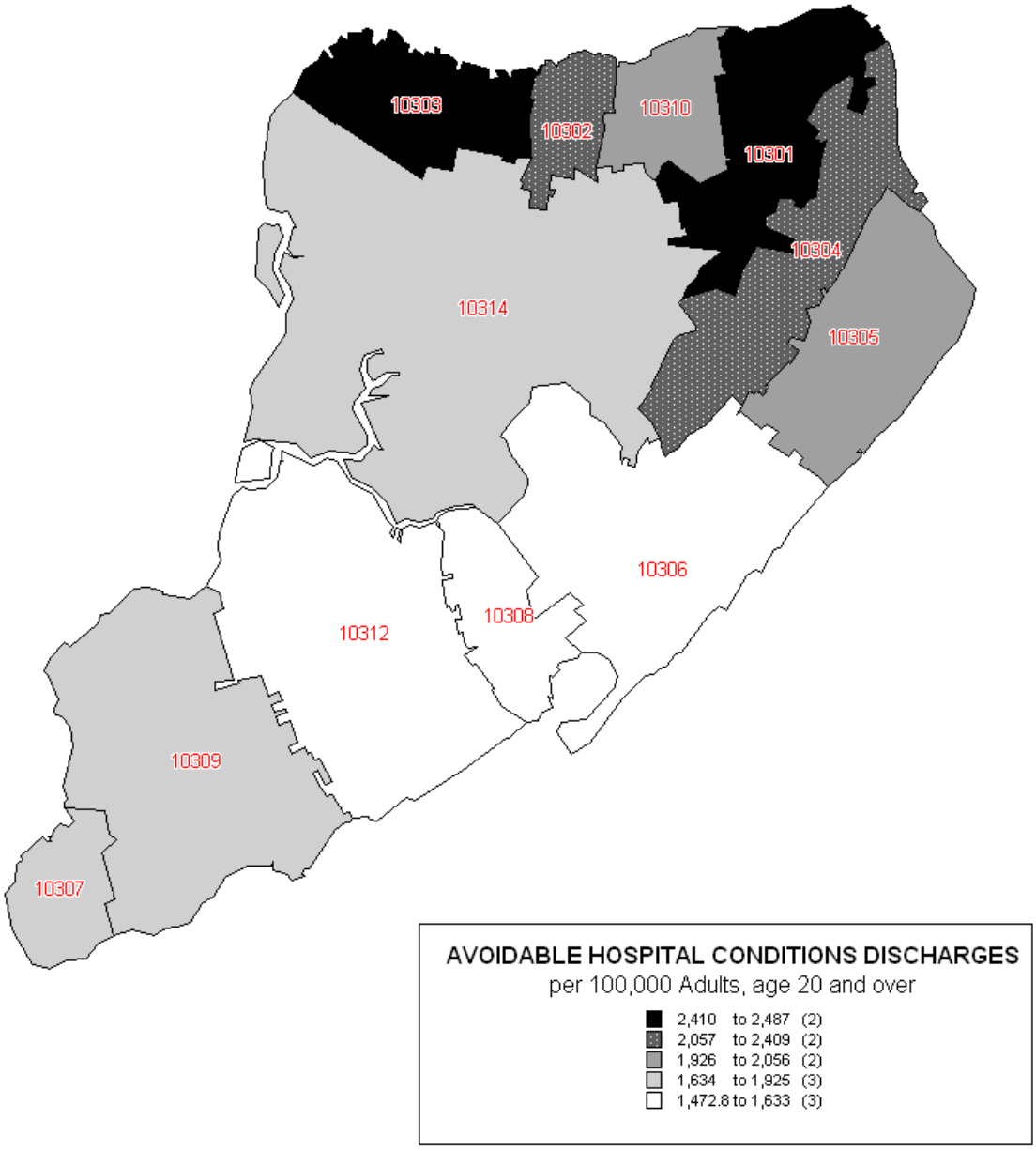
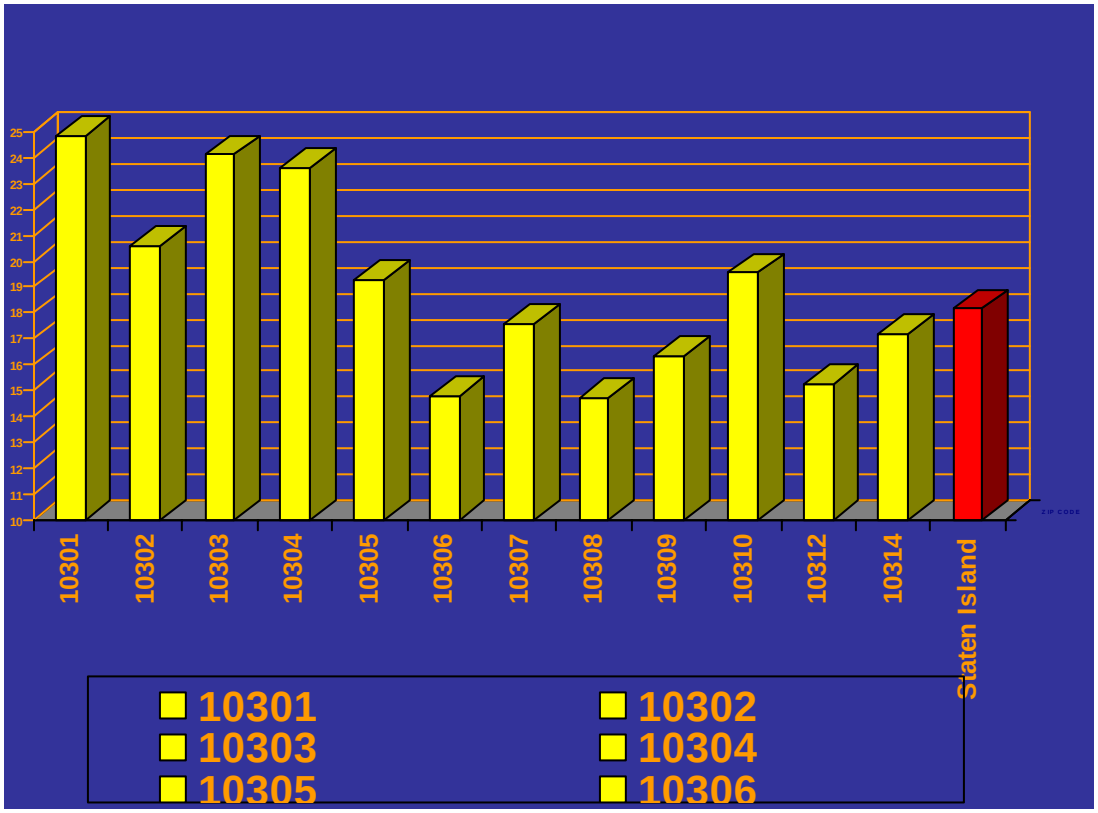


