

Early Stage Investigator Lecture

Type 1 Diabetes Management in the U.S.: Epidemiologic Evidence, Trends, and Emerging Challenges

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National Institutes of Health
Office of Disease Prevention

Disclosures

Work support by NIDDK - K01DK138273



Overview

1. Background on type 1 diabetes
2. Glycemic control and new diabetes technologies
3. Obesity and weight management
4. Future directions for research



Overarching question of the talk

How well is type 1 diabetes being managed in the US?



BACKGROUND



What is Type 1 diabetes

Autoimmune condition

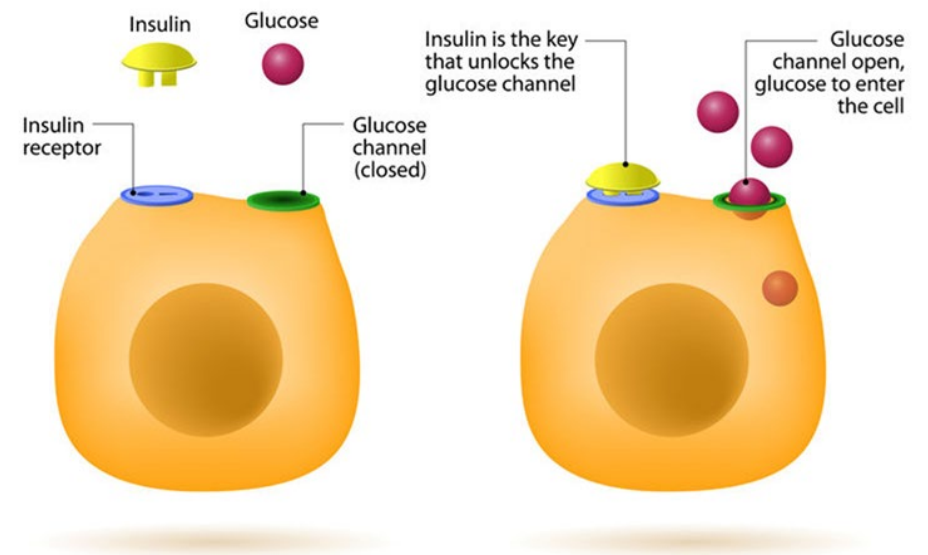
Beta cells (that produce insulin) are destroyed

Treatment – lifelong use of insulin

Typically diagnosed by

- Elevated blood sugar
- Autoantibodies (markers of autoimmunity)

Onset peaks at childhood, but can occur at all ages



Source: <https://www.shutterstock.com/image-illustration/how-does-insulin-work-283557914>



