



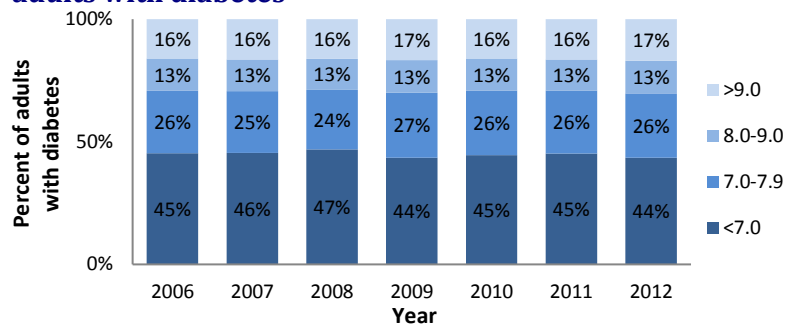
## Trends in Blood Sugar Control among Adults with Diabetes in New York City, 2006-2012

Diabetes is a chronic disease that requires good control of blood sugar, blood pressure, and cholesterol. Over the long term, poor control of blood sugar in people with diabetes can result in microvascular complications including kidney failure, blindness, and nerve damage that may increase the risk of lower extremity amputation.<sup>1</sup> Lifestyle modification and medication management are important parts of effective diabetes management and can prevent these complications.<sup>2</sup>

An A1C test measures average blood sugar over the past three months.<sup>3</sup> 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. The risk for microvascular complications rises with higher A1C levels.<sup>2,3</sup>

### Overall, blood sugar control among adults with diabetes who are receiving medical care has changed little over time

#### Annual blood sugar control based on latest A1C test in adults with diabetes



Source: New York City A1C Registry, 2006-2012

- The average A1C for New York City (NYC) adults with diabetes ranged between 7.6% and 7.7% annually from 2006 through 2012.
- Less than half of adults (44% to 47%) with diabetes had good blood sugar control (A1C less than 7%) annually from 2006 through 2012.
- Nearly one in three adults with diabetes did not meet less stringent blood sugar control goals (A1C less than 8%) annually from 2006 through 2012.

**Data Source: New York City A1C Registry:** The NYC A1C Registry (Registry) was created in 2006 and contains A1C results of NYC residents tested by clinical laboratories via a mandatory reporting system. 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 2012. This definition utilizes the American Diabetes Association-recommended A1C cut-point of 6.5% to determine diabetes since the Registry does not contain diagnosis codes.

**Definitions: A1C,** also called the hemoglobin A1C test, is a blood test which measures average blood sugar levels over the past three months. This test is used to diagnose people with diabetes but is also used to monitor average blood sugar in people who have diabetes. An A1C level that is greater than 9% is estimated to correspond to an average blood sugar over 212 mg/dl.<sup>2,3</sup> [The National Committee for Quality Assurance](#) defines poor control of A1C as an A1C greater than 9%.

**Neighborhood poverty** is defined as: very high poverty (30% or more residents living at or below Federal Poverty Level [FPL]), high poverty (20 to <30% residents living at or below FPL), medium poverty (10 to <20% residents living at or below FPL), low poverty (0 to <10% residents living at or below FPL).

#### References:

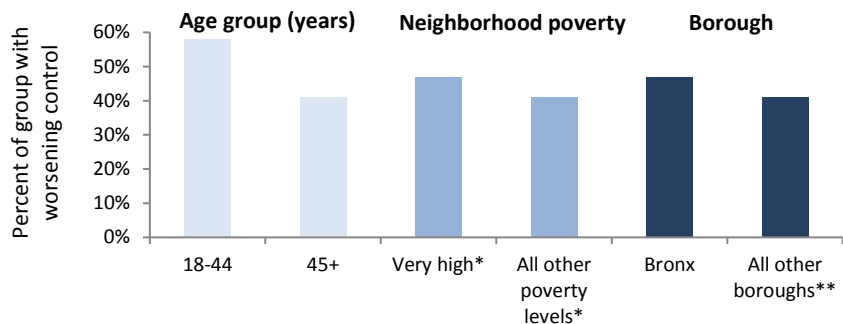
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## Changes in blood sugar control differ by age and neighborhood of residence

Among 132,219 adults with diabetes who entered the New York City A1C Registry between 2006 through 2008 and who had yearly A1C testing through 2012, the following trends were observed for A1C control over time (based on comparing a person's latest A1C test in 2012 with the earliest test in the Registry).