Chart 2
Age-Adjusted Rates of Avoidable Hospital Conditions / 1,000 Persons by Staten Island Zip Code, 1998-2002



Our findings with regard to rates of AHC are consistent with previous evidence that there are great disparities in access to care within Staten Island. For example, although the borough's flu vaccination rate is above average for the city, the percentage of residents receiving vaccines varies greatly throughout the island. Residents in the northern part of the island received flu shots at much lower frequency, with rates varying from as high as 63% vaccinated in the South Shore to only 54% in Stapleton and St. George.[30] An American Cancer Society Report released in April of 2007 raised additional concerns about the equality of access to care on Staten Island. The report found that: "Doctors are less likely to diagnose Black Islanders with cancers in their earliest stages."

Revascularization

Revascularization services -- percutaneous transluminal coronary angioplasty (PTCA) and coronary artery bypass graft surgery (CABG) -- are an example of specialty services known to be effective for the treatment of severe medical conditions. Although revascularizations are expensive procedures, recent evidence suggests that the benefits of these interventions far exceed the costs. We have developed an index that allows us to compare the use of revascularization across geographic areas while accounting for differences in the prevalence of heart disease.[31] Although the true prevalence of ischemic heart disease (IHD) in any population will never be known since the illness may be asymptomatic, we will examine mortality rates for acute myocardial infarction (AMI) as a proxy for the prevalence of IHD. We do not assume that every person who has an AMI receives one of these procedures. Nor do we assume that this is the only diagnosis for which these procedures are an appropriate intervention. Our examination of the ratio of revascularization rates to AMI mortality rates is merely an index that attempts to adjust for the prevalence of heart disease.

Borough-level comparison: The ratio of revascularization to AMI suggests that, after adjustment for the burden of ischemic heart disease, access to revascularization among residents of Staten Island is slightly lower but almost identical to the average for the city. Residents of Manhattan receive far more revascularizations relative to the rate of heart disease than residents of any other borough – and residents of the Bronx receive far fewer than residents of the other boroughs. Without clinical data, it is impossible to assess whether residents of Manhattan receive too many of these procedures or whether residents of other boroughs receive too few. Nevertheless, our findings suggest that borough-level

differences in access to revascularization are unlikely to explain the extraordinarily high rate of death due to heart disease in Staten Island compared with the rest of the city (Table 13).

