Title: State of Type 1 Diabetes Management and Outcomes from the T1D Exchange in 2016-2018

Conscience

Authors: Nicole C. Foster, MS[1], Roy W. Beck, MD, PhD[1], Kellee M. Miller, PhD[1], Mark A. Clements, MD[2], Michael R. Rickels, MD, MS[3], Linda A. DiMeglio, MD, MPH[4], David M. Maahs, MD, PhD[5], William V. Tamborlane, MD[6], Richard Bergenstal, MD[7], Elizabeth Smith, BS[1], Beth A. Olson, BAN, RN, CDE[7], Satish K. Garg, MD[8] for the T1D Exchange Clinic Network

Author Affiliations:
[1]Jaeb Center for Health Research, Tampa, FL
[2]Children's Mercy Hospital, Kansas City, MO
[3]University of Pennsylvania Perelman School of Medicine, Rodebaugh Diabetes Center, Philadelphia, PA
[4]Indiana University School of Medicine, Indianapolis, IN
[5]Stanford University, Stanford, CA
[6]Yale University School of Medicine, New Haven, CT
[7]International Diabetes Center Park Nicollet, Minneapolis, MN
[8]University of Colorado Denver, Barbara Davis Center for Childhood Diabetes, Aurora, CO

Short Running Title: T1D Exchange Registry 2016-2018

Corresponding Author: Nicole Foster, Jaeb Center for Health Research, 15310 Amberly Drive, Suite 350, Tampa, FL 33647; Phone: (813) 975-8690, Fax: (800) 816-7601, E-mail: t1dstats3@jaeb.org

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Abstract (250/250)

Objective: To provide a snapshot of the profile of adults and youth with type 1 diabetes (T1D) in the U.S. and assessment of longitudinal changes in T1D management and clinical outcomes in the T1D Exchange registry.

Research Design and Methods: Data on diabetes management and outcomes from 22,697 registry participants (age 1-93 years) were collected between 2016 and 2018 and compared with data collected in 2010-2012 for 25,529 registry participants.

Results: Mean HbA1c in 2016-2018 increased from 65 mmol/mol at age 5 years to 78 mmol/mol between ages 15-18, with a decrease to 64 mmol/mol by age 28 and 58-63 mmol/mol beyond age 30. The American Diabetes Association (ADA) HbA1c goal of <58 mmol/mol for youth was achieved by only 17% and the goal of <53 mmol/mol for adults by only 21%. Mean HbA1c levels changed little between 2010-2012 and 2016-2018, except in adolescents who had a higher mean HbA1c in 2016-2018. Insulin pump use increased from 57% in 2010-2012 to 63% in 2016-2018. Continuous glucose monitoring (CGM) increased from 7% in 2010-2012 to 30% in 2016-2018, rising >10-fold in children <12 years old. HbA1c levels were lower in CGM users than nonusers. Severe hypoglycemia was most frequent in participants ≥50 years old and diabetic ketoacidosis was most common in adolescents and young adults. Racial differences were evident in use of pumps and CGM and HbA1c levels.

Conclusions: Data from the T1D Exchange registry demonstrate that only a minority of adults and youth with T1D in the U.S. achieve ADA goals for HbA1c.

In 2010, the T1D Exchange clinic registry initiated the first large database of clinical characteristics and clinical outcomes of children and adults with type 1 diabetes throughout the U.S. The data have provided an overview of the state of metabolic control, acute complications, and diabetes management of type 1 diabetes in the U.S. (1; 2) and the opportunity to compare U.S. data with other registries from Europe and Australia (3-12).

Herein, we present an updated snapshot of the state of T1D in the U.S. and an assessment of changes over time.

Methods

The T1D Exchange Clinic Registry data collection was performed by 81 U.S. based pediatric and adult endocrinology practices in 35 states. Nineteen and 38 centers primarily care for adult and pediatric patients respectively, and 24 care for both. Sixty-three are institution-based, 17 are community based, and one is in a managed care setting. Details on eligibility criteria, the informed consent process, and baseline data collection have been published previously (1). During the initial enrollment period (September 2010 through August 2012), 25,833 individuals with T1D (14,593 <18 years old and 11,240 ≥18 years old) were enrolled. Subsequently, an additional 8,544 participants were enrolled through August, 2017. Core data were updated annually from medical records.

This report includes data from 22,697 participants collected between January 1, 2016 and March 31, 2018 (N=3,536 in 2016, N=15,955 in 2017, and N=3,206 in 2018). Participants with a history of pancreas or islet cell transplantation and those pregnant at the time of data collection were excluded.

Participants who were followed for 5 years completed a detailed questionnaire regarding diabetes management and acute complications (Year 5 questionnaire), similar to the questionnaire completed at enrollment (N=11,061).

Information on age, date of diagnosis, body mass index (BMI; height and weight), insurance status, insulin pump use, continuous glucose monitoring (CGM) use, non-insulin glucose-lowering medication use, and HbA1c levels obtained as part of usual care were collected from medical records. Frequency of self-monitoring of blood glucose (SMBG) was assessed from meter download (if available) or from participant report in the clinic chart. The occurrences of severe hypoglycemia (SH) and diabetic ketoacidosis (DKA) in the prior 3 months and aspects of diabetes management including timing and frequency of insulin administration, duration of technology use, use of technology features, use of CGM to decide/adjust insulin dose, checking for ketones, use of glucagon, device downloading, and use of mobile medical applications were participant-reported from the subset of participants/caregivers who completed the Year 5 questionnaire. For an event to be counted as SH required loss of consciousness or seizure and for an event to be counted as DKA required an overnight hospitalization.

<u>Statistical Methods</u>

Results were tabulated according to age group. Cross-sectional comparisons of data collected during 2010-2012 were made with data collected during 2016-2018; 12,705 participants had information available from both the 2010-2012 and 2016-2018 time periods. Cross-sectional comparisons of use of pump and use of CGM included participants with at least 1 year diabetes duration. To assess mean HbA1c over the lifespan, participants were grouped by year of age at the time of measurement. To minimize the impact of potential cohort effects and duration effects, cross-sectional comparisons of HbA1c included 9,657 participants contained in both time cohorts with at least 3 years of duration at the time of the 2010-2012 data collection.

Multivariable linear regression models were used to assess the association between HbA1c and time period (2010-2012 and 2016-2018), and to assess the association between 2016-2018 HbA1c and participant characteristics adjusting for age, diabetes duration, and clinic site. Multivariable logistic regression models were used to assess the association between reported SH and DKA (separately) in 2016-2018 and the following: insulin pump use, CGM use, and HbA1c. To account for possible confounding, the following covariates were assessed for associations with each outcome through bivariate analysis and selection models: age, diabetes duration, race/ethnicity, sex, SMBG, insurance status, pump status (when not covariate of interest), CGM (when not covariate of interest) status, HbA1c (when not covariate of interest) clinic.

Results are expressed as means ± standard deviations for normally distributed variables or medians (interquartile range) for non-normally distributed variables. Data analyses were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC). All p-values are two-sided.

Results

The 22,697 participants with data from 2016-2018 ranged in age from 1 to 93 years old; duration of diabetes ranged from <1 year to 80 years, 50% were female, 82% were non-Hispanic White, and 74% had private health insurance. About half (10,249 [49%]) of participants were overweight or obese. Additional participant and clinical characteristics are described, stratified by age, in Supplemental Table S1. Participant and clinical characteristics generally were similar between the 2010-2012-time cohort and the 2016-2018-time cohort, although, as expected, participants in the 2016-2018 cohort were 4-5 years older with about 4-5 years longer diabetes duration (Supplemental Table S2).

Utilization of Diabetes Technology and Aspects of Diabetes Management

Use of an insulin pump increased from 57% in 2010-2012 to 63% in 2016-2018, with the largest increases in children (50% to 64% in children <6 years old and 58% to 68% in children 6-12 years old) (Supplemental Figure S1). More than half of participants using an insulin pump in 2016-2018 were using a Medtronic pump (53%); 18% were using an Insulet pump, 18% Animas, and 12% Tandem. Use of CGM increased from 7% in 2010-2012 to 30% in 2016-2018, with an exponential increase in use beginning between years 2013 and 2014 (Figures 1A and 1B). Children had a >10-fold increase in CGM use (4% to 51% in children <6 years old and 3% to 37% in children 6-12 years old) (Figure 1B). Most participants using CGM in 2016-2018 were using a Dexcom CGM system (77%). Racial disparities were present in frequency of pump and CGM use across all age groups (Supplemental Table S3).

