EQUAL TREATMENT

The Case for More Effective Diabetes Care in Select New York City Neighborhoods

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Executive Summary

According to the New York City Department of Health and Mental Hygiene (DOHMH), New York City is experiencing a diabetes epidemic. Particularly when uncontrolled, diabetes can be a debilitating and potentially deadly illness, leading to strokes, heart attacks, kidney failure, blindness and other major health problems. Older age, obesity, lack of exercise and a family history are major risk factors for the disease, which is significantly more prevalent among Black and Hispanic New Yorkers than other groups. Altogether, an estimated 450,000 or over 8% of adults in New York City have diabetes, another 225,000 may have diabetes but not know it and 700,000 additional New Yorkers with pre-diabetes are likely to develop the disease. Nationally, the annual cost of caring for persons with diabetes may be as high as $132 billion, including both the cost of treatment and related costs, such as disability payments and time lost from work.

With good medical oversight many of the most severe complications of diabetes can be delayed or avoided altogether. However, all too often medical guidelines for treating diabetes, which demand a lot of time and good disease management skills from the treating physician, are not appropriately followed. In this study, therefore, we sought to identify neighborhoods in the City where increased education and outreach to medical professionals might have a particularly strong impact on the number and severity of complications suffered by diabetes patients.

After analyzing demographic, hospital and other health data, we identified nine areas – Stapleton/St.George, Willowbrook, East Harlem, Flushing/Clearview, Central Harlem/Morningside Heights, Williamsburg/Bushwick, Port Richmond, Jamaica, and Bedford Stuyvesant/Crown Heights – where diabetic residents suffer rates of serious complications that are much higher than one would expect based on the number of diabetics living in the neighborhood. Significantly, these are not always the communities where DOHMH and others focus their most intense diabetes-related initiatives, since many of these areas do not have the most diabetic residents. Targeted outreach to the medical providers serving these communities could be an effective supplement to existing public health efforts.

As part of our analysis, we made a number of important findings:

Finding 1: Identifying the Neighborhoods with the Largest Number of Diabetics. Diabetes rates in New York City's neighborhoods vary from a high of almost 15% in East Harlem and Williamsburg/Bushwick, to a low of less than 2% in the Upper East Side and in Gramercy Park/Murray Hill. Other neighborhoods with very high diabetes rates are Crotona/Tremont, High Bridge/Morrisania, Hunts Point/Mott Haven, East New York, Bedford Stuyvesant/Crown Heights, Pelham/Throgs Neck, and Washington Heights/Inwood.

Finding 2: The Neighborhoods with the Highest Rates of Diabetes Complications Are Not Always the Ones with the Most Diabetics. We found a number of instances where neighborhoods rank very differently on the measures of diabetes prevalence and diabetes complications. For example, the Stapleton/St George neighborhood in northern Staten Island has 29% fewer diabetics than the average New York City

neighborhood, but 53% more complications. Similarly, the Coney Island/Sheepshead Bay area of Brooklyn has 7% fewer diabetics than average, but 27% more complications, while Downtown Brooklyn/Brooklyn Heights/Park Slope has 15% fewer diabetics than average, but 13% more complications.

Finding 3: Many Neighborhoods with Excess Numbers of Complications Are Outside Conventional Public Health Target Areas. We found that many of the neighborhoods with "excess" complications are ones that are not normally targeted for public health interventions, as they are thought to have fewer "risk factors." For example, the two neighborhoods with the highest number of "excess" complications are in Staten Island – St. George and Willowbrook. Of the thirteen neighborhoods that have more complications than expected, or many more, only three (East Harlem, Williamsburg/Bushwick, and Bedford Stuyvesant/Crown Heights) are among the neighborhoods with the greatest numbers of diabetics.

Finding 4: Surprisingly, Socio-Economic Factors Do Not Account For Why Some Neighborhoods Have Excess Levels of Diabetes Complications. Factors like poverty, lack of education, and minority status are often good predictors of public health problems, including diabetes and a variety of other serious medical conditions. However, once we took into account the number of diabetics in a neighborhood, we found that demographic factors have little or no effect on the level of diabetes complications.

Finding 5: Neighborhoods with More Obese and Sedentary Residents Have More Diabetics, but This Does Not Explain What Happens To Those Diabetics. Although as expected we found that neighborhoods with high rates of obesity and inactivity among their residents have more diabetics, we discovered that those diabetics are no more likely to develop complications than diabetics elsewhere.

Finding 6: Having Better Access to Healthcare does not By Itself Reduce the Level of Excess Diabetes Complications among a Neighborhood's Residents. We found that the availability of medical care has some relationship to the number of people in a neighborhood who have diabetes. Unexpectedly, however, access to medical care has virtually no significant relationship to whether those diabetics have excess amounts of complications.

Finding 7: The Main Reason Some Neighborhoods Have Excess Complications Is That Their Residents Receive Less Effective Health Care. Of all the factors measured in this study, the one that has the biggest effect on whether diabetics develop complications is the *quality* of primary and preventative care. We assessed this factor using the "Ambulatory Care Sensitive index" – a measurement of hospitalization rates for conditions that can be handled in the community if the care is effective. It is clear that having access to medical care is, in itself, not enough. The bottom line is that New York City's diabetics do not need simply more health care, but better health care.

Based on these findings, we make the following recommendations:

Recommendation 1:

DOHMH should identify the specific health facilities and providers that provide the majority of ambulatory care to people who live in Stapleton-St.George, Willowbrook, East Harlem, Flushing-Clearview, Central Harlem-Morningside Heights, Williamsburg-Bushwick, Port Richmond, Jamaica and Bedford Stuyvesant-Crown Heights – the nine neighborhoods we identified as having many more diabetes complications than expected.

Recommendation 2:

With the assistance of the State Health Department, DOHMH should conduct special quality assurance studies and other appropriate analyses of those providers' diabetes management practices.

Recommendation 3:

If justified by the results of such studies, DOHMH should expand the amount of professional education about diabetes management in those areas – for example, through participation in hospital "grand rounds."

Recommendation 4:

DOHMH should not use diabetes prevalence, hospitalizations or mortality by themselves as measures of where to focus public health campaigns concerning diabetes management. The agency should also take into account where the number of people who develop diabetes complications is out of proportion to the number of diabetics and use this information as an indicator of possible deficiencies in disease management, particularly when designing campaigns for educating health professionals.

Recommendation 5:

In designing future community health surveys, DOHMH should ask interviewees additional questions about the development of diabetes complications and use this information to examine further the issue of why diabetics who live in some neighborhoods are more likely to develop complications than diabetics who live in other neighborhoods.

Recommendation 6:

As appropriate, DOHMH should use the methodology set forth in this report to look at complications from other chronic diseases, for example, cancer and heart disease.

Objectives of the Study

1. Introduction

Ten percent of the country's population accounts for 70% of all health expenditures.[1] The most costly patients tend to have chronic or complex diseases,[2] among the most costly of which is diabetes.[3] Nationally, the annual cost of caring for persons with diabetes is estimated to total $132 billion, including both treatment costs and related costs, such as disability payments and time lost from work.[4]

There is no reliable estimate of the cost of treating diabetics who live in New York City, but the amount clearly is significant given the large number of City residents who have the disease. According to the New York City Department of Health and Mental Hygiene (DOHMH), New York is experiencing a diabetes "epidemic"[5]; more than 450,000 or over 8% of adults in New York City have diabetes, another 225,000 may have diabetes but not know it and 700,000 additional New Yorkers with pre-diabetes are likely to develop the disease.[6]

The City pays substantial diabetes treatment costs through its share of Medicaid spending, which is projected to total $4.628 billion in FY 2005. It also contributes through its role in helping to insure retired City employees, since 20% of New Yorkers who are 65 years of age or older have the disease.[7] In addition, the City's public hospital system, the Health and Hospitals Corporation (HHC), incurs substantial costs from treating the uninsured, who are much less likely to get the kind of preventative health services – like blood sugar testing for diabetics – that can help to reduce their need for emergency department visits and in-hospital care.[8] Indeed, HHC estimates that it sustains costs of as much as $186 million per year treating uninsured diabetics for problems relating to their disease.[9]

2. Public Policy Issue: Reducing Health Care Costs By Making Sure That Diabetics Get Better Care

Diabetes is particularly costly because it increases the risk that someone will develop other chronic diseases as well. For example, diabetics are four to five times more likely to develop congestive heart failure – the leading and most expensive cause of hospitalization among patients over 65 – than others with similar risk factors.[10] At the time of diagnosis, approximately half of all diabetics are already experiencing one of the disease's many serious complications,[11] including stroke, kidney disease and blindness.[12]

Diabetics develop some chronic complications simply as a result of having the disease for a long time. However, as detailed later in the "Background" section, most complications can be prevented or at least delayed by following generally accepted clinical guidelines, which focus on controlling the level of sugar in the diabetic's blood. Unfortunately, these guidelines frequently are not followed, even on things as basic as regular blood sugar testing.[13] As a result, there are many more complications than necessary, leading to more preventable hospitalizations, deaths, and costs. Indeed, a large percentage of treatment costs are for treatment of late complications.[14]

For this reason, DOHMH is aggressively trying to improve compliance with the guidelines. In fact, one of the explicit goals of its sweeping new public health initiative, "Take Care New York," is to promote better diabetes management by providing individual health care professionals with information and tools for prevention, diagnosis and treatment and by establishing partnerships with larger providers, including HHC and community clinics.[15]

3. Objectives

In light of DOHMH's efforts, one of the main objectives of this study is to identify neighborhoods where intensive professional education and outreach would be particularly helpful.

DOHMH is already carrying out both citywide and neighborhood-level diabetes programs. The citywide efforts include publishing summaries of the guidelines for managing diabetes,[16] and holding community meetings to discuss each neighborhood's overall community health profile.[17] More intensive programs focused on a wide range of health issues are being carried out in the South and East Bronx, North and Central Brooklyn, and East and Central Harlem as people living in these neighborhoods suffer disproportionately from preventable conditions such as asthma, diabetes, heart disease, cancer, HIV, depression and substance abuse.[18]

In this report we try to identify additional areas where there is a need to educate professionals about managing diabetes in particular. We call attention to differences between the number of diabetics in a neighborhood and the number of people who have serious complications from diabetes. For example, we would expect many residents of the South Bronx, Central Brooklyn, and East Harlem to have serious complications from diabetes simply because many of them are diabetic. However, in some neighborhoods diabetics do not get good disease management and they suffer more complications as a result. In such neighborhoods, a targeted investment in professional education might have a powerful impact, even in the absence of a much broader public health program.

