Social Determinants of Health in the Ambulatory Cardiology Clinic

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Disclosures:

Related

- Funding: Delaware INBRE
- Co-lead author of 2017 American Academy of Pediatrics Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents

Unrelated

- Member of a scientific advisory committee for Merck Pharmaceuticals
- MEDSCAPE speaker/consultant
- Regeneron study site primary investigator

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Objectives:

Framework for understanding social determinants of health (SDoH).

Known impact of area deprivation on ambulatory cardiology outcomes (e.g., pediatric hypertension, transition of care).

Intervention strategies to address barriers to care related to SDoH.

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Health is more than individual health…

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In your practice….

- 1 in 10 to 1 in 20 of our patients have FOOD INSECURITY

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Food Insecurity:

- Definition: Limited access to adequate food because of financial constraints or residence in under-resourced food environments

- Food *security* for a household means all members have access at all times to enough food for an active, healthy life. Food security includes, at a minimum:
  - The ready availability of nutritionally adequate and safe foods.
  - Assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).

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Food Insecurity:

- Food insecurity is associated with higher stages of cardio-kidney metabolic (CKM)- a syndrome described by the American Heart Association in 2023 to describe the intersection between cardiovascular, kidney and metabolic disorders.
- Roughly 50% of US adolescents have at least CKM stage 1 (dysfunctional adiposity), and higher stages of CKM are associated most significantly with food insecurity (even after controlling for individual factors such as race, ethnicity, and access to care).

Baker-Smith CM, Gauen AM, Petito LC, Khan SS, Allen NB. Under review

Food Insecurity:

- Higher risk of perinatal complications:
  - 14% of ~20,000 women living in Northern California had food insecurity during pregnancy
  - Food insecurity was associated with
    - 13% greater risk for gestational diabetes
    - 28% greater risk for preeclampsia
    - 19% greater risk for preterm birth
    - 23% greater risk for NICU admission
  - Receipt of *food assistance* during pregnancy (7.6%) was associated with attenuated risk for these complications

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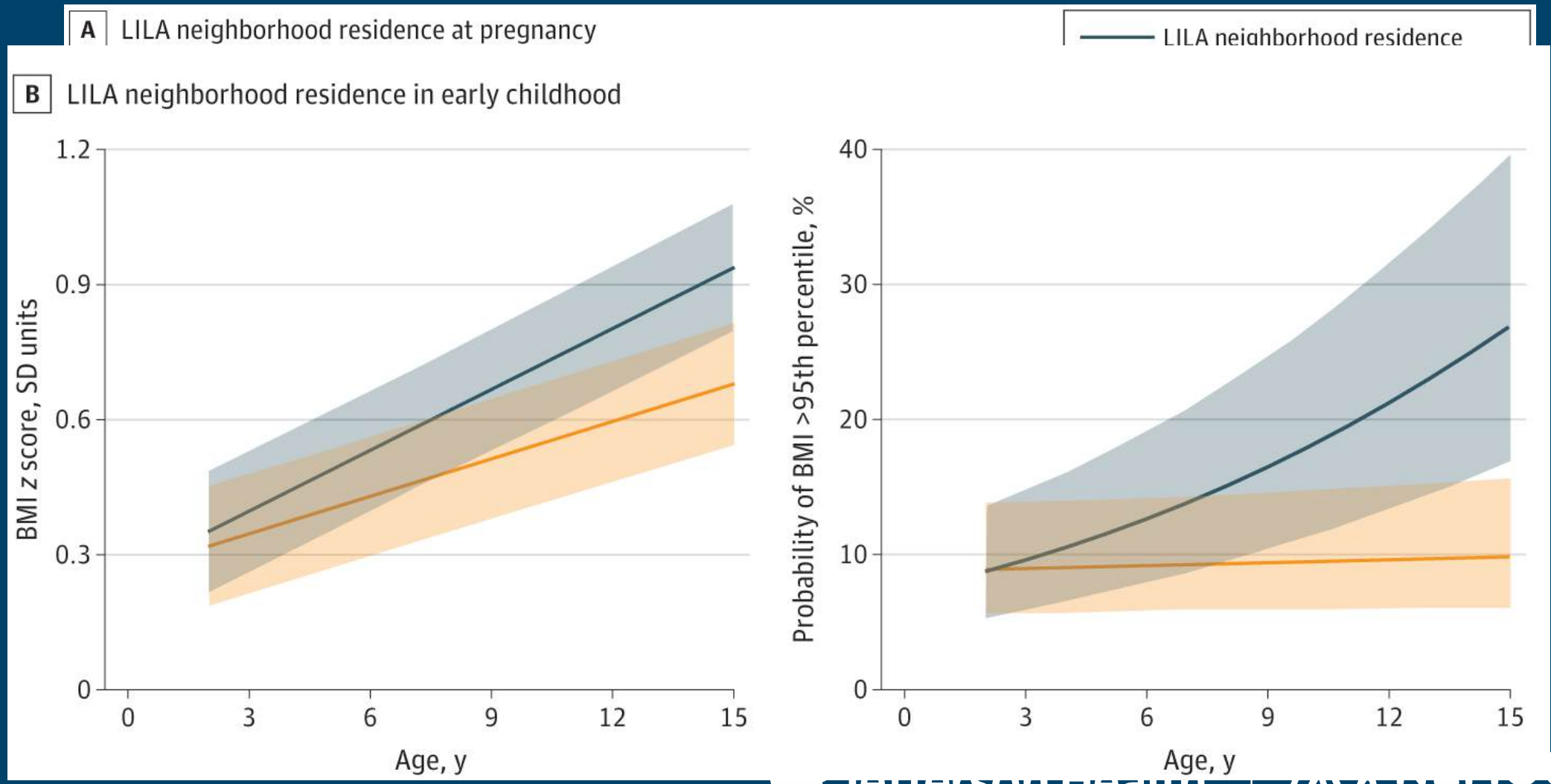
Chelab RF, et al. JAMA Netw Open. 2025