Use of non-insulin glucose-lowering medication in addition to insulin was uncommon across all age groups (Supplemental Table S1) although use increased slightly between 2010-2012 and 2016-2018 (Supplemental Table S2). Metformin was the most common non-insulin medication but used by only 6% of participants ≥26 years old.

Aspects of diabetes self-management in 2016-2018 are described in Supplemental Table S4. Of note, among non-CGM users, SMBG was done more frequently in younger pediatric participants. Most participants bolused insulin prior to the start of a meal. Checking of ketones was more common in children than adults, and blood ketones were very uncommonly checked across all ages; only about 20% reported having a blood ketone meter. Most participants never downloaded blood glucose meters, CGM devices, or insulin pumps at home. Other than using the Dexcom Share feature by Dexcom CGM users, use of mobile medical applications was very uncommon.

<u>Metabolic Control</u>

<u>2016-2018</u>

Mean HbA1c levels varied with age, race/ethnicity, and socio-economic status (Supplemental Table S5). Mean HbA1c during childhood increased from 8.1% (65 mmol/mol) at 5 years old to 9.3% (78 mmol/mol) between ages 15-18, with a steady decrease down to 8.0% (65 mmol/mol) by age 28; mean HbA1c remained fairly steady around 7.5%-7.9% (58-63 mmol/mol) beyond age 30 (Figure 2). The American Diabetes Association (ADA) HbA1c target as of 2018 of <7.5% (<58 mmol/mol) for youth with T1D was achieved by only a small percentage of children and adolescents <18 years old (17%); only 21% of adults achieved the

ADA goal of <7.5% (<53 mmol/mol). Mean HbA1c was higher in African-Americans than non-Hispanic Whites or Hispanic Whites across all age groups even after adjusting for differences in socioeconomic status (Supplemental Table S5).

Across all age groups, HbA1c was lower in pump and CGM users (P<0.001 adjusted for age, diabetes duration, race/ethnicity, annual income, SMBG; Figure 3). Among CGM users, differences in HbA1c between pump and MDI users were small, except in adolescents and young adults where mean HbA1c was lower in pump users than injection users.

Comparison of 2016-2018 Cohort with 2010-2012 Cohort

Among the 9,657 participants who had data present in both 2010-2012- and 2016-2018- and at least 3 years diabetes duration in 2010-2012, mean HbA1c was higher in 2016-2018 as compared with 2010-2012. The adjusted mean HbA1c was 7.8% (62 mmol/mol) in 2010-2012 and 8.4% (68 mmol/mol) in 2016-2018 (P<0.001 adjusted for age, diabetes duration, SMBG, and use of a CGM). The increase over time in HbA1c was predominately seen in adolescents and young adults (Figure 2).

Acute Complications in 2016-2018 Cohort

Among the subset of participants with data available from the Year 5 questionnaire (N=11,061), 6% reported experiencing seizure or loss of consciousness due to hypoglycemia in the 3 months prior to questionnaire completion; 3-month frequency of SH (seizure/LOC) ranged from 5% in participants <18 years old to 10% in participants ≥50 years old (Table 1). Insulin pump use was associated with lower frequency of experiencing a SH event (5% versus 9%;

P<0.001 adjusted for age, diabetes duration, sex, race/ethnicity, insurance status, CGM status) and CGM use trended towards a lower SH frequency (5% versus 7%; P=0.06 adjusted for age, diabetes duration, sex, race/ethnicity, insurance status, and pump use). The frequency of SH was not associated with HbA1c level (P=0.55 adjusted for age, diabetes duration, sex, race/ethnicity, insurance status, CGM use, pump use; Table 1).

At least one DKA event in the 3 months prior to the questionnaire was reported by 3% of participants, with the highest frequency (4%) in participants <26 years old (Table 1). Participants using an insulin pump were less likely to report experiencing a DKA event than participants using injections (2% versus 4%; P=0.002 adjusted for age, diabetes duration, sex, race/ethnicity, insurance status, CGM, SMBG, and HbA1c). Similarly, participants using CGM had fewer DKA events than non-CGM users (1% versus 3%; P=0.04 adjusted for age, diabetes duration, sex, race/ethnicity, insurance status, pump use, and HbA1c). Participants with higher HbA1c were more likely to experience a DKA event than participants with lower HbA1c (0.7% in participants with HbA1c <8.0% [<64 mmol/mol] and 7% in participants with HbA1c ≥9.0% [≥75 mmol/mol]; P<0.001 adjusted for age, diabetes duration, sex, race/ethnicity, insurance status, SMBG, CGM status, pump status).

Discussion

The T1D Exchange registry has provided important information about individuals with type 1 diabetes, how type 1 diabetes is managed in the US along with clinical outcomes. In the most recent data reported herein, across all age groups only a minority of individuals meet ADA HbA1c goals and HbA1c levels remain particularly high in adolescents and young adults.

Indeed, mean HbA1c levels have increased from 2010-2012 to 2016-2018 in teens and emerging adults. This surprising finding remained after limiting the analysis to the participants who had T1D duration of at least 3 years at baseline (2010-2012) and after adjustment for age and duration of diabetes. Within this age range of adolescents and young adults, factors that have been associated with HbA1c levels such as race/ethnicity and socio-economic status appeared balanced between the two time periods (data not shown). Thus, we do not have an explanation for this increase and it is possible that the finding could reflect a difference in diabetes duration between time periods even though duration was adjusted for in analysis or be due to other unmeasured confounding factors. Nevertheless, there is no indication from these data that HbA1c levels in the registry as a whole have improved over this 5-year period despite an increase in the use of insulin pumps and CGM.

HbA1c levels were higher in African Americans than in non-Hispanic or Hispanic whites as previously reported in the registry (13). A T1D Exchange study demonstrated that only about half of the HbA1c difference between whites and African-Americans can be explained by higher mean glucose in African-Americans, with the other half of the difference between races having a non-glycemic basis presumably due to genetic differences in red blood cell lifespan, differences in red blood cell glycation rates, or other, as of yet undefined, biologic or genetic factors (14). Of interest, a difference in HbA1c levels between race/ethnicities exists even among those in the highest income category.

As shown previously, SH occurs more commonly in older adults than in younger participants particularly those with long duration of type 1 diabetes. A prior T1D Exchange study demonstrated that hypoglycemia unawareness is a substantial risk factor for SH in older adults (15). In an attempt to standardize self-reporting of SH in a large registry, SH was defined by the occurrence of seizure or loss of consciousness. Of note, SH risk was not associated with HbA1c level in contrast to the Diabetes Control and Complications Trial which found a strong association of lower HbA1c levels with a higher SH risk (16). However, the risk of DKA was strongly associated with HbA1c levels, with a substantial increase in DKA risk at HbA1c levels >9.0% (>75 mmol/mol) presumably representing more frequent missed insulin doses. As seen previously, DKA risk was highest in adolescents and young adults.

Perhaps the most notable change in diabetes management over the 5-7 years of registry data is the substantial increase in use of CGM in recent years. This increase has been most prominent in young children, presumably related to the ability of a parent to monitor the CGM glucose data remotely. It is noteworthy that there has been minimal adoption of other mobile medical applications. Pump use has increased modestly over this time period. The benefit of pump use and CGM use on HbA1c levels is apparent across age groups. Among CGM users, HbA1c levels were similar whether the participants were using MDI or an insulin pump, supporting the finding of clinical trials that have demonstrated benefit of CGM in MDI users to be comparable to that demonstrated in pump users (17; 18). Pump use was associated with a lower DKA frequency compared with injection users. Although this is likely related to differences between pump users and MDI users rather than the insulin delivery modality, this finding nevertheless shows no indication that pump use poses an increased DKA risk. This finding is consistent with that of the DPV registry (19). Pump users also had a lower SH frequency than MDI users. Although CGM users would be expected to have a lower SH frequency than nonusers, the difference was relatively small, which could be reflecting the possibility that CGM was prescribed because of frequent SH. SH and DKA events were collected using different criteria in 2010-2012 precluding a comparison with the data from the earlier period. Although use of devices has increased, downloading of device data with retrospective review of the data as part of diabetes self-management has not. With recent greater emphasis on seamless transmission of data to the cloud and enhancements in reporting and decision-support tools, the integration of device data into self-management can be expected to increase.