To address this issue, we developed an index of "excess" complications – whether the number of diabetes complications found in a neighborhood is more than one would expect based on the number of diabetics. We will argue that DOHMH should use this information as a factor in identifying additional neighborhoods in which to conduct more intensive professional education.

Based on these considerations, the report has five main goals.

1) Measure the relative prevalence of diabetes in each neighborhood;
2) Measure the relative level of diabetes complications in each neighborhood;
3) Identify the neighborhoods with high rates of excess complications – where the rate of diabetes complications is more than could be expected based on the relative number of diabetics;
4) Explain why some neighborhoods have high rates of excess complications;

5) Find out whether the factors associated with excess complications are different from the factors that explain the relative number of people who develop diabetes in the first place (e.g., percentage who are obese).

Background

1. Nature of the Disease

Diabetes is a serious illness in which the body is unable to process blood sugar (glucose) and deliver it to the cells. Most of the food we eat is turned into sugar, or glucose, which our cells need to absorb for energy. In order to break down the sugar and deliver it to the cells, the body needs a hormone called insulin. Diabetes occurs when the body can not produce enough insulin or is unable to use its own insulin as well as it should. As a result, too much sugar, or glucose, remains in the blood stream, which can lead to serious health complications.[19]

Roughly 95% of people diagnosed with diabetes have Type 2 diabetes (formerly called "adult-onset diabetes").[20] Twenty percent of people over 65 have this disease and half of all new cases occur in people over age 55.[21] According to DOHMH and most medical authorities, Type 2 diabetes can often be prevented or delayed by maintaining a healthy weight and getting sufficient physical activity.[22]

2. Risk Factors for Diabetes

The chief risk factors for diabetes are older age, obesity, lack of physical activity, and family history of diabetes.

The biggest preventable risk factor is being overweight or obese. Only 3% of adult New Yorkers who are of normal weight have diabetes, compared to 9% of those who are overweight and 17% of those who are obese.[23] Indeed, 80 percent of adults in New York City with diabetes are overweight.[24]

A second major factor is age. Only 3.6% of adults ages 35-44 years old have diabetes, while 15.1% of adults ages 55-64 have the disease and 19.2% of those over 64 years old are diabetic.[25]

In addition, Hispanic and Black New Yorkers are more likely than other New Yorkers to have diabetes. Among New York City residents who are 40 years of age or older, 12% of the Hispanics and 11% of the Blacks say that a doctor has told them they have diabetes, as compared with 5% of the Whites and 7% of Asians.[26] A major reason for these ethnic differences is that Black and Hispanic New Yorkers are more likely than White or Asian New Yorkers to be obese.[27]

3. Overview of Diabetes Complications

In 2001, there were 20,080 hospitalizations in New York City where diabetes was the primary reason for the hospitalization. Fifteen percent (168,570) of all hospitalizations were for people with diabetes, regardless of whether the diabetes was the primary reason for the hospitalization.[28]

Diabetes is the sixth leading cause of death in New York City, causing more than 1,700 documented deaths a year, based on information contained in death certificates.[29] The actual number of diabetes-related deaths, however, undoubtedly is much higher, since diabetics often die from the complications of diabetes, rather than from diabetes itself.[30]

The serious complications of diabetes include:

- Stroke – Diabetics are two to three times more likely than the general population to have the most common type of stroke and tend to have more severe disabilities as a result of stroke.[31]
- Cardiovascular disease – Diabetics are three times more likely than others to die of cardiovascular diseases like heart attacks and congestive heart failure and are twenty times more likely to have peripheral vascular disease.[32]
- Kidney disease. Diabetes is the leading cause of kidney failure, accounting for 46% of new cases of end-stage renal disease.[33]
- Eye Disease – Diabetes is the most frequent cause of blindness among adults.
- Nervous System Damage -- After 25 years of living with diabetes, 60% to 70% of diabetics have damage to the nervous system, particularly the nerves that that go between the brain and the feet, toes, and hands.
- Amputations – As a byproduct of the damage to the nervous and/or circulatory systems, diabetics are twelve times as likely to have amputations, mainly of the foot and lower legs.[34] More than half of all non-traumatic lower extremity amputations in New York State occur among diabetics.[35]

4. Many of these Complications Can Be Prevented And Controlled By Following Established Medical Guidelines

When the established guidelines for managing diabetes are followed, diabetics are much less likely to develop serious complications.[36] These guidelines, however, can require a lot of time and involvement by the treating physician. For example the most important guidelines involve regularly monitoring glucose levels to keep blood sugar levels as close to normal as possible and, as appropriate, reducing them through diet, exercise, insulin and drugs. The specific guidelines include:

- Blood Sugar Monitoring. Physicians should monitor the patient's sugar level every three to six months through an A1C test, which shows the average blood sugar over the previous 2-3 months. Keeping a low A1C score helps avoid diabetic complications involving the kidneys, eyes, feet and nerves.[37] In fact, the United Kingdom Prospective Diabetes Study found that, for every percentage drop in the A1C score, complications were reduced by 35%.[38]

- Blood Pressure Monitoring. Blood pressure should be checked during every visit to the doctor. Type 2 diabetics who adhere to intensive blood pressure control significantly reduce their risk of blindness, heart failure, and diabetes-related death, as well as complications involving the smallest blood vessels, such as those found in the eyes, nerves and kidneys.[39] The Centers for Diseases Control and Prevention estimates that diabetes-related kidney failure could be reduced by 50% through better control of blood pressure and glucose.[40] According to a seminal British study, tight blood pressure control reduced the risk of stroke by 44% and the risk of heart failure by 56%.[41]

- Annual Cholesterol Monitoring. According to DOHMH,[42] when doctors intensely control a Type 2 diabetic's cholesterol, glucose, and blood pressure, they cut in half the risk of complications involving heart attacks, congestive heart failure and small blood vessels, such as those found in the eyes, nerves and kidneys.

- Smoking Prevention/Cessation. Doctors should identify diabetics who smoke and encourage them to stop. Smoking reduces the flow of blood to cells, which can lead to heart disease, impotence and amputations. This is especially true when the patient also has high blood sugar.

- Establishing Self-management Goals for the Patient. In addition to taking these steps, under the guidelines doctors are also supposed to involve diabetics in managing their own care. The patient-doctor agreement should involve physical activity, nutrition, weight management, and daily self-monitoring of blood sugar and condition of feet. DOHMH observes that many people with type 2 diabetes can control their blood glucose with a proper diet and regular exercise.[43] Glucose self-monitoring allows patients to keep track of how their sugar levels change during the day in response to what they eat, their medication, stress, exercise and illness and to make adjustments accordingly.[44] Moreover, up to 85% of diabetes-related leg and foot amputations can be prevented if diabetics keep their feet clean and dry and check them daily for red spots, cuts, swelling, and blisters.[45]

5. Frequent Deviations From The Medical Guidelines Contribute To "Excess" Levels of Diabetes Complications

Although fewer diabetics would have severe complications if these guidelines were followed, there is inadequate compliance, both by doctors and patients. For example, [46]

- Only 15% of New York City's diabetics know their current blood sugar level. Fewer than 10% of Black and Hispanic diabetics, 22% of White diabetics, and 43% of Asian diabetics know their blood sugar level.[47] According to DOHMH Commissioner Frieden, this means that "the vast majority of New Yorkers with diabetes are at risk of developing severe, potentially life-threatening complications."[48]

- Nearly two-thirds of New Yorkers with diabetes do not know their blood pressure.

- More than three-quarters of New Yorkers with diabetes do not know their cholesterol level.

- 60% of New Yorkers with diabetes fail to exercise at least three times a week.

- People with diabetes are at high risk for the flu and should get a flu shot every year regardless of age, yet only 40% of New Yorkers with diabetes actually get flu shots.

- Although many diabetes patients should take aspirin to prevent cardio-vascular complications, 77% of New York City's diabetics fail to do so.

6. Poor Doctor/Patient Communication Can Interfere With Care

Effective communication is often complicated by race, cultural and ethnic group differences, as well as language barriers. For example, according to CDC-funded research,[49] Black and Hispanic residents of the Bronx:

- Have wide-spread distrust and fear of the health care system;
- Believe that health providers have prejudices and make negative assumptions about racial and ethnic minorities;
- Have received impersonal, assembly-line care in clinics and hospitals;
- Experience poor patient/doctor communication, which contributes to a lack of information about how to detect, prevent and manage chronic diseases, especially diabetes and heart disease;
- Perceive the health system as being disrespectful;
- Have found that doctors do not understand their cultural use of traditional remedies (e.g., herbs) and the role of religion in how they contend with health problems.

Studies also show that in large cities like New York, many patients also have low "health literacy," which refers to the "ability to read, comprehend and act on medical instructions."[50] Patients with low health literacy have difficulties with tasks such as reading the label on a bottle of pills, interpreting the values on a blood sugar test, and understanding an appointment slip or medical consent form. A study of adult primary care patients at San Francisco General Hospital found that diabetes patients with low levels of health literacy had worse control over their blood sugar levels and were therefore more likely to have diabetes complications.[51] Unfortunately, the doctors in the study failed to regularly assess whether the patients understood what the doctors wanted them to do and could recall those directions later.[52] Had they communicated better, the doctors might have been more successful in managing the patients' diabetes.

Methodology

We sought to identify the New York City neighborhoods where the level of diabetes complications is more than one would expect based on the number of diabetics and the age of the residents. We then used demographic and other information to compare these neighborhoods to the others. This section explains how we measured "neighborhood," "number of diabetics" and "level of diabetes complications." It also summarizes the sources of demographic and other background information.

1. Definition of Neighborhoods

We used the United Hospital Fund's classification of neighborhoods. Since this the standard classification for New York City health statistics, it allows us to draw on a variety of different sources.