Independent of individual sociodemographic characteristics, residence in low-income access neighborhoods in early life is associated with higher BMI from childhood to adolescence



Aris IM, et al. JAMA Pediatrics. 2024

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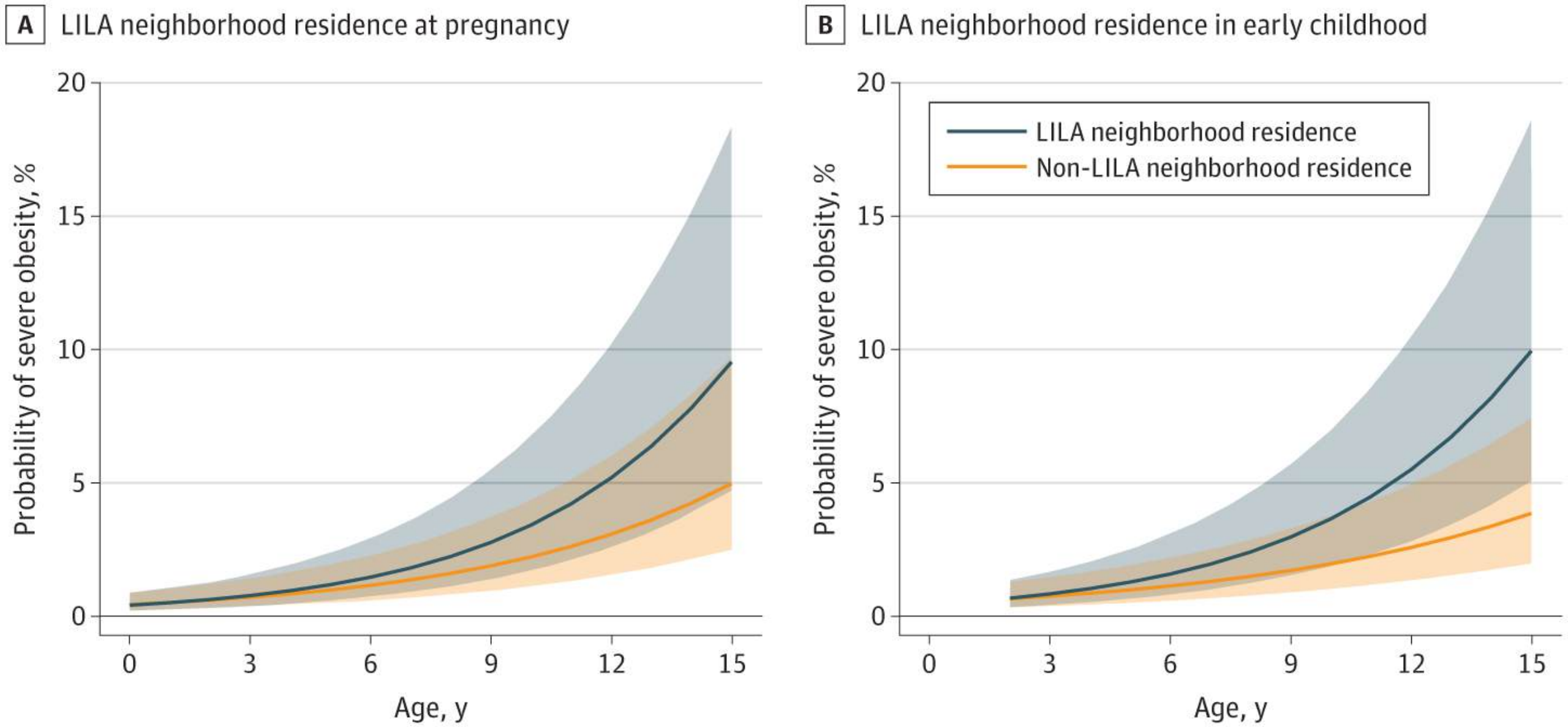
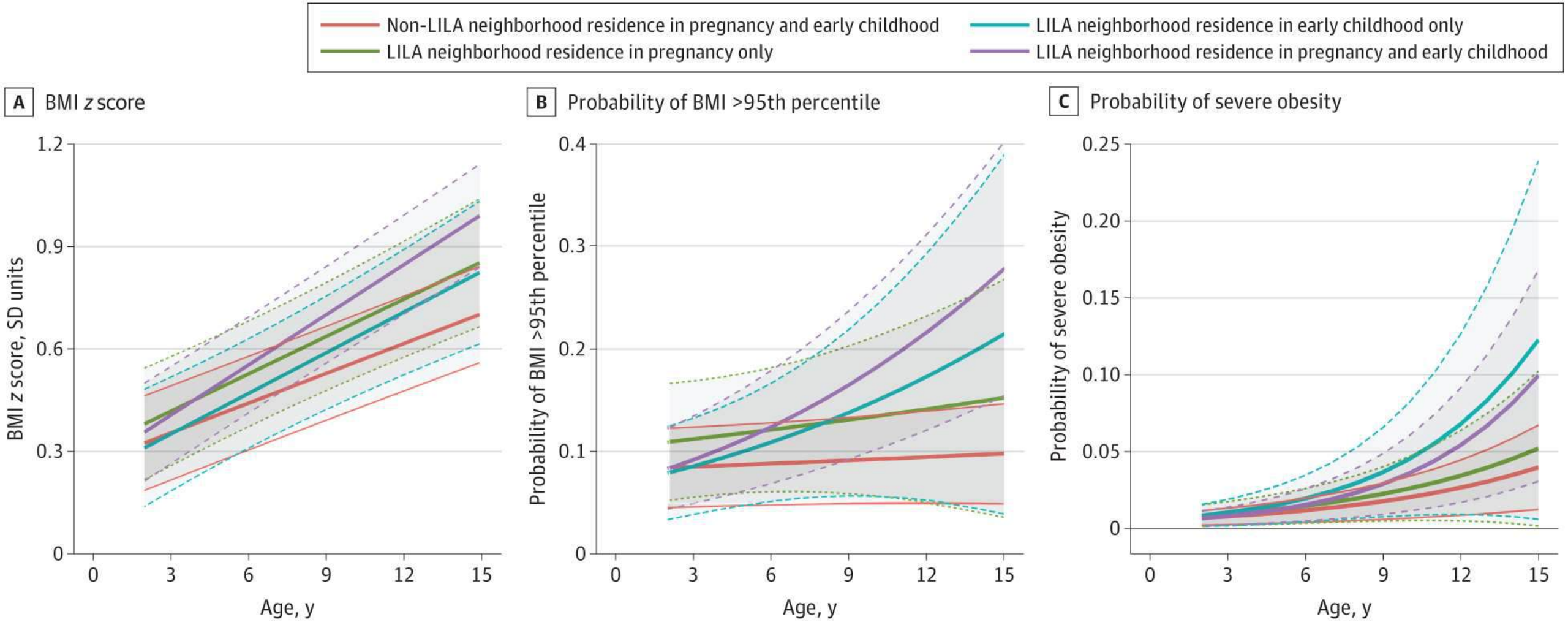