Epidemiology of T1DM in the US

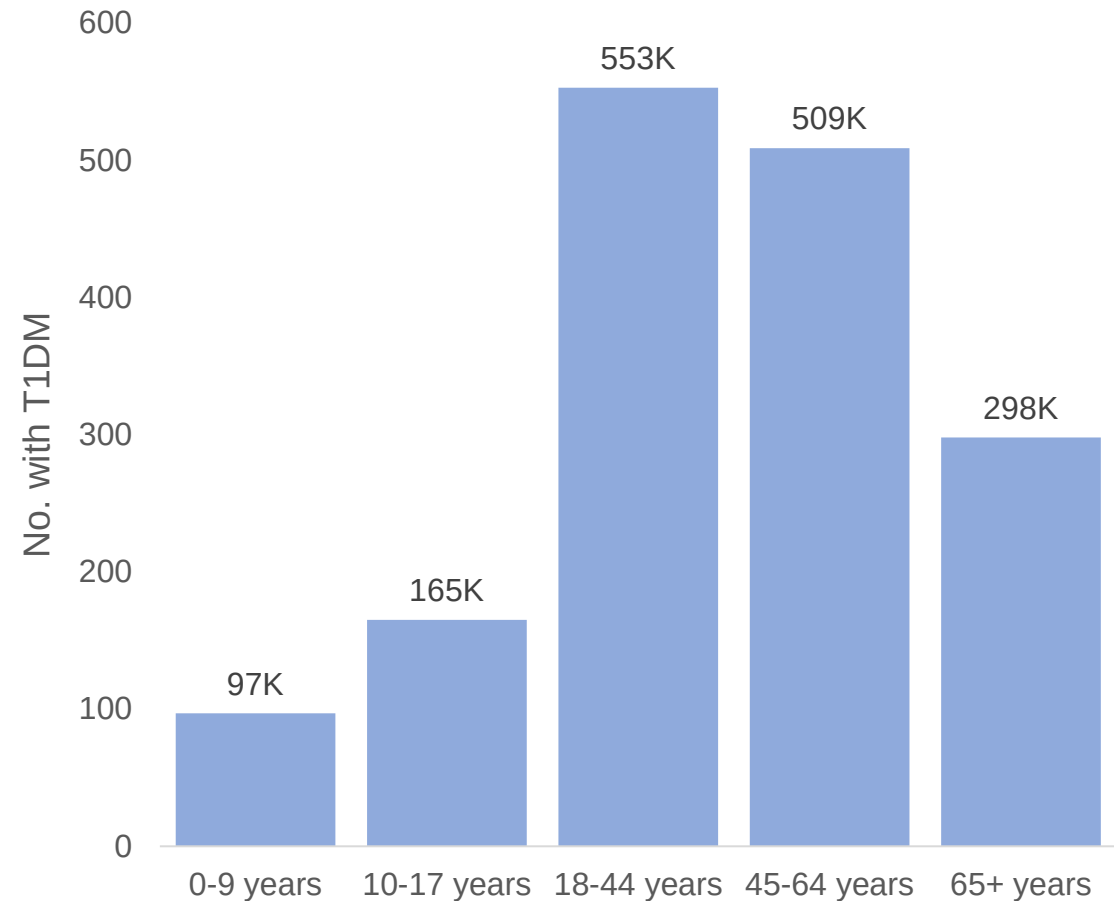


~4 per every 1000 US youth

~5 per every 1000 US adults

~1.6M individuals total

~50% 45 or older



Epidemiology of T1DM in the US

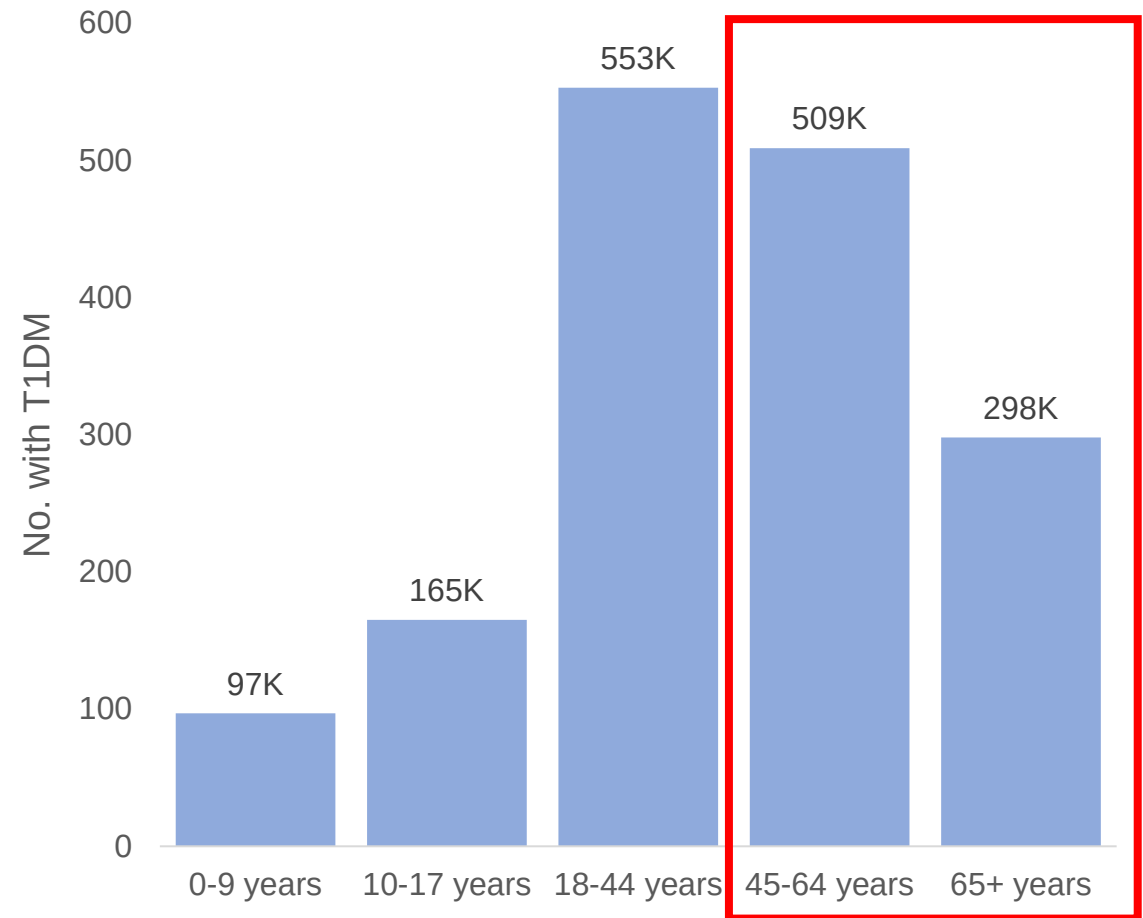


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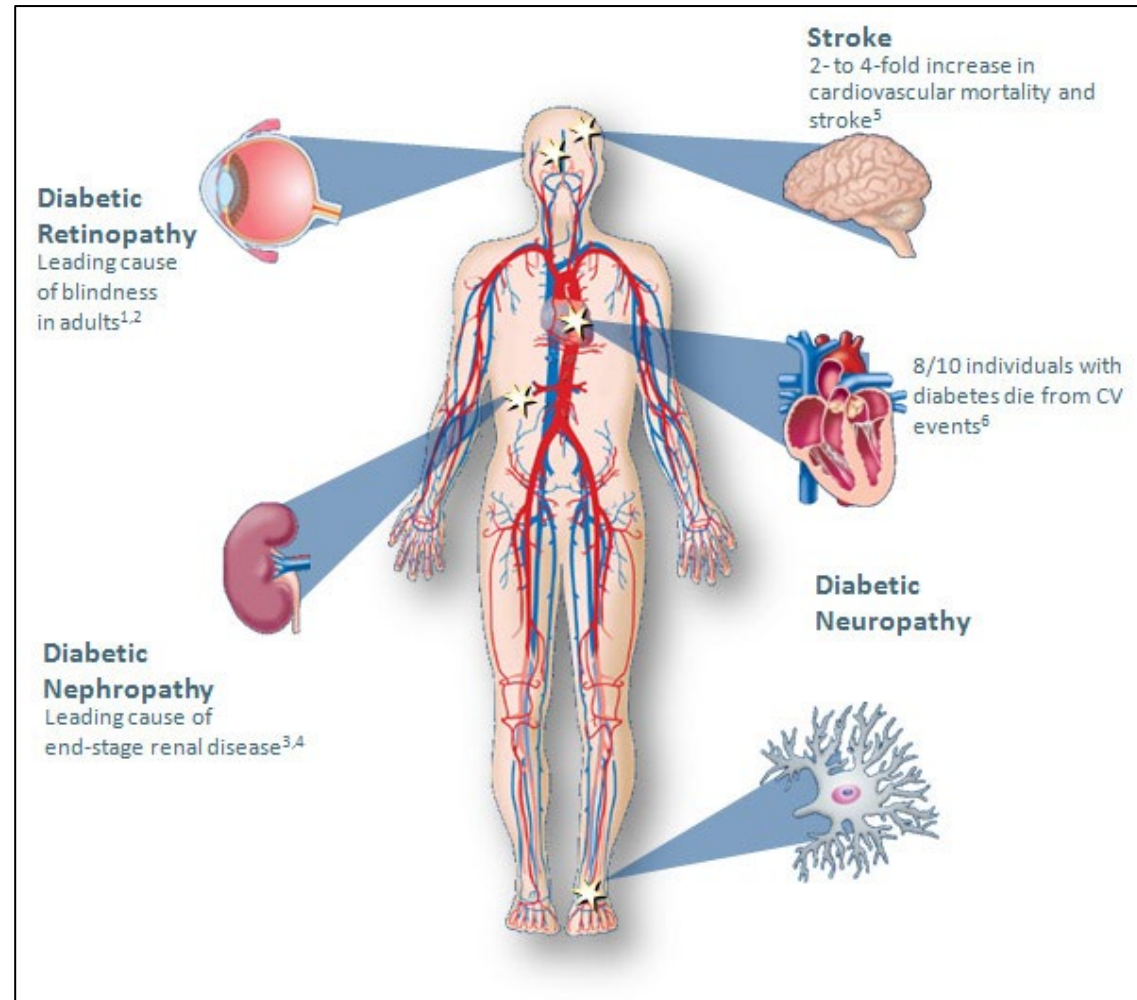
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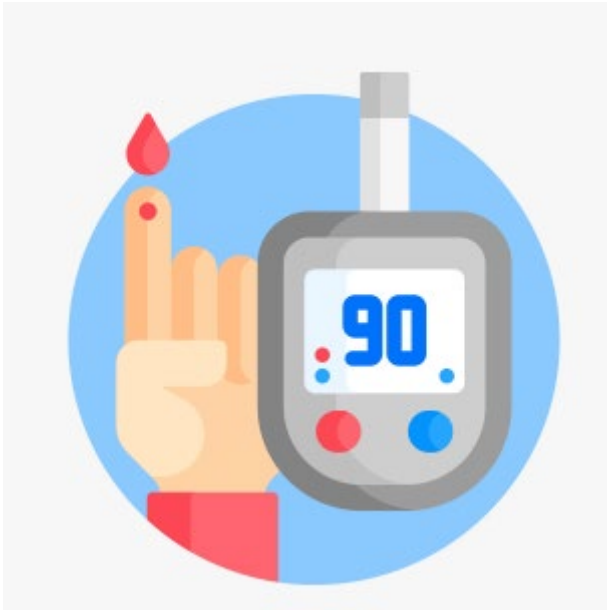


Type 1 diabetes – high risk for complications

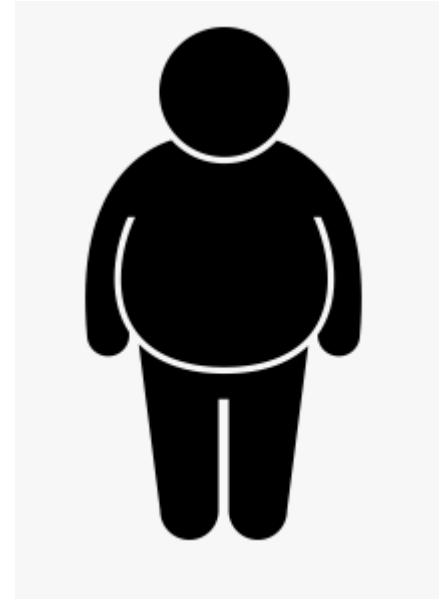


Established and emerging risk factors for complications

Glucose management

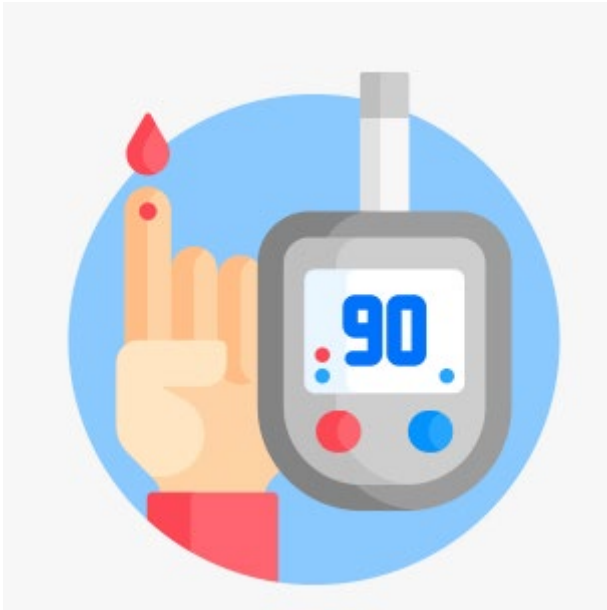


Obesity management

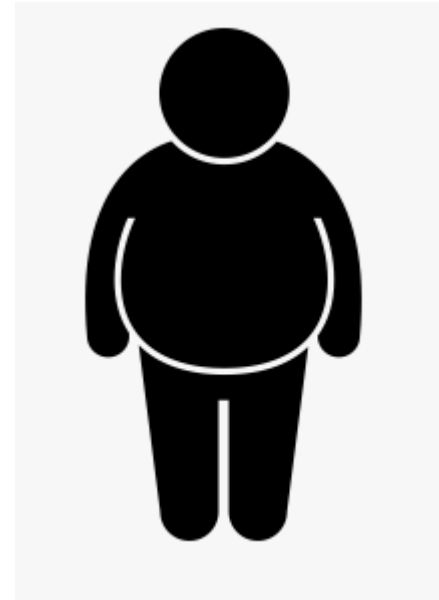


Established and emerging risk factors for complications

Glucose management



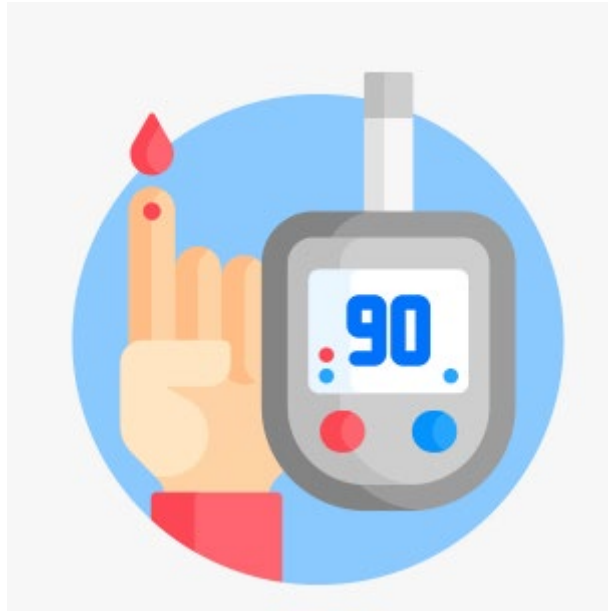
Obesity management



How well are we managing these risk factors in the US?

