#### Impact of Food Insecurity in Persons with Diabetes: Quantitative and qualitative perspectives

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#### Outline

- Food insecurity trends and trajectories in the US
- Trends in diabetes in youth and adults and diabetes-related complications
- SEARCH for Diabetes in Youth and the SEARCH Food Security Cohort Study (SFS)
- SFS aims, design & methods
- Results of the SFS pilot study
- Food insecurity experience in adults with diabetes: Greenville Health System/Prisma Health
- Conclusions





#### US Trends in food insecurity by race and ethnicity, 2001-17







#### Life Trajectories of a Participant Who Has Experienced Food Insecurity Chronically



Note: Each mentioned experience of food insecurity on the timeline was presented using **a black diamond** to illustrate where these experiences occurred in relation to other positive and negative life events.

Younginer, Nicholas A., et al. "Resilience and Hope: Identifying Trajectories and Contexts of Household Food Insecurity." *Journal of Hunger & Environmental Nutrition* 10.2 (2015): 230-258.

#### Life Trajectories of a Participant Who Has Experienced Food Insecurity Intermittently



Note: Each mentioned experience of food insecurity on the timeline was presented using **a black diamond** to illustrate where these experiences occurred in relation to other positive and negative life events.





#### Life Trajectories of a Participant Who Has Experienced Food Insecurity Recently



Note: Each mentioned experience of food insecurity on the timeline was presented using **a black diamond** to illustrate where these experiences occurred in relation to other positive and negative life events.





### Trends in diabetes in youth and adults and diabetes-related complications



#### Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults





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http://www.cdc.gov/diabetes/statistics/slides/maps\_diabetes\_trends.pdf

#### Trends in diabetes-related complications





## Incidence of T1D and T2D in US Youth, by Age and Race/Ethnicity (2002-2012)

**Type 1 Diabetes** 

**Type 2 Diabetes** 



Mayer-Davis et al, New Engl J Med 2017



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#### Prevalence of Diabetes Complications and Comorbidities Among YYA with Diabetes, by Type and Race/Ethnicity





### SEARCH for Diabetes in Youth and SEARCH Food Security Cohort Study



#### SEARCH for Diabetes in Youth Study



#### SEARCH study sites



Diabetes surveillance in youth age <20: ~ 5 million each year

Incidence of all types of diabetes 2002 – present

Prevalence of diabetes in 2001, 2009, 2017

Mortality surveillance in youth-onset diabetes



## SEARCH and SEARCH Food Security Cohort Study (SFS)





SEARCH For Diabetes in Youth

# SFS aims, study design & methods



#### SFS Study Aims



SFS initiated a multi-center cohort study of youth and young adults (YYAs) with T1D and T2D diabetes by leveraging the ongoing SEARCH 4 study and adding two subsequent data collection time points at three sites:

- Aim 1: To prospectively evaluate the influence of household food insecurity (HFI) on changes in glycemic control in YYAs with T1D and T2D
- Aim 2: To quantify the mediating role of nutritional, mental health, and behavioral pathways through which HFI may affect changes in glycemic control in YYAs with T1D and T2D
- Aim 3: To prospectively evaluate the influence of HFI on changes in health care utilization and medical and non-medical health care costs in YYAs with T1D and T2D







#### **Conceptual Framework of SFS Study**





#### SFS Study Design

- Eligibility Criteria:
  - All SEARCH 4 cohort visit participants in CO, SC, WA
  - Pregnant women rescheduled as per S4 protocol
- Data Collection FU 1 (goal n=1,069)
  - Online surveys only began October 2018
  - Duration for completion: 45-60 minutes
- Data Collection FU 2 (goal n=962)
  - Online surveys + clinic visit (non-fasting 2 ml blood draw, height, weight) – begin August 2019



#### SFS Data Collection (1)



Variables		SFS	
	4	FU 1	FU 2
Exposure			
Food Security	Х	Х	Х
Food Assistance, date of benefit distribution	(X)	Х	Х
Socioeconomic variables			
Education	Х	Х	Х
Employment	Х	Х	Х
Income	Х	Х	Х
Health Insurance	Х	Х	Х
Other social determinants of health			
Housing and Homelessness		Х	Х
Diabetes Numeracy		Х	Х
Racial Discrimination		Х	Х
Transportation		Х	Х