A
LILA neighborhood residence at pregnancy
B
LILA neighborhood residence in early childhood
Probability of severe obesity, %
20
15
10
5
0
0
3
6
9
12
15
Age, y
LILA neighborhood residence
Non-LILA neighborhood residence



Aris IM, et al. JAMA Pediatrics. 2024

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Additional Risks:

- Transition of care: pediatric to adult care (financial barriers, unplanned hospitalizations, chronic health conditions); >20% lost to follow-up
  - Decreased healthcare access in low-income areas
- Missed appointments
- Neurodevelopmental outcomes
- Exposure to adverse childhood experiences (ACEs) and impact on mental health and health outcomes

Bailey K, et al Pediatrics. 2023

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Health Exists Within A Social Construct:

Levels of Influence*

Individual	Interpersonal	Community	Societal

Domains of Influence *(Over the Lifecourse)*

- Behavioral
- Physical/Built Environment
- Sociocultural Environment

	Individual	Interpersonal	Community	Societal
Biological	Biological Vulnerability and Mechanisms	Caregiver-Child Interaction Family Microbiome	Community Illness Exposure Herd Immunity	Sanitation Immunization Pathogen Exposure
Behavioral	Health Behaviors Coping Strategies	Family Functioning School/Work Functioning	Community Functioning	Policies and Laws
Physical/Built Environment	Personal Environment	Household Environment School/Work Environment	Community Environment Community Resources	Societal Structure
Sociocultural Environment	Sociodemographics Limited English Cultural Identity Response to Discrimination	Social Networks Family/Peer Norms Interpersonal Discrimination	Community Norms Local Structural Discrimination	Social Norms Societal Structural Discrimination
Health Care System	Insurance Coverage Health Literacy Treatment Preferences	Patient-Clinician Relationship Medical Decision-Making	Availability of Services Safety Net Services	Quality of Care Health Care Policies
Outcomes	Individual Health	Family/ Organizational Health	Community Health	Population Health

of Minority Health and Health Disparities, 2018
Populations: Racial and Ethnic Minority Groups (defined by OMB Directive 15), People with Lower Socioeconomic Status,

Health Outcomes	Individual Health	Family/ Organizational Health	Community Health	Population Health

Multiple Indices for Describing Deprivation:

Table. Comparison of Correlation and Agreement Between the 2015 and 2021 Child Opportunity Indexes and Other Neighborhood Indexes Overall and Stratified by Urban-Rural Status

