Variability of High Blood Sugar Levels among Adults with Diabetes in New York City, 2006-2015

Diabetes causes elevated blood sugar levels.[1] Experiencing frequent high blood sugar levels over time can lead to organ damage, increasing the risk of complications such as kidney failure, blindness and lower extremity amputation.[2] Persons with diabetes are also at increased risk for cardiovascular disease (CVD).[2] Modification of diet and exercise as well as medication management are essential for improving blood sugar control and CVD risk factors to prevent these complications.[2]

An A1C test reflects average blood sugar levels over the past three months.[3] Current guidelines recommend that non-pregnant adults with diabetes maintain their A1C level at less than 7%, although for some individuals a higher treatment target may be appropriate.[2] The risk for complications rises with higher A1C levels, and the National Committee for Quality Assurance defines poor control of A1C as an A1C greater than 9%.

Prior analyses[4,5] from the New York City (NYC) Health Department have examined the prevalence of high blood sugar levels cross-sectionally. However, an individual's blood sugar levels can vary over time. This report focuses on the prevalence of persons with long-term high blood sugar, which has not been previously reported. This brief presents data on 311,775 adults with diabetes who had A1C test results over a period of at least seven years that were reported to the NYC A1C Registry during 2006-2015.

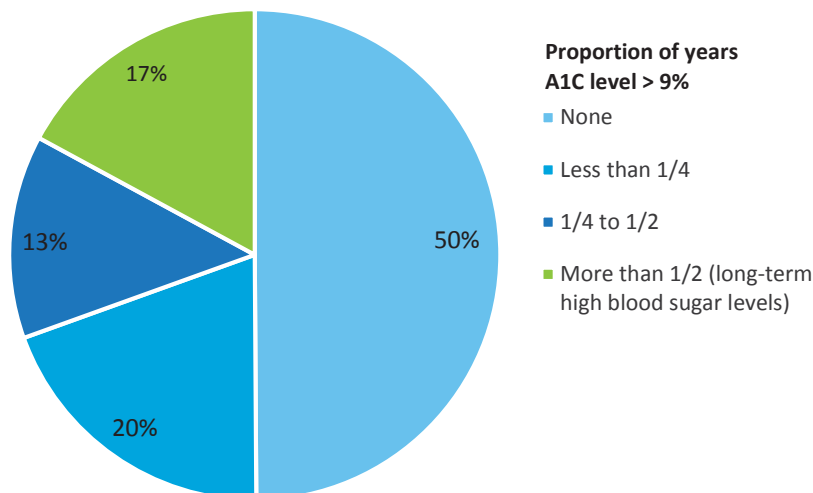**Definitions:**

High blood sugar level:
Any A1C test result greater than 9% was considered a high blood sugar level. This corresponds to an average blood sugar over 212 mg/dl.[2,3]

Long-term high blood sugar levels were defined as persons having at least one reported A1C result greater than 9% in more than half of the years the person had results in the Registry from 2006-2015. This definition was selected over presenting the proportion of all results greater than 9% to control for increased testing frequencies recommended for persons not meeting blood sugar targets.

Neighborhood: The United Hospital Fund classifies New York City into 42 neighborhoods, comprised of contiguous ZIP codes. For more information visit: nyc.gov/assets/doh/downloads/pdf/ah/zipcodetable.pdf

Over a ten-year period, half of adults with diabetes experienced high blood sugar levels

Percentage of adults with diabetes by proportion of years with high blood sugar levels, New York City, 2006-2015^

Proportion of years A1C level > 9%
- None
- Less than 1/4
- 1/4 to 1/2
- More than 1/2 (long-term high blood sugar levels)

^Data are limited to adults with diabetes who received an A1C test; high blood sugar defined as A1C > 9%
Source: New York City A1C Registry, 2006-2015, crude estimates