Despite the value of the data from the registry, there are limitations to the interpretation of the results. The registry is not population-based as all participants in the registry are treated at endocrinology centers that focus on the care of patients with type 1 diabetes, nor are all patients at each clinic included in the registry. Thus, individuals not being seen by an endocrinologist are not represented and underinsured/uninsured individuals are likely underrepresented as well. As a result, certain reported frequencies such as use of devices likely are overestimates. The low proportion of registry participants meeting ADA HbA1c targets, particularly in adolescents and young adults, also is more likely to be an overestimate than underestimate, indicating that glycemic control in a general population of youth and adults with type 1 diabetes may be even worse than what was found in the registry.

In summary, recent data from the T1D Exchange registry demonstrate that only a minority of adults and youth with T1D meet ADA goals for HbA1c. Glycemic control has not improved overall between 2010-2012 and 2016-2018 and in fact appears to have worsened particularly in adolescents. CGM use has substantially increased in recent years and CGM use is associated with lower HbA1c levels. Racial disparities remain in use of technology and in glycemic control. We hope that these data will stimulate further research and efforts to find ways to improve glucose control and bridge the gap in different racial backgrounds.

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Nicole Foster is the guarantor of this work, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

Duality of Interest: The authors have no conflicts of interest to report.

Table 1. Frequency of Acute Complications in 2016-2018

	6 - 12 yrs old		13 - 17 yrs old		18 - 25 yrs old		26 - 49 yrs old		≥50 yrs old	
	N	**# ≥ 1 Event (%)**	**N**	**# ≥ 1 Event (%)**	**N**	**# ≥ 1 Event (%)**	**N**	**# ≥ 1 Event (%)**	**N**	**# ≥ 1 Event (%)**
Frequency of 1 ≥ Severe Hypoglycemia Event in Prior 3 Months										
Overall	1313	62 (5%)	3183	155 (5%)	2445	138 (6%)	2143	157 (7%)	1976	189 (10%)
Insulin Delivery Method										
Pump	973	39 (4%)	2134	67 (3%)	1585	78 (5%)	1442	85 (6%)	1243	114 (9%)
Injections	317	22 (7%)	967	83 (9%)	817	58 (7%)	656	71 (11%)	706	74 (11%)
CGM Status										
CGM user	414	14 (3%)	584	15 (3%)	424	17 (4%)	684	36 (5%)	577	39 (7%)
CGM non-user	899	48 (5%)	2599	140 (5%)	2021	121 (6%)	1459	121 (8%)	1399	150 (11%)
Most Recent HbA1c										
<7.0% (<53 mmol/mol)	96	4 (4%)	174	8 (5%)	257	11 (4%)	575	37 (6%)	498	51 (10%)
7.0-<7.5% (53-<58 mmol/mol)	148	4 (3%)	268	9 (3%)	283	10 (4%)	395	19 (5%)	372	41 (11%)
7.5-<8.0% (58-<64 mmol/mol)	214	9 (4%)	410	15 (4%)	341	14 (4%)	357	24 (7%)	375	30 (8%)
8.0-<9.0% (64-<75 mmol/mol)	420	19 (5%)	866	38 (4%)	596	36 (6%)	398	27 (7%)	397	35 (9%)
≥9.0% (≥75 mmol/mol)	380	25 (7%)	1370	79 (6%)	888	60 (7%)	265	36 (14%)	184	17 (9%)
Frequency of ≥1 Diabetic Ketoacidosis Event in Prior 3 Months										
Overall	1313	31 (2%)	3183	113 (4%)	2445	96 (4%)	2143	43 (2%)	1976	22 (1%)
Insulin Delivery Method										
Pump	973	12 (1%)	2134	49 (2%)	1585	44 (3%)	1442	24 (2%)	1243	14 (1%)
Injections	317	17 (5%)	967	61 (6%)	817	51 (6%)	656	17 (3%)	706	8 (1%)
CGM Status										
CGM user	414	4 (1%)	584	9 (2%)	424	9 (2%)	684	5 (1%)	577	1 (<1%)
CGM non-user	899	27 (3%)	2599	104 (4%)	2021	87 (4%)	1459	38 (3%)	1399	21 (2%)

Most Recent HbA1c										
<7.0% (<53 mmol/mol)	96	0	174	1 (1%)	257	2 (1%)	575	2 (<1%)	498	3 (1%)
7.0-<7.5% (53-<58 mmol/mol)	148	1 (1%)	268	3 (1%)	283	3 (1%)	395	2 (1%)	372	2 (1%)
7.5-<8.0% (58-<64 mmol/mol)	214	3 (1%)	410	2 (1%)	341	5 (1%)	357	2 (1%)	375	0
8.0-<9.0% (64-<75 mmol/mol)	420	5 (1%)	866	18 (2%)	596	9 (2%)	398	9 (2%)	397	8 (2%)
≥9.0% (≥75 mmol/mol)	380	20 (5%)	1370	83 (6%)	888	74 (8%)	265	25 (9%)	184	5 (3%)