Census tracts	2016 Social Vulnerability Index vs 2015 COI		2015 Social Deprivation Index vs 2015 COI		2022 Environmental Justice Index vs 2021 COI	
	Spearman *r* (95% CI)	Weighted Cohen κ (95% CI)	Spearman *r* (95% CI)	Weighted Cohen κ (95% CI)	Spearman *r* (95% CI)	Weighted Cohen κ (95% CI)
All	−0.853 (−0.851 to −0.855)	0.657 (0.654 to 0.660)	−0.836 (−0.833 to −0.838)	0.639 (0.636 to 0.643)	−0.662 (−0.666 to −0.658)	0.449 (0.445 to 0.453)
Urban	−0.860 (−0.862 to −0.858)	0.672 (0.668 to 0.675)	−0.847 (−0.845 to −0.850)	0.658 (0.654 to 0.662)	−0.703 (−0.707 to −0.699)	0.489 (0.484 to 0.493)
Rural	−0.767 (−0.760 to −0.774)	0.543 (0.533 to 0.552)	−0.757 (−0.749 to −0.764)	0.509 (0.499 to 0.518)	−0.561 (−0.572 to −0.548)	0.255 (0.246 to 0.264)

besity Ikomi and Baker-Smith

	COI
	2010, 2015
Track	
Childhood opportunity	
Multiple (public, proprietary)	
29	
1 to 100 (1, most deprived)	
No	
Education	
Population aged ≥25 years with < 9years of education	x
Population ≥25 years with ≥ a high school diploma	x
Employed persons ≥16 years of age in white-collar occupations; Percentage in a management, business, science or arts occupation	x
Income and Employment	
Median family income	x
Income disparity	x

	x (Percentage with a high school degree or higher)	[a]	N/A
	x (Percentage with a college degree or higher)	x	N/A
	x	N/A	x (high skill employment)
	x	x	x
	N/A	N/A	N/A

Ikomi and Baker-Smith.
Bucholz EM, et al. JAMA Pediatrics 2024.

JAMA Network | Open

Original Investigation | Cardiology

Association of Area Deprivation With Primary Hypertension Diagnosis Among Youth Medicaid Recipients in Delaware

Carissa M. Baker-Smith, MD, MPH, MS; Wei Yang, PhD; Mary J. McDuffie, MA; Erin P. Nescott, MS; Bethany J. Wolf, PhD; Cathy H. Wu, PhD; Zugui Zhang, PhD; Robert E. Akins, PhD

Abstract

IMPORTANCE The association between degree of neighborhood deprivation and primary hypertension diagnosis in youth remains understudied.

OBJECTIVE To assess the association between neighborhood measures of deprivation and primary hypertension diagnosis in youth.

DESIGN, SETTING, AND PARTICIPANTS This cross-sectional study included 65 452 Delaware Medicaid-insured youths aged 8 to 18 years between January 1, 2014, and December 31, 2019. Residence was geocoded by national area deprivation index (ADI).

EXPOSURES Higher area deprivation.

MAIN OUTCOMES AND MEASURES The main outcome was primary hypertension diagnosis based on *International Classification of Diseases, Ninth Revision* and *Tenth Revision* codes. Data were analyzed between September 1, 2021, and December 31, 2022.

RESULTS A total of 65 452 youths were included in the analysis, including 64 307 (98.3%) without