- 38% of adults 18 to 44 years old experienced a worsening of blood sugar control (A1C increase of at least 0.5%) compared with 32% of those 45 to 64 years old, and 27% of those 65 years and older.
- Among adults that entered the Registry with good blood sugar control (A1C less than 7%), worsening of blood sugar control (A1C change of at least 0.5%) was highest in the following groups:
  - Adults 18 to 44 (58% experienced worsening vs. 36% of adults 65 and older)
  - Residents of very high poverty neighborhoods (47% experienced worsening vs. 39% adults in low poverty neighborhoods)
  - Residents of the Bronx (47% experienced worsening vs. 39% of adults from Queens)
- However, change in blood sugar control showed no differences by borough or neighborhood poverty level among adults that entered the Registry in poor control (A1C greater than 9%).

### Worsening of blood sugar control in adults entering the New York City A1C Registry with A1C less than 7%



\*Very high poverty is defined as 30% or more residents living at or below Federal Poverty Level [FPL], all other poverty levels represents 0 to <30% residents living at or below FPL.

\*\*Represents Brooklyn, Manhattan, Queens, Staten Island

Source: New York City A1C Registry, 2006-2012

## Nearly two in three NYC adults with diabetes do not consistently maintain A1C below 8%

Blood sugar control can fluctuate in persons with diabetes. Among adults with diabetes that entered the Registry between 2006 through 2008 and who had yearly A1C testing through 2012, the following trends were observed when examining persistence of blood sugar control using a less stringent target (above an A1C level of 8% or higher, and below 8%).

- Adults 18 to 44 years old were twice as likely to have persistently high blood sugar levels (A1C of 8% or higher) compared with those 45 years and older (10% vs. 4%), and four times as likely when compared with those 65 years and older (10% vs. 2%).
- Men with diabetes were less likely to always have an A1C below 8% compared with women (33% vs. 38%).
- Adults with diabetes living in very high poverty neighborhoods were less likely to always have an A1C below 8% compared with those living in low poverty neighborhoods (28% vs. 44%).
- Adults with diabetes living in the Bronx were less likely to always have an A1C below 8% compared with persons in other boroughs (29% vs. 38%).

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# Epi Data Tables

New York City Department of Health and Mental Hygiene

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## Trends in Blood Sugar Control among Adults with Diabetes in New York City, 2006-2012

### Data Tables

- Table 1.** Blood sugar control among adults with likely diabetes who received medical care, New York City, 2006-2012
- Table 2.** Blood sugar control change among adults with likely diabetes who received medical care, by demographic characteristics, New York City, 2006-2008 through 2012
- Table 3.** Persistence of blood sugar control among adults with likely diabetes who received medical care, by demographic characteristics, New York City, 2006-2008 through 2012

### Data Source

**New York City A1C Registry:** The NYC A1C Registry (Registry) was created in 2006 and contains A1C results of NYC residents tested by clinical laboratories via a mandatory reporting system. 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 2012. This definition utilizes the American Diabetes Association-recommended A1C cut-point of 6.5% to determine diabetes since the Registry does not contain diagnosis codes.



**Table 1: Blood sugar control among adults with likely diabetes who received medical care, New York City, 2006-2012**

Source: New York City A1C Registry, 2006-2012; restricted to NYC residents ages 18 and older at time of entering the registry

Rates are based on the latest A1C test result with the last available NYC zip code in each calendar year for registrants reported to the A1C Registry with likely diabetes who received medical care, defined as having a history of at least two A1C test values  $\geq 6.5\%$  between 2006 and 2012.

Year	Number (n)					Percent (%)				Mean and median of A1C test result			
	A1C Category (A1C %)					A1C Category (A1C %)				Mean	Median	IQR25	IQR75
	<7%	7-7.9%	8-9%	>9%	Total	<7%	7-7.9%	8-9%	>9%				
2006	96,819	54,638	28,019	34,451	213,927	45.3	25.5	13.1	16.1	7.6	7.1	6.5	8.2
2007	140,038	77,672	39,695	50,443	307,848	45.5	25.2	12.9	16.4	7.6	7.1	6.5	8.2
2008	158,257	82,131	42,627	54,733	337,748	46.9	24.3	12.6	16.2	7.6	7.0	6.4	8.2
2009	176,058	107,143	53,904	67,815	404,920	43.5	26.5	13.3	16.7	7.7	7.1	6.5	8.3
2010	197,452	117,204	58,190	71,029	443,875	44.5	26.4	13.1	16.0	7.6	7.1	6.5	8.2
2011	213,808	121,169	60,020	77,538	472,535	45.2	25.6	12.7	16.4	7.6	7.1	6.5	8.2
2012	204,751	123,285	63,228	79,472	470,736	43.5	26.2	13.4	16.9	7.7	7.1	6.5	8.3