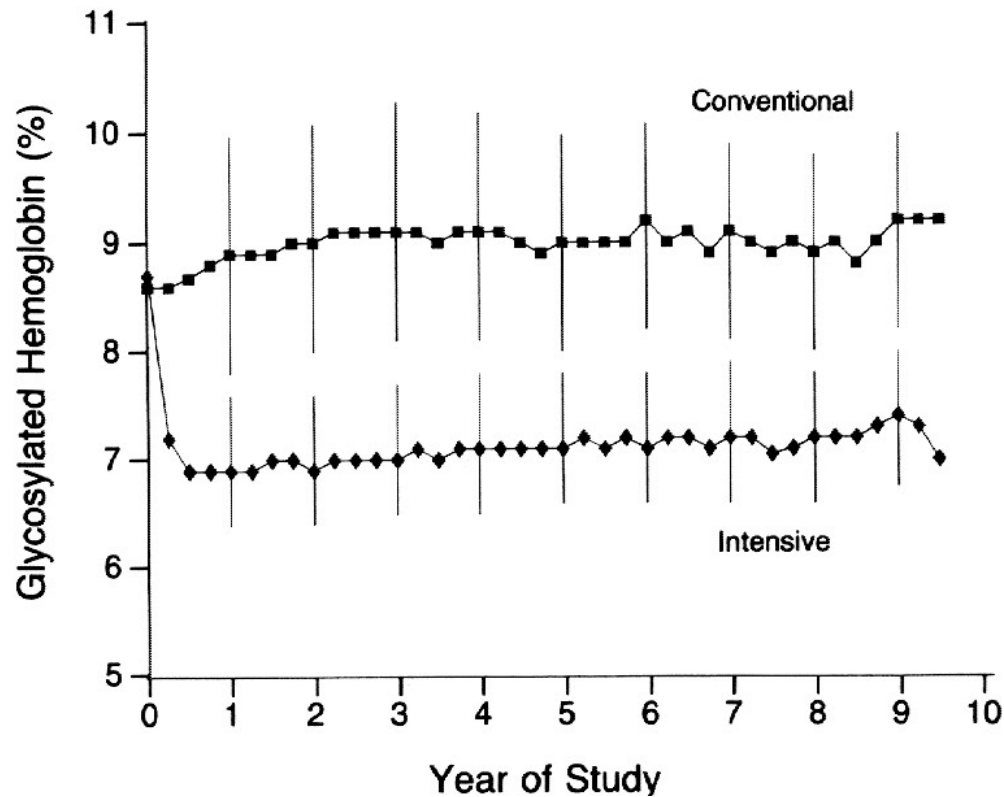


Glycemic control in type 1 diabetes in the US



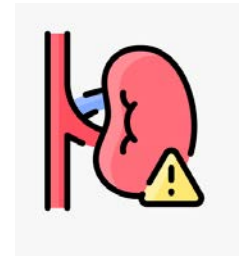
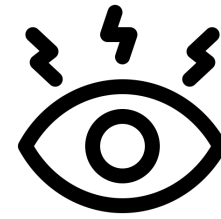
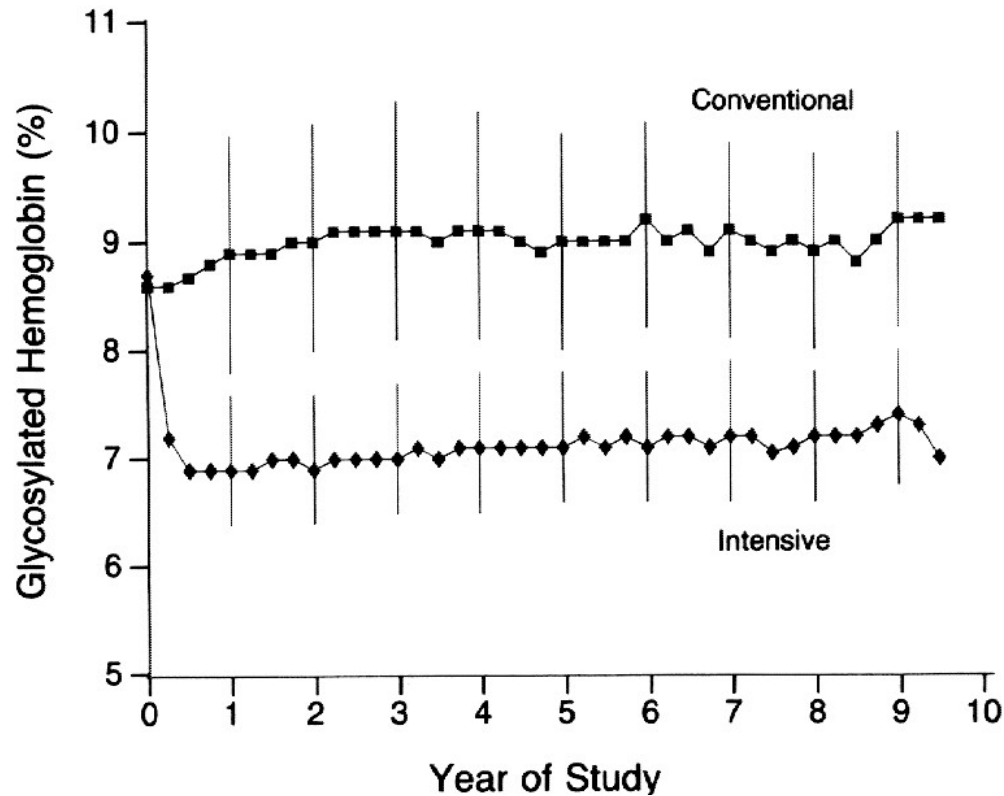
Glycemic control prevents complications

Diabetes Control and Complications Trial (DCCT)

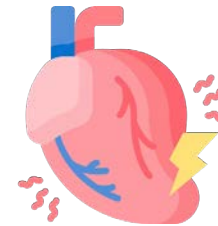


Glycemic control prevents complications

Diabetes Control and Complications Trial (DCCT)

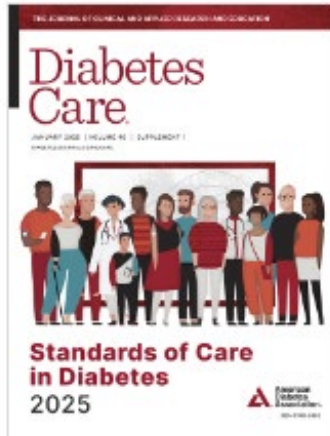


~50 to 75% lower risk of microvascular complications during trial



~30 to 60% lower risk CVD and mortality during post-trial follow-up

Glycemic control essential for clinical management and population health



Glycemic Goals

Recommendations

6.3a An A1C goal of <7% (<53 mmol/mol) is appropriate for many nonpregnant adults without severe hypoglycemia or frequent hypoglycemia affecting health or quality of life. **A**

D-5.2 Proportion of the diabetic population with an A1c value less than 7 percent

Revised

Persons with diagnosed diabetes whose A1c value is less than 7% (age adjusted, percent, 18+ years)

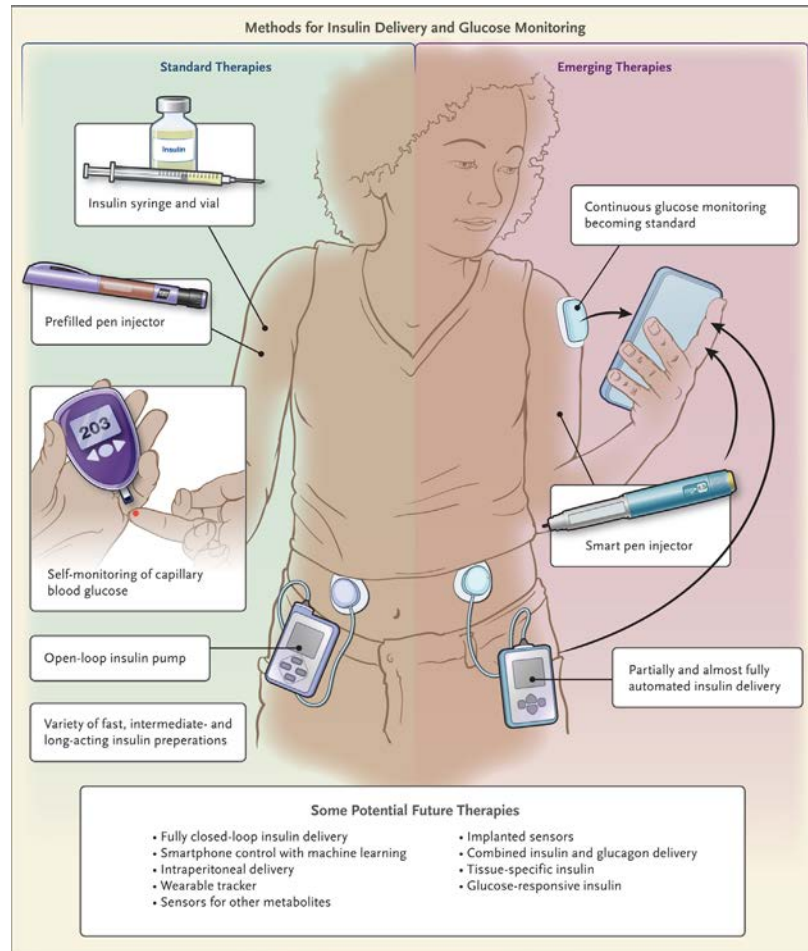
2020 Baseline (year): 53.1 (2005–08)

2020 Target: Not applicable ¹

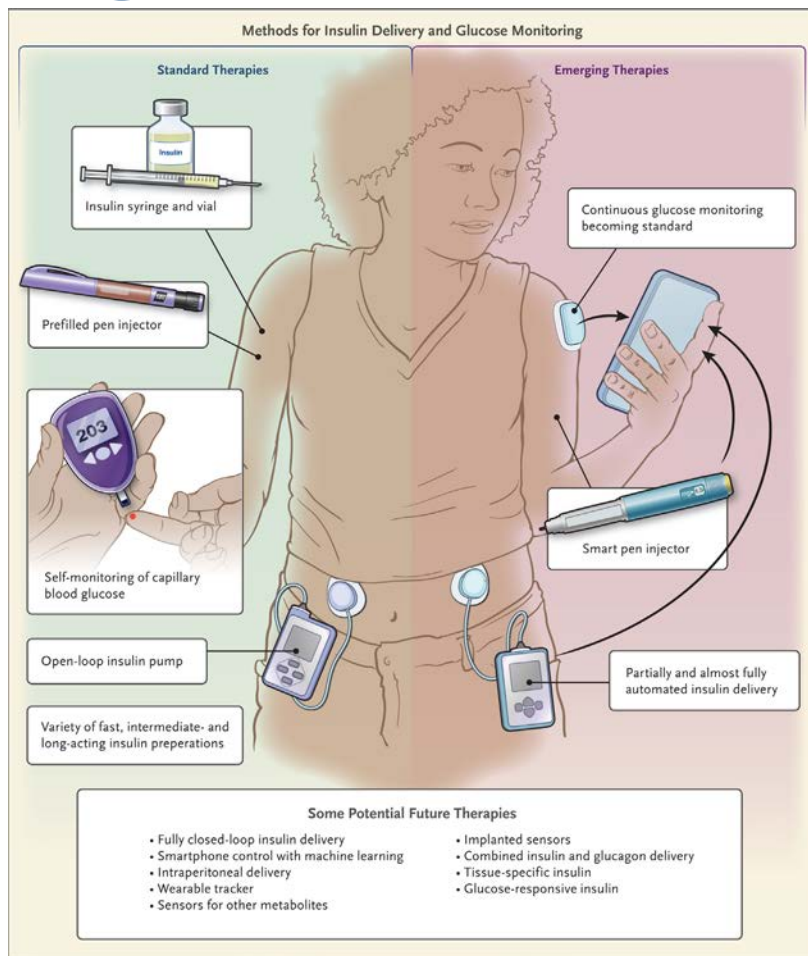
Desired Direction: ↑ Increase desired



Evolving landscape of type 1 diabetes management



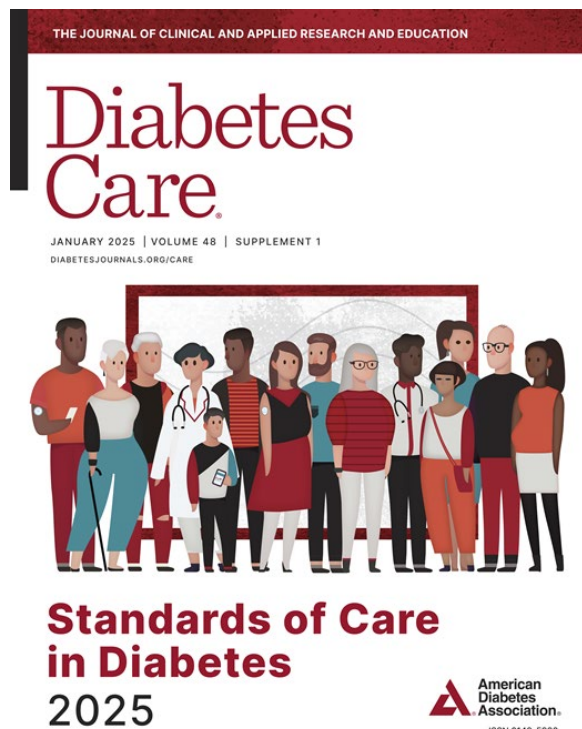
Evolving landscape of type 1 diabetes management



Automated insulin delivery



Diabetes technologies recommended for all type 1 diabetes patients



7.15 Recommend real-time CGM (rtCGM) **A** or intermittently scanned CGM (isCGM) for diabetes management to youth **C** and adults **B** with diabetes on any type of insulin therapy. The choice of CGM device should be made based on the individual's circumstances, preferences, and needs.