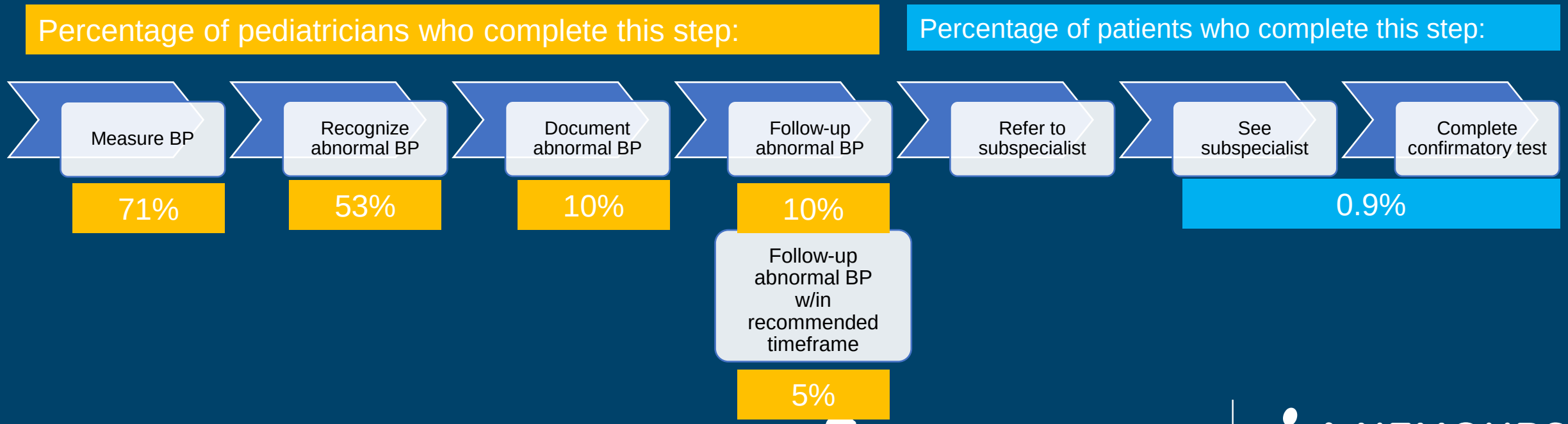
Key Points

Question Is there an association between neighborhood measures of deprivation and hypertension diagnosis in youth?

Findings In this cross-sectional study of 65 452 Delaware Medicaid-insured youths aged 8 to 18 years between 2014 and 2019, residence in neighborhoods with a higher area deprivation index was associated with primary hypertension diagnosis.

Meaning These findings suggest that there is an association between greater neighborhood deprivation and a diagnosis of primary hypertension in youths, which may be an important factor to consider in assessing the

Blood Pressure Assessment: Challenges



Rea CJ, Brady TM, et al. J Pediatr 2022

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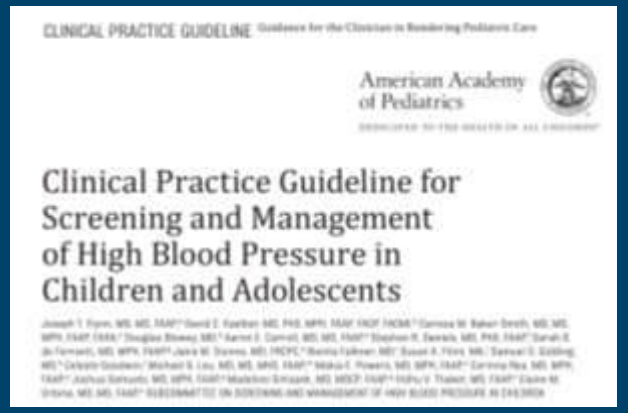
Screening Requires Multiple Outpatient Visits Over the Course of Weeks to Months

Table 1:	Blood Pressure Evaluation Algorithm, Derived from 2017 Pediatric Clinical Practice Guideline (CPG)					
BP Category	**BP Screening Schedule**	**Lifestyle Counseling**	**ABPM**	**Diagnostic Evaluation**	**Initiate Treatment**	**Consider Subspecialty Referral**
Normal	Annual	X				
HTN	Iniital measurement	X				
	Second measurement: Repeat in 1-2 weeks if **stage 1 BP** Repeat in 1week if **stage 2 BP**	X	X	X	X	X
	Third measurement: Repeat in 3 months in **stage 1 BP**	X	X	X	X	X
	Stage 1: SBP 130-139mmHg; DBP <80mmHg			Stage 2: SBP 140+ mmHg; DBP ≥ 80mmHg		



Flynn JT, Kaelber DC, Baker-Smith CM, et al Pediatrics 2017

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Screening Requires Multiple Outpatient Visits Over the Course of Weeks to Months

Patient

Multiple missed days from school

Anxiety leading to increased in-office BP

Parent

Multiple missed days from work

Primary Provider

# of available visits for repeat BP assessment

Lack of comfort with in-office BP assessment

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Hypertension is undiagnosed in 74% of US children and adolescents.