The United Hospital Fund defined 42 neighborhoods by combining several adjoining zip codes. DOHMH uses the same classification, but in its most recent reports, refers to some of the neighborhoods by other names. However, the only difference between the two organizations is in some of the terminology. They both include the same zip codes in each neighborhood.[53] We use the original United Hospital Fund labels. Appendix A lists the neighborhoods and cross-references the two sets of names.

2. Relative Number of Diabetics in Each Neighborhood

The statistics on the relative number of diabetics in each neighborhood are from DOHMH. DOHMH asked New Yorkers "Have you ever been told by a doctor that you have diabetes?" Based on the number who answered "yes," DOHMH estimated that roughly 8% of adult New Yorkers know that they have diabetes. In addition, according to DOHMH estimates, another 4% may have the disease, but do not yet know it.[54]

As discussed earlier, age is a major factor in the development of diabetes. To make it easier to compare different neighborhoods, DOHMH adjusted the percentages to take into account the fact that some neighborhoods have more older people than others. In our tables, we use these "age-adjusted" percentages in our measurement of the prevalence of diabetes in each neighborhood.

DOHMH collected this and other information as part of its Community Health Survey (CHS). The CHS surveyed 9,674 adults with telephones from May to July 2002. Interviews were conducted in Spanish, Chinese, Greek, Korean, Russian, Yiddish, Polish, and Haitian Creole. Respondents were asked not only about diabetes, but also about other issues, including access to health care, cardiovascular disease risks, mental health, nutrition and exercise, and smoking.[55]

To assure a minimum number of interviews in each neighborhood, DOHMH combined the surveys from some of the 42 United Hospital Fund neighborhoods with those of adjacent, demographically similar neighborhoods. For example, DOHMH analyzed Long Island City/Astoria and West Queens, which the United Hospital Fund treated as two neighborhoods, as one single neighborhood. This resulted in 33 community health sur-

vey neighborhoods. When DOHMH combined United Hospital Fund neighborhoods in this way, we used the prevalence of diabetes in the combined neighborhood as the best estimate of the prevalence in each of the component United Hospital Fund neighborhoods (e.g., same percentage for Long Island City/Astoria as for West Queens).

3. Relative Level of Diabetes Complications in Each Neighborhood

We developed five measures of the level of diabetes complications in each United Hospital Fund neighborhood. We then combined the five measures into a single composite index, using a statistical technique called factor analysis. Each component of the index deals with diabetes-related hospitalizations or deaths. We took into account both the size of the neighborhood and the age of neighborhood residents. The statistics are for 2001, the most recent year for which data were available.

The five measures are:

- Hospitalizations: Frequency with which neighborhood residents were admitted to a hospital primarily for treatment of diabetes, per 100,000 residents.
- Chronic Complications: Frequency with which neighborhood residents developed chronic complications of diabetes (diabetes with kidney, nerve, eye, or peripheral circulatory manifestations), per 100,000 residents.
- Acute Complications: Frequency with which neighborhood residents experienced diabetic comas and other acute complications of diabetes, per 100,000 residents.
- Major Procedures: Frequency with which neighborhood residents had various hospital procedures related to severe, inadequately controlled diabetes – such as amputations, renal dialysis and the removal of skin ulcers – per 100,000 residents.
- Deaths: Number of deaths in which diabetes was the primary cause, per 100,000 residents.

Appendix B contains the details on how each measure was constructed. The source for the age-adjusted mortality measure is DOHMH. The other measures were constructed by the City Comptroller's Office with the advice of outside experts.[56] They are based on hospital data collected by the State Health Department (Statewide Planning and Research Cooperative System – also known as "SPARCS").

The following table validates our index by showing that the five components of the complications index are highly correlated with each other and with the index as a whole.[57]

TABLE 1
Index Of Diabetes Complications*

Correlations Between the Overall Index and Each of Its Components

	OVERALL INDEX	COMPONENTS OF COMPLICATIONS INDEX				
		Hospitaliz-ations	Chronic Complications	Acute Complications	Major Procedures	Deaths
OVERALL INDEX	**X**	0.97	0.93	0.98	0.94	0.87
COMPONENTS OF INDEX						
Hospitalizations	0.97	**X**	0.84	0.97	0.86	0.86
Chronic Complications	0.93	0.84	**X**	0.89	0.96	0.69
Acute Complications	0.98	0.97	0.89	**X**	0.88	0.84
Major Procedures	0.94	0.86	0.96	0.88	**X**	0.70
Deaths	0.87	0.86	0.69	0.84		**X**

*All rates are age-adjusted. See Appendix B for details.

4. Demographic and Other Contextual Factors

We measured demographic and other contextual factors using 2000 census data, DOHMH community health profiles, the State Health Department's SPARCS database, and the United Hospital Fund publication, *New York City Community Health Atlas, 2002.*

Most of the demographic and SPARCS data are available on-line through the Infoshare Community Data System Online (www.infoshare.org), which includes most publicly available sources of information on New York City neighborhoods.[58] The DOHMH and United Hospital Fund neighborhood profiles can be downloaded from their respective web sites.[59]

Findings

Finding 1: Identifying the Neighborhoods With the Largest Number of Diabetics

Diabetes rates vary greatly from neighborhood to neighborhood. After adjusting for age,[60] the diabetes rates in New York City's neighborhoods varied from a high of almost 15% in East Harlem and Williamsburg/Bushwick, to a low of less than 2% in the Upper East Side and in Gramercy Park/Murray Hill.

Table 2 shows the percentage in each neighborhood and how that compares with the "average" New York City neighborhood. The highest rates are in East Harlem, Williamsburg/Bushwick, Crotona/Tremont, High Bridge/Morrisania, Hunts Point/Mott Haven, East New York, Bedford Stuyvesant/Crown Heights, Pelham/Throgs Neck, and Washington Heights/Inwood. The percentages in these neighborhoods (12.4% to 14.9%) are at least 54% to 84% higher than the average (8.1%).

The prevalence of diabetes is three to eight times greater in these neighborhoods than in the neighborhoods with the lowest percentages – Gramercy Park/Murray Hill, Upper East Side, Flushing/Clearview, Upper West Side, Greenwich Village/Soho, Chelsea/Clinton, and the South Beach/Tottenville and Willowbrook sections of Staten Island.

In the latter neighborhoods, the prevalence of diabetes ranges from 1.8% to 3.9%, which is 51% to 77% lower than the average.

TABLE 2
Prevalence of Diabetes
Comparison of New York City Neighborhoods

Variation From Average	Neighborhood Ranked In Order of Decreasing Prevalence	Percentage saying a doctor told them they have diabetes	Percentage Above/ Below Average Prevalence Rate
More Than 50% Higher Than Average Neighborhood	East Harlem	14.9%	84%
	Williamsburg - Bushwick	14.6%	81%
	Crotona - Tremont	13.8%	71%
	High Bridge - Morrisania	13.8%	71%
	Hunts Point - Mott Haven	13.8%	71%
	East New York	13.0%	61%
	Bedford Stuyvesant - Crown Hts	12.8%	58%
	Pelham - Throgs Neck	12.8%	58%
	Washington Hts - Inwood	12.4%	54%
10% to 50% Higher Than Average Neighborhood	Fordham - Bronx Park	11.1%	38%
	Jamaica	10.3%	27%
	Northeast Bronx	10.1%	25%
	Southeast Queens	9.7%	20%
	Central Harlem - Morningside Hts	9.2%	14%
Within 10% of Average Neighborhood	Borough Park	8.8%	9%
	East Flatbush - Flatbush	8.5%	5%
	Canarsie - Flatlands	8.5%	5%
	Bayside - Little Neck	8.5%	5%
	Fresh Meadows	8.5%	5%
	Average: All Neighborhoods	***8.1%***	***0%***
	Sunset Park	7.9%	-2%
	Southwest Queens	7.8%	-3%
	Kingsbridge - Riverdale	7.7%	-4%
	Greenpoint	7.7%	-5%
	Ridgewood - Forest Hills	7.6%	-6%
	Coney Island - Sheepshead Bay	7.5%	-7%
10% to 50% Lower Than Average Neighborhood	Downtown Bklyn - Bklyn Hts - Park Slope	6.8%	-15%
	Union Square - Lower East Side	6.6%	-18%
	Rockaway	6.3%	-22%
	Bensonhurst - Bay Ridge	6.2%	-23%
	Port Richmond	5.7%	-29%
	Stapleton - St. George	5.7%	-29%
	Long Island City - Astoria	5.5%	-32%
	West Queens	5.5%	-32%
	Lower Manhattan	5.0%	-39%
More Than 50% Lower Than Average Neighborhood	Willowbrook	3.9%	-51%
	South Beach - Tottenville	3.9%	-51%
	Chelsea - Clinton	3.8%	-53%
	Greenwich Village - Soho	3.8%	-53%
	Upper West Side	3.5%	-57%
	Flushing - Clearview	2.2%	-73%
	Upper East Side	1.8%	-77%
	Gramercy Park - Murray Hill	1.8%	-77%

Finding 2: The Neighborhoods with the Highest Rates of Diabetes Complications Are Not Always the Ones With the Most Diabetics

The next table, Table 3, ranks New York City neighborhoods by their scores on the index of diabetes complications, adjusted for the residents' age.[61]

TABLE 3
Rates At Which Diabetics Experienced Serious Complications
Comparison of New York City Neighborhoods