7.26 AID systems should be the preferred insulin delivery method to improve glycemic outcomes and reduce hypoglycemia and disparities in youth and adults with type 1 diabetes **A** and other types of insulin-deficient diabetes **E** who are capable of using the device (either by themselves or with a caregiver). Choice of an AID system should be made based on the individual's circumstances, preferences, and needs. **A**



Research questions

- How has glycemic control changed over time in adults and youth T1DM?
- How has the use of new technologies changed over time?
- How have disparities in glycemic control and technology use changed?



Data source



Optum Labs Data Warehouse

- Labs, prescriptions, medical encounters
- Over 200M patients
- 15 years of data (2009-2023)

Inclusion

- Youth (<18 years) and adults (18+ years) with type 1 diabetes
- HbA1c measured
- N=~187,000



Key outcomes

Glycemic control

- Average HbA1c < 7%

Use of diabetes device

- CGM
- Insulin pump

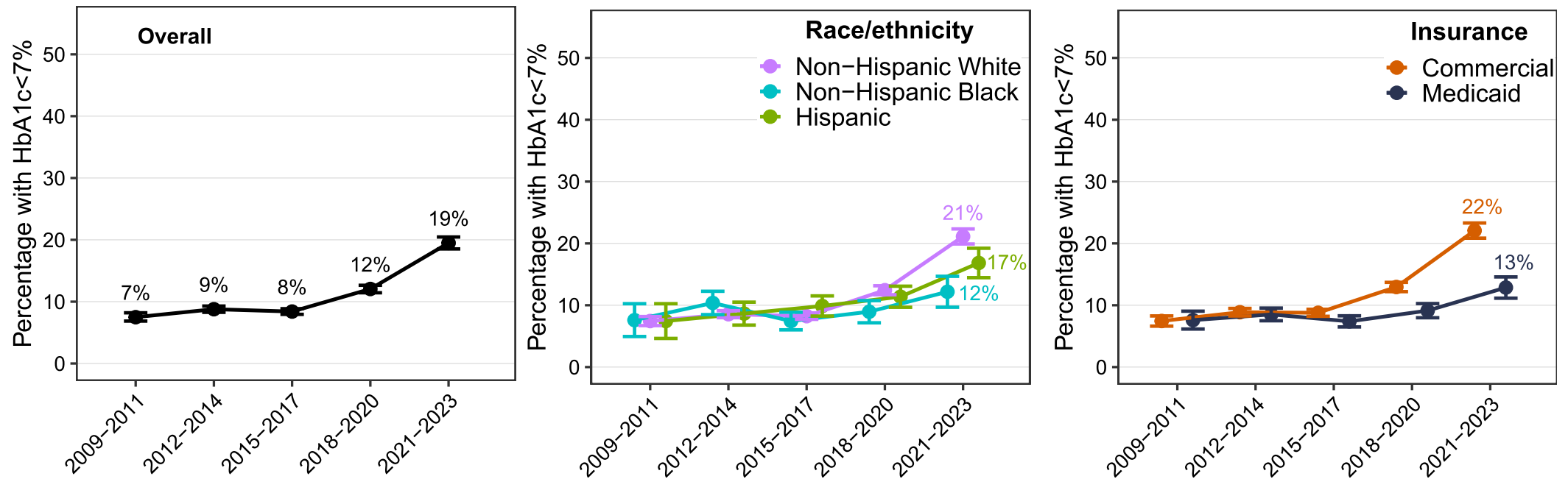


Characteristics of patients with T1DM

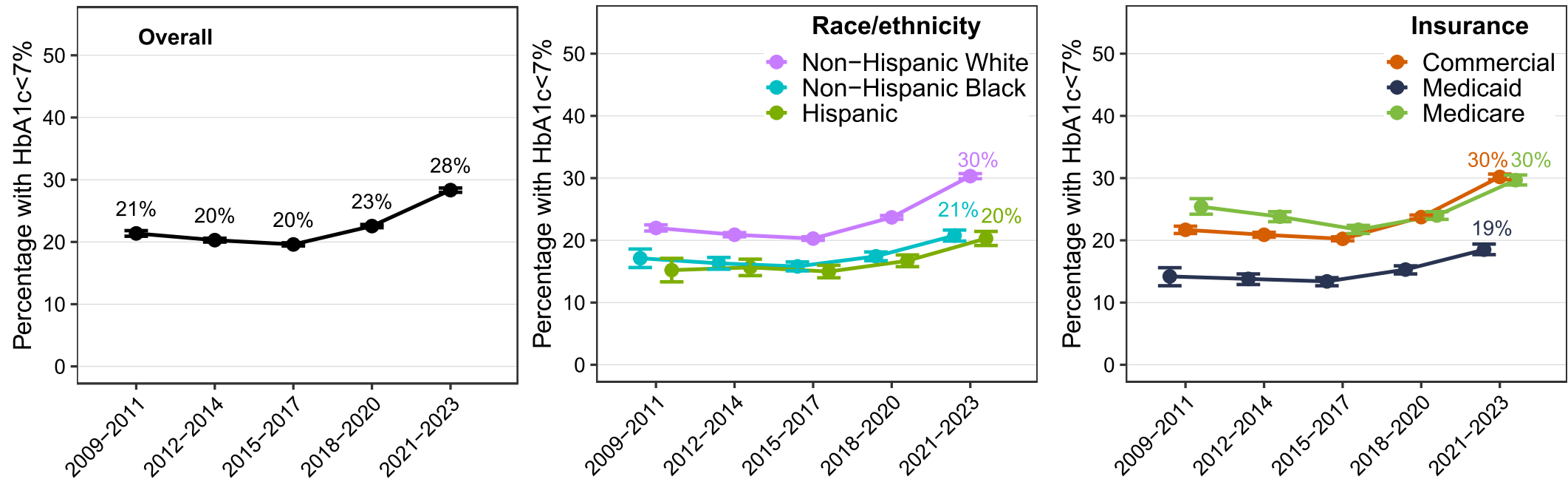
	Youth with T1DM	Adults with T1DM
	N=26,853	N=159,737
Age, years, mean (SD)	12 (4)	45 (16)
Race/ethnicity, %		
Non-Hispanic White	74%	76%
Non-Hispanic Black	9%	12%
Hispanic	10%	6%
Non-Hispanic Asian	1%	2%
Insurance type, %		
Commercial	68%	63%
Medicaid	25%	12%
Medicare	-	16%
Uninsured or Unknown	7%	9%