Hansen ML, et al. JAMA 2007

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BP Category (see Table 3)	BP Screening Schedule	Lifestyle Counseling (Weight, Nutrition)	Check Upper and Lower Extremity BP	ABPM	Diagnostic Evaluation	Initiate Treatment	Consider Sub-specialty Referral
Normal	Annual	X					
Elevated BP	Initial measurement	X					
	Second measurement: Repeat in 6 months	X	X				
	Third measurement: Repeat in 6 months	X		X	X		X
Stage 1 HTN	Initial measurement	X					
	Second measurement: Repeat in 1-2 weeks	X	X				
	Third measurement: Repeat in 3 months	X		X	X	X	X
Stage 2 HTN	Initial measurement	X	X				
	Second measurement: Repeat/refer to specialty care within 1 week	X		X	X	X	X

Figure 1: 2017 Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents

Flynn J, Kaelber D, Baker-Smith C, et al 2017

“Point of Care” ABPM

Journal of the American College of Cardiology

JACC Journals › JACC › Archives › Vol. 83 No. 13_Supplement

Previous | Next

FEASIBILITY AND ACCEPTANCE OF EARLY AMBULATORY BLOOD PRESSURE MONITORING FOR ENHANCED PEDIATRIC HYPERTENSION DIAGNOSIS WITHIN A HIGH DEPRIVATION COMMUNITY

OPEN ACCESS

Pediatric And Congenital Heart Disease

Carissa Marrie Baker-Smith, Carol Prospero, Hal Byck, Megan Keeth, Bridgette Hindt, Jorge Gilces, Varsha Zadokar, Areli Martinez, Kelly Hussong, and Erica Sood

JACC. 2024 Apr, 83 (13_Supplement) 1667

Ambulatory Blood Pressure Monitor (ABPM)

ABPM= ambulatory blood pressure monitoring

LEVELS OF INFLUENCE				
	Individual	**Interpersonal**	**Community**	**Societal**
Biological	Biologic vulnerabilities; renovascular, cardiac, vascular	Pre-eclampsia, gestational HTN	Environmental factors Community level food sources	Environmental pollutants
Behavioral	Salt intake	Family eating patterns	Farmer's markets Healthy/affordable food	Nutrition policies
Physical Built Environment	Personal food environment and access	Household food environment and stressors	Neighborhood food sources	Societal structures (redlining, zoning)
Sociocultural Environment	Food preferences, sociodemographic, cultural identity	Social networks Peer norms	Community norms	Social norms (food sources, supply chain)
Healthcare Systems	Insurance coverage, access, health literacy, treatment preferences	Patient-clinician relationship; tools to enhance physician HTN screening and diagnosis	Availability of resources; safety nets; efforts to improve HTN awareness	Quality of care; health care policy
Health Outcomes	**Individual Health**	**Family/ Organizational Health**	**Community Health**	**Population Health**

Created by Carissa M. Baker-Smith, MD MPH; adapted from NIMH framework

JAMA Network Open

Invited Commentary | Pediatrics

The Importance of Parent and Clinician Stakeholder Input—Guiding the Guidelines

Carissa M. Baker-Smith, MD, MPH, MS

Pediatric hypertension is a risk factor for target organ damage in childhood and major adverse cardiovascular events in adulthood[1] but remains undiagnosed in 74% of cases.[2] Even among children and adolescents who meet guideline-determined criteria for antihypertensive therapy,[3] rates of

+ Related article

Author affiliations and article information are listed at the end of this article.