Figure 1A. Continuous Glucose Monitoring Use over Time

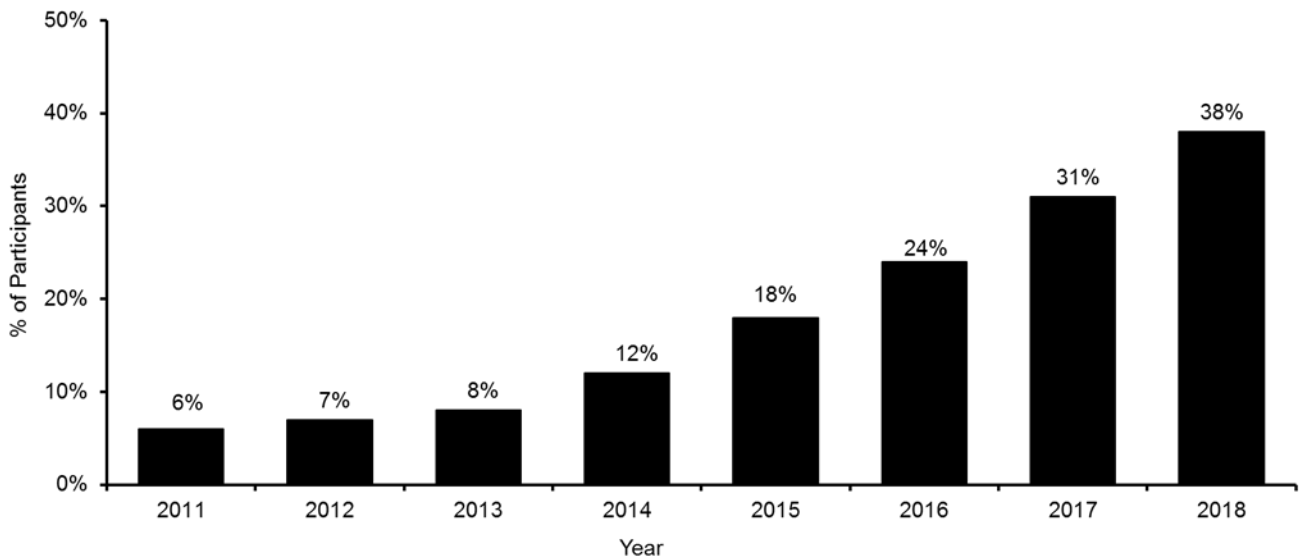


Figure 1B. Continuous Glucose Monitoring Use 2010-2012 versus 2016-2018

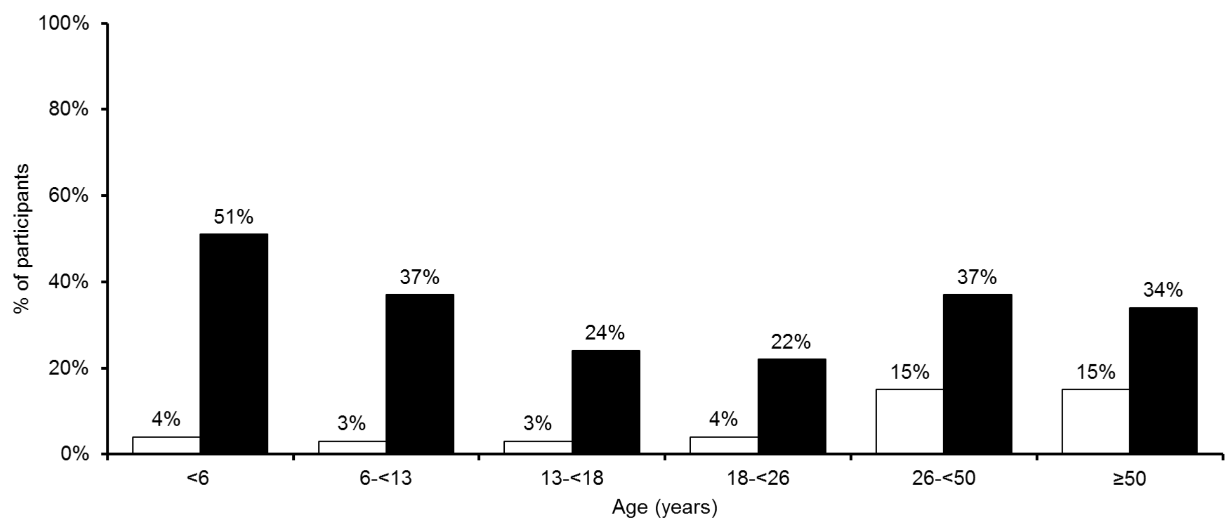
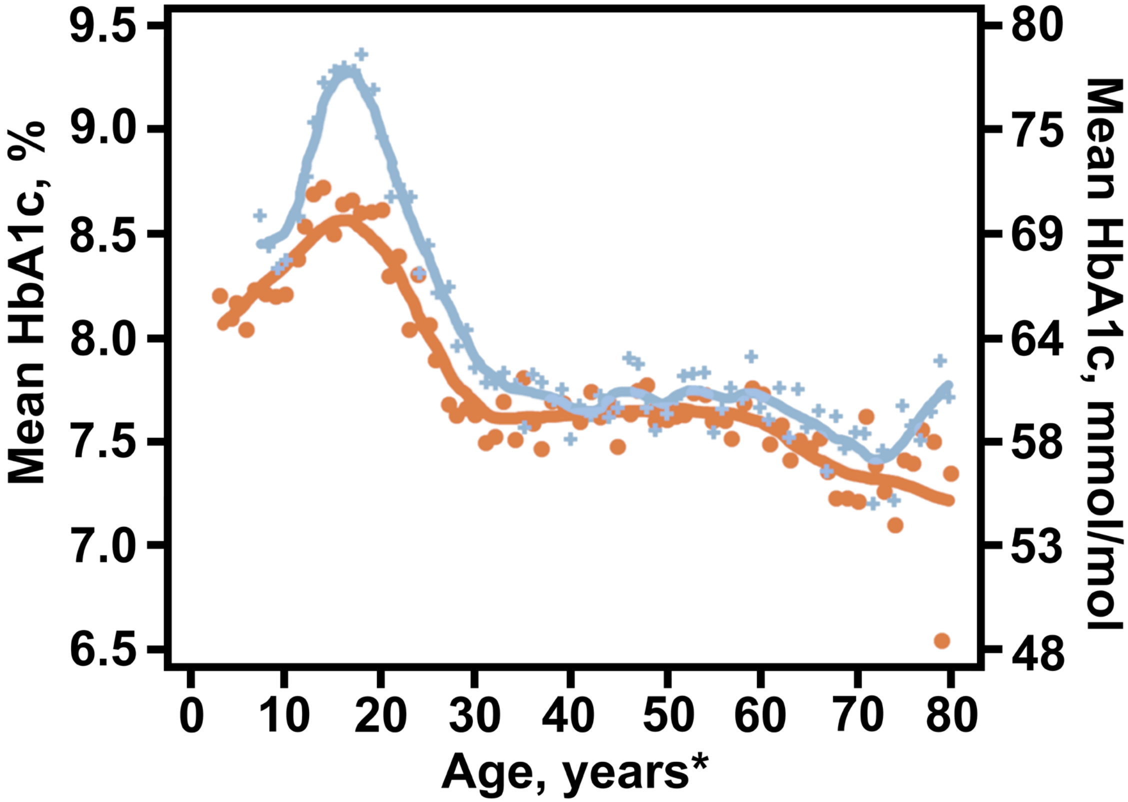


Figure Legend

Solid white represents 2010-2012 (7% use CGM overall)

Solid black represents 2016-2018 (30% use CGM overall)

Figure 2. Average HbA1c by Year of Age: 2010-2012 versus 2016-2018



Orange line represents 2010-2012 cohort, blue line represents 2016-2018 cohort

Participants must be contained in both cohorts with at least 3 years duration for the 2010-2012 collection

*≥80 years old are pooled

Figure 3. Mean HbA1c by Technology Use in 2016-2018

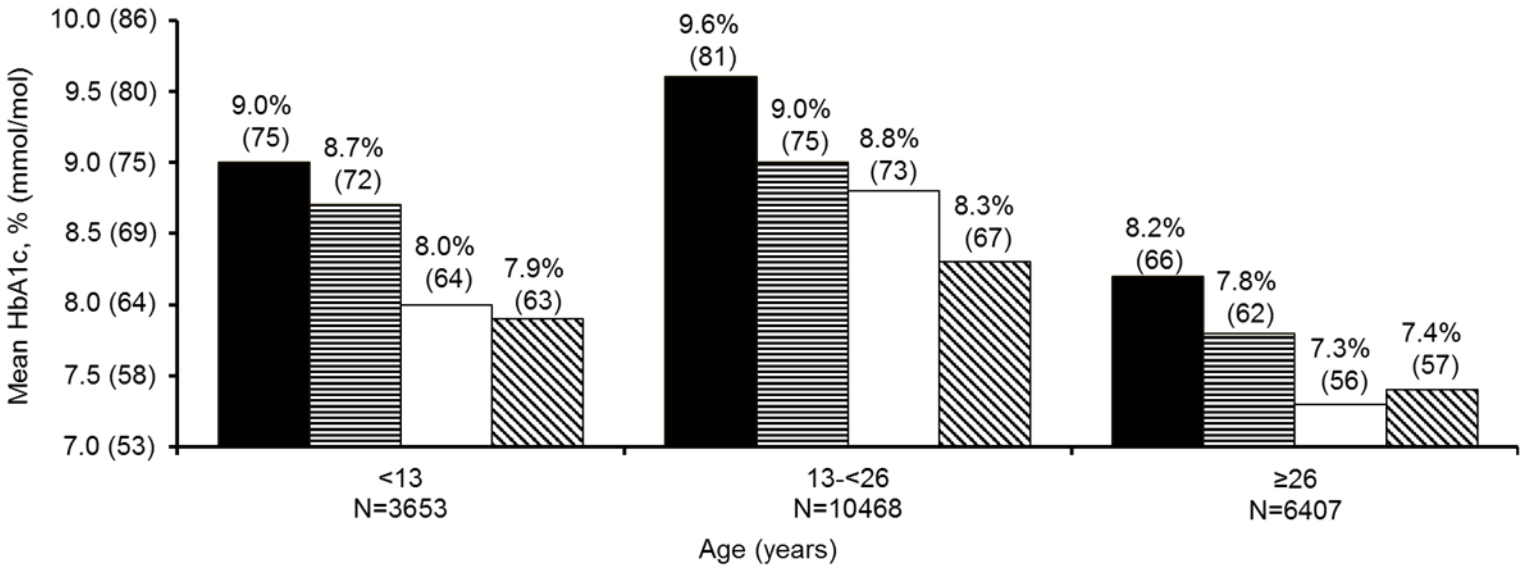


Figure Legend

Solid black represents Injection only.
Horizontal stripes represent Pump only.
Solid white represents Injection+CGM.
Diagonal stripes represent Pump+CGM.