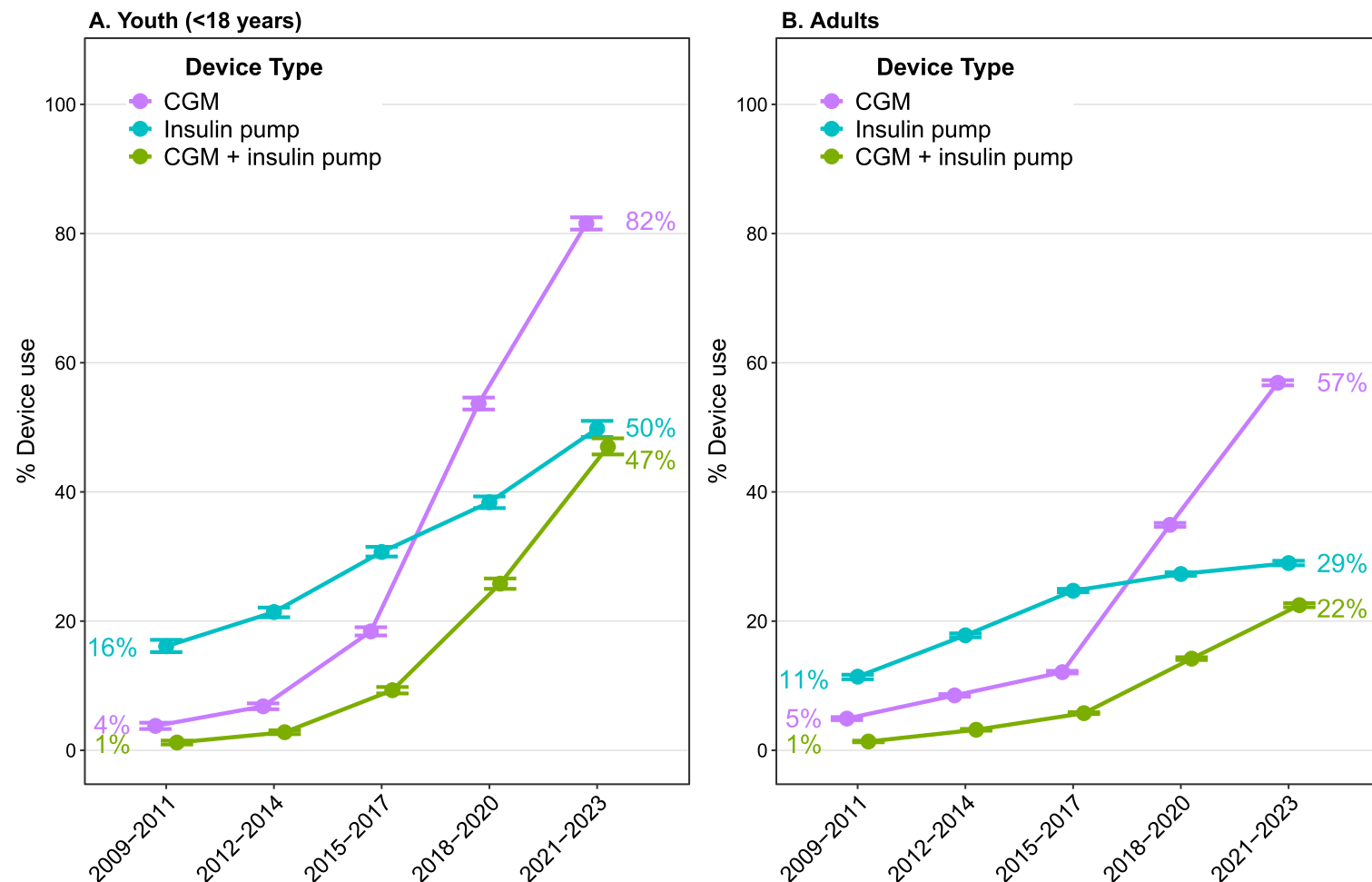
Glycemic control improving in youth



Glycemic control improving in adults



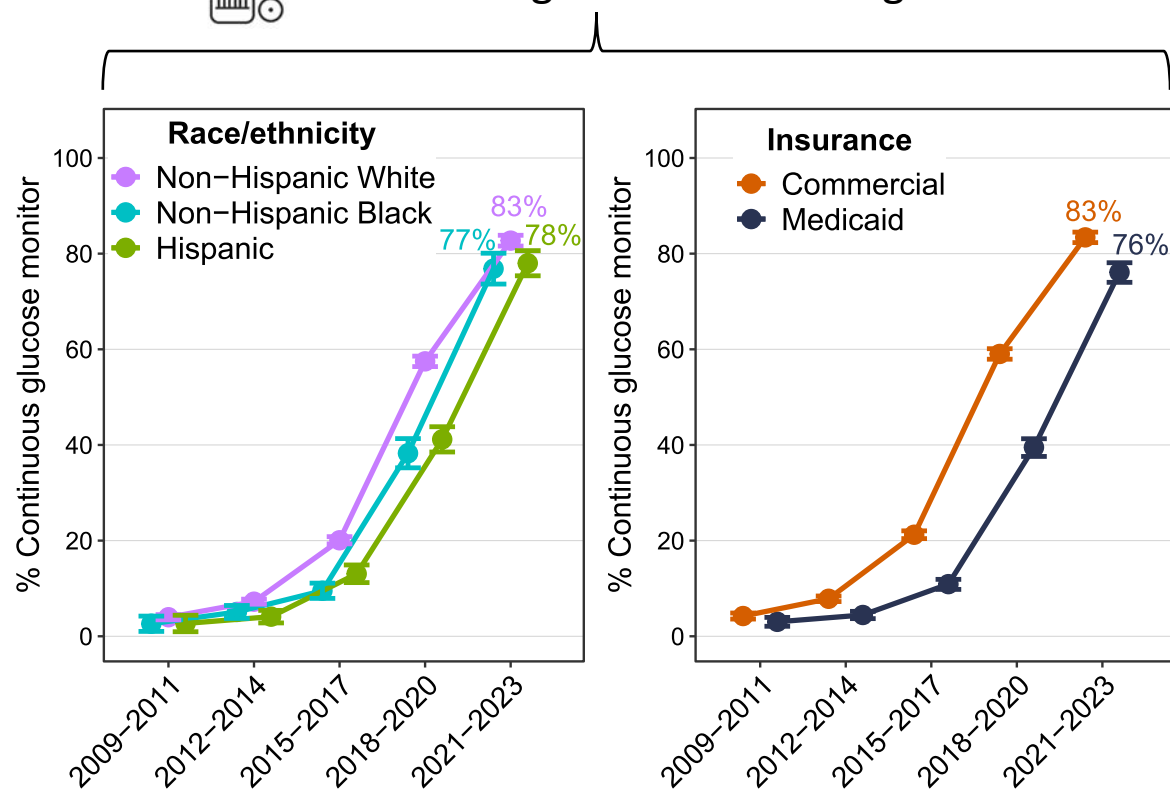
Rapid increase in technology use



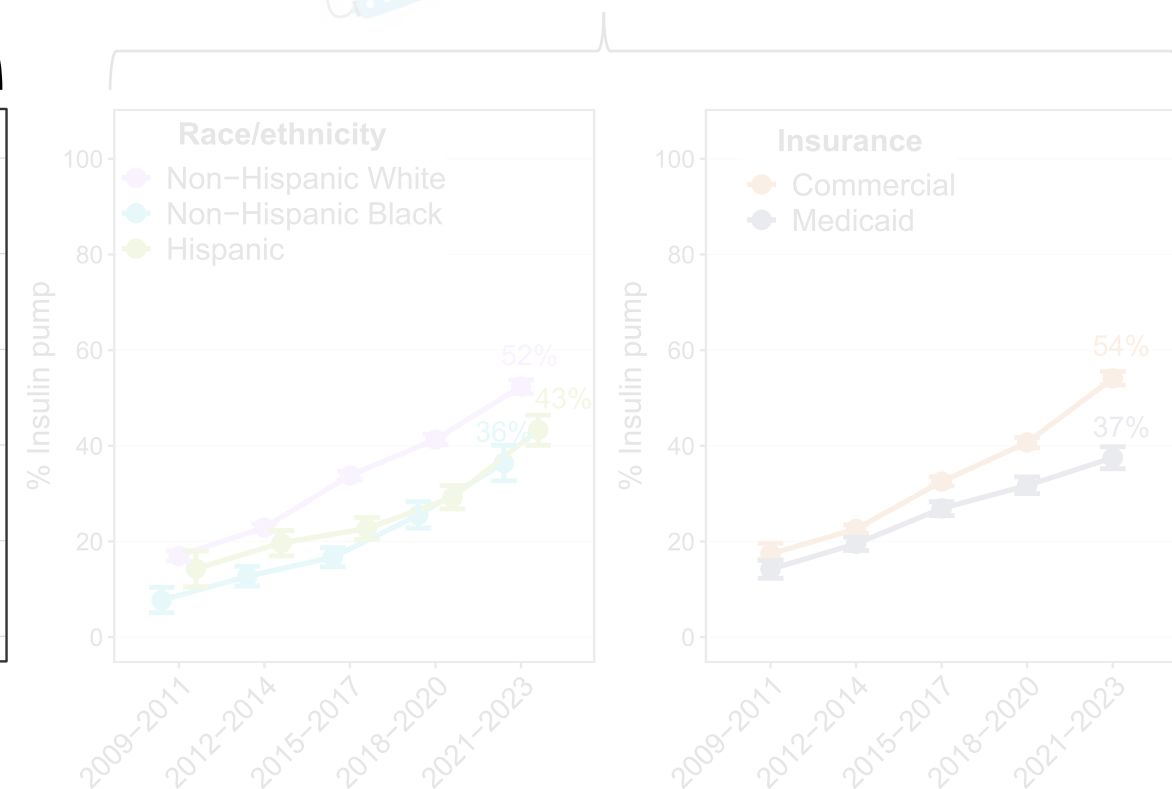
Some reductions in tech use disparities among youth



Continuous glucose monitoring



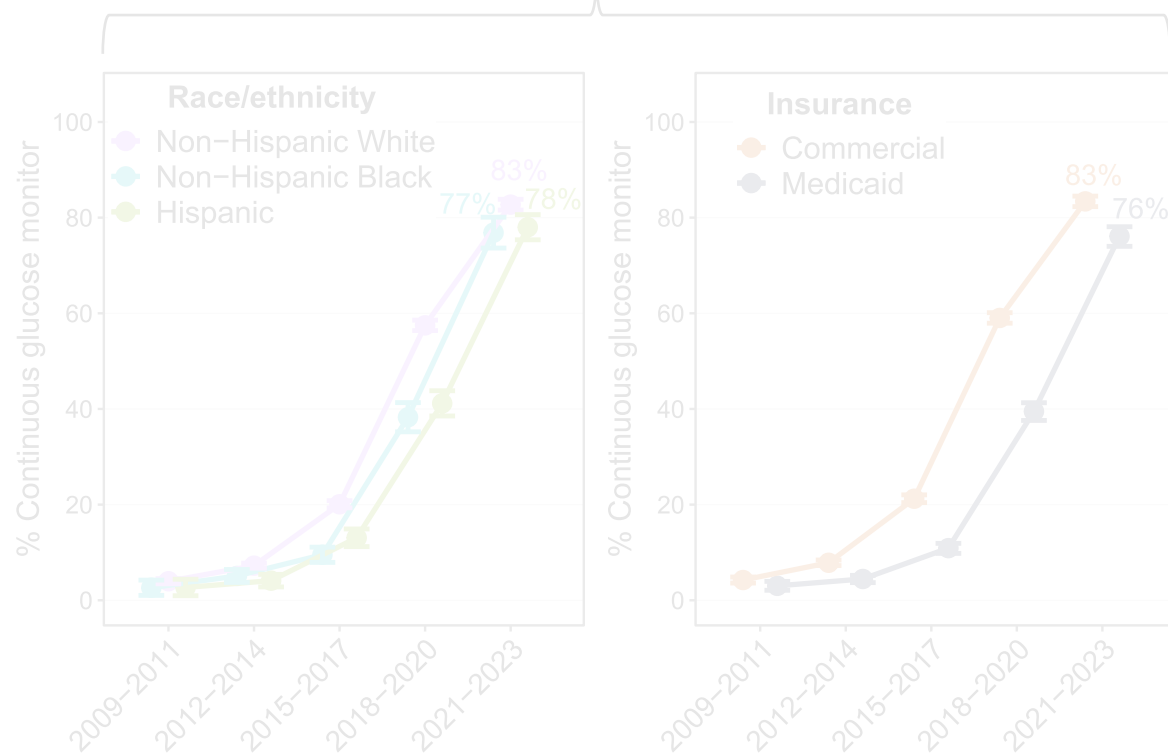
Insulin pumps



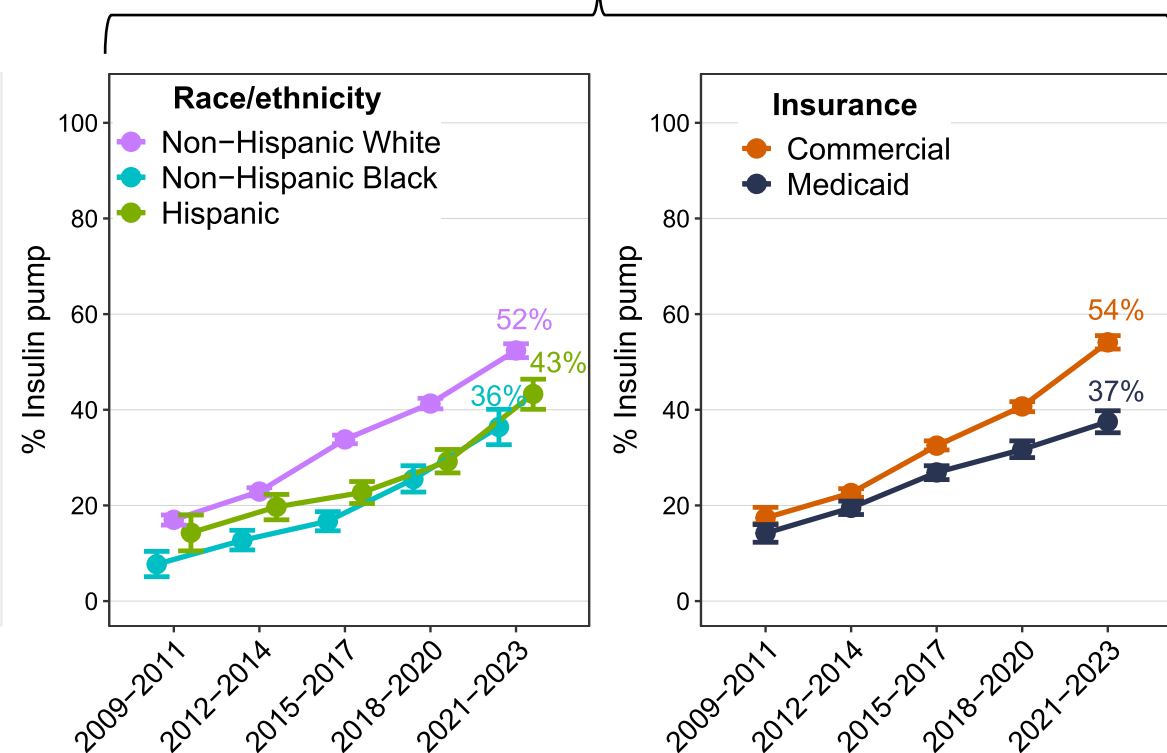
Some reductions in tech use disparities among youth