Variation From Average	Neighborhood Ranked In Order of Decreasing Score on Index of Serious Diabetes Complications	Score on Index of Diabetes Complications	Percentage Above/ Below Average Diabetes Complications Score
More Than 50% Higher Than Average Neighborhood	East Harlem	4.09	132%
	Williamsburg - Bushwick	4.00	127%
	Bedford Stuyvesant - Crown Hts	3.41	94%
	Crotona - Tremont	3.10	76%
	Jamaica	3.02	71%
	Central Harlem - Morningside Hts	2.86	63%
	Northeast Bronx	2.78	58%
	East New York	2.71	54%
	Stapleton - St. George	2.70	53%
10% to 50% Higher Than Average Neighborhood	High Bridge - Morrisania	2.63	49%
	Hunts Point - Mott Haven	2.51	42%
	Coney Island - Sheepshead Bay	2.23	27%
	Pelham - Throgs Neck	2.20	25%
	Fordham - Bronx Park	2.19	25%
	Port Richmond	2.07	18%
	East Flatbush - Flatbush	2.00	14%
	Downtown Bklyn - Bklyn Hts - Park Slope	1.98	13%
	Willowbrook	1.93	10%
Within 10% of The Average	Washington Hts - Inwood	1.86	6%
	Rockaway	1.83	4%
	Southwest Queens	1.80	2%
	Average: All Neighborhoods	***1.76***	***0%***
	Kingsbridge - Riverdale	1.69	-4%
10% to 50% Lower Than Average Neighborhood	Southeast Queens	1.53	-13%
	Canarsie - Flatlands	1.47	-17%
	Ridgewood - Forest Hills	1.46	-17%
	Flushing - Clearview	1.41	-20%
	Sunset Park	1.32	-25%
	Bensonhurst - Bay Ridge	1.26	-29%
	Union Square - Lower East Side	1.24	-29%
	Borough Park	1.08	-39%
	West Queens	1.07	-39%
	South Beach - Tottenville	1.03	-42%
	Greenpoint	0.94	-46%
More Than 50% Lower Than Average Neighborhood	Chelsea - Clinton	0.87	-51%
	Long Island City - Astoria	0.77	-56%
	Fresh Meadows	0.69	-61%
	Bayside - Little Neck	0.69	-61%
	Upper West Side	0.68	-61%
	Lower Manhattan	0.49	-72%
	Upper East Side	0.28	-84%
	Greenwich Village - Soho	0.04	-98%
	Gramercy Park - Murray Hill	0.00	-100%

The two neighborhoods with the highest complications scores (East Harlem and Williamsburg/Bushwick) and the two with the lowest scores (Gramercy Park/Murray Hill and Greenwich Village/Soho) are the same as when we ranked neighborhoods by the number of diabetics.

More strikingly, there are several instances where neighborhoods rank very differently on the two measures. For example, the Stapleton/St George neighborhood in northern Staten Island has 29% fewer diabetics than the average New York City neighborhood (Table 2), but 53% more complications (Table 3). Likewise, the Coney Island/Sheepshead Bay area of Brooklyn has 7% fewer diabetics (Table 2), but 27% more complications, while Downtown Brooklyn/Brooklyn Heights/Park Slope has 15% fewer diabetics (Table 2), but 13% more complications.

This shows that some neighborhoods have more diabetes complications than one might expect based on the number of diabetics. In addition, there are other kinds of discrepancies between Table 2 and Table 3 that lead to the same conclusion. For example, East Harlem and Williamsburg/Bushwick rank at the top of both tables, yet the difference between them and other New York City neighborhoods is even greater for complications than for prevalence. They are 84% and 81% higher than average for the number of diabetics, but 132% and 127% higher for level of diabetes complications.

Similarly, lower down the prevalence ranking, Jamaica has 27% more diabetics, but 71% more complications; Central Harlem has 14% more diabetics, but 63% more complications; and Northeast Bronx, has 25% more diabetics, but 58% more complications.

Finding 3: Many Neighborhoods With Excess Numbers of Complications Are Outside Conventional Public Health Target Areas

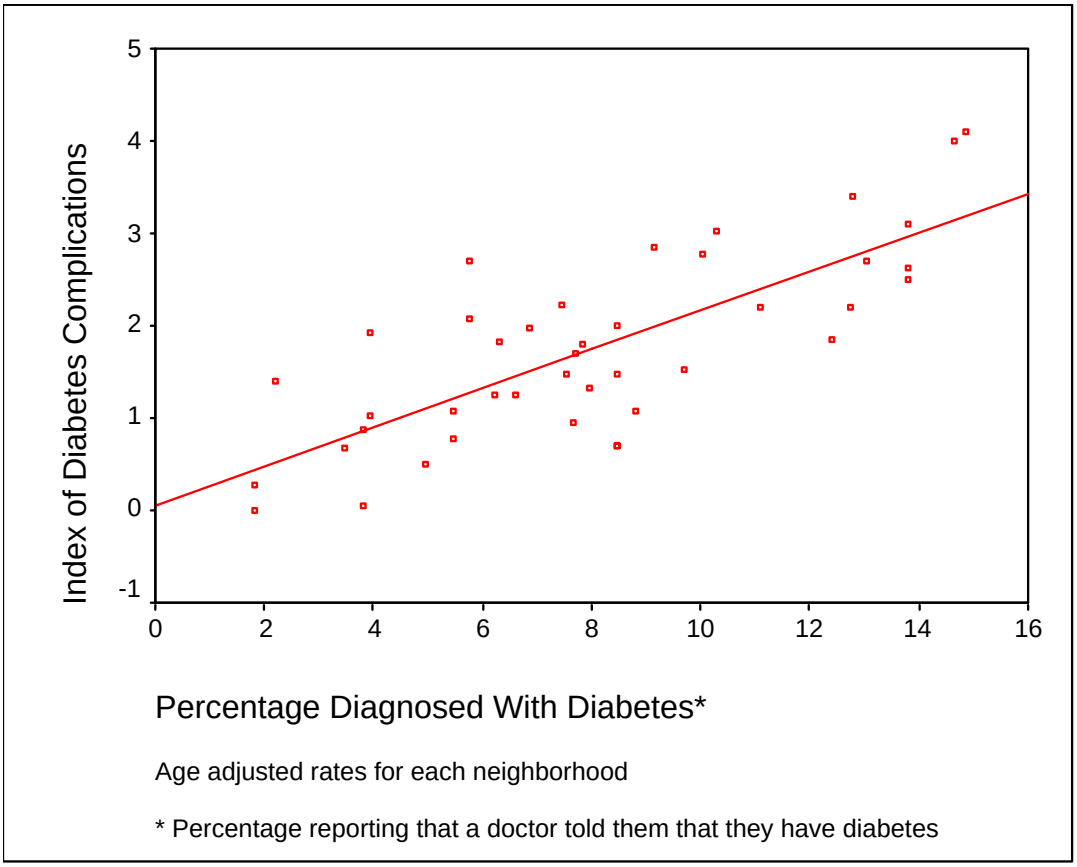
Figure 1 provides a broader picture of the relationship between the number of diabetics and the level of diabetic complications. One of the purposes of the graph is to make it easier to understand how we measure “excess complications” – the main issue of the report.

Each dot in Figure 1 represents a neighborhood. The horizontal axis is the percentage diagnosed with diabetes. The vertical axis is the neighborhood’s score on the index of diabetes complications. Not surprisingly, Figure One shows that neighborhoods tend to have higher complications scores when they have more diabetics.

However, of more importance, Figure 1 also shows that a large number of neighborhoods have complications scores that are significantly higher or lower than one might expect based on the number of diabetics. The starting point for analyzing such discrepancies – the core of this report – is the straight line that runs in the middle of the dots. This is a kind of running average. It is the best statistical estimate of the level of complications that would be “expected,” given a particular number of diabetics. For example, when 10% of the residents are diabetic (horizontal axis), the “expected” complications score (height of the sloping line) would be roughly 2. If the complications score were higher than that, we could say that the neighborhood has more complications than expected. If the score were lower than 2 we could say that it has fewer complications

than expected. The further a neighborhood is above the line, the greater the level of "excess" complications. In the rest of this report, we focus on the size of such discrepancies.

Figure 1: Relationship Between Diabetes Complications and Diabetes Prevalence



We quantified the reasoning in Figure 1 through a statistical technique called multiple regression analysis. Through these regressions, we calculated each neighborhood's "expected" complications score, based on the number of diabetics and the age of neighborhood residents.[62] We then calculated "excess" (positive or negative) complications by subtracting the "expected" score from the actual score. We expressed this difference in standardized units -- standard deviations above/ below the mean (these generally range +2 to –2 standard deviations).[63]

Table 4 ranks New York City neighborhood by their scores on this index of "Excess Diabetes Complications." Based on the size of the difference between the actual and expected scores, we classified each neighborhood as having many more complications than expected, more than expected, within expected range, fewer than expected, and many fewer than expected.

TABLE 4
"Excess" Levels of Serious Diabetes Complications
Comparison of New York City Neighborhoods

Difference Between Actual and Expected Score On Index of Diabetes Complications	Neighborhood Ranked By Amount Of "Excess" Complications	Distance From Expected Score In Standardized Units Above/ Below The Expected Score
Many More Complications Than Expected	Stapleton - St. George	2.22
	Willowbrook	1.63
	East Harlem	1.39
	Flushing - Clearview	1.38
	Central Harlem - Morningside Hts	1.36
	Williamsburg - Bushwick	1.32
	Port Richmond	1.25
	Jamaica	1.23
	Bedford Stuyvesant - Crown Hts	1.03
More Complications Than Expected	Northeast Bronx	0.94
	Coney Island - Sheepshead Bay	0.93
	Downtown Bklyn - Bklyn Hts - Park Slope	0.75
	Rockaway	0.69
Within Expected Range	East Flatbush - Flatbush	0.24
	South Beach - Tottenville	0.22
	Crotona - Tremont	0.20
	Southwest Queens	0.14
	Chelsea - Clinton	0.02
	Kingsbridge - Riverdale	0.00
	Distance From Expected Score When Actual Score Equals Expected Score	***0.00***
	East New York	-0.14
	Upper West Side	-0.16
	Bensonhurst - Bay Ridge	-0.18
	West Queens	-0.22
	Upper East Side	-0.25
	Ridgewood - Forest Hills	-0.29
	Union Square - Lower East Side	-0.31
	Fordham - Bronx Park	-0.32
Fewer Complications Than Expected	High Bridge - Morrisania	-0.53
	Canarsie - Flatlands	-0.59
	Sunset Park	-0.65
	Gramercy Park - Murray Hill	-0.68
	Long Island City - Astoria	-0.69
	Hunts Point - Mott Haven	-0.72
	Pelham - Throgs Neck	-0.84
	Southeast Queens	-0.89
	Lower Manhattan	-0.95
Many Fewer Complications Than Expected	Greenpoint	-1.13
	Greenwich Village - Soho	-1.27
	Washington Hts - Inwood	-1.27
	Borough Park	-1.29
	Fresh Meadows	-1.78
	Bayside - Little Neck	-1.79

What is most striking about Table 4 is that many of the neighborhoods with "excess" complications are ones that are not normally targeted for public health interventions, as they are thought to have fewer "risk factors." A wide range of DOHMH programs focus

on three areas – South and East Bronx, North and Central Brooklyn, and East and Central Harlem – since residents of these neighborhoods have a variety of serious public health problems. However, we found that the two neighborhoods with the most "excess" diabetes complications are in Staten Island: St. George (actual level of complications is 2.22 standard deviations more than would be expected based on the number of diabetics) and Willowbrook (1.63 standard deviations more than expected).