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Supplemental Table S1. Participant Characteristics: 2016-2018

	Overall N=22,697	1 - 5 yrs old N= 415	6 - 12 yrs old N=3688	13 - 17 yrs old N= 6675	18 - 25 yrs old N= 4535	26 - 49 yrs old N= 3939	≥50 yrs old N=3445
Demographic and Clinical Characteristics							
Sex[a] – *N(%) Female*	11,394 (50%)	185 (45%)	1772 (48%)	3249 (49%)	2235 (49%)	2143 (55%)	1810 (53%)
Race/Ethnicity[a]- *N(%)*							
White Non-Hispanic	18,368 (82%)	317 (78%)	2775 (76%)	5142 (77%)	3606 (80%)	3353 (86%)	3175 (93%)
Black Non-Hispanic	1288 (6%)	22 (5%)	251 (7%)	436 (7%)	224 (5%)	217 (6%)	138 (4%)
Hispanic or Latino	1866 (8%)	42 (10%)	382 (11%)	703 (11%)	495 (11%)	193 (5%)	51 (1%)
Other	1008 (4%)	26 (6%)	228 (6%)	365 (5%)	199 (4%)	134 (3%)	56 (2%)
Annual Household Income[a]- *N(%)*							
< $50,000	5086 (31%)	110 (36%)	949 (34%)	1564 (31%)	879 (29%)	953 (31%)	631 (25%)
$50,000 - <$75,000	2817 (17%)	59 (19%)	471 (17%)	829 (17%)	441 (15%)	552 (18%)	465 (19%)
≥$75,000	8725 (52%)	134 (44%)	1357 (49%)	2580 (52%)	1703 (56%)	1535 (50%)	1416 (56%)
Education Level[a] – *N(%)*							
Less than Bachelor degree	10,558 (49%)	221 (55%)	1760 (50%)	3192 (50%)	2427 (57%)	1554 (43%)	1404 (45%)
Bachelor degree	6049 (28%)	97 (24%)	940 (27%)	1735 (27%)	980 (23%)	1374 (38%)	923 (30%)
Master, professional or doctorate	4724 (22%)	86 (21%)	811 (23%)	1435 (23%)	881 (21%)	715 (20%)	796 (25%)
Insurance Status[a] – *N(%)*							
Private	16,028 (74%)	242 (63%)	2324 (68%)	4503 (72%)	3498 (80%)	3229 (85%)	2232 (66%)
Other	5339 (25%)	139 (36%)	1032 (30%)	1716 (27%)	812 (19%)	517 (14%)	1123 (33%)
None	243 (1%)	5 (1%)	49 (1%)	68 (1%)	48 (1%)	50 (1%)	23 (<1%)
Duration of Diabetes - *median (IQR)*	10 (6, 19)	2 (2, 3)	6 (3, 7)	8 (6, 11)	11 (8, 15)	22 (15, 29)	35 (23, 46)
Duration Group- *N(%)*							
1-< 5 years	3392 (15%)	370 (>99%)	1509 (42%)	1113 (17%)	261 (6%)	99 (3%)	40 (1%)
5-< 10 years	7300 (32%)	2 (<1%)	1949 (54%)	3313 (50%)	1527 (34%)	378 (10%)	131 (4%)

10-<20 years	6617 (29%)	-	159 (4%)	2190 (33%)	2551 (56%)	1211 (31%)	506 (15%)
20-< 30 years	2207 (10%)	-	-	-	186 (4%)	1372 (35%)	649 (19%)
30-< 40 years	1489 (7%)	-	-	-	-	718 (18%)	771 (22%)
40-< 49 years	985 (4%)	-	-	-	-	153 (4%)	832 (24%)
≥ 50 years	516 (2%)	-	-	-	-	-	516 (15%)
BMI Z-Score[a]- *mean ± SD*	0.4±1.0	0.8±1.1	0.6±1.2	0.8±1.0	0.2±1.0	0.09±0.8	-0.1±0.8
BMI Group[b] - N(%)							
Underweight/Normal Weight	10,577 (51%)	239 (59%)	2457 (67%)	3793 (58%)	2183 (52%)	1002 (31%)	903 (33%)
Overweight	6022 (29%)	98 (24%)	728 (20%)	1651 (25%)	1334 (32%)	1169 (36%)	1042 (38%)
Obese	4227 (20%)	68 (17%)	466 (13%)	1122 (17%)	679 (16%)	1074 (33%)	818 (30%)
Diabetes Management							
Pump use[a] – *N (%)*	14,047 (63%)	233 (64%)	2403 (68%)	4040 (62%)	2700 (60%)	2542 (66%)	2129 (62%)
CGM use[a] – *N(%)*	6547 (30%)	183 (51%)	1302 (37%)	1553 (24%)	963 (22%)	1402 (37%)	1144 (34%)
Self-Monitoring of Blood Glucose[c]- *mean ± SD*	4.1±2.4	6.4±2.4	5.5±2.3	3.8±2.2	3.3±2.4	3.9±2.4	4.6±2.3
0-3 times per day	5402 (41%)	10 (6%)	295 (14%)	2062 (46%)	1641 (58%)	885 (45%)	509 (28%)
4-6 times per day	5947 (45%)	85 (53%)	1139 (56%)	1912 (43%)	946 (33%)	861 (44%)	1004 (55%)
6-9 times per day	1508 (11%)	48 (30%)	482 (24%)	384 (9%)	184 (6%)	163 (8%)	247 (13%)
≥ 10 times per day	448 (3%)	17 (11%)	133 (6%)	91 (2%)	66 (2%)	66 (3%)	75 (4%)
Non-insulin medications for blood glucose control- *N(%)*							
Metformin	811 (4%)	0	12 (<1%)	185 (3%)	171 (4%)	257 (7%)	186 (5%)
GLP-1 agonist	300 (1%)	0	0	8 (<1%)	27 (<1%)	163 (4%)	102 (3%)
DPP-IV*i*	9 (<1%)	0	0	0	0	4 (<1%)	5 (<1%)
SGLT2*i*	232 (1%)	0	0	1 (<1%)	14 (<1%)	119 (3%)	98 (3%)
Pramlintide	131 (>1%)	0	0	3 (<1%)	9 (<1%)	52 (1%)	67 (2%)
Other[d]	28 (<1%)	0	0	2 (<1%)	2 (<1%)	10 (<1%)	14 (<1%)

[a]39 transgender participants; race/ethnicity information missing for 167 participants; Annual income missing for 6069 participants; education information missing for 1366 participants; insurance status information missing for 1087 participants; BMI information missing for 1872 participants; insulin modality (pump use) information missing for 528 participants; information on use of CGM missing for 899 participants| parental education level used for participants <18 years old

[b] Underweight/Normal weight defined as $< 85^{th}$ bmi percentile adjusted for age and sex for participants < 20 years and bmi < 25 for adults ≥ 20 years, overweight defined as 85^{th} - $< 95^{th}$ bmi percentile for participants < 20 years and bmi 25-<30 for adults ≥ 20 years , obese defined as $\geq 95^{th}$ bmi percentile for participants < 20 years and bmi ≥ 30 for adults ≥ 20 years; age and sex-adjusted

[cs]SMBG available for 13,344 participants not using a continuous glucose monitor

[d]Includes: thiazolidinediones and sulfonylureas

Supplemental Table S2. Participant Characteristics 2010-2012 versus 2016-2018

	2010-2012 N=25,529	**2016-2018[a] N=22,697**
Age (years) - *mean±StD*	22 ± 17	26 ± 18
Female – *N(%)*	12,706 (50%)	11,394 (50%)
Non-Hispanic White – *N(%)*	20,954 (82%)	18,368 (82%)
Private insurance – *N(%)*	17,081 (75%)	16,028 (74%)
Duration of diabetes – *median (IQR)*	6 (2,14)	10 (6, 19)
BMI z-score - *mean±StD*	0.4 ± 1.0	0.4 ± 1.0
Pump use – *N(%)*	12,637 (57%)	14,047 (63%)
CGM use – *N(%)*	1591 (7%)	6547 (30%)
Self-monitoring of blood glucose[b] - *mean±StD*	4·7 ± 3·0	4·1 ± 2·4
Non-insulin medications for blood glucose control- *N(%)*		
Metformin	388 (2%)	811 (4%)
GLP-1 agonist	34 (<1%)	300 (1%)
DPP-IV*i*	9 (<1%)	9 (<1%)
SGLT2*i*	0	232 (1%)
Pramlintide	124 (<1%)	131 (<1%)
Other[c]	24 (<1%)	28 (<1%)

StD = standard deviation

[a]12,705 (56%) participants in the 2016-2018 cohort also in the 2010-2012 cohort