Continuous glucose monitoring



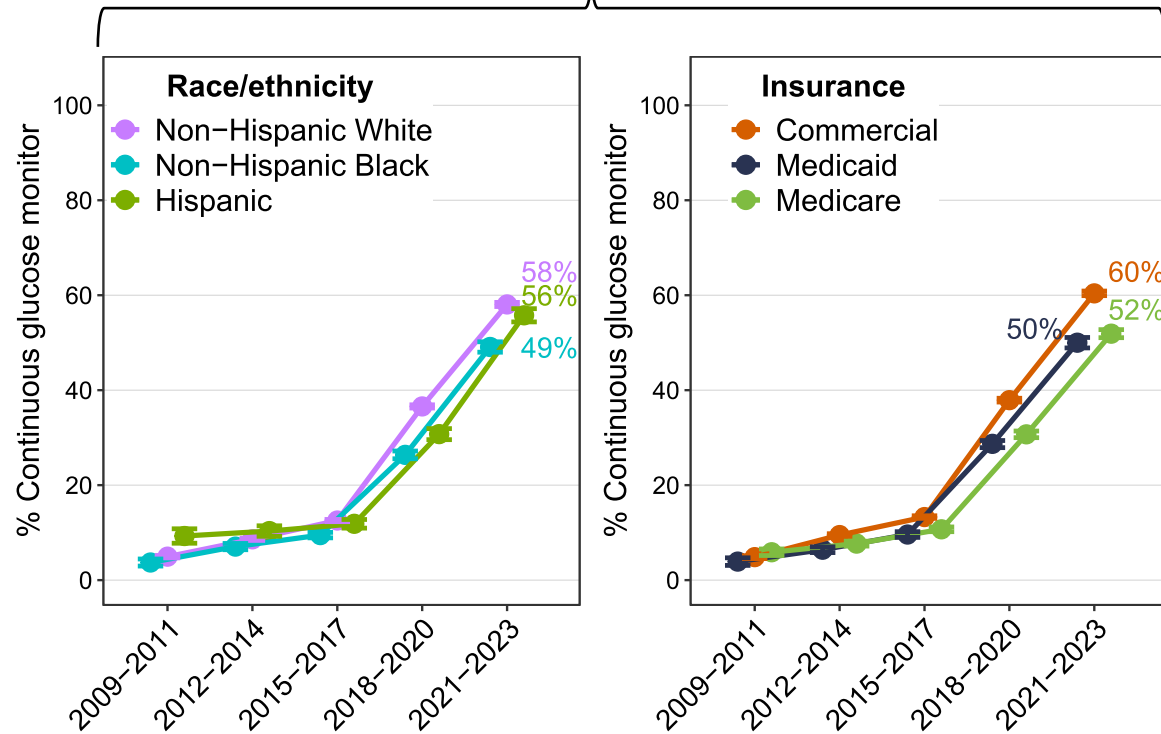
Insulin pumps



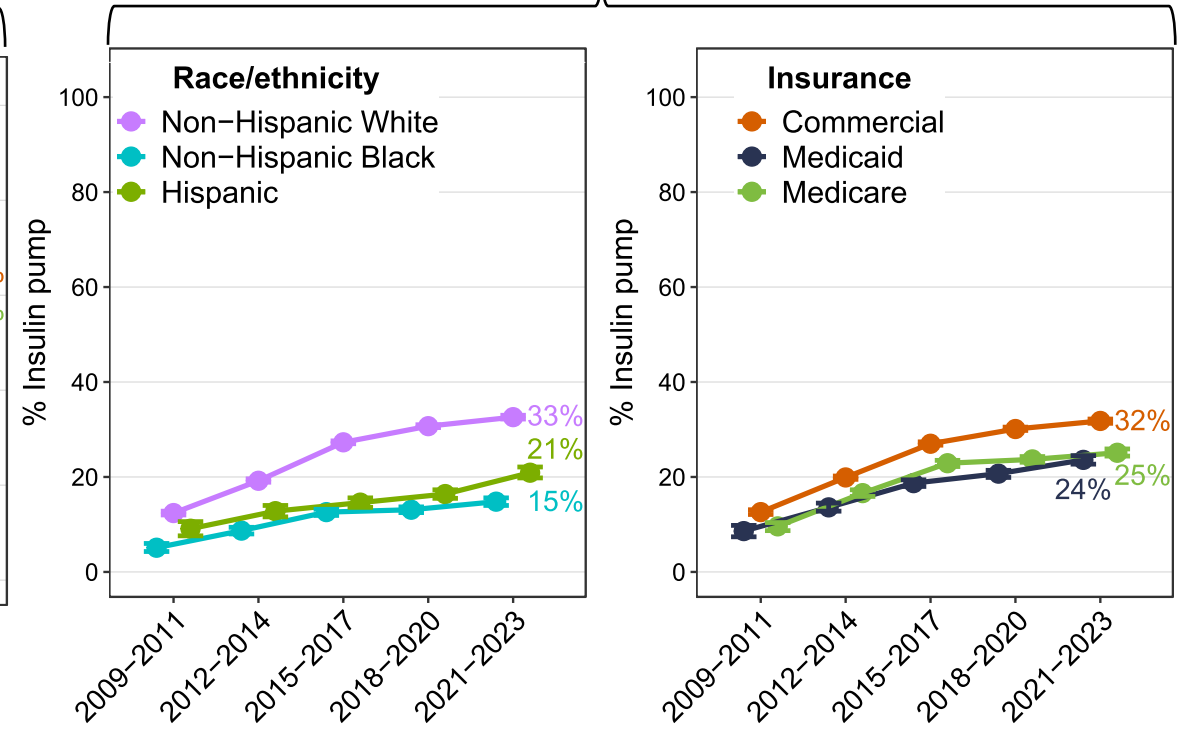
Differences in tech persists among adults



Continuous glucose monitoring



Insulin pumps



Conclusions

- Glycemic control is improving in youth and adults
- Rising diabetes technology use may be important contributor
- However, ~80% of youth and ~70% of adults not achieving A1c targets
- Differences in glycemic control growing across race, ethnicity, and SES



Where do we go from here?

1. Ensure universal insulin access
 - ~25% of adults <65y with T1D ration insulin (Fang and Selvin, 2023, JAMA)
2. Expand access to technologies; use remains lowest in
 - Racial/ethnic minority and low SES patients
 - Adult patients
3. Patient and provider education on tech
4. Fundamental factors shaping health



Obesity in type 1 diabetes in the US



Assumptions about obesity in T1DM

THE LANCET Diabetes & Endocrinology

Review

Obesity in people living with type 1 diabetes

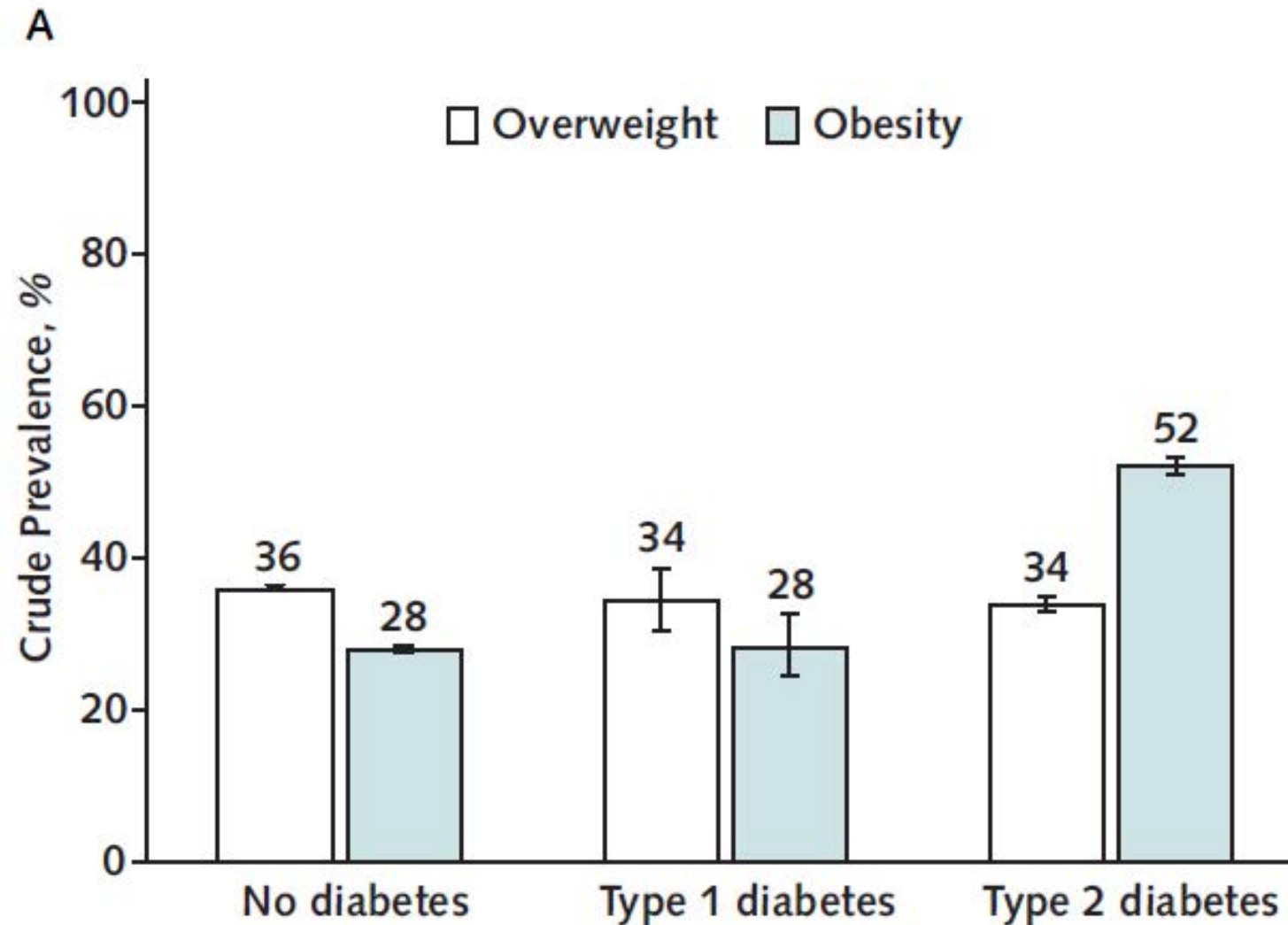
Summary

Although type 1 diabetes is traditionally considered a disease of lean people, overweight and obesity are becoming increasingly more common in individuals with type 1 diabetes.