- Among adults with an A1C result reported to the Registry, nearly one in three adults (30%) had an A1C greater than 9% in at least one-quarter of the years of test results.
- Over one in six adults (17%) experienced long-term high blood sugar levels
- Younger adults, ages 18 to 44, were three times more likely to experience long-term high blood sugar levels compared with older adults, ages 65 and older (36% vs. 11%).
- Among adults who had at least one A1C greater than 9%, 7% (more than one in 15) had high blood sugar in every year they had test results.
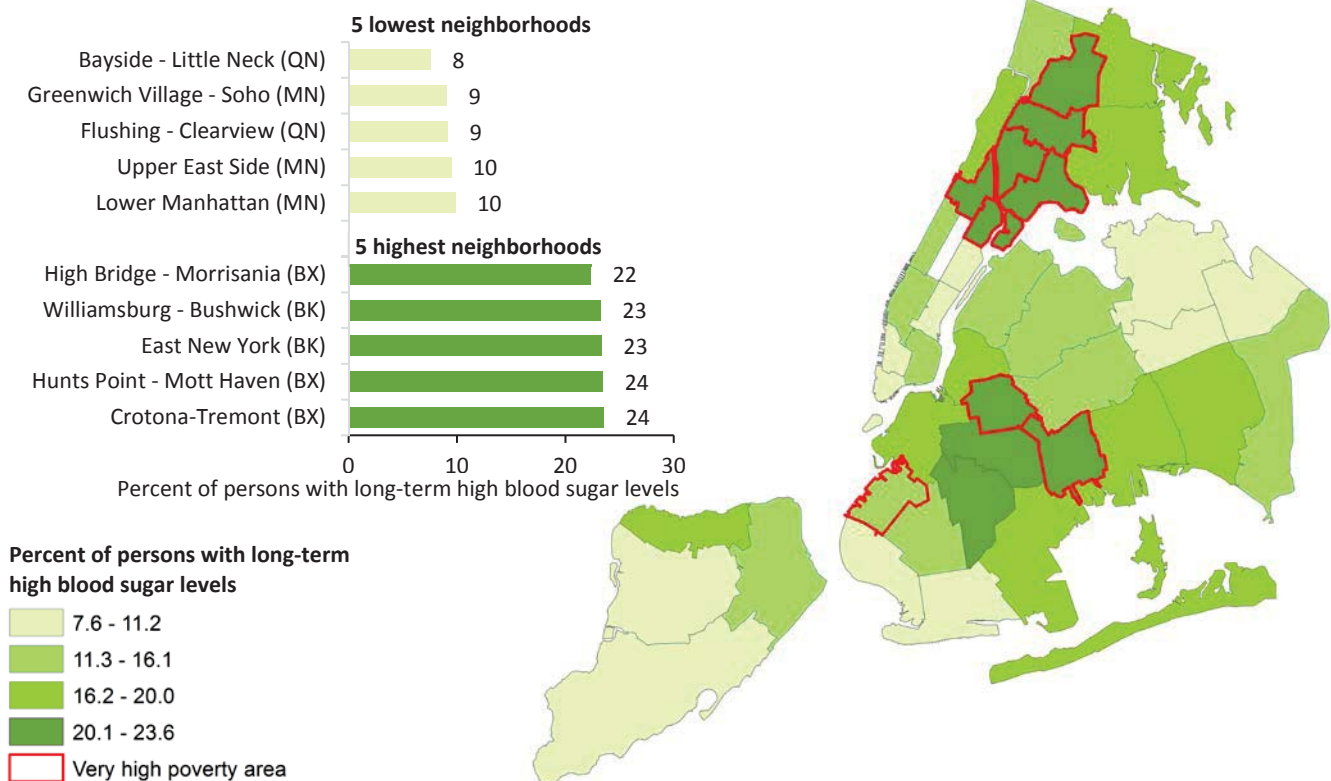
The prevalence of long-term high blood sugar levels differed by neighborhood poverty

- Residents of very high poverty neighborhoods (defined as neighborhoods with more than 30% of the population living below the Federal Poverty Level (FPL)) were nearly two times more likely to experience long-term high blood sugar levels compared with persons living in the most affluent neighborhoods (defined as neighborhoods with less than 10% of the population living below the FPL) (22% vs. 12%).

- In ten NYC neighborhoods (the Bronx: Fordham-Bronx Park, Crotona-Tremont, High Bridge-Morrisania, Hunts Point-Mott Haven; Brooklyn: Bedford Stuyvesant-Crown Heights, East New York, East Flatbush-Flatbush, Williamsburg-Bushwick; Manhattan: Central Harlem-Morningside Heights, East Harlem) more than one in five residents with diabetes experienced long-term high blood sugar levels, and these neighborhoods accounted for nearly 40% of the total population experiencing long-term high blood sugar levels.

- Citywide prevalence of long-term high blood sugar levels among adults with diabetes ranged from 8% in Bayside – Little Neck, Queens to 24% in Crotona-Tremont and Hunts Point-Mott Haven, the Bronx.

Prevalence of long-term high blood sugar levels among adults with diabetes, by United Hospital Fund neighborhood, New York City, 2006-2015^

5 lowest neighborhoods

Neighborhood	Value
Bayside - Little Neck (QN)	8
Greenwich Village - Soho (MN)	9
Flushing - Clearview (QN)	9
Upper East Side (MN)	10
Lower Manhattan (MN)	10

5 highest neighborhoods

Neighborhood	Value
High Bridge - Morrisania (BX)	22
Williamsburg - Bushwick (BK)	23
East New York (BK)	23
Hunts Point - Mott Haven (BX)	24
Crotona-Tremont (BX)	24