Thirteen neighborhoods have more complications than expected, or many more. Only three of the thirteen (East Harlem, Williamsburg/Bushwick, and Bedford Stuyvesant/Crown Heights) are among the neighborhoods with the greatest numbers of diabetics. In only five (those three plus Jamaica and Northeast Bronx) is the number of diabetics more than 10% higher than the average. In seven of the neighborhoods, the number of diabetics is actually lower than the average – sometimes, much lower (Flushing/Clearview, Willowbrook, Port Richmond, Stapleton/St. George, Rockaway, Downtown Brooklyn/Brooklyn Heights-Park Slope, and Coney Island/Sheepshead Bay). For instance, the number of diabetics in Flushing/Clearview is 73% lower than the average and, in Willowbrook, 51% lower than the average).

At the other extreme, there are some neighborhoods that have many fewer complications than expected – for example, the Fresh Meadows and Bayside-Little Neck sections of Queens and Greenwich Village/Soho. The big surprise is Washington Heights-Inwood, which is near the bottom of the "excess complications" table, in spite of having a fairly large number of diabetics (54% more than the average).

In the following sections, we will try to explain why some neighborhoods have more complications than expected. We will look at the following factors:

- socio-economic (mainly poverty and ethnicity);
- eating habits and other behaviors that increase the risk of initially developing diabetes;
- access to doctors and other health care providers; and
- the quality of the care people get when they do see a doctor or other health care provider.

Finding 4: Surprisingly, Socio-Economic Factors Do Not Account For Why Some Neighborhoods Have Excess Levels of Diabetes Complications

Poverty, lack of education, and minority status are often good predictors of public health problems, including diabetes and a variety of other serious conditions like tuberculosis, asthma, infant mortality and substance abuse. Socio-economic factors are, in fact, highly correlated with the prevalence of diabetes. The greater the number of poor and minority residents, the greater the number of diabetics. However, the same is not true for excess diabetes complications. The statistical correlations are, at best, small. Poor and minority neighborhoods do have a lot of people who die from, or are hospitalized for, complications of diabetes. But that is because they have more diabetics to begin with. *Once one takes into account the number of diabetics in a neighborhood, demographic factors have little or no effect on the level of diabetes complications.*

How To Interpret The Following Tables:

Table 5 documents this point. Like the tables that follow it (except Table 8), Table 5 lists neighborhood traits on the left side of each row. In this table, those traits are socio-economic (e.g., percentage of households below the poverty line and the percentage of residents who are Black). Different traits are listed in the rows of the tables that follow Table 5 (for example, the numbers of health care providers and the prevalence of "risky" behaviors).

In these tables the first column of numbers indicates the correlation of the neighborhood traits with the number of diabetics across New York City neighborhoods (prevalence). The second column indicates the correlation of the neighborhood traits with the level of excess complications across New York City neighborhoods – the extent to which the level of complications is more than would be expected based on the number of diabetics and the age of neighborhood residents.

The numbers in each row show the strength of the statistical relationship between that specific neighborhood trait and either the number of diabetics (first column of numbers) or the extent to which the number of complications is more than expected (second column of numbers). The higher the number, the stronger the correlation – from a minimum of zero to a maximum of 1.0. The numbers – called Pearson partial correlation coefficients – statistically control for the age of each neighborhood's diabetics, as well as for the age composition of the neighborhood as a whole.[64]

For example, the first row of Table 5 indicates that the percentage of households receiving public assistance has a .74 correlation with diabetes prevalence, but zero correlation with excess complications. This means that neighborhoods with more households on public assistance tend also to have a correspondingly high number of diabetics, but that these diabetics are no more likely than those in other neighborhoods to develop complications from their disease.

The .74 correlation is very high (in a sample this size, correlations above .30 are statistically significant). Since the correlation is not 1.0, the relationship is not perfect – where every increase in the percentage of people on public assistance is associated with exactly equivalent increase in diabetes prevalence. But the number is close enough that we can assume that the increase happens more often than not.

TABLE 5
Correlations Between Socio-Economic Factors And Diabetes Rates
New York City Neighborhoods

Socio-Economic Factor	Correlations With Diabetes Prevalence and Excess Complications (Controlling for the Diabetics' Age)	
	Prevalence	Excess Complications
Receiving public assistance (percentage of households)	.74	.00
Enrolled in Medicaid (percentage of individuals)	.71	-.05
Did not graduate high school (percentage of adults)	.70	-.09
Not employed (percentage of civilian workforce)	.70	.07
Below poverty line (percentage of households)	.67	-.03
Hispanic (percentage of individuals)	.50	-.23
Does not speak English (percentage of individuals)	.40	-.29
Foreign born (percentage of individuals)	.24	-.30
Black (percentage of individuals)	.37	.29

The first five rows of Table 5 deal with the relative levels of poverty and education in each neighborhood – the percentage of residents receiving public assistance, enrolled in Medicaid, failing to graduate high school, unemployed or below the poverty line. The results are the same for all five measures. *The poorer the neighborhood, the greater the number of diabetics (correlations between .67 and .74), but diabetics who live in better off neighborhoods are just as likely as those in poorer neighborhoods to develop complications (correlations around zero).*

The last four rows deal with race and ethnicity. The findings are similar, although less striking. Hispanic, non-English speaking and Black neighborhoods tend to have more diabetics than other neighborhoods (correlations of .50, .40 and .37), as do those with many foreign born residents, but the correlation with foreign born residents is small enough to be within the margin of sampling error (.24). However, race and ethnicity do not have a correspondingly strong effect on whether diabetics develop complications. All the correlations are .30 or lower -- close to or within the margin of statistical error. Three of the effects (of being Hispanic, non-English-speaking, or foreign born) are actually *negative* – i.e., if the correlations were statistically significant, one would say that these diabetics are *less* likely to develop complications.

The U.S. Centers for Disease Control and Prevention noted that Blacks and Hispanics are more likely than Whites to die from diabetes. Commenting on New York State statistics for 2002, CDC said, that "[r]ates of death from diabetes were 145% higher among blacks and 38% higher among Hispanics" than among whites."[65] Others have noted similar racial disparities with regard to other kinds of complications – e.g., in the need for leg amputations and the development of end stage renal disease.[66]

Our findings suggest that, at least in New York City, these disparities are often due to the fact that Black and Hispanic residents are more likely to be diabetic (e.g., because of differences in diet and exercise), and less related to what happens after they become diabetic.

Finding 5: Neighborhoods With More Obese and Sedentary Residents Have More Diabetics, But This Does Not Explain What Happens To Those Diabetics

As discussed earlier, obesity and lack of physical activity are two of the main risk factors for developing diabetes. Consistent with this well-established fact, Table 6 shows that the number of diabetics in a neighborhood is very highly correlated both with the percentage of residents who are obese (.70) and with the percentage who have not participated in any physical activities or exercises during the last 30 days (.67).[67]

Studies show that obesity and lack of exercise is more common among poor New Yorkers and among Blacks and Hispanics. A major reason that socioeconomic factors are so highly correlated with diabetes prevalence (first column of Table 5) is because those factors are also associated with obesity and lack of exercise.

However, as in our analysis of socio-economic factors (Table 5), we once again find that variables associated with high prevalence are not necessarily associated with excess complications. Table 6 shows that neighborhoods with high rates of obesity and inactivity among their residents have more diabetics, but that those diabetics are no more likely to develop complications than diabetics elsewhere. The correlations with excess complications are very small and easily within the margin of statistical error (.18 and -.14). These neighborhoods have higher levels of diabetes complications because they have more diabetics.

This finding is consistent with DOHMH's strategy of emphasizing professional education about managing existing diabetes cases over getting people to lose weight. Health Commissioner Frieden told the *New York Times* that his agency was going to be aggressive in educating doctors and hospital workers about diabetes management. He said that it would be more effective to do this than to focus on educating the public at large about the value of losing weight, since there are "no evidence-based models for getting people to lose weight."[68]

In addition to looking at obesity and exercise, we also looked at smoking, using DOHMH data. The clinical guidelines encourage diabetics to stop smoking because it exacerbates some of the problems that they already have from high sugar levels. For example, smoking reduces the flow of blood to cells, which is already a problem for many diabetics. Restricting the flow of blood to the cells can lead to heart disease, impotence and amputations.[69] However, we did not find any correlation between the percentage of residents who smoke and either the number of diabetics or the level of excess complications.

TABLE 6
Effect of Obesity, Exercise and Smoking
New York City Neighborhoods

Behavioral Factor	Correlations With Diabetes Prevalence and Excess Complications (Controlling for the Diabetics' Age)	
	Prevalence	Excess Complications
Obesity -- percentage of residents with body-mass index of 30 or higher	.70	.18
Lack of exercise -- percentage of adults who say that they have not participated in any physical activities or exercises "during the past 30 days"	.67	-.14
Smoking -- percentage of residents who say they smoke	-.02	.14

Finding 6: Having Better Access to Healthcare Does Not By Itself Reduce the Level of Excess Diabetes Complications Among a Neighborhood's Residents

Based on the findings so far, we concluded that excess complications are not primarily attributable to demographic factors. We then looked at factors more closely associated with the availability and quality of health care. *We found that having more access to health care does not, in itself, reduce the level of excess complications, but that having access to good health care does.*

Table 7 deals with health care access in and of itself, apart from the issue of quality of the care being received. We used six measures of health care access.