- T1DM assumed to be “disease of lean people”
- Emerging evidence suggest obesity growing
- Lack of nationally representative data in US

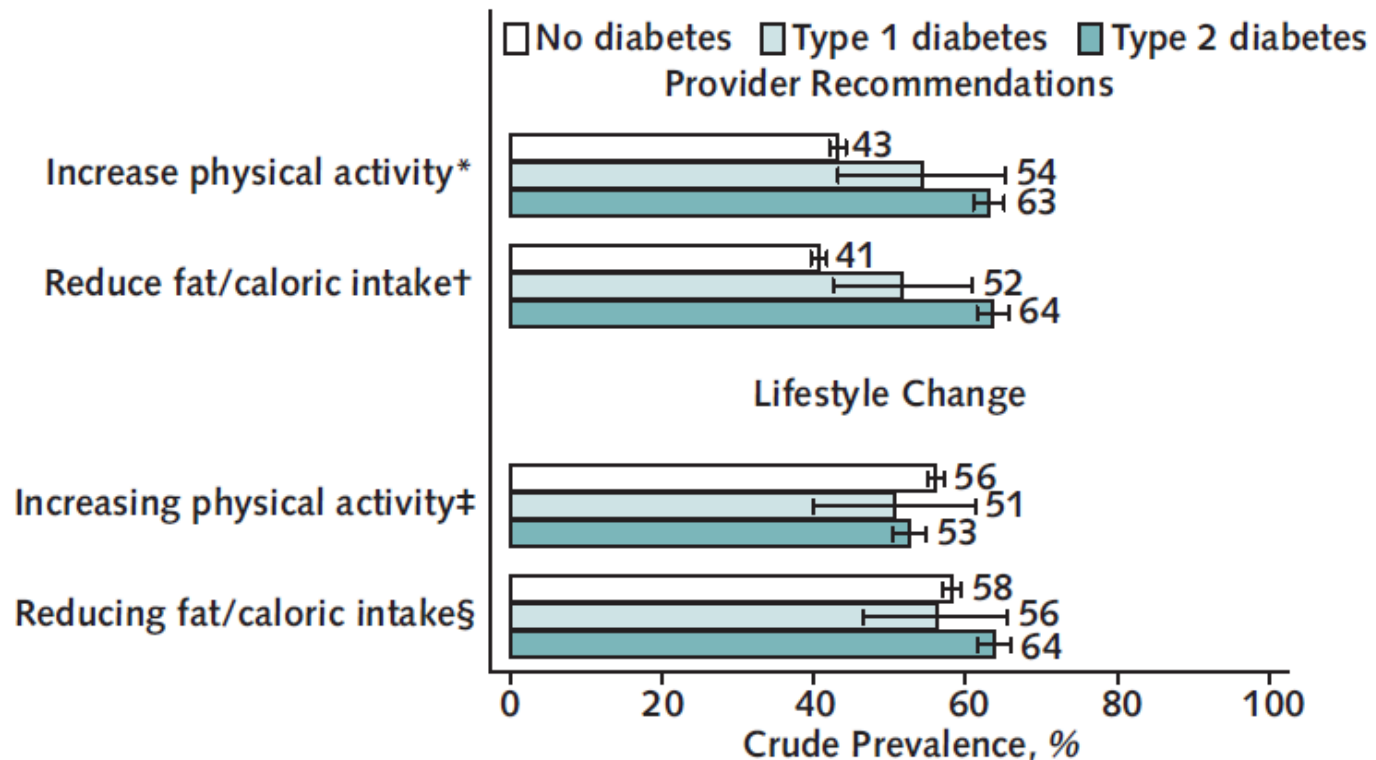


62% of US adults with T1DM have overweight or obesity



Lifestyle management in T1DM

C



~50% T1DM + overweight/obesity recommended lifestyle management

~50% engaged in lifestyle management



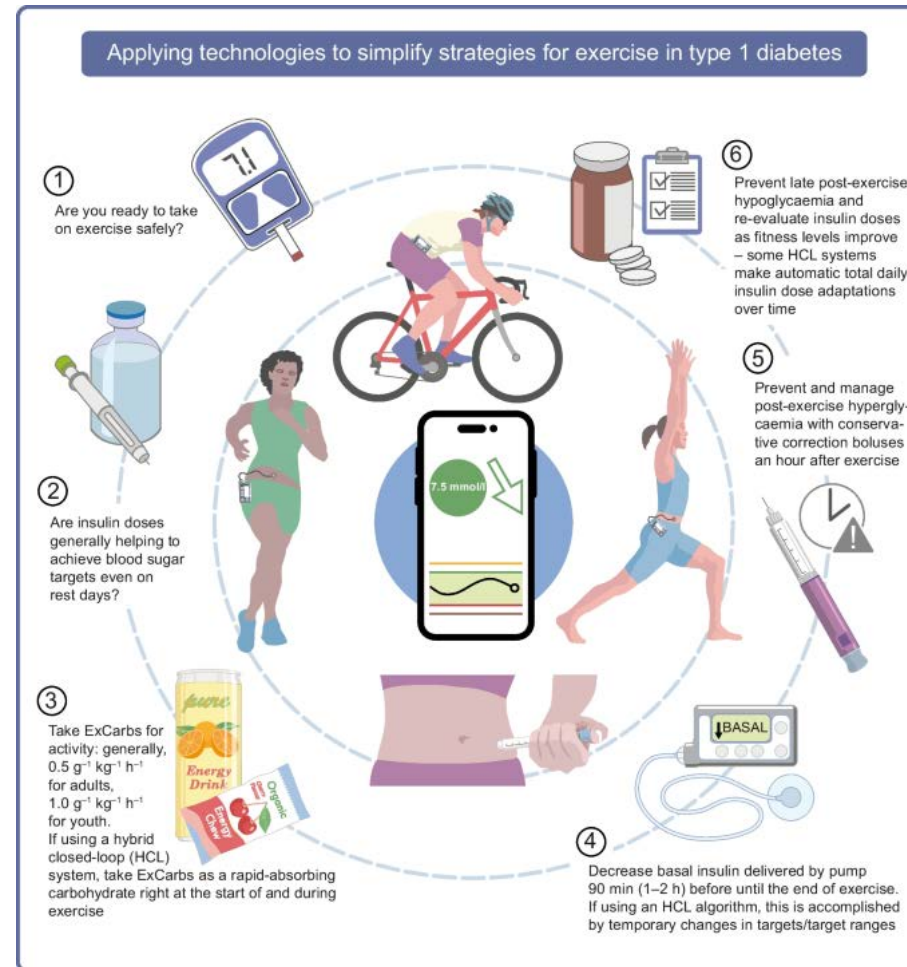
Hypoglycemia poses major challenges

Barriers to Physical Activity Among Patients With Type 1 Diabetes **FREE**

CONCLUSIONS—Fear of hypoglycemia is the strongest barrier to regular physical activity in adults with type 1 diabetes, who should therefore be informed and supported in hypoglycemia management.



More studies are needed



Presentation Outline

DIABETES, OBESITY AND METABOLISM
A JOURNAL OF PHARMACOLOGY AND THERAPEUTICS

ORIGINAL ARTICLE |  Full Access

Trends in obesity and glucagon-like peptide-1 receptor agonist prescriptions in type 1 diabetes in the United States

Yunwen Xu PhD, Justin B. Echouffo Tcheugui MD, Josef Coresh MD, Morgan E. Grams MD, Elizabeth Selvin PhD, Michael Fang PhD, Jung-Im Shin MD 

First published: 03 March 2025 | <https://doi.org/10.1111/dom.16300>



Context

- Obesity may be growing in T1DM
- GLP1-RA not currently approved for T1DM patients
- Early trials found
 - Benefits (weight loss, lower HbA1c)
 - Safety concerns (increased hypo, DKA)



Explicit warning about hypoglycemia



HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use WEGOVY safely and effectively. See full prescribing information for WEGOVY.

WEGOVY (semaglutide) injection, for subcutaneous use
Initial U.S. Approval: 2017

WARNINGS AND PRECAUTIONS

- *Acute Pancreatitis*: Has occurred in clinical trials. Discontinue promptly if pancreatitis is suspected. Do not restart if pancreatitis is confirmed (5.2).
- *Acute Gallbladder Disease*: Has occurred in clinical trials. If cholelithiasis is suspected, gallbladder studies and clinical follow-up are indicated (5.3).
- *Hypoglycemia*: Concomitant use with insulin or an insulin secretagogue may increase the risk of hypoglycemia, including severe hypoglycemia. Reducing the dose of insulin or insulin secretagogue may be necessary. Inform all patients of the risk of hypoglycemia and educate them on the signs and symptoms of hypoglycemia (5.4).