Percentages may not add to 100 due to rounding

**Table 2: Blood sugar control change among adults with likely diabetes who received medical care, by demographic characteristics, New York City, 2006-2008 through 2012**

Source: New York City A1C Registry, 2006-2012; restricted to NYC residents ages 18 and older at time of initial entry into the registry between 2006-2008

Changes are calculated from the first test in 2006-2008 and the last test in 2012 for registrants reported to the A1C Registry with likely diabetes who received medical care, defined as having a history of at least two A1C test values  $\geq 6.5\%$  between 2006 and 2012.

	Total <sup>3</sup>			Change in A1C control from the first test (A1C %)																
	Number			<7.0% <sup>3</sup>			7.0-7.9% <sup>3</sup>			8.0-9.0% <sup>4</sup>			>9.0% <sup>5</sup>							
	Number	Percent <sup>6</sup>		Number	Percent <sup>6</sup>		Number	Percent <sup>6</sup>		Number	Percent <sup>6</sup>		Number	Percent <sup>6</sup>						
	Better <-0.5%	Same -0.5% to 0.5%	Worse >0.5%		Better <-0.5%	Same -0.5% to 0.5%	Worse >0.5%		Better <-0.5%	Same -0.5% to 0.5%	Worse >0.5%		Better <-0.5%	Same -0.5% to 0.5%	Worse >0.5%		Better <-0.5%	Same -0.5% to 0.5%	Worse >0.5%	
<b>First test in 2006-2008<sup>1</sup></b>																				
<b>Overall</b>	132,219	31	38	31	58,748	7	51	42	33,414	32	40	28	17,141	53	24	23	22,916	77	11	12
<b>Age group</b>																				
18-44	12,200	35	28	38	4,345	5	37	58	2,521	25	35	40	1,652	42	24	34	3,682	72	13	15
45-64	67,868	33	36	32	28,196	6	49	45	16,569	30	40	30	9,313	51	24	25	13,790	77	11	12
65+	52,151	29	43	27	26,207	8	56	36	14,324	36	41	23	6,176	58	24	18	5,444	82	10	9
<b>Sex</b>																				
Female	76,869	30	39	31	34,575	7	52	41	19,891	32	41	27	9,842	52	25	23	12,561	76	12	13
Male	54,551	33	36	31	23,836	7	50	43	13,331	33	39	28	7,172	54	23	23	10,212	80	10	10
Unknown	799	29	37	34	337	6	50	45	192	29	37	34	127	46	31	24	143	67	15	18
<b>Neighborhood poverty<sup>2</sup></b>																				
Low poverty	22,036	28	42	30	11,313	7	54	39	5,593	33	42	26	2,477	54	26	21	2,653	78	11	11
Medium poverty	47,024	30	40	30	21,546	7	53	40	12,262	32	42	27	5,909	54	24	22	7,307	78	11	11
High Poverty	34,043	33	37	31	14,619	7	50	43	8,495	32	39	29	4,482	52	24	24	6,447	77	11	12
Very high poverty	29,047	35	33	32	11,243	7	46	47	7,048	32	37	30	4,263	51	24	25	6,493	77	11	12
Unknown	69	35	42	23	27	4	74	22	16	31	38	31	10	60	20	20	16	75	6	19
<b>Borough</b>																				
Bronx	30,142	35	33	32	12,030	7	46	47	7,446	33	37	30	4,276	52	23	24	6,390	77	11	12
Brooklyn	39,188	33	37	30	16,477	7	52	41	9,945	33	39	28	5,365	52	25	23	7,401	78	11	12
Manhattan	19,045	30	39	32	9,091	7	51	42	4,668	32	40	27	2,315	52	25	23	2,971	76	11	13
Queens	35,163	29	42	30	16,759	7	54	39	9,103	31	43	26	4,200	53	24	22	5,101	77	11	12
Staten Island	8,614	27	40	33	4,365	6	51	43	2,237	32	40	28	975	54	24	22	1,037	80	11	10
Unknown	67	34	43	22	26	4	77	19	15	27	40	33	10	60	20	20	16	75	6	19

Percentages may not add to 100 due to rounding

1. Includes only those who had at least one test every subsequent year, and who lived in the same zip code between the first and last test.