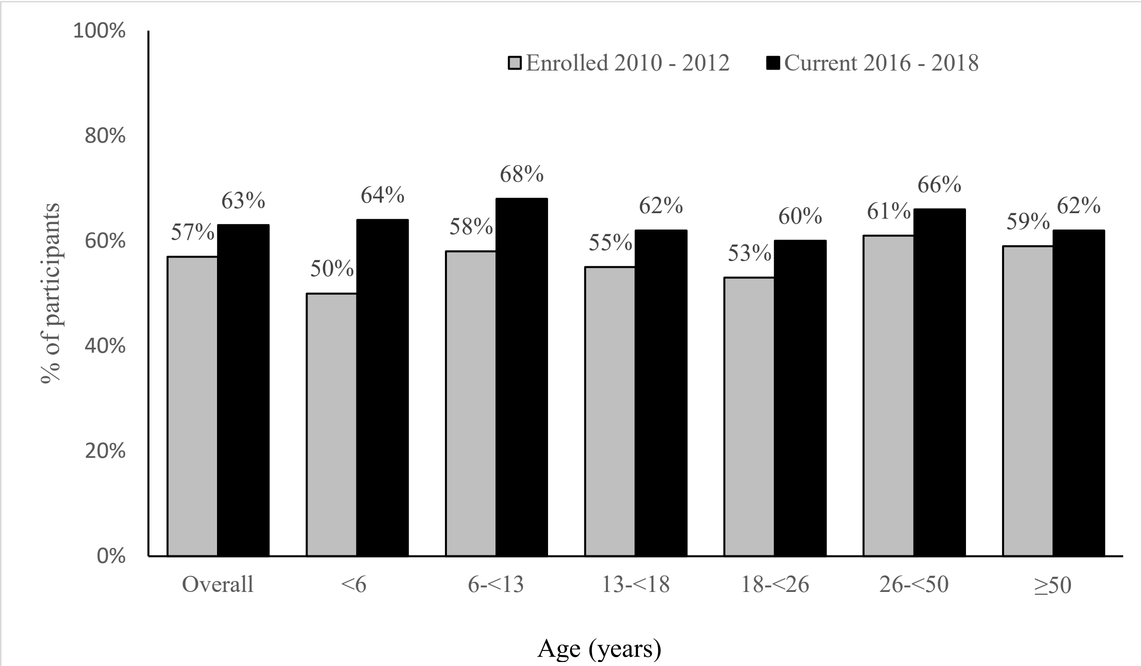
[b]Calculation excludes participants using CGM

[c]Includes: thiazolidinediones and sulfonylureas

Supplemental Table S3. Use of Technology by Race/Ethnicity: 2016-2018

	Age (years)								
	<13			13 - 25			≥26		
	White Non-Hispanic	Black Non-Hispanic	Hispanic or Latino	White Non-Hispanic	Black Non-Hispanic	Hispanic or Latino	White Non-Hispanic	Black Non-Hispanic	Hispanic or Latino
Pump use – *n(%)*									
Annual Household Income									
<$50,000	398 (59%)	37 (37%)	69 (45%)	782 (50%)	65 (25%)	67 (45%)	789 (62%)	40 (29%)	46 (49%)
$50,000-<$75,000	294 (72%)	9 (41%)	34 (68%)	696 (68%)	16 (28%)	31 (50%)	600 (65%)	21 (51%)	17 (68%)
≥$75,000	1011 (81%)	22 (73%)	62 (72%)	2724 (74%)	47 (52%)	128 (72%)	1902 (70%)	39 (64%)	50 (76%)
CGM use – *n(%)*									
Annual Household Income									
<$50,000	172 (26%)	8 (8%)	21 (14%)	227 (15%)	14 (5%)	43 (10%)	312 (25%)	13 (10%)	15 (16%)
$50,000-<$75,000	172 (43%)	3 (15%)	18 (36%)	225 (22%)	3 (5%)	17 (17%)	315 (35%)	10 (26%)	11 (44%)
≥$75,000	658 (54%)	8 (26%)	46 (55%)	1207 (33%)	8 (9%)	72 (31%)	1218 (46%)	15 (26%)	33 (51%)

Supplemental Figure S1. Pump Use 2010-2012 versus 2016-2018



Supplemental Table S4. Aspects of Self-Reported Diabetes Management in 2016-2018

	Overall N=11,007		6 - 12 yrs old N=1312		13 - 17 yrs old N= 3179		18 - 25 yrs old N= 2440		26 - 49 yrs old N= 2122		≥50 yrs old N=1953	
Insulin Use												
Timing of insulin bolus – ***N(%)***												
At least several minutes before the meal	2671	24%	359	27%	626	20%	419	17%	544	26%	723	37%
Immediately before the meal	4822	44%	579	44%	1491	47%	1009	41%	944	44%	798	41%
During the meal	1178	11%	105	8%	351	11%	339	14%	262	12%	121	6%
After the meal	2336	21%	269	21%	711	22%	673	28%	372	18%	311	16%
Frequency of use of insulin pump features to decide insulin dose based on carbohydrate intake – ***N(%)***												
Always	4892	65%	699	70%	1462	66%	1063	66%	859	59%	809	64%
Sometimes	1151	15%	100	10%	240	11%	257	16%	326	22%	228	18%
Rarely	441	6%	32	3%	102	5%	96	6%	141	10%	70	6%
Never	1084	14%	166	17%	415	19%	197	12%	141	10%	165	13%
Frequency of use of insulin pump features to decide insulin dose based on elevated glucose values – ***N(%)***												
Always	4984	66%	675	68%	1476	67%	1095	68%	892	61%	846	67%
Sometimes	1384	18%	149	15%	311	14%	285	18%	383	26%	256	20%
Rarely	302	4%	25	3%	71	3%	77	5%	80	5%	49	4%
Never	898	12%	148	15%	361	16%	156	10%	112	8%	121	10%
Frequency of use of insulin pump features to decide insulin dose based on both carbohydrate intake and elevated glucose values – ***N(%)***												
Always	5049	67%	718	72%	1507	68%	1093	68%	864	59%	867	68%
Sometimes	889	12%	133	13%	344	16%	160	10%	130	9%	122	10%
Rarely	322	4%	31	3%	74	3%	67	4%	102	7%	48	4%

Never	1308	17%	115	12%	294	13%	293	18%	371	25%	235	18%
Frequency of missed insulin bolus - *N(%)*												
Never	3330	30%	541	41%	810	25%	535	22%	670	32%	774	40%
Once a month or less	3411	31%	430	33%	894	28%	687	28%	736	35%	664	34%
Once a week or less	1867	17%	165	13%	595	19%	501	21%	339	16%	267	14%
2 days per week	1335	12%	112	9%	482	15%	376	15%	225	11%	140	7%
3-4 days per week	572	5%	28	2%	208	7%	191	8%	88	4%	56	3%
5-6 days per week	143	1%	10	<1%	53	2%	41	2%	20	<1%	19	<1%
At least once a day	351	3%	24	2%	138	4%	112	5%	47	2%	30	2%
Frequency of missed basal for injection users[a] – *N(%)*												
Never	2125	61%	248	79%	575	60%	397	48%	417	62%	487	70%
Once a month or less	911	26%	53	17%	240	25%	265	32%	187	28%	166	24%
Once a week or less	214	6%	8	3%	65	7%	77	9%	34	5%	30	4%
2 days per week	119	3%	2	<1%	52	5%	46	6%	15	2%	4	<1%
3-4 days per week	37	1%	0	0	7	<1%	18	2%	7	1%	5	<1%
5-6 days per week	7	<1%	2	<1%	2	<1%	2	<1%	1	<1%	0	0
At least once a day	67	2%	2	<1%	22	2%	27	3%	8	1%	8	1%
Duration of infusion set wear (days) – *mean±std*	3.1±0.8		2.8±0.6		2.9±0.7		3.2±0.8		3.4±0.9		3.3±0.9	
Glucose Monitoring												
Frequency of deciding amount of insulin bolus based only on CGM[b] – *N(%)*												
Always	277	7%	22	4%	52	6%	48	7%	99	10%	56	8%
Most of the time	1154	30%	114	21%	217	24%	232	35%	374	39%	217	29%
Sometimes	1201	31%	187	34%	306	34%	206	31%	278	29%	224	30%
Rarely	671	18%	116	21%	177	19%	113	17%	130	14%	135	18%
Never	510	13%	112	20%	156	17%	58	9%	70	7%	114	15%
Adjust insulin dose based on trend arrows on CGM[b] – *N(%)*	2870	75%	400	72%	634	70%	533	81%	773	81%	530	71%
Ketone Monitoring												
Method of ketone checking – *N(%)*												