Flynn J, Kaelber D, Baker-Smith C, et al 2017

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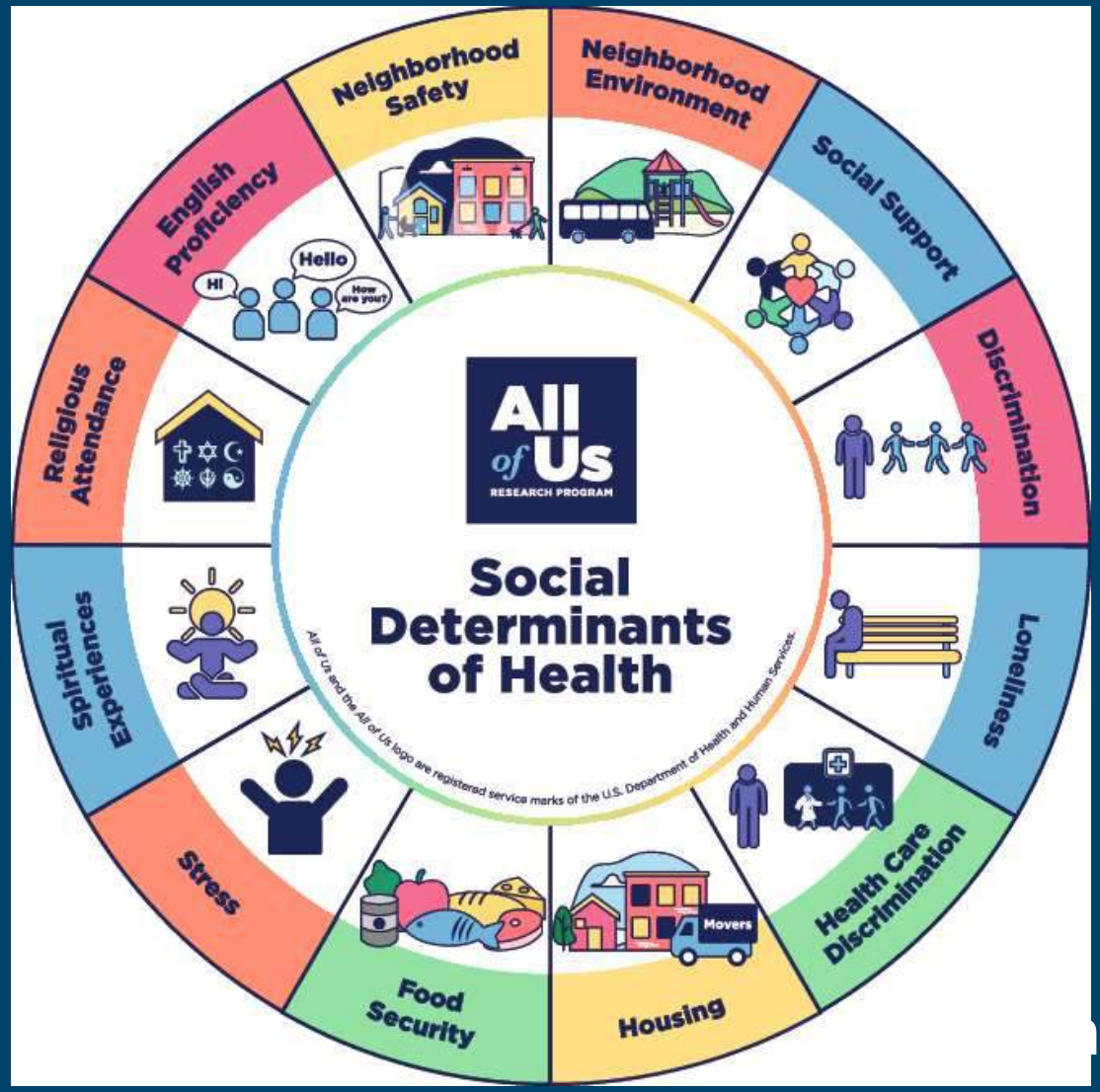
Social Determinants of Health Wheel



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Potential Solutions:

- Nemours Children's Health (NCH)/State of Delaware
  - Nemours' Whole Child Health initiative- Proposed by Lawrence Moss, MD, FACS, FAAP, President and CEO of Nemours Children's Health
  - First-of-its-kind payment model for children's health
  - 120,000 children covered by Delaware's Medicaid Program
  - NCH will be incentivized to address medical and non-medical drivers of children's health (to avoid unnecessary medical expenses)
  - "pay for health" model
  - Integration of primary care, specialty, and hospital health initiatives
  - Work alongside local and state government agencies to coordinate access to the broader range of services needed to help children thrive and achieve optimal health

Nemours - News Releases from Nemours

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