Table 13. Ratio of Age-Adjusted Rates of Revascularization: Age-Adjusted Rate of AMI in New York City by Borough of Residence, 1998-2002

New York City	Staten Island	Bronx	Brooklyn	Manhattan	Queens
1.29	1.24	0.91	1.26	1.69	1.35

Source: SPARCS, 1998-2002

Neighborhood comparison: Within Staten Island, we find disparities in access to revascularization, although the gap between the wealthier and poor neighborhoods of Staten Island not quite as large as it is for access to primary care. The ratio of revascularization to AMI is substantially lower in Port Richmond and St. Georges than in the two southern UHF neighborhoods (Table 14).

Table 14. Ratio of Age-Adjusted Rates of Revascularization : Age-Adjusted Rate of AMI in Staten Island, by UHF neighborhood of Residence, 1998-2002

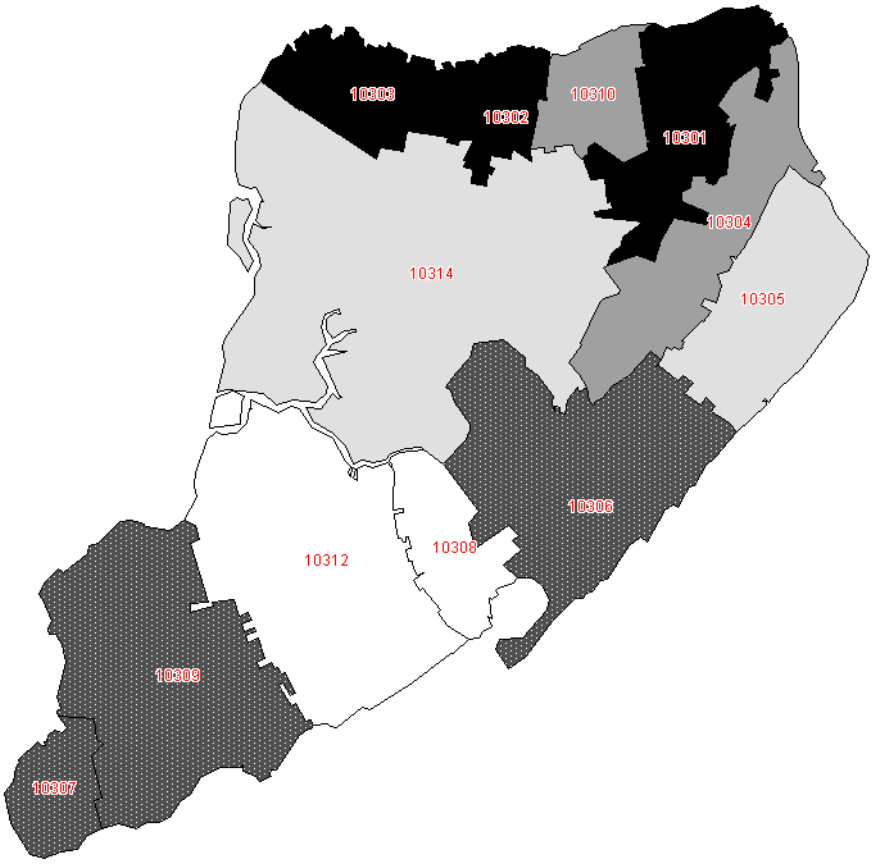
Staten Island	Port Richmond	Willowbrook	St. Georges	South Beach
1.24	1.13	1.30	1.18	1.28

Source: SPARCS, 1998-2002

When we disaggregate to the zip code level, we see greater variation in access to revascularization. The ratio, 1.05, in zip code 10301 is nearly as low as the ratio we see in the Bronx (18% less than New York City). The ratio of 1.38 in zip code 10308 is above average for the city and comparable to the ratio in Queens (Map 3; Table 17; Chart 3).