Blood	943	9%	273	21%	368	12%	194	8%	54	3%	54	3%
Urine	5233	47%	809	62%	2090	66%	1383	57%	575	27%	376	19%
Sometimes blood and sometimes urine	333	3%	59	4%	144	5%	89	4%	23	1%	18	<1%
Rarely check for ketones with blood or urine	1724	16%	119	9%	366	11%	415	17%	443	21%	380	19%
Never check for ketones	2828	26%	53	4%	215	7%	364	15%	1048	49%	1148	58%
Has a blood-ketone meter at home – *N(%)*	2230	20%	490	37%	840	26%	605	25%	173	8%	122	6%
Has urine ketone strips at home – *N(%)*	7838	71%	1116	85%	2809	88%	2084	85%	1069	50%	759	38%
Frequency of checking ketones via blood in 30 day period (days) - *median (IQR)*	0 (0,0)		0 (0,0)		0 (0,0)		0 (0,0)		0 (0,0)		0 (0,0)	
Frequency of checking ketones via urine in 30 day period (days) – *median (IQR)*	0 (0,1)		0 (0,3)		0 (0,2)		0 (0,1)		0 (0,0)		0 (0,0)	
HbA1c Goals												
Participant reported having an HbA1c goal – *N(%)*	10046	91%	1185	90%	2829	89%	2223	91%	2000	93%	1808	91%
HbA1c goal – *N(%)*												
<42 mmol/mol (<6%)	670	7%	40	3%	91	3%	107	5%	245	12%	187	10%
<48 mmol/mol (<6·5%)	1387	14%	85	7%	189	7%	260	12%	490	25%	363	20%
<53 mmol/mol (<7·0%)	3949	39%	393	33%	958	34%	896	40%	894	45%	808	45%
<58 mmol/mol (<7·5%)	2391	24%	427	36%	862	31%	563	25%	234	12%	305	17%
<64 mmol/mol (<8·0%)	1087	11%	189	16%	442	16%	252	11%	100	5%	104	6%
<69 mmol/mol (<8·5%)	404	4%	38	3%	203	7%	107	5%	27	1%	28	2%
≥69 mmol/mol (≥8·5%)	112	1%	6	<1%	60	2%	34	2%	6	<1%	6	<1%
Use of Glucagon												
Used glucagon in prior 3 months to treat severe hypoglycemia – *N(%)*	331	3%	30	2%	81	3%	52	2%	53	2%	115	6%
Used glucagon in small doses in prior 3 months before or during exercise – *N(%)*	36	<1%	3	<1%	18	<1%	7	<1%	4	<1%	4	<1%
Used glucagon in small doses in prior 3 months in place of carbohydrates – *N(%)*	29	<1%	8	<1%	9	<1%	6	<1%	2	<1%	4	<1%
Device Downloading												

Frequency download blood glucose meter outside of doctor's office: non-CGM users[bc] – *N(%)*												
Never	5750	71%	529	62%	1590	63%	1420	72%	1115	78%	1095	81%
<1 time a year	461	6%	53	6%	137	5%	145	7%	84	6%	42	3%
Once per year	246	3%	34	4%	79	3%	74	4%	37	3%	22	2%
A few times a year	877	11%	134	16%	337	13%	196	10%	107	7%	103	8%
Once per month	446	5%	57	7%	207	8%	85	4%	47	3%	50	4%
2-3 times per month	174	2%	28	3%	85	3%	28	1%	17	1%	16	1%
Once per week	105	1%	14	2%	43	2%	16	<1%	16	1%	16	1%
2-5 times per week	26	<1%	4	<1%	14	<1%	2	<1%	4	<1%	2	<1%
6-7 times per week	47	<1%	5	<1%	19	<1%	8	<1%	6	<1%	9	<1%
Frequency download blood glucose meter outside of doctor's office: CGM users[bc] – *N(%)*												
Never	1585	60%	205	51%	289	51%	246	59%	464	69%	381	67%
<1 time a year	172	7%	18	5%	41	7%	36	9%	45	7%	32	6%
Once per year	95	4%	14	4%	24	4%	25	6%	15	2%	17	3%
A few times a year	420	16%	82	21%	114	20%	69	17%	88	13%	67	12%
Once per month	217	8%	47	12%	63	11%	28	7%	40	6%	39	7%
2-3 times per month	85	3%	21	5%	22	4%	10	2%	13	2%	19	3%
Once per week	40	2%	9	2%	15	3%	2	<1%	5	<1%	9	2%
2-5 times per week	6	<1%	0	0	3	<1%	1	<1%	1	<1%	1	<1%
6-7 times per week	12	<1%	4	1%	0	0	0	0	5	<1%	3	<1%
Reason for infrequent meter downloading (< once per month)[d] – *N(%)*												
Do not own computer	564	6%	99	9%	143	5%	106	5%	106	5%	110	6%
Did not know it was possible to download	1127	12%	98	9%	365	14%	277	13%	198	10%	189	11%
Did not know how to download	2097	22%	187	17%	536	21%	474	21%	381	19%	519	30%
Download too hard to understand	444	5%	53	5%	148	6%	67	3%	79	4%	97	6%
Takes too much time	2133	22%	187	17%	531	20%	566	26%	566	26%	283	16%

Meter software not compatible with computer	891	9%	117	11%	254	10%	214	10%	153	8%	153	9%
Get blood glucose downloads from pump	1784	19%	230	22%	516	20%	406	18%	347	18%	285	16%
Prefer written records	1236	13%	173	16%	360	14%	259	12%	187	10%	257	15%
Do not find data useful	856	9%	53	5%	174	7%	244	11%	222	11%	163	9%
Frequency of downloading CGM data outside doctor's office[b] – ***N(%)***												
Never	2278	51%	262	42%	571	50%	421	51%	552	52%	472	57%
<1 time per year	280	6%	33	5%	64	6%	62	8%	76	7%	45	5%
Once per year	144	3%	14	2%	30	3%	34	4%	43	4%	23	3%
A few times a year	670	15%	126	20%	169	15%	119	15%	161	15%	95	11%
Once per month	576	13%	100	16%	157	14%	96	12%	127	12%	96	12%
2-3 times per month	221	5%	43	7%	50	4%	37	5%	48	5%	43	5%
Once per week	153	3%	27	4%	54	5%	15	2%	25	2%	32	4%
More than once per week	38	<1%	8	1%	12	1%	6	<1%	8	<1%	4	<1%
Everyday	125	3%	18	3%	37	3%	29	4%	22	2%	19	2%
Reason for infrequent CGM downloading (<once per month)[d] – ***N(%)***												
Does not own computer	169	5%	26	6%	46	6%	24	4%	39	5%	34	5%
Did not know it was possible to download	388	12%	49	11%	134	16%	82	13%	60	7%	63	10%
Did not know how to download	790	23%	102	23%	218	26%	138	22%	158	19%	174	27%
Download too hard to understand	233	7%	32	7%	58	7%	35	6%	54	6%	54	9%
Takes too much time	1139	34%	129	30%	241	29%	232	36%	366	44%	171	27%
CGM software not compatible with computer	360	11%	37	9%	59	7%	77	12%	101	12%	86	14%
Prefer written records	351	10%	67	15%	98	12%	68	11%	53	6%	65	10%
Does not find data useful	323	10%	25	6%	69	8%	66	10%	91	11%	72	11%
Frequency download insulin pump data outside doctor's office[a] – ***N(%)***												
Never	4587	60%	456	45%	1148	50%	1054	64%	1017	69%	912	71%
<1 time per year	503	7%	62	6%	162	7%	134	8%	94	6%	51	4%