Data source



National EHR database

Inclusion

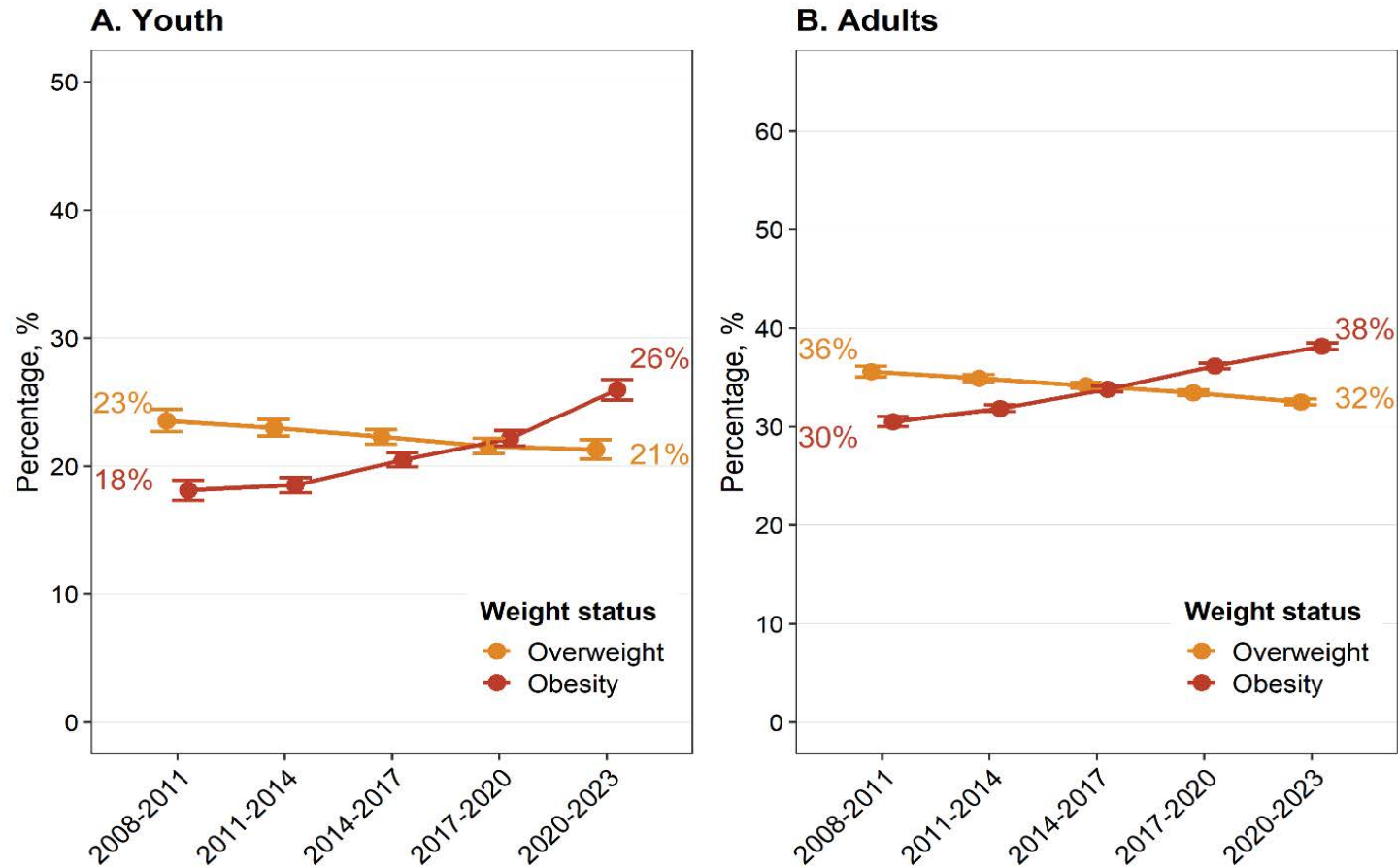
- Youth (<18 years) and adults (18+ years) with type 1 diabetes
- N=~200,000

Outcomes

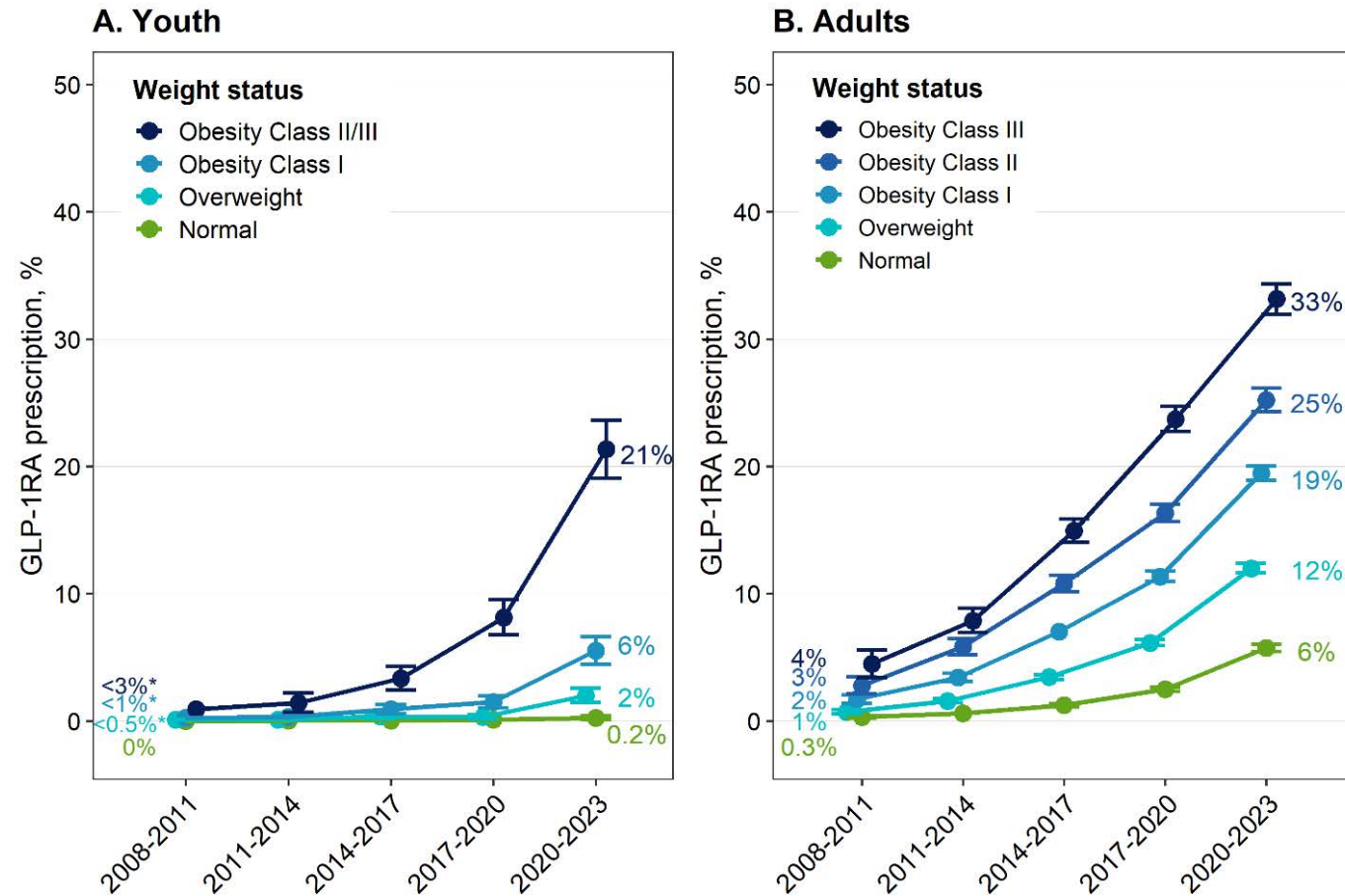
- Obesity (using standard cutpoints for youth and adults)
- Use of GLP1-RAs



Increasing obesity in T1DM



GLP1-RA use increasing rapidly in T1DM



Implications

- Obesity has reach epidemic levels in youth and adults with T1DM
- Safety poses a major challenge for weight management
- Need for more research on lifestyle and pharmacotherapy



FUTURE DIRECTION

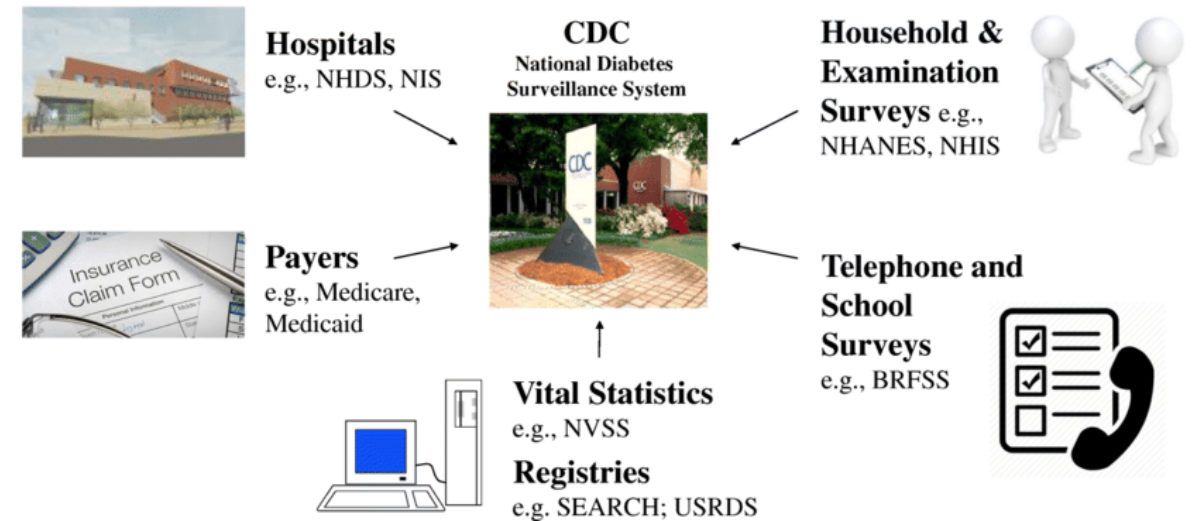


Type 2 diabetes surveillance in the US

- Systematically tracked T2DM for decades
- Ongoing and emerging challenges
- Informs:
 - Prevention
 - Screening
 - Treatment
 - Disparities

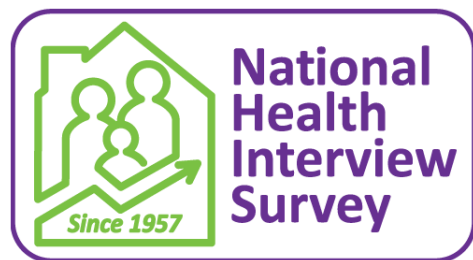
SECONDARY DATA SOURCES

PRIMARY DATA COLLECTION

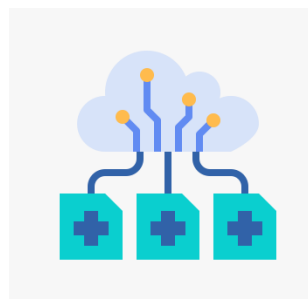


Emerging data for epidemiology for type 1 diabetes

First national representative study on T1DM



Large electronic health records database



Major NIDDK studies



Can we build a similar infrastructure for T1DM in the US?



Acknowledgements

Main T1DM collaborators

- Liz Selvin
- Jung-Im Shin
- Yunwen Xu
- Justin B. Echouffo Tcheugui

Colleagues and friends

Welch Center

JHU School of Public Health