- Percentage of adults who have a personal doctor. This measurement reflects the percentage of adults who responded "yes" when the DOHMH Community Health Survey asked, "Do you have one person you think of as your personal doctor or health care provider?".[70]
- Primary care doctors within 30 minutes travel time. This measurement reflects United Hospital Fund statistics on the number of primary care doctor FTEs per 100,000 residents.[71] United Hospital Fund calculated this using information from a New York State Department of Education survey of physicians applying for re-licensure.
- Total number of doctors within 30 minutes travel time. The source is the same as for primary care doctors.
- Number of hospitals in the neighborhood. The statistics are from the New York City Department of City Planning, as reported by Infoshare Community Data System
- Number of free-standing ambulatory care facilities in the neighborhood. The source is the same as for hospitals.
- Percentage of diabetic hospital patients who are insured. Using State Health Department's SPARCs database, we calculated the number of hospital patients who were diagnosed as having diabetes while they were in the hospital, regardless of whether that was the primary reason they were admitted to the hospital.

We then calculated the percentage with a SPARCS payer status of "self-pay," which generally means "uninsured."

We found the availability of medical care has some relationship to the number of people in a neighborhood who have diabetes, but virtually no significant relationship to whether those diabetics have excess amounts of complications.

In neighborhoods where more residents have personal doctors or there are many doctors nearby, there are fewer diabetics. The correlation coefficients are -.42 (percentage of adults with a personal doctor), -.38 (primary care doctors within 30 minutes travel time), and -.31 (total number of doctors within 30 minutes travel time). There is little or no correlation with the other measures of access – hospitals, ambulatory care facilities, and uninsured diabetics.

While access has some correlation with the number of diabetics, it has virtually no effect on excess complications. None of the correlations is statistically significant. Only one of them is close to being statistically significant (percentage with a personal doctor), but that correlation does not make sense except as sampling error (i.e., the coefficient has a positive value; if the correlation were statistically significant, it would suggest that a diabetic is more likely to develop complications if he or she had a personal doctor).[72]

The bottom line is that having access to medical care is, in itself, not enough. The doctor has to do a good job managing the patient's diabetes.

TABLE 7
Correlations Between Access To Health Care And Diabetes Rates
New York City Neighborhoods

Measure of Patients' Access To Health Care	Correlations With Diabetes Prevalence and Excess Complications (Controlling for the Diabetics' Age)	
	Prevalence	Excess Complications
Percentage of adults who have a personal doctor	-.42	.27
Primary care doctors within 30 minutes travel time	-.38	-.11
Total number of doctors within 30 minutes travel time	-.31	-.11
Number of hospitals in the neighborhood	-.22	.20
Number of free standing ambulatory care facilities in the neighborhood	-.01	.08
Percentage of diabetic hospital patients who are uninsured	.05	-.06

Finding 7: The Main Reason Some Neighborhoods Have Excess Complications Is That Their Residents Receive Less Effective Health Care

There is no direct way to measure the quality of care for a neighborhood as a whole.[73] However, one measure that health analysts regularly use for comparing neighborhoods is the "Ambulatory Care Sensitive" (ACS) index,[74] which reflects the hospitalization rates for conditions that can be handled in the community if the care is effective.[75] For these conditions, effective care can keep someone out of the hospital by preventing the onset of the illness or condition, by controlling an acute episode of the illness, or by managing

a chronic disease or condition. The failure to prevent unnecessary hospitalizations reflects poor care. The next table, Table 8, ranks New York City neighborhoods by their score on the ACS index.

TABLE 8
Total ACS Hospital Admissions per 100,000 Population
New York City Neighborhoods

Variation From Average	Neighborhood Ranked In Order of Decreasing Number of Admissions	Admissions Rate	Percentage Above/ Below Average Admissions Rate
More Than 50% Higher Than Average Neighborhood	Williamsburg - Bushwick	2,357	134%
	East Harlem	2,214	120%
	Crotona - Tremont	1,977	97%
	High Bridge - Morrisania	1,947	94%
	Hunts Point - Mott Haven	1,837	83%
	East New York	1,672	66%
	Bedford Stuyvesant - Crown Hts	1,650	64%
	Central Harlem - Morningside Hts	1,567	56%
10% to 50% Higher Than Average Neighborhood	Fordham - Bronx Park	1,421	41%
	Port Richmond	1,378	37%
	Stapleton - St. George	1,281	27%
	Jamaica	1,259	25%
	Rockaway	1,255	25%
	Pelham - Throgs Neck	1,185	18%
Within 10% of The Average	East Flatbush - Flatbush	1,038	3%
	Downtown Bklyn - Bklyn Hts - Park Slope	1,008	0%
	Average: All Neighborhoods	***1,006***	***0%***
	Sunset Park	920	-9%
	Northeast Bronx	915	-9%
10% to 50% Lower Than Average Neighborhood	Washington Hts - Inwood	888	-12%
	Southwest Queens	877	-13%
	Union Square - Lower East Side	834	-17%
	Greenpoint	791	-21%
	Canarsie - Flatlands	789	-22%
	Southeast Queens	781	-22%
	Kingsbridge - Riverdale	769	-24%
	Coney Island - Sheepshead Bay	747	-26%
	Chelsea - Clinton	739	-27%
	Willowbrook	693	-31%
	West Queens	687	-32%
	Ridgewood - Forest Hills	682	-32%
	Long Island City - Astoria	676	-33%
	South Beach - Tottenville	663	-34%
	Lower Manhattan	584	-42%
	Fresh Meadows	566	-44%
	Bensonhurst - Bay Ridge	543	-46%
	Flushing - Clearview	501	-50%
	Borough Park	499	-50%
More Than 50% Lower Than Average Neighborhood	Gramercy Park - Murray Hill	486	-52%
	Upper West Side	463	-54%
	Bayside - Little Neck	397	-61%
	Upper East Side	385	-62%
	Greenwich Village - Soho	326	-68%

Hospitalization rates for diabetes are included in the ACS index, but diabetes is only one of the many conditions included. Table 9 shows the correlations both for the index as a whole and for some of the key components, other than diabetes.

Table 9 shows that the ACS index is highly correlated both with the number of diabetics (.65) and with excess diabetes complications (.48). There are more diabetics in the neighborhoods with poor primary and preventative care, yet when people do get diabetes, poor care also makes them more likely to develop complications. This helps explain our earlier finding that many of the neighborhoods with fewer diabetics nevertheless have higher than average levels of diabetes complications. That outcome is probably the result of poor care. Such neighborhoods would especially benefit from DOHMH providing more intensive professional education.

The correlations with the ACS index are not simply a result of the fact that diabetes hospitalizations are part of the overall index. The findings are similar when, instead of looking at the index as a whole, we look at specific components of the index that are not closely related to diabetes or the complications of diabetes. For example, the correlation between excess complications and hospitalizations for an ear condition called otitis media is .52, the correlation with chronic obstructive pulmonary disease hospitalizations is .51 and the correlation with adult pneumonia hospitalizations is .58.

Of all the factors measured in this study, the factor that has the biggest effect on whether diabetics develop complications is the quality of primary and preventative care, as reflected in the Ambulatory Care Sensitive index. New York City's diabetics do not need simply more health care, but better health care.

TABLE 9
Effect of High Quality Primary and Preventative Care
New York City Neighborhoods

Ambulatory Care Sensitive Index And Its Components	Correlations With Diabetes Prevalence and Excess Complications (Controlling for the Diabetics' Age)	
	Prevalence	Excess Complications
All ambulatory care sensitive conditions	*.65*	*.48*
Adult bronchitis/asthma	.67	.20
Adult otitis media/URI	.31	.52
Adult pneumonias	.20	.58
Chronic obstructive pulmonary disease	.10	.51
Congestive heart failure	.63	.38
Hypertension	.61	.47
Kidney/urinary tract infection	.55	.40
Renal failure and dialysis	.62	.34
Respiratory infections/inflammations	-.03	.30

Recommendations

Recommendation 1:

DOHMH should identify the specific health facilities and providers that provide the majority of ambulatory care to people who live in Stapleton-St.George, Willowbrook, East Harlem, Flushing-Clearview, Central Harlem-Morningside Heights, Williamsburg-Bushwick, Port Richmond, Jamaica and Bedford Stuyvesant-Crown Heights – the nine neighborhoods identified in Table 4 as having many more diabetes complications than expected.

Recommendation 2:

With the assistance of the State Health Department, DOHMH should conduct special quality assurance studies and other appropriate analyses of those providers' diabetes management practices.

Recommendation 3:

If justified by the results of such studies, DOHMH should expand the amount of professional education about diabetes management in those areas – for example, through participation in hospital "grand rounds."

Recommendation 4:

DOHMH should not use diabetes prevalence, hospitalizations or mortality by themselves as measures of where to focus public health campaigns concerning diabetes management. The agency should also take into account where the number of people who develop diabetes complications is out of proportion to the number of diabetics and use this information as an indicator of possible deficiencies in disease management, particularly when designing campaigns for educating health professionals. Of course, it is important to note that the neighborhood statistics only measure <u>possible</u> deficiencies. They can help DOHMH target follow-up efforts, but they are not proof of <u>actual</u> deficiencies.

Recommendation 5:

In designing future community health surveys, DOHMH should ask interviewees additional questions about the development of diabetes complications and use this information to examine further the issue of why diabetics who live in some neighborhoods are more likely to develop complications than diabetics who live in other neighborhoods. One of the limitations of this report is that our findings about this issue are based on neighborhood level information even when it would have been preferable to use information about individuals, since that was the only data available to us. For example, in examining the effect of being uninsured on whether a diabetic develops complications, we did not look at individual uninsured New Yorkers, but rather at an aggregate measure – the percentage of neighborhood residents who are uninsured. Our findings would

have been stronger if we had had all the appropriate information on individuals. DOHMH should add the appropriate questions to future Community Health Surveys and make the underlying data publicly available.

Recommendation 6:

As appropriate, DOHMH should use the methodology set forth in this report to look at complications from other chronic diseases, for example, cancer and heart disease.