#### SFS Data Collection (2)



Variables		SFS	
	4	FU 1	FU 2
Outcomes			
HbA1c	Х		х
Height, Weight	Х		х
Episodes of self-reported hypoglycemia and ketoacidosis	Х	х	Х
Health care utilization	Х	Х	Х
Health care cost	х	х	Х
Diabetes Management (glucose monitoring, medication regimen, adherence)	Х	x	x
Mediators			
Dietary intake (FFQ)	Х		
Dietary intake (screener)		х	Х
Depression	Х	Х	Х
Anxiety		х	Х
Perceived stress, perceived social support		Х	Х
Physical activity and inactivity	Х	х	х





#### SFS FU 1 Completion (as of 5/16/19)

Site	SFS FU currently eligible	SFS complete (% out of currently eligible)	SFS partial (% out of currently eligible)	Total
Carolina	284	112 (39.4%)	5 (1.8%)	117
Colorado	319	83 (26.0%)	3 (0.9%)	86
Washington	166	52 (31.3%)	7 (4.2%)	59
Total	769	247 (32.1%)	15 (2.0%)	262



# Results of the SFS pilot study



#### DIABETES RESEARCH AND CLINICAL PRACTICE 138 (2018) 128-137



#### Food insecurity is associated with high risk glycemic control and higher health care utilization among youth and young adults with type 1 diabetes

Jason A. Mendoza <sup>a,b,c,\*</sup>, Wren Haaland <sup>b</sup>, Ralph B. D'Agostino <sup>d</sup>, Lauren Martini <sup>e</sup>, Catherine Pihoker <sup>a,b</sup>, Edward A. Frongillo <sup>f</sup>, Elizabeth J. Mayer-Davis <sup>h</sup>, Lenna L. Liu <sup>a,b</sup>, Dana Dabelea <sup>i</sup>, Jean M. Lawrence <sup>j</sup>, Angela D. Liese <sup>e,g</sup>





#### Prevalence of Household Food Security (FS) in Youth with T1 Diabetes in SC & WA (2013-2015)



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N=226

Mendoza, J. A. *et al.* Food insecurity is associated with high risk glycemic control and higher health care utilization among youth and young adults with type 1 diabetes. *Diabetes Res. Clin. Pract.* **138**, 128–137 (2018).

#### Prevalence of Household Food Security (FS) in Youth with T2 Diabetes in SC & WA (2013-2015)



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N=76; Unpublished findings from SEARCH for Diabetes in Youth Food Insecurity Ancillary Study , Liese A and Mendoza J.

#### 





Mendoza, J. A. *et al.* Food insecurity is associated with high risk glycemic control and higher health care utilization among youth and young adults with type 1 diabetes. *Diabetes Res. Clin. Pract.* **138**, 128–137 (2018).

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Association of household food insecurity with high risk glycemic control (HbA<sub>1c</sub> >9%), hospitalizations, and emergency department visits among individuals with T1Ds

Outcomes	OR (95% CI)
High risk glycemic control* (n=226)	2.37 (1.10, 5.09)
Hospitalizations <sup>+</sup> (n=203)	2.96 (0.92, 9.51)
ED Visits <sup>‡</sup> (n=203)	2.95 (1.17, 7.45)

\* Logistic Regression analyses. Adjusted for age, sex, race/ethnicity, socioeconomic status, study site, diabetes duration, and health insurance The Negative binomial regression analysis involving Cohort participants only, the subsample of participants who completed questions on hospitalizations, Emergency Department (ED) visits, and insulin regimen



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Mendoza, J. A. et al. Food insecurity is associated with high risk glycemic control and higher health care utilization among youth and young adults with type 1 diabetes. Diabetes Res. Clin. Pract. 138, 128-137 (2018).



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Mean HbA1c was 9.8% for T1D participants living in food-insecure households vs. 9.0% for those living in food-secure households (p=0.021).



Mendoza, J. A. *et al.* Food insecurity is associated with high risk glycemic control and higher health care utilization among youth and young adults with type 1 diabetes. *Diabetes Res. Clin. Pract.* **138**, 128–137 (2018).