Percent of persons with long-term high blood sugar levels

Percent of persons with long-term high blood sugar levels

- 7.6 - 11.2
- 11.3 - 16.1
- 16.2 - 20.0
- 20.1 - 23.6
- Very high poverty area

^Data are limited to adults with diabetes who received an A1C test; high blood sugar defined as A1C > 9%
BX=the Bronx; BK=Brooklyn; MN=Manhattan; QN=Queens
The United Hospital Fund classifies New York City into 42 neighborhoods, comprised of contiguous ZIP codes. For more information visit:
nyc.gov/assets/doh/downloads/pdf/ah/zipcodetable.pdf
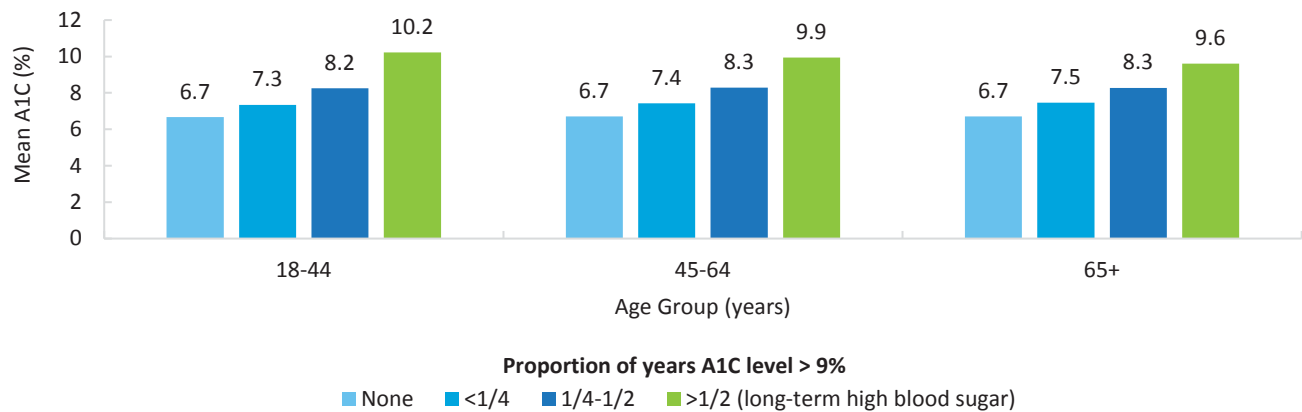*Source: New York City A1C Registry, 2006-2015, crude estimates*

Data Source:
The New York City A1C Registry (Registry) was created in 2006 and contains A1C tests sent to clinical laboratories for NYC residents. All data presented in this report are limited to NYC adults ages 18 and older at the time of their first reported result in the Registry and who had diabetes, defined as at least two A1C test values of 6.5% or greater at any point in time since inception of the Registry in 2006 through 2015. This definition utilizes the American Diabetes Association-recommended A1C cut-point of 6.5% for diabetes diagnosis since the Registry does not contain diagnosis codes.

Average blood sugar levels were considerably higher among persons who frequently experienced high levels (over 9%)

- Mean A1C among adults who never experienced high A1C levels was 6.7%.
- Among adults who experienced high A1C levels at least one-quarter of their years in the Registry, mean A1C over time was 9.2%.
- Among adults with long-term high blood sugar levels, mean A1C over time was 9.8%.

Mean A1C by age group and proportion of years that high blood sugar levels (A1C > 9%) were identified, New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015, crude estimates

A1C testing was not more frequent among persons experiencing long-term high blood levels

- Adults with diabetes had an average of 2.3 A1C tests per year in the Registry.
- A1C testing frequency was similar across age groups, borough of residence, and neighborhood poverty level.
- Although the American Diabetes Association guidelines suggest testing as frequently as every three months (four tests per year) for persons that have poor blood sugar control[2], one in three adults (33%) with long-term high blood sugar levels averaged fewer than two tests per year.

References:
1 U.S. National Library of Medicine. Diabetes. MedlinePlus. medlineplus.gov/diabetes.html. Accessed July 17, 2017.
2 American Diabetes Association. Standards of Medical Care in Diabetes – 2017. *Diabetes Care*. 2017;40(suppl 1):S1-135.
3 National Institutes of Diabetes and Digestive and Kidney Diseases. U.S. Department of Health and Human Services, National Institutes of Health, NIH Publication No 14-7816, March 2014. niddk.nih.gov/health-information/diabetes/overview/tests-diagnosis/a1c-test. Accessed October 17, 2017.
4 Chamany S, Wu W, Parton H. Diabetes and Its Complications. New York City Department of Health and Mental Hygiene: Epi Data Brief (36); November 2013.
5 Chamany S, Jiang Q, Wu W. Trends in Blood Sugar Control among Adults with Diabetes in New York City, 2006-2012. New York City Department of Health and Mental Hygiene: Epi Data Brief (53); January 2015.

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New York City Department of Health and Mental Hygiene

Epi Data Tables

Variability of High Blood Sugar Levels among Adults with Diabetes in New York City, 2006-2015

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	Data Source

The New York City A1C Registry (Registry) was created in 2006 and contains A1C tests sent to clinical laboratories for NYC residents. All data presented in this report are limited to NYC adults ages 18 and older at the time of their first reported result in the Registry and who had at least two A1C test values of 6.5% or greater at any point in time since inception of the Registry in 2006 through 2015. This definition utilizes the American Diabetes Association-recommended A1C cut-point of 6.5% for diabetes diagnosis since the Registry does not contain diagnosis codes.