2. Neighborhood income level are defined as: very high poverty (30% or more residents living at or below Federal Poverty Level [FPL]), high poverty (20 to <30% residents living at or below FPL), medium poverty (10 to <20% residents living at or below FPL), low poverty (0 to <10% residents living at or below FPL).

3. Chi square tests are significant for all demographic variables (p<0.01).

4. Chi square tests are significant for demographic variables of age group, neighborhood poverty (both p<0.01) and sex (p<0.05).

5. Chi square tests are significant for demographic variables of age group and sex (both p<0.01).

6. Columns correspond to percent in group that had improvement in A1C control from the first test of more than 0.5% (Better <-0.5%), change remained within 0.5% improvement or worsening (Same -0.5% to 0.5%), or worsened in A1C control by more than 0.5% (Worse >0.5%).

**Table 3: Persistence of blood sugar control among adults with likely diabetes who received medical care, by demographic characteristics, New York City, 2006-2008 through 2012**

Source: New York City A1C Registry, 2006-2012; restricted to NYC residents ages 18 and older at time of entering the registry

Numbers and percents are calculated from the registrants reported to the A1C Registry with likely diabetes who received medical care, defined as having a history of at least two A1C test values  $\geq 6.5\%$  between 2006 and 2012, and had their first tests in 2006-2008 and their last tests in 2012.

A1C test result statuses are classified based on all tests the A1C Registry collected for each registrant from 2006 to 2012.

	2006-2008 <sup>2</sup>				2006 <sup>2</sup>				2007 <sup>2</sup>				2008 <sup>2</sup>				
	Number	% by A1C test status			Number	% by A1C test status			Number	% by A1C test status			Number	% by A1C test status			
		Total <sup>1</sup>	Always $\geq 8\%$	Ever $\geq 8\%$		Never $\geq 8\%$	Total <sup>1</sup>	Always $\geq 8\%$		Ever $\geq 8\%$	Never $\geq 8\%$	Total <sup>1</sup>		Always $\geq 8\%$	Ever $\geq 8\%$	Never $\geq 8\%$	Total <sup>1</sup>
<b>Overall</b>	<b>132,219</b>	<b>5</b>	<b>60</b>	<b>36</b>	<b>72,508</b>	<b>4</b>	<b>63</b>	<b>33</b>	<b>36,520</b>	<b>5</b>	<b>58</b>	<b>37</b>	<b>23,191</b>	<b>6</b>	<b>53</b>	<b>41</b>	
<b>Age group</b>																	
18-44	12,200	10	69	21	5,559	9	73	18	3,762	10	68	22	2,879	11	64	26	
45-64	67,868	6	63	31	36,445	5	66	29	19,012	6	62	32	12,411	6	57	37	
65+	52,151	2	53	45	30,504	2	57	42	13,746	3	51	47	7,901	3	44	53	
<b>Sex</b>																	
Female	76,869	5	58	38	43,053	4	61	35	20,774	5	56	39	13,042	6	50	45	
Male	54,551	4	63	33	29,053	4	65	31	15,479	5	62	34	10,019	6	58	36	
Unknown	799	7	61	32	402	5	67	28	267	9	59	33	130	10	48	42	
<b>Neighborhood poverty<sup>3</sup></b>																	
Low poverty	22,036	3	53	44	11,796	3	56	42	6,392	3	52	45	3,848	4	49	47	
Medium poverty	47,024	4	58	38	24,771	4	61	36	13,449	5	57	38	8,804	5	51	44	
High Poverty	34,043	5	61	34	19,050	5	64	32	8,950	6	59	35	6,043	7	55	39	
Very high poverty	29,047	6	66	28	16,854	5	69	26	7,711	7	64	29	4,482	8	59	34	
Unknown	69	12	55	33	37	11	62	27	18	6	44	50	14	21	50	29	
<b>Borough</b>																	
Bronx	30,142	5	66	29	18,640	4	69	27	7,284	6	64	31	4,218	6	60	33	
Brooklyn	39,188	5	60	35	20,699	5	63	33	11,169	6	58	36	7,320	7	53	40	
Manhattan	19,045	4	58	37	11,293	4	61	36	4,550	5	57	38	3,202	5	53	42	
Queens	35,163	4	56	40	16,542	3	59	38	11,378	4	57	39	7,243	5	50	46	
Staten Island	8,614	3	55	42	5,297	2	56	41	2,123	4	53	43	1,194	5	51	44	
Unknown	67	12	55	33	37	11	62	27	16	6	44	50	14	21	50	29	

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1. Includes only those who had at least one test every subsequent year, and who lived in the same zip code between the first and last test.

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