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#### Socioeconomic position profiles in T1 & T2



→ Higher SEP: 75% → Lower SEP: 25%

Sutherland M et al. in review 2019; presented at ADA 78th Scientific Sessions, June 22-26, 2018, Orlando, FL.





#### Next steps

- Start analyses of SFS baseline/SEARCH 4 data (crosssectional):
  - Prevalence of household food insecurity (HFI) in YYA with T1D and T2D
  - Association of HFI and glycemic control in T1D and T2D
  - Association of HFI and fear of hypoglycemia
  - Contribution of child-reported FI to outcomes, independent of household FI among youth with diabetes
- Prospective analyses starting spring 2021 including FU 1 data, starting late 2021/spring 2022 including FU 2 (Aim 1-3).





The food insecurity experience in adults with T2D: GHS/Prisma Upstate Cognitive Interviews

#### Purpose

 The goal of this study was to better understand how persons with type 2 diabetes (T2D) experience and manage their diabetes in the context of household food insecurity.



#### Methods 1

#### • Sample:

- 12 GHS patients with
- clinically documented T2D
- Screened positive for food insecurity

#### • Recruitment:

 Invited by providers from the Greenville Health System (GHS) and contacted by two staff persons (JS and LR) for in-person interviews





#### Methods 2

#### Interview guide:

- Household Food Security
- prompted to reflect on experiences of living with T2D related to the food insecurity experiences described in the questions.

#### • Analysis:

- NVivo software preliminary coding of emergent themes
- parent and child codes peer debriefing meetings
- 7 themes emerged



#### **Demographic Characteristics**

Age, mean (SD)	54 (8.3)
Years since diagnosis, mean (SD)	6.8 (7.8)
Race, %	
African American	71
White	29
Sex, %	
Female	79
Male	21



## Themes identified in relation to diabetes management strategies in times of food insecurity

- Importance of eating before taking medication
- Skipping dose of medication
- Stretching/cutting food
- First and end of month food strategies
- Trade-offs (tuition, medicine)

- Provider recommendations vs. food realities
- Help from others
  - Sources of help
  - Feelings about getting help
  - Impermanence of help



## Importance of eating before taking medication

"You've got to eat and then you've got to take your medicine and you know some of the medicine that you're taking, you got to feed it."



#### Skipping or changing dose of medication

"... Because if I take my medicine and don't have nothing to eat behind it, then what's the point of taking it because it's going to put you in the hospital right on ... So I just rather not take it if I ain't got nothing to eat to cover it."



### Stretching/cutting food

*"If I've got just a little food, then I'm going to try to stretch that little food because I got to make sure that I do take it [medicine] because I can't not take it"* 



#### Trade-offs

"So there's days when I have to kind of weigh and tuition wins out.[...] during the summer months where I don't pay tuition, it was better... Because I had the money to cover where I really needed to eat."

"Honestly, because I'd rather them [children] eat something that they want to eat than for me to worry about taking care of myself."



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### Help from others

""So it costs me a lot for medicine. I'm just paying rent and paying for medicine and paying bills [...]. See, my brother he was helping me and everything, bring food. But he had to change jobs, and he hadn't been able to help me..."



#### Provider recommendations vs. food realities

"My diabetes doctor [...] she would tell me that I need to snack. [..] She was like asking me how often do I eat and I told her that I was eating twice a day, you know. And I was because I'm stretching my food. Like I say. I don't get but so many food stamps, so you've got to do what you've got to do. [..] I can't snack and eat, too, because something's got to give. Something's got to be saved."



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#### Summary of results

- Throughout the interviews, various challenges affecting persons with T2D and food insecurity emerged.
- Participants shared strategies and experiences with managing blood sugar levels and how this was impacted by their food security status. Strategies included skipping medication doses, stretching or cutting meals and making trade-offs between food and medicine.
- Participants were very aware of interrelationship between taking diabetes medication and food and impact on blood sugar levels.





#### Conclusion

- Experiencing food insecurity presents unique challenges for patients with complex chronic diseases like diabetes, where food intake and medication use need to be carefully aligned.
- Food insecure patients with diabetes use a variety of strategies to manage their situation, often with very little guidance or tangible help from their healthcare providers.

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#### Questions?