Table 1. Demographic characteristics of persons with diabetes with at least seven years of A1C results by proportion of years with high blood sugar levels[1,2], New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015; restricted to NYC residents ages 18 and older at the time of entering the Registry

	Numbers of persons by proportion of years with high blood sugar levels				Percent of persons by proportion of years with high blood sugar levels			
	No years with high blood sugar levels	Less than 1/4 of years with high blood sugar levels	1/4 to 1/2 of years with high blood sugar levels	More than 1/2 of years with high blood sugar levels	No years with high blood sugar levels	Less than 1/4 of years with high blood sugar levels	1/4 to 1/2 of years with high blood sugar levels	More than 1/2 of years with high blood sugar levels
Total	155,706	60,986	41,825	53,258	50	20	13	17
Age group[3]								
18-44	3,840	2,279	2,221	4,719	29	18	17	36
45-64	49,338	24,653	19,523	29,024	40	20	16	24
65+	102,528	34,054	20,081	19,515	58	19	11	11
Borough of residence[3,4]								
Bronx	27,390	13,799	10,374	13,728	42	21	16	21
Brooklyn	45,648	17,850	12,325	16,637	49	19	13	18
Manhattan	22,725	8,435	5,627	7,063	52	19	13	16
Queens	48,759	17,005	11,192	13,291	54	19	12	15
Staten Island	11,024	3,836	2,246	2,476	56	20	12	13
Sex[3,5]								
Female	92,377	32,193	21,700	28,328	53	18	12	16
Male	63,066	28,702	20,041	24,839	46	21	15	18
Neighborhood poverty[3,6,7]								
30 to <100% (very high poverty)	31,161	15,216	11,444	16,266	42	21	15	22
20 to <30% (high poverty)	40,685	16,192	11,477	14,775	49	20	14	18
10 to <20% (medium poverty)	58,171	21,297	14,038	16,951	53	19	13	15
0 to <10% (low poverty)	25,154	8,086	4,722	5,093	58	19	11	12

Numbers and percents above are calculated from the registrants reported to the A1C Registry with likely diabetes who had at least two A1C test values ≥ 6.5% between 2006 and 2015, and had results in the Registry for at least seven years between 2006 and 2015.

[1] Any A1C test result greater than 9% was considered a high blood sugar level.

[2] The proportion of years with high blood sugar levels is based on the number of distinct years a person had an A1C result of over 9% divided by the total number of distinct years they had an A1C result reported to the Registry between 2006 and 2015.

[3] Chi square tests are significant for all demographic variables of age group, borough of residence, sex and neighborhood poverty (all p<0.0001).

[4] For 345 people, borough of residence could not be identified.

[5] For 526 people, sex was listed as unknown, and 3 people had sex listed as other.

[6] Neighborhood poverty (zip code level) is defined as the percentage of the population living below the Federal Poverty Line (FPL) based on the American Community Survey (2011-2015). Neighborhoods are categorized into four groups as follows: "Low poverty" neighborhoods are those with <10% of the population living below the FPL; "Medium poverty" neighborhoods have 10-<20% of the population below FPL; "High Poverty" neighborhoods have 20-<30% of the population living below the FPL; "Very high poverty" neighborhoods have >=30% of the population living below the FPL.

[7] For 1,047 people, neighborhood poverty level could not be defined.

Table 2. Duration of high blood sugar levels among adults with diabetes by proportion of years with high blood sugar levels[1,2], New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015; restricted to NYC residents ages 18 and older at the time of entering the Registry

	Total number of persons	Number of years (%) with high blood sugar levels										
		0 years	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
Total	311,775	155,706 (49.9%)	42,064 (13.5%)	26,083 (8.4%)	19,725 (6.3%)	16,265 (5.2%)	14,191 (4.6%)	12,461 (4.0%)	11,400 (3.7%)	7,384 (2.3%)	4,469 (1.4%)	2,027 (1.0%)
No years in poor control												
Number of years of tests between 2006-2015												
7	44,759	44,759 (100%)										
8	38,349	38,349 (100%)										
9	36,337	36,337 (100%)										
10	36,261	36,261 (100%)										
Less than 1/4 of years with high blood sugar levels												
Number of years of tests between 2006-2015												
7	12,112		12,112 (100%)									
8	16,608		10,310 (62.1%)	6,298 (37.9%)								
9	16,358		10,083 (61.6%)	6,275 (38.4%)								
10	15,908		9,559 (60.1%)	6,349 (39.9%)								
1/4 to 1/2 of years with high blood sugar levels												
Number of years of tests between 2006-2015												
7	12,619			7,161 (56.7%)	5,458 (43.3%)							
8	8,876				4,867 (54.8%)	4,009 (45.2%)						
9	8,646				4,690 (54.2%)	3,956 (45.8%)						
10	11,684				4,710 (40.3%)	3,802 (32.5%)	3,172 (27.1%)					
More than 1/2 of years with high blood sugar levels												
Number of years of tests between 2006-2015												
7	15,566					4,498 (28.9%)	4,023 (25.8%)	3,552 (22.8%)	3,493 (22.4%)			
8	12,162						3,475 (28.6%)	3,133 (25.8%)	2,752 (22.6%)	2,802 (23.0%)		
9	14,018						3,521 (25.1%)	2,914 (20.8%)	2,655 (18.9%)	2,451 (17.5%)	2,477 (17.7%)	
10	11,512							2,862 (24.9%)	2,500 (21.7%)	2,131 (18.5%)	1,992 (17.3%)	2,027 (17.6%)

Numbers and percents above are calculated from the registrants reported to the A1C Registry with likely diabetes who had at least two A1C test values ≥ 6.5% between 2006 and 2015, and had results in the Registry for at least seven years between 2006 and 2015.