Map 3

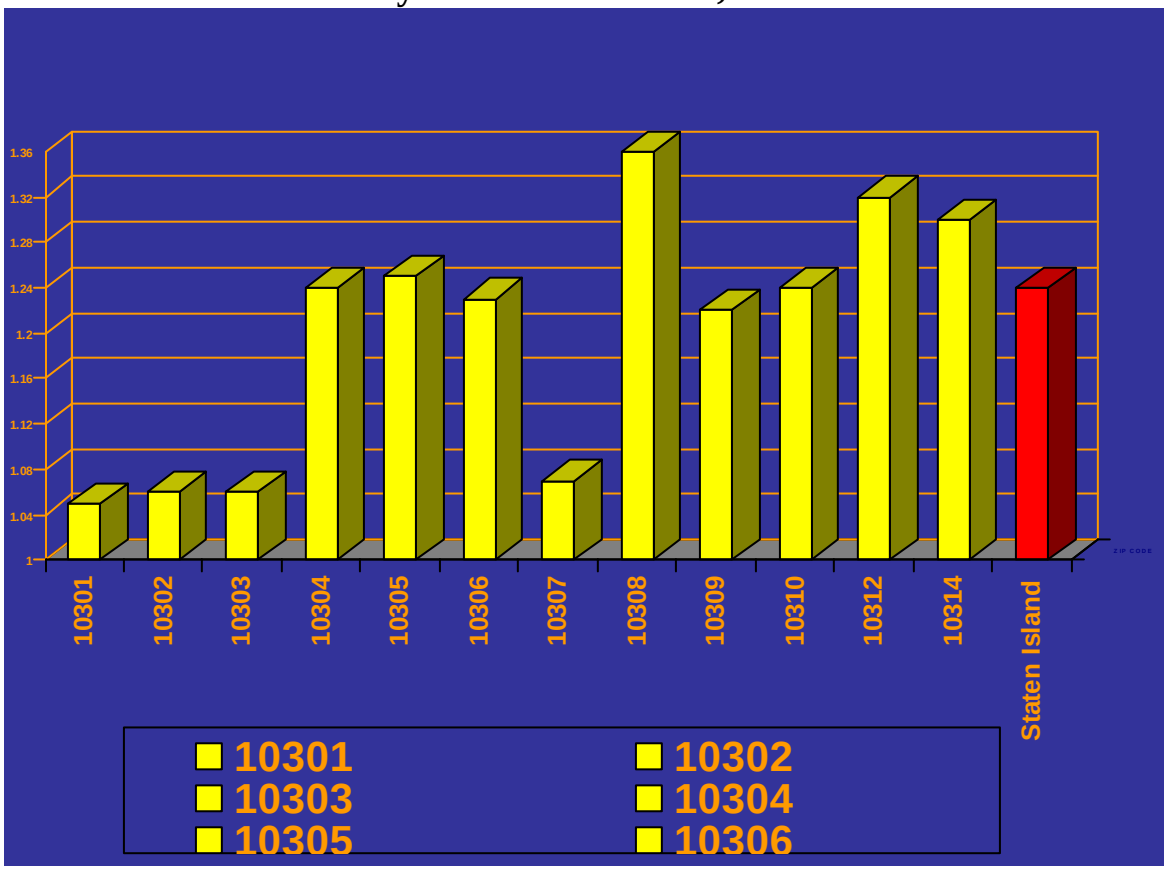
RATIO OF CORONARY REVASCULARIZATION TO MYOCARDIAL INFARCTION
AN ASSESSMENT OF ACCESS TO TERTIARY CARE



RATIO CORONARY REVASCULARIZATIONS to MYOCARDIAL INFARCTION ADMISSIONS
rates per 100,000 adults age 20 and over

- 1.05 to 1.069 (3)
- 1.07 to 1.239 (3)
- 1.24 to 1.249 (2)
- 1.25 to 1.319 (2)
- 1.32 to 1.381 (2)

Chart 3
Ratio of Age-Adjusted Rates of Revascularization to Age-Adjusted Rates of Acute Myocardial Infarction, 1998-2002



Discussion and next steps

A number of state and local officials have noted high rates of hospitalization and death among residents of Staten Island. As we noted in the introduction, rates of all cause mortality, as well as mortality due to heart disease, cancer, influenza and pneumonia are all higher among residents of Staten Island than the average for NYC. These findings are surprising because, by most measures, residents of Staten Island have higher incomes and higher levels of education than residents of the other boroughs of NYC.

We find that, despite these alarming rates of hospitalization and death, overall access to primary and specialty health care does not appear to be substantially worse in Staten Island than the rest of the city. Nevertheless, there are marked disparities in access to care, which affect more than 178,000 Staten Islanders - or 40% of the population (St. Georges and Port Richmond). The density of doctors and hospital beds on Staten Island is lower than for NYC, as a whole, but the borough's age-adjusted rates of AM, AHC, as well as our ratio of age-adjusted revascularization to AMI mortality, close to the averages for NYC, although, again, significant disparities exist within the borough. Furthermore, residents of the Island are more likely to have health insurance and more likely to report having a personal care physician than are residents of the city as a whole.