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[1] Marc L. Berk and Alan C. Monheit, "The Concentration of Health Care Expenditures, Revisited," Health Affairs, March/April 2001, page 12.
[2] Ashley Short, Glen Mays and Jessica Miller, "Disease Management: A Leap of Faith to Lower-Cost, Higher Quality Health Care", Center for Studying Health Systems Change, *Issue Brief*, October 2003.
[3] New York State Department of Health, "Diabetes Prevalence and Care in New York State," *Behavioral Risk Factor Surveillance System Newsletter*, Winter 1997, page 2.
[4] New York City Department of Health and Mental Hygiene, *City Health Information*, May 2003, "Diabetes Prevention and Management," page 1.
[5] New York City Department of Health and Mental Hygiene, *Health Disparities in New York City*, July 2004, page 15.
[6] New York City Department of Health and Mental Hygiene*, Take Care New York: A Policy for a Healthier New York City*, March 2004, page 29.
[7] 19.2%, according to New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, January 2003, "Diabetes is Epidemic," page 1. The statistic is based on interviews that asked people whether a doctor has ever told them that they have diabetes.
[8] New York City Department of Health and Mental Hygiene*, NYC Vital Signs*, March 2004, "New Yorkers Without Health Care Coverage Are Not Getting the Care They Need," page 3.
[9] Information obtained from HHC Office of Corporate Planning and HIV Services, based on patient data from FY 2002.
[10] American Diabetes Association, Uncomplicated Guide to Diabetes Complications, Alexandria, Virginia: American Diabetes Association, 2002, pages 85-86.
[11] New York City Department of Health and Mental Hygiene, *City Health Information*, May 2003, "Diabetes Prevention and Management," page 1.
[12] American Diabetes Association, Uncomplicated Guide to Diabetes Complications, Alexandria, Virginia: American Diabetes Association, 2002.
[13] Evidence is presented later in the report, mainly in the section called "Background."
[14] Joel Zonszein, M.D., Director, Clinical Diabetes Center, Albert Einstein College of Medicine, Testimony Before New York City Council Health Committee, January 12, 1996.
[15] New York City Department of Health and Mental Hygiene*, Take Care New York: A Policy for a Healthier New York City*, March 2004, pages 18 and 29.
[16]For example, New York City New York City Department of Health and Mental Hygiene, *City Health Information*, May 2003, "Diabetes Prevention and Management."
[17] Neighborhood health profiles are posted on the agency's web site.
[18] New York City Department of Health and Mental Hygiene, Web Site, "Fact Sheet on the District Health Program" (Document dated July 2003).
[19] New York City Department of Health and Mental Hygiene: "Fact Sheet on Diabetes" (web site) and articles on diabetes in the November 2003 issue of *Health and Mental Health News* and the January 2003 issue of *NYC Vital Signs*.
[20] New York City Department of Health and Mental Hygiene, *Health and Mental Health News*, November 2003, "Health Alert: Diabetes is Epidemic, But It Can Be Prevented And Controlled," page 1.
[21] In Type 1 diabetes (formerly known as "juvenile-onset diabetes"), the body can not make enough insulin itself. To survive, Type 1 diabetics need to take several insulin shots a day. Type 1 occurs most often in children and young adults.
[22] New York City Department of Health and Mental Hygiene*, Take Care New York: A Policy for a Healthier New York City*, March 2004, page 58.
[23] New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, January 2003, "Diabetes is Epidemic," page 3.

[24] New York City Department of Health and Mental Hygiene, *City Health Information*, May 2003, "Diabetes Prevention and Management," page 1.
[25] New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, January 2003, "Diabetes is Epidemic," page 2.
[26] New York City Department of Health and Mental Hygiene, *Take Care New York*, *A Policy for a Healthier New York City* March 2004, page 15.
[27] New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, July 2003, "One in 6 New Yorker City Adults Is Obese," page 2. They are also less likely to be insured.
[28] Both statistics are based on the Comptroller's Office analysis of the State Health Department's "SPARCS" database. We will discuss that database in the "Methodology" section. The first statistic is from the "primary diagnosis" field. The second was developed by examining whether there was a diabetes code in any of the diagnosis fields.
[29] New York City Department of Health and Mental Hygiene, Summary of Vital Statistics, 2002.
[30] American Diabetes Association web site.
[31] Ischemic stroke. American Diabetes Association, Uncomplicated Guide to Diabetes Complications, Alexandria, Virginia: American Diabetes Association, 2002, pages 97-99.
[32] American Diabetes Association, Uncomplicated Guide to Diabetes Complications, Alexandria, Virginia: American Diabetes Association, 2002, page 148.
[33] American Diabetes Association, Uncomplicated Guide to Diabetes Complications, Alexandria, Virginia: American Diabetes Association, 2002, page 128.
[34] Joel Zonszein, M.D., Director, Clinical Diabetes Center, Albert Einstein College of Medicine, Testimony Before New York City Council Health Committee, January 12, 1996.
[35] New York State Department of Health, Diabetes Program Web Page, November 28, 2003. In this context, "non-traumatic" means that the amputation is not the result of a physical injury like a car accident.
[36]New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, January 2003, "Diabetes is Epidemic." Page 1. The January 2003 issue of the journal *Diabetes Care* contains detailed information on the established medical guidelines and the basis for those guidelines. The expert consensus is also summarized in documents issued by the National Diabetes Education Program, which is a joint project of the National Institutes on Health and the Centers for Disease Control and Prevention ("Diabetes Overview Fact Sheet" and "National Diabetes Fact Sheet").
[37] American Diabetes Association, Complete Guide to Diabetes, Alexandria, Virginia: American Diabetes Association, 2002, pages 89-91.
[38] American Diabetes Association "Implications of the United Kingdom Prospective Diabetes Study, *Diabetes Care*, 2003, Volume 26, pages S28-S32.
[39] New York City Department of Health and Mental Hygiene, *City Health Information*, May 2003, "Diabetes Prevention and Management," page 2.
[40] U.S. Centers for Disease Control and Prevention, "National Diabetes Fact Sheet: National estimates and general information on diabetes in the United States (1997)."
[41] American Diabetes Association "Implications of the United Kingdom Prospective Diabetes Study, *Diabetes Care*, 2003, Volume 26, pages S28-S32.
[42] New York City Department of Health and Mental Hygiene, *City Health Information*, May 2003, "Diabetes Prevention and Management," page 2.
[43] New York City Department of Health and Mental Hygiene, January 25, 2003 Press Release.
[44] American Diabetes Association, Complete Guide to Diabetes, Alexandria, Virginia: American Diabetes Association, 2002, pages 136-173.
[45] U.S. Centers for Disease Control and Prevention, "National Diabetes Fact Sheet: National estimates and general information on diabetes in the United States (1997)."
[46] Except where otherwise noted, the New York City statistics are from New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, January 2003, "Diabetes is Epidemic" or New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, August 2003, "The State of New York City's Health."
[47] New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, January 2003, "Diabetes is Epidemic," page 3.
[48] New York City Department of Health and Mental Hygiene, January 25, 2003 Press Release.
[49] Bronx Health REACH (Racial and Ethnic Approaches to Community Health), Report by Charmaine Ruddock, 2003.
[50] Dean Schillinger, M.D., *et al, "*Association of Health Literacy With Diabetes Outcomes*,"* *Journal of the American Medical Association*, July 24/31, 2002, pages 475-482.

[51] Dean Schillinger, M.D., *et al, "*Association of Health Literacy With Diabetes Outcomes*,"* *Journal of the American Medical Association*, July 24/31, 2002, pages 475-482. The study statistically controlled for various factors that might confound the result, like education, income, and age.
[52] Dean Schillinger, M.D., *et al, "Closing the Loop: Physician Community With Diabetic Patients Who Have Low Health Literacy,*" *Archives of Internal Medicine*, January 13,, 2003, pages 83-90.
[53] October 20, 2003 e-mail from Adam Karpati, MD to Barry Skura. Dr. Karpati was in charge of producing the most recent DOHMH neighborhood profiles.
[54] New York City Department of Health and Mental Hygiene, *NYC Vital Signs*, January 2003, "Diabetes is Epidemic," page 1.
[55] New York City Department of Health and Mental Health Web Site, "NYC Community Health Data: Technical Notes," November 7, 2003.
[56]The most important advice came from Dr. Arnold Saperstein (Medical Director of MetroPlus Health Plan), Dr. Terry Mahotière, MD (a diabetes expert at the Island Peer Review Organization, which performs quality assurance studies for the Medicare program), Frank Meliota (Director of Medical Records at Jacobi Hospital), and Jeanne Papamichail (Director of Health Information Systems at Elmhurst Hospital). In addition, Professor Len Rodberg of Queens College used the SPARCS system to create a database summarizing the medical records of all patients admitted to New York City hospitals in 2001 and diagnosed by the hospital as having diabetes. We used this database to create the four hospitalization measures. Appendix B contains more details.
[57] The numbers in the table are Pearson correlation coefficients. Such coefficients range in value from zero (no correlation) to 1.0 (perfect correlation). In a sample this size, a correlation of .30 or better would indicate a significant relationship between two variables.
[58] The New York City Comptroller's Office subscribes to Infoshare On-Line.
[59] The DOHMH community health link is www.ci.nyc.ny.us/html/doh/html/browse/browse-community.html. The link to United Hospital Fund web site is www.uhfnyc.org.
[60] See methodology section and Appendix B.
[61] Details on the age adjustment are in methodology section and in Appendix B.
[62] In later tables, we will also take into account the age of the hospital patients who have been diagnosed by the hospital as having diabetes, in order to make our reasoning more "complete." However, this does not make any practical difference in our findings.
[63]Statisticians refer to such differences as "standardized residuals."
[64]The age of the diabetics was measured by the percentage of 65 years of age or older. We estimated this from the State Health Department's "SPARCS" database. Using "SPARCS," we counted the number of 2001 hospital admissions in which the patient was diagnosed as having diabetes, regardless of whether that was the primary reason the patient was hospitalized. For each neighborhood, we counted the number that were 65 years of age or older, and divided that by the total number of diabetics who were hospitalized. In addition, we also took into account the age composition of the neighborhood as a whole. As discussed in "Research Methods" and Appendix B, that adjustment was part of the original calculation of diabetes rates. We did both age adjustments – neighborhood as a whole and just the diabetes patients – for completeness. But, for practical purposes, the results would have been essentially the same if we had only adjusted for the age composition of all neighborhood residents and not also the age of the residents who are diabetic.
[65] U.S. Centers for Disease Control and Prevention, "The Burden of Chronic Diseases and Their Risk Factors: National and State Perspectives, 2001."
[66] For example, Margaret V. Davis, Program Manager, Downstate Region of New York State Affiliate of the American Diabetes Association, Testimony to New York City Council Health Committee, January 11, 1996; and The Institute For Urban Family Health, Review of the Literature for Bronx CDC REACH 2010 Project (Neil S. Calman, M.D., Principal Investigator), January 2001.
[67] The neighborhood traits addressed in Tables 9 and 10 (obesity, lack of exercise, smoking and perception of ones own general health) are from the City Health Department's Community Health Survey and are reported on the agency's web site. DOH adjusted each neighborhood's percentages to the 2000 U.S. standard age distribution.
[68]*New York Times*, January 25, 2003, "New York Facing Epidemic of Diabetes, Health Officials Say."
[69] American Diabetes Association, Complete Guide to Diabetes, Alexandria, Virginia: American Diabetes Association, 2002, pages 295-296.
[70]As in other instances, DOHMH adjusted each neighborhood's percentage to the 2000 U.S. standard age distribution.
[71]United Hospital Fund, *New York City Community Health Atlas, 2002*.