Row percentages may not sum to 100% due to rounding.

[1] Any A1C test result greater than 9% was considered a high blood sugar level.

[2] The proportion of years with high blood sugar levels is based on the number of distinct years a person had an A1C result of over 9% divided by the total number of distinct years they had an A1C result reported to the Registry between 2006 and 2015.

Table 3. Prevalence of long-term high blood sugar levels,[1,2] by United Hospital Fund neighborhood[3], New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015; restricted to NYC residents ages 18 and older at the time of entering the Registry

United Hospital Fund neighborhood	Number of persons with long-term high blood sugar levels	Percent of persons with long-term high blood sugar levels	Number of people with diabetes
Bronx			
Kingsbridge - Riverdale	517	16	3,212
Northeast Bronx	2,034	19	10,720
Fordham - Bronx Park	2,358	22	10,758
Pelham - Throgs Neck	2,847	19	14,753
Crotona-Tremont	2,172	24	9,208
High Bridge - Morrisania	2,244	22	10,027
Hunts Point - Mott Haven	1,556	24	6,613
Brooklyn			
Greenpoint	554	17	3,241
Downtown - Heights - Park Slope	970	18	5,365
Bedford Stuyvesant - Crown Heights	2,901	22	13,176
East New York	1,981	23	8,458
Sunset Park	561	15	3,637
Borough Park	1,176	12	9,620
East Flatbush - Flatbush	2,897	22	13,248
Canarsie - Flatlands	1,722	19	9,143
Bensonhurst - Bay Ridge	719	11	6,780
Coney Island - Sheepshead Bay	1,344	11	12,007
Williamsburg - Bushwick	1,812	23	7,785
Manhattan			
Washington Heights - Inwood	1,838	20	9,421
Central Harlem - Morningside Heights	1,266	21	6,173
East Harlem	1,245	22	5,656
Upper West Side	636	13	4,850
Upper East Side	317	10	3,322
Chelsea - Clinton	386	14	2,819
Gramercy Park - Murray Hill	210	11	1,961
Greenwich Village - Soho	133	9	1,469
Union Square - Lower East Side	940	13	7,250
Lower Manhattan	92	10	929
Queens			
Long Island City - Astoria	912	15	6,080
West Queens	2,443	15	16,157
Flushing - Clearview	930	9	10,103
Bayside - Little Neck	226	8	2,990
Ridgewood - Forest Hills	1,072	12	8,693
Fresh Meadows	435	11	4,086
Southwest Queens	2,239	17	12,946
Jamaica	2,637	18	14,998
Southeast Queens	1,554	16	9,949
Rockaway	843	20	4,245
Staten Island			
Port Richmond	530	19	2,734
Stapleton - St. George	747	15	5,156
Willowbrook	434	10	4,160
South Beach - Tottenville	765	10	7,532

Numbers and percents above are calculated from the registrants reported to the A1C Registry with likely diabetes who had at least two A1C test values ≥ 6.5% between 2006 and 2015, and had results in the Registry for at least seven years between 2006 and 2015.

[1]Any A1C test result greater than 9% was considered a high blood sugar level.

[2]Long-term high blood sugar levels was defined as experiencing at least one A1C result of greater than 9% in more than half of the years a person had results in the Registry from 2006-2015.

[3]The United Hospital Fund classifies New York City into 42 neighborhoods, comprised of contiguous ZIP codes. For more information visit:
http://www1.nyc.gov/assets/doh/downloads/pdf/ah/zipcodetable.pdf.

Table 4. Average blood sugar levels over time by demographic characteristics, New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015; restricted to NYC residents ages 18 and older at the time of entering the Registry