Based on our initial findings, it seems likely that social, environmental and behavioral factors may contribute to the poor health outcomes we describe above. The high rates of smoking and obesity reported by Staten Islanders in the NYC Community Health Survey provide strong evidence that this may also be a significant contributing factor. Although DOHMH appears to be making progress in its efforts to reduce smoking among residents of the Island, greater efforts are needed to address these public health challenges.

To what extent does Staten Island's built environment contribute to its higher rates of obesity? Are there interventions that might improve the diets and/or increase the physical activity of Island residents? Similarly, why have rates of smoking remained so much higher on Staten Island? Does this reflect inadequate investment in smoking cessation programs on Staten Island – or are the strategies that have enjoyed great success in other parts of the city less effective among residents of this borough?

Although worse access, on average, disease prevention, primary, and specialty health care is not a likely explanation for the borough's poor aggregate health care indicators – and greater attention to public health interventions is clearly justified – there is no question that Staten Island's health system faces significant challenges. In addition to the well documented financial instability of its hospitals, our analysis points to huge disparities in access to care within Staten Island. Rates of AM and AHC are about 30 percent ***higher*** – and the ratio of revascularization to AMI is about 10 percent ***lower*** - among residents of Port Richmond and St. Georges/Stapleton neighborhoods than among residents of the Willowbrook and South Beach neighborhoods. These low revascularization rates suggest lack of access to subspecialty care in these areas.

Policy Implications for Staten Island

- Since there are significant disparities in access to health care, which affect more than 178,000 Staten Islanders -- 40% of the population (mostly on the North Shore in St. Georges and Port Richmond), the health care system for this population could be improved by targeting these areas for increased availability of health services ranging from clinical prevention to primary, as well as specialty revascularization services.

- More research should be conducted to identify specific interventions in these areas that would provide the needed services. Clinical prevention services, while necessary, are not a sufficient response to the present burden of disease. The same applies for primary care. It will be important to develop an integrated response to the areas of highest risk which we have identified and to assemble a mix of clinical prevention, primary care, and specialty services that are tailored to the needs of all Staten Islanders.
- Finally, although we have demonstrated that access to Staten Island's health care system is not substantially worse than the NYC average, it is still deeply troubling that Staten Island's mortality heart disease and cancer was 25% higher than the NYC average and mortality from influenza/pneumonia was 75% higher than the NYC average. This pattern is consistent with hospitalization data indicating that admissions for heart disease in Staten Island were 15% higher, in 2004, than the NYC average. We are left to conclude that Staten Island's health disadvantage most likely reflects social determinants of health, e.g. such unhealthy behaviors as obesity and smoking, which are supported by S.I.'s high obesity and smoking rates in comparison to the NYC average. Like the health care access problem, obesity rates are significantly more severe on the North Shore than on the South Shore. In contrast, smoking patterns appear to be unusually high across all areas of Staten Island. Clearly, there is a need for more research on the social determinants of health in Staten Island and specifically on how to make behavior modification programs more effective for Staten Islanders.

Appendix 1: Zip Code Tables

Table 15.
Age-Adjusted Rates of Amenable Mortality per 1000 Persons 1-74
in Staten Island by Zip Code of Residence, 1999-2003

Staten Island	
Zip codes	**Rate per 1000 (N)**
10301	1.62
10302	1.48
10303	1.91
10304	1.55
10305	1.26
10306	1.13
10307	1.30
10308	1.14
10309	1.39
10310	1.61
10312	1.15
10314	1.23

Source: New York City Department of Health and Mental Hygiene, Birth and Death Files, 1999-2003.

Table 16.
Age-Adjusted Rates of Avoidable Hospital Condition per 1000 Persons 20+
in Staten Island by Zip Code of Residence, 1998-2002

Staten Island	
Zip codes	
10301	24.87 (709)
10302	20.58 (222)
10303	24.11 (300)
10304	23.60 (625)
10305	19.27 (543)
10306	14.81 (650)
10307	17.59 (105)
10308	14.73 (260)
10309	16.35 (213)
10310	19.54 (283)
10312	15.28 (501)
10314	17.18 (1077)

Source: SPARCs, 1998-2002.

Table 17.
Ratio of Age-Adjusted Rates of Revascularization:Age-Adjusted Rate of AMI in Staten Island by Zip Code of Residence, 1998-2002

Staten Island	
Zip codes	
10301	1.05
10302	1.06
10303	1.06
10304	1.24
10305	1.25
10306	1.23
10307	1.07
10308	1.38
10309	1.22
10310	1.24
10312	1.32
10314	1.30

Source: SPARCs, 1998-2002

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