[72] If significant, the correlation between excess complications and percent with personal doctors might mean one of two things. One possibility would be that diabetics are more likely to have complications when they have a personal doctor – which makes no sense. It might also mean that people with more complications need to see a doctor more often, and, for that reason, consider some doctors their personal doctors.

[73]The way to measure the quality of care directly is generally by having a doctor or nurse review patient medical records. The record reviews typically evaluate whether the health care provider followed clinical guidelines – for example, whether appropriate diagnostic tests were performed. However, much of this data is not publicly available. The data that is publicly available (e.g., "report cards" dealing with the quality of care provided by specific managed care plans) is not available in a form that would be appropriate to use in measuring the overall quality of care for all residents of particular neighborhoods.

[74]The index was developed primarily by Professor John Billings of New York University.

[75] Physician experts selected the conditions.

Appendix A
Names of United Hospital Fund (UHF) Neighborhoods, Listed By Both UHF Name and City Health Department Name

United Hospital Fund Neighborhood	City Health Department Name For The Same Zip Codes
Bayside - Little Neck	Northeast Queens
Bedford Stuyvesant - Crown Hts	Central Brooklyn
Bensonhurst - Bay Ridge	Southwest Brooklyn
Borough Park	Borough Park
Canarsie - Flatlands	Canarsie and Flatlands
Central Harlem - Morningside Hts	Central Harlem
Chelsea - Clinton	Chelsea and Clinton
Coney Island - Sheepshead Bay	Southern Brooklyn
Crotona - Tremont	Central Bronx
Downtown Bklyn - Bklyn Hts - Park Slope	Northwest Brooklyn
East Flatbush - Flatbush	Flatbush
East Harlem	East Harlem
East New York	East New York and New Lots
Flushing - Clearview	North Queens
Fordham - Bronx Park	Fordham and Bronx Park
Fresh Meadows	Central Queens
Gramercy Park - Murray Hill	Gramercy Parl and Murray Hill
Greenpoint	Greenpoint
Greenwich Village - Soho	Greenwich Village - Soho
High Bridge - Morrisania	High Bridge and Morrisania
Hunts Point - Mott Haven	Hunts Point and Mott Haven
Jamaica	Jamaica
Kingsbridge - Riverdale	Kingsbridge - Riverdale
Long Island City - Astoria	Northwest Queens
Lower Manhattan	Lower Manhattan
Northeast Bronx	Northeast Bronx
Pelham - Throgs Neck	Southeast Bronx
Port Richmond	Port Richmond
Ridgewood - Forest Hills	West Central Queens
Rockaway	Rockaways
South Beach - Tottenville	The South Shore
Southeast Queens	Southeast Queens
Southwest Queens	Southwest Queens
Stapleton - St. George	Stapleton and St.George
Sunset Park	Sunset Park
Union Square - Lower East Side	Lower East Side
Upper East Side	Upper East Side
Upper West Side	Upper West Side
Washington Hts - Inwood	Inwood and Washington Heights
West Queens	West Queens
Williamsburg - Bushwick	Bushwick and Williamsburg
Willowbrook	Mid-Island

Appendix B
Construction of Index of Diabetes Complications

We used a technique called factor analysis to combine five complications measures into a single composite index. This appendix describes how we constructed each of the five components and combined them through factor analysis.

Components of Complications Index

One of the components is the neighborhood's diabetes mortality rate. Our source is the New York City Department of Health and Mental Hygiene (DOHMH). Based on its analysis of death certificates, DOHMH determined the primary cause of each death and where the person last resided. DOHMH counted how often residents of each neighborhood died primarily because of diabetes and then divided that number by the number of residents, expressed as the rate per 100,000 residents. DOHMH then adjusted the numbers so that they show what the rate would be if each neighborhood had the same percentage of older and younger residents.[1] This is the age adjusted mortality rate.

The other four components deal with hospitalizations. Our source is a State Health Department database, the Statewide Planning and Research Cooperative System ("SPARCS"). SPARCS summarizes the medical records of all patients discharged from New York State hospitals. The summary includes what the hospital saw as the reason the patient was hospitalized on each specific occasion (e.g., the patient had a heart attack or went into diabetic coma).[2] It also summarizes the patients' other medical conditions (which may or may not have anything to do with why the patient was admitted that time) and the procedures that the hospital performed (e.g., leg amputation).

Using SPARCS, Queens College Professor Len Rodberg created a diabetes database for us to use in our analysis.[3] The database contains information from the medical records of all patients admitted to New York City hospitals in 2001 and diagnosed by the hospital as having diabetes. This includes both the patients who were admitted on a particular occasion primarily because of their diabetes and those who were diagnosed by the hospital as having diabetes, but admitted on that particular occasion primarily for other reasons.[4]

SPARCS indicates the zip code in which each patient lives. We identified the United Hospital Fund neighborhood into which each zip code fell. Based on this

[1] In technical terms, DOHMH's age adjustment involved standardizing each neighborhood's age distribution on the 2000 age distribution of the country as a whole.
[2] SPARCS calls this the primary diagnosis field.
[3] Professor Rodberg operates the Infoshare Community Data System, which includes most publicly available sources of information on New York City neighborhoods. The City Comptroller's Office subscribes to Infoshare Online (www.infoshare.org).
[4] In SPARCS terminology, we sampled all hospitalizations where there was an ICD 9 of 250 code in either the primary diagnosis field or in any of the additional diagnoses fields.

information, we tallied the frequency with which diabetics from each neighborhood were hospitalized for various reasons, and the procedures that were performed on them once they were hospitalized.

After consulting with various medical experts,[5] we used the hospitalization data to develop four measures of the level of diabetes complications in each neighborhood:

1. Frequency With Which Neighborhood Residents Were Admitted To A Hospital Primarily For Treatment of Their Diabetes

The number of hospital admissions where diabetes was the primary reason for the hospitalization,[6] per 100,000 population.

2. Frequency With Which Neighborhood Residents Developed Chronic Complications of Diabetes

The number of hospital admissions in which doctors diagnosed the patient as having diabetes with kidney, nerve, eye, or peripheral circulatory (flow of blood through blood vessels) manifestations,[7] per 100,000 population.

3. Frequency With Which Neighborhood Residents Experienced Comas and Other Acute Complications of Diabetes

The number of hospital admissions in which doctors diagnosed the patient as having diabetes with ketotic or hyperosmolar comas or with other acute diabetic conditions, such as hypoglycemic shock,[8] per 100,000 population.

4. Frequency With Which Neighborhood Residents Had Diabetes Related Amputations And Other Procedures Related To Severe, Inadequately Controlled Diabetes

The number of hospital admissions in which one of the following procedures were performed, per 100,000 population.

- Amputations or bypasses on the legs of patients who had been diagnosed as having diabetes with peripheral circulatory complications.[9]
- Kidney dialysis of patients who had been diagnosed as diabetes with renal complications[10]

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[5]The key sources were: Dr. Arnold Saperstein (Medical Director of MetroPlus Health Plan), Dr. Terry Mahotière, MD (a diabetes expert at the Island Peer Review Organization, which performs quality assurance studies for the Medicare program), Frank Meliota (director of Medical records at Jacobi Hospital), and Jeanne Papamichail (Director of Health Information Systems at Elmhurst Hospital).

[6]In SPARCS terminology, a primary diagnosis with an ICD 9 code of "250".

[7] ICD 9 code of 250.4, 250.5, 250.6 or 250.7 in any diagnosis field.

[8] ICD 9 code of 250.1, 250.2, 250.3 or 250.8 in any diagnosis field.

[9] Has both a diagnosis of diabetes with peripheral circulatory manifestations (ICD 9 code of 250.7) in any diagnosis field and also a procedure code of 84.01 to 84.17 (amputations—mostly toe, foot, below knee, above knee), or 39.29 (peripheral vascular shunt or bypass) in any procedure field.

[10] Has both a diagnosis of diabetes with renal manifestations in any diagnosis field (ICD 9 code of 250.4) and also a procedure code of 39.95 (renal dialysis) in any procedure field.

- Skin ulcer removal on patients who had been diagnosed as having diabetes with neurological or peripheral circulatory complications.[11]

After we constructed the four measures related to hospitalizations, we adjusted each neighborhood's score to take into account the number of elderly people in that neighborhood (elderly diabetics are more likely to have complications simple because they have had the disease longer). We did this by statistical regressions, in which we regressed each measure on the percentage of residents aged 65 or older. The age-adjusted scores were used in our factor analysis. [12]

Combining the Composite Measures into A Single Index

The factor analysis showed that five measures are so highly correlated with each other that they could be summarized by a single composite index ranging in value from –1.76 to +2.33. For ease of use, we added 1.76 to each score, so that the lowest score is zero, and the highest 4.09..The correlation coefficients are shown in the body of the report in the table entitled "Index of Diabetes Complications."

[11] Has both a diagnosis of diabetes with peripheral circulatory (250.7) or neurological (250.6) manifestations in any diagnosis field and also an ICD 9 code of 86.22 (Removal by excision of devitalized tissue, slough, or necrosis – lesions -- from a wound or infection) in any procedure field.

[12] In technical terms, the resulting values are called "residuals" – the score above or below what would have been predicted solely on the basis of the percentage of elderly people in the neighborhood.

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