		Blood sugar levels over time (A1C)[3]			
	Number of registrants	Mean	Median	25th percentile	75th percentile
Proportion of years with high blood sugar levels[1,2]					
No years	155,706	6.7	6.6	6.4	7.0
Less than 1/4 of years	60,986	7.4	7.5	7.1	7.8
1/4 years or more	95,083	9.2	8.9	8.3	9.8
1/4 to 1/2 of years	41,825	8.3	8.3	7.9	8.6
More than 1/2 of years	53,258	9.8	9.6	9.1	10.4
Age group					
18-44	13,059	8.3	8.0	6.9	9.5
45-64	122,538	7.9	7.5	6.7	8.7
65+	176,178	7.4	7.1	6.5	7.9
Borough of residence[4]					
Bronx	65,291	7.8	7.4	6.7	8.5
Brooklyn	92,460	7.6	7.3	6.6	8.3
Manhattan	43,850	7.5	7.2	6.6	8.2
Queens	90,247	7.5	7.2	6.6	8.1
Staten Island	19,582	7.4	7.1	6.6	7.9
Sex[5]					
Female	174,598	7.6	7.2	6.6	8.2
Male	136,648	7.6	7.3	6.7	8.3
Neighborhood poverty[6,7]					
30 to <100% (very high poverty)	74,087	7.8	7.4	6.7	8.6
20 to <30% (high poverty)	83,129	7.6	7.3	6.6	8.3
10 to <20% (medium poverty)	110,457	7.5	7.2	6.6	8.1
0 to <10% (low poverty)	43,055	7.4	7.0	6.5	7.9

The data above are calculated from the registrants reported to the A1C Registry with likely diabetes who had at least two A1C test values ≥ 6.5% between 2006 and 2015, and had results in the Registry for at least seven years between 2006 and 2015.

[1]Any A1C test result greater than 9% was considered a high blood sugar level.

[2]The proportion of years with high blood sugar levels is based on the number of distinct years a person had an A1C result of over 9% divided by the total number of distinct years they had an A1C result reported to the Registry between 2006 and 2015.

[3]Blood sugar levels over time (A1C) were based on first calculating the mean A1C value within individuals by year, then calculating the mean A1C of these summarized yearly data within individuals, and finally determining the mean, median, 25th percentile, and 75th percentile A1C values across individuals.

[4]For 345 people, borough of residence could not be identified.

[5]For 526 people, sex was listed as unknown, and 3 people had sex listed as other.

[6]Neighborhood poverty (zip code level) is defined as the percentage of the population living below the Federal Poverty Line (FPL) based on the American Community Survey (2011-2015). Neighborhoods are categorized into four groups as follows: "Low poverty" neighborhoods are those with <10% of the population living below the FPL; "Medium poverty" neighborhoods have 10-<20% of the population below FPL; "High Poverty" neighborhoods have 20-<30% of the population living below the FPL; "Very high poverty" neighborhoods have >=30% of the population living below the FPL.

[7]For 1,047 people, neighborhood poverty level could not be defined.

Table 5. Average blood sugar levels over time by demographic characteristics, stratified by proportion of years with high blood sugar levels[1,2], New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015; restricted to NYC residents ages 18 and older at the time of entering the Registry

| | Blood sugar levels over time (A1C)[3] by proportion of years with high blood sugar levels | | | | | | | | | | | | | | | | | | | | | | | |
| | No years with high blood sugar levels | | | | | | Less than 1/4 of years with high blood sugar levels | | | | | | 1/4 to 1/2 of years with high blood sugar levels | | | | | | More than 1/2 of years with high blood sugar levels | | | | | |
	Number of registrants	Mean	Standard Deviation	Median	25th percentile	75th percentile	Number of registrants	Mean	Standard Deviation	Median	25th percentile	75th percentile	Number of registrants	Mean	Standard Deviation	Median	25th percentile	75th percentile	Number of registrants	Mean	Standard Deviation	Median	25th percentile	75th percentile
Age group																								
18-44	3,840	6.7	0.5	6.6	6.3	7.0	2,279	7.3	0.6	7.4	6.9	7.8	2,221	8.2	0.6	8.3	7.8	8.7	4,719	10.2	1.3	10.0	9.3	11.0
45-64	49,338	6.7	0.5	6.6	6.3	7.0	24,653	7.4	0.5	7.5	7.1	7.8	19,523	8.3	0.6	8.3	7.9	8.6	29,024	9.9	1.1	9.7	9.1	10.6
65+	102,528	6.7	0.4	6.7	6.4	7.0	34,054	7.5	0.5	7.5	7.1	7.8	20,081	8.3	0.5	8.3	7.9	8.6	19,515	9.6	0.9	9.4	9.0	10.1
Borough of residence[4]																								
Bronx	27,390	6.7	0.5	6.6	6.3	7.0	13,799	7.4	0.5	7.4	7.1	7.8	10,374	8.3	0.5	8.3	7.9	8.6	13,728	9.9	1.1	9.7	9.1	10.5
Brooklyn	45,648	6.7	0.5	6.7	6.4	7.0	17,850	7.5	0.5	7.5	7.1	7.8	12,325	8.3	0.5	8.3	8.0	8.6	16,637	9.9	1.1	9.7	9.1	10.5
Manhattan	22,725	6.7	0.5	6.6	6.3	7.0	8,435	7.4	0.5	7.4	7.1	7.8	5,627	8.3	0.5	8.3	7.9	8.6	7,063	9.8	1.1	9.6	9.1	10.4
Queens	48,759	6.7	0.5	6.7	6.4	7.0	17,005	7.5	0.5	7.5	7.1	7.8	11,192	8.3	0.5	8.3	7.9	8.6	13,291	9.8	1.0	9.6	9.0	10.4
Staten Island	11,024	6.7	0.5	6.7	6.4	7.0	3,836	7.4	0.5	7.5	7.1	7.8	2,246	8.3	0.5	8.3	7.9	8.6	2,476	9.8	1.0	9.6	9.1	10.4
Sex[5]																								
Female	92,377	6.7	0.5	6.6	6.4	7.0	32,193	7.5	0.5	7.5	7.1	7.8	21,700	8.3	0.5	8.3	8.0	8.6	28,328	9.9	1.1	9.7	9.1	10.5
Male	63,066	6.7	0.5	6.7	6.4	7.0	28,702	7.4	0.5	7.4	7.1	7.8	20,041	8.3	0.5	8.3	7.9	8.6	24,839	9.8	1.0	9.6	9.0	10.4
Neighborhood poverty[6,7]																								
30 to <100% (very high poverty)	31,161	6.7	0.5	6.6	6.4	7.0	15,216	7.4	0.5	7.4	7.1	7.8	11,444	8.3	0.5	8.3	7.9	8.6	16,266	9.9	1.1	9.7	9.1	10.5
20 to <30% (high poverty)	40,685	6.7	0.5	6.6	6.4	7.0	16,192	7.4	0.5	7.5	7.1	7.8	11,477	8.3	0.5	8.3	7.9	8.6	14,775	9.9	1.1	9.7	9.1	10.5
10 to <20% (medium poverty)	58,171	6.7	0.5	6.7	6.4	7.0	21,297	7.5	0.5	7.5	7.1	7.8	14,038	8.3	0.5	8.3	7.9	8.6	16,951	9.8	1.0	9.6	9.0	10.4
0 to <10% (low poverty)	25,154	6.7	0.5	6.6	6.3	7.0	8,086	7.4	0.5	7.5	7.1	7.8	4,722	8.3	0.5	8.3	7.9	8.6	5,093	9.7	1.0	9.5	9.0	10.3