Once per year	273	4%	40	4%	83	4%	70	4%	45	3%	35	3%
A few times a year	1173	15%	228	23%	418	18%	213	13%	173	12%	141	11%
Once per month	756	10%	134	13%	310	14%	130	8%	94	6%	88	7%
2-3 times per month	251	3%	55	5%	108	5%	29	2%	28	2%	31	2%
Once per week	120	2%	21	2%	54	2%	6	<1%	20	1%	19	1%
More than once per week	15	<1%	2	<1%	6	<1%	3	<1%	3	<1%	1	<1%
Everyday	24	<1%	6	<1%	6	<1%	3	<1%	4	<1%	5	<1%
Reason for infrequent insulin pump downloading (<once per month)[d] – *N(%)*												
Does not own computer	356	5%	69	9%	95	5%	58	4%	66	5%	68	6%
Did not know it was possible to download	571	9%	43	5%	169	9%	142	10%	102	8%	115	10%
Did not know how to download	1584	24%	155	20%	432	24%	322	22%	295	22%	380	33%
Download too hard to understand	441	7%	61	8%	146	8%	73	5%	76	6%	85	7%
Takes too much time	2170	33%	226	29%	607	34%	542	37%	535	40%	260	23%
Insulin pump software not compatible with computer	771	12%	117	15%	201	11%	185	13%	143	11%	125	11%
Prefer written records	725	11%	136	17%	212	12%	154	10%	95	7%	128	11%
Does not find data useful	682	10%	60	8%	146	8%	200	14%	154	12%	122	11%
Uses a mobile medical application to assist with diabetes care – *N(%)*	1799	16%	303	23%	566	18%	425	17%	334	16%	171	9%
Tasks performed using mobile medical application[d] – *N(%)*												
View glucose meter data	352	20%	42	14%	116	20%	84	20%	62	19%	48	28%
View CGM data	1298	72%	248	82%	416	73%	280	66%	243	73%	111	65%
View insulin pump data	175	10%	31	10%	56	10%	30	7%	26	8%	32	19%
Manage patterns and adjust insulin	400	22%	67	22%	103	18%	97	23%	83	25%	50	29%
Share results with healthcare provider	409	23%	66	22%	108	19%	82	19%	87	26%	66	39%
Share results with family members	485	27%	124	41%	193	34%	94	22%	43	13%	31	18%
Record foods	226	13%	19	6%	49	9%	84	20%	54	16%	20	12%
Track exercise	207	12%	9	3%	34	6%	70	16%	68	20%	26	15%

Diabetes mobile medical applications used[d] – *N(%)*												
Dexcom Share	1218	68%	239	79%	408	72%	267	63%	211	63%	93	54%
Medtronic Connect	135	8%	19	6%	33	6%	25	6%	36	11%	22	13%
Glooko	73	4%	13	4%	25	4%	13	3%	14	4%	8	5%
Tidepool	44	2%	2	<1%	5	<1%	10	2%	18	5%	9	5%
MySugr	91	5%	8	3%	27	5%	37	9%	16	5%	3	2%
Hypoglycemia awareness												
Awareness of beginning to experience low blood sugar (0=Never aware and 5 = Always aware) – *median (IQR)*	4 (3,5)		4 (3,4)		4 (4,5)		4 (4,5)		4 (3,5)		4 (3,5)	
Level of blood sugar before feel symptoms – *N(%)*												
At least 3·9 mmol/L (70 mg/dL)	4637	42%	534	41%	1628	51%	1271	52%	712	33%	492	25%
3·3-3·8 mmol/L (60-69 mg/dL)	3670	33%	439	33%	1009	32%	835	34%	791	37%	596	30%
2·8-3·3 mmol/L (50-59 mg/dL)	1788	16%	225	17%	399	13%	264	11%	429	20%	470	24%
2·2-2·7 mmol/L (40-49 mg/dL)	538	5%	69	5%	80	3%	45	2%	121	6%	223	11%
<2·2 mmol/L (<40 mg/dL)	320	3%	33	3%	51	2%	22	<1%	69	3%	145	7%
Never feel symptoms	108	<1%	13	<1%	16	<1%	8	<1%	21	<1%	50	3%

[a]N=7568 participants reported insulin pump use; N=3480 reported multiple daily injection use

[b]N=3830 participants reported using a CGM; N=223 reported using a Medtronic 530G pump/CGM

[c]N=297 participants reported not using a blood glucose meter (N=246 non-CGM users | N=51 CGM users)

[d]Proportions of each row assessed individually (represent row percentages)

Supplemental Table S5. HbA1c by Participant Characteristics: 2016-2018

	HbA1c (Mean ± StD)*						
	1 - 5 yrs old N= 415	**6 - 12 yrs old N=3688**	**13 - 17 yrs old N= 6675**	**18 - 25 yrs old N= 4535**	**26 - 49 yrs old N= 3939**	**≥50 yrs old N=3445**	**P-value[a]**
Overall	66±13.1 8.2±1.2	69±15.3 8.5±1.4	77±20.8 9.2±1.9	74±20.8 8.9±1.9	62±16.4 7.8±1.5	61±13.1 7.7±1.2	<0.001
Race/Ethnicity							<0.001
White Non-Hispanic	64±12 8.0±1.1	68±14.2 8.4±1.3	75±19.7 9.0±1.8	72±19.7 8.7±1.8	61±14.2 7.7±1.3	60±13.1 7.6±1.2	
Black Non-Hispanic	75±16.4 9.0±1.5	81±18.6 9.6±1.7	92±24 10.6±2.2	89±25.1 10.3±2.3	77±24 9.2±2.2	72±17.5 8.7±1.6	
Hispanic or Latino	68±16.4 8.4±1.5	72±15.3 8.7±1.4	80±21.9 9.5±2.0	79±23 9.4±2.1	65±15.3 8.1±1.4	62±12 7.8±1.1	
Other	69±14.2 8.5±1.3	73±16.4 8.8±1.5	80±21.9 9.5±2.0	76±21.9 9.1±2.0	64±18.6 8.0±1.7	63±14.2 7.9±1.3	
Annual Household Income							<0.001
< $50,000	72±131 8.7±1.2	75±16.4 9.0±1.5	85±23 9.9±2.1	80±23 9.5±2.1	66±17.5 8.2±1.6	64±14.2 8.0±1.3	
$50,000 - <$75,000	64±12 8.0±1.1	70±14.2 8.6±1.3	77±19.2 9.2±1.8	74±19.2 8.9±1.8	62±14.2 7.8±1.3	61±13.1 7.7±1.2	
≥$75,000	61±10.9 7.7±1.0	65±12 8.1±1.1	73±18.6 8.8±1.7	70±18.6 8.6±1.7	58±13.1 7.5±1.2	58±10.9 7.5±1.0	
Pump use							<0.001
Pump	63±12 7.9±1.1	67±13.1 8.3±1.2	74±18.6 8.9±1.7	70±17.5 8.6±1.6	61±13.1 7.7±1.2	60±12 7.6±1.1	
Multiple daily injections	69±14.2 8.5±1.3	74±16.4 8.9±1.5	83±23 9.7±2.1	78±24 9.3±2.2	66±18.6 8.2±1.7	62±15.3 7.8±1.4	
CGM use							<0.001
CGM user	61±10.9 7.7±1.0	64±10.9 8.0±1.0	69±16.4 8.5±1.5	67±16.4 8.3±1.5	57±10.9 7.4±1.0	57±10.9 7.4±1.0	
Non-CGM user	72±13.1 8.7±1.2	73±15.3 8.8±1.4	80±21.9 9.5±2.0	76±21.9 9.1±2.0	65±17.5 8.1±1.6	62±14.2 7.8±1.3	

Self-Monitoring of Blood Glucose[b]							<0.001
0-3 times per day	81±17.5 9.6±1.6	85±20.8 9.9±1.9	88±21.9 10.2±2.0	81±21.9 9.6±2.0	70±19.7 8.6±1.8	68±16.4 8.4±1.5	
4-6 times per day	72±13.1 8.7±1.2	73±14.2 8.8±1.3	74±17.5 8.9±1.6	67±16.4 8.3±1.5	62±13.1 7.8±1.2	61±12 7.7±1.1	
6-9 times per day	65±10.9 8.1±1.0	68±12 8.4±1.1	66±15.3 8.2±1.4	63±16.4 7.9±1.5	56±10.9 7.3±1.0	56±9.8 7.3±0.9	
≥ 10 times per day	67±8.7 8.3±0.8	64±9.8 8.0±0.9	63±9.8 7.9±0.9	63±17.5 7.9±1.6	55±12 7.2±1.1	52±8.7 6.9±0.8	

[*]In each cell, HbA1c is expressed as mmol/mol on top and % on bottom.

[a]P-value from multivariable linear regression model; annual income was included as an ordinal factor and self-monitoring of blood glucose was included as a continuous factor in the model

[b]Self-monitoring of blood glucose assessed in non-CGM users