The data above are calculated from the registrants reported to the A1C Registry with likely diabetes who had at least two A1C test values ≥ 6.5% between 2006 and 2015, and had results in the Registry for at least seven years between 2006 and 2015.

[1] Any A1C test result greater than 9% was considered a high blood sugar level.

[2] The proportion of years with high blood sugar levels is based on the number of distinct years a person had an A1C result of over 9% divided by the total number of distinct years they had an A1C result reported to the Registry between 2006 and 2015.

[3] Blood sugar levels over time (A1C) were based on first calculating the mean A1C value within individuals by year, then calculating the mean A1C of these summarized yearly data within individuals, and finally determining the mean, median, 25th percentile, and 75th percentile A1C values across individuals.

[4] For 345 people, borough of residence could not be identified.

[5] For 526 people, sex was listed as unknown, and 3 people had sex listed as other.

[6] Neighborhood poverty (zip code level) is defined as the percentage of the population living below the Federal Poverty Line (FPL) based on the American Community Survey (2011-2015). Neighborhoods are categorized into four groups as follows: "Low poverty" neighborhoods are those with <10% of the population living below the FPL; "Medium poverty" neighborhoods have 10-<20% of the population below FPL; "High Poverty" neighborhoods have 20-<30% of the population living below the FPL; "Very high poverty" neighborhoods have >=30% of the population living below the FPL.

[7] For 1,047 people, neighborhood poverty level could not be defined.

Table 6. A1C testing frequency over time by proportion of years with high blood sugar levels[1,2] and demographic characteristics, New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015; restricted to NYC residents ages 18 and older at the time of entering the Registry

	Number of registrants	Yearly A1C test frequency[3]			
		Mean	Median	25th percentile	75th percentile
Total	311,775	2.3	2.2	1.8	2.7
Proportion of years with high blood sugar levels					
No years	155,706	2.2	2.1	1.7	2.6
Less than 1/4 of years	60,986	2.4	2.3	1.8	2.8
1/4 years or more	95,083	2.4	2.3	1.8	2.8
1/4 to 1/2 of years	41,825	2.4	2.3	1.8	2.8
More than 1/2 of years	53,258	2.4	2.3	1.8	2.9
Age group					
18-44	13,059	2.2	2.0	1.6	2.5
45-64	122,538	2.2	2.1	1.7	2.6
65+	176,178	2.4	2.3	1.8	2.8
Borough of residence[4]					
Bronx	65,291	2.3	2.1	1.7	2.6
Brooklyn	92,460	2.3	2.1	1.8	2.7
Manhattan	43,850	2.4	2.2	1.8	2.8
Queens	90,247	2.3	2.2	1.8	2.8
Staten Island	19,582	2.3	2.1	1.7	2.7
Sex[5]					
Female	174,598	2.3	2.2	1.8	2.7
Male	136,648	2.3	2.2	1.8	2.7
Neighborhood poverty[6,7]					
30 to <100% (very high poverty)	74,087	2.3	2.1	1.8	2.7
20 to <30% (high poverty)	83,129	2.3	2.1	1.8	2.7
10 to <20% (medium poverty)	110,457	2.3	2.2	1.8	2.7
0 to <10% (low poverty)	43,055	2.3	2.2	1.8	2.8

The data above are calculated from the registrants reported to the A1C Registry with likely diabetes who had at least two A1C test values ≥ 6.5% between 2006 and 2015, and had results in the Registry for at least seven years between 2006 and 2015.

[1]Any A1C test result greater than 9% was considered a high blood sugar level.

[2]The proportion of years with high blood sugar levels is based on the number of distinct years a person had an A1C result of over 9% divided by the total number of distinct years they had an A1C result reported to the Registry between 2006 and 2015.

[3]Yearly A1C test frequency was based on first calculating the mean testing frequency within individuals across the years in which the individual had an A1C result between 2006 and 2015, and then determining the mean, median, 25th percentile, and 75th percentile testing frequency across individuals.

[4]For 345 people, borough of residence could not be identified.

[5]For 526 people, sex was listed as unknown, and 3 people had sex listed as other.

[6]Neighborhood poverty (zip code level) is defined as the percentage of the population living below the Federal Poverty Line (FPL) based on the American Community Survey (2011-2015). Neighborhoods are categorized into four groups as follows: "Low poverty" neighborhoods are those with <10% of the population living below the FPL; "Medium poverty" neighborhoods have 10-<20% of the population below FPL; "High Poverty" neighborhoods have 20-<30% of the population living below the FPL; "Very high poverty" neighborhoods have >=30% of the population living below the FPL.

[7]For 1,047 people, neighborhood poverty level could not be defined.

Table 7. A1C testing frequency (categorical) over time by proportion of years with high blood sugar levels[1,2] and demographic characteristics, New York City, 2006-2015

Source: New York City A1C Registry, 2006-2015; restricted to NYC residents ages 18 and older at the time of entering the Registry

	Number of registrants	Percent of registrants by average yearly A1C test frequency category[3]			
		1 to less than 2 tests per year	2 to less than 3 tests per year	3 to less than 4 tests per year	4 or more tests per year
Total	311,775	36.0	46.7	14.2	3.1
Proportion of years with high blood sugar levels					
No years	155,706	39.3	46.1	12.4	2.2
Less than 1/4 of years	60,986	32.8	48.3	15.6	3.3
1/4 years or more	95,083	32.5	46.8	16.2	4.6
1/4 to 1/2 of years	41,825	32.4	47.4	16.1	4.1
More than 1/2 of years	53,258	32.6	46.2	16.4	4.9
Age group					
18-44	13,059	44.9	42.0	10.3	2.9
45-64	122,538	40.7	45.1	11.7	2.5
65+	176,178	32.0	48.1	16.3	3.6
Borough of residence[4]					
Bronx	65,291	38.2	46.8	12.2	2.7
Brooklyn	92,460	36.3	45.8	14.5	3.3
Manhattan	43,850	33.4	47.6	15.1	3.9
Queens	90,247	34.7	47.3	15.2	3.0
Staten Island	19,582	38.7	45.4	13.1	2.7
Sex[5]					
Female	174,598	35.7	47.6	14.0	2.7
Male	136,648	36.3	45.6	14.5	3.7
Neighborhood poverty[6,7]					
30 to <100% (very high poverty)	74,087	36.7	47.0	13.5	2.9
20 to <30% (high poverty)	83,129	36.6	46.4	14.0	3.1
10 to <20% (medium poverty)	110,457	35.1	47.0	14.7	3.2
0 to <10% (low poverty)	43,055	35.7	46.0	14.8	3.6

The data above are calculated from the registrants reported to the A1C Registry with likely diabetes who had at least two A1C test values ≥ 6.5% between 2006 and 2015, and had results in the Registry for at least seven years between 2006 and 2015.

Row percentages may not sum to 100% due to rounding.

[1]Any A1C test result greater than 9% was considered a high blood sugar level.

[2]The proportion of years with high blood sugar levels is based on the number of distinct years a person had an A1C result of over 9% divided by the total number of distinct years they had an A1C result reported to the Registry between 2006 and 2015.

[3]Yearly A1C test frequency was based on first calculating the mean testing frequency within individuals across the years in which the individual had an A1C result between 2006 and 2015, and then determining the mean, median, 25th percentile, and 75th percentile testing frequency across individuals.

[4]For 345 people, borough of residence could not be identified.

[5]For 526 people, sex was listed as unknown, and 3 people had sex listed as other.

[6]Neighborhood poverty (zip code level) is defined as the percentage of the population living below the Federal Poverty Line (FPL) based on the American Community Survey (2011-2015). Neighborhoods are categorized into four groups as follows: "Low poverty" neighborhoods are those with <10% of the population living below the FPL; "Medium poverty" neighborhoods have 10-<20% of the population below FPL; "High Poverty" neighborhoods have 20-<30% of the population living below the FPL; "Very high poverty" neighborhoods have >=30% of the population living below the FPL.

[7]For 1,047 people, neighborhood poverty level could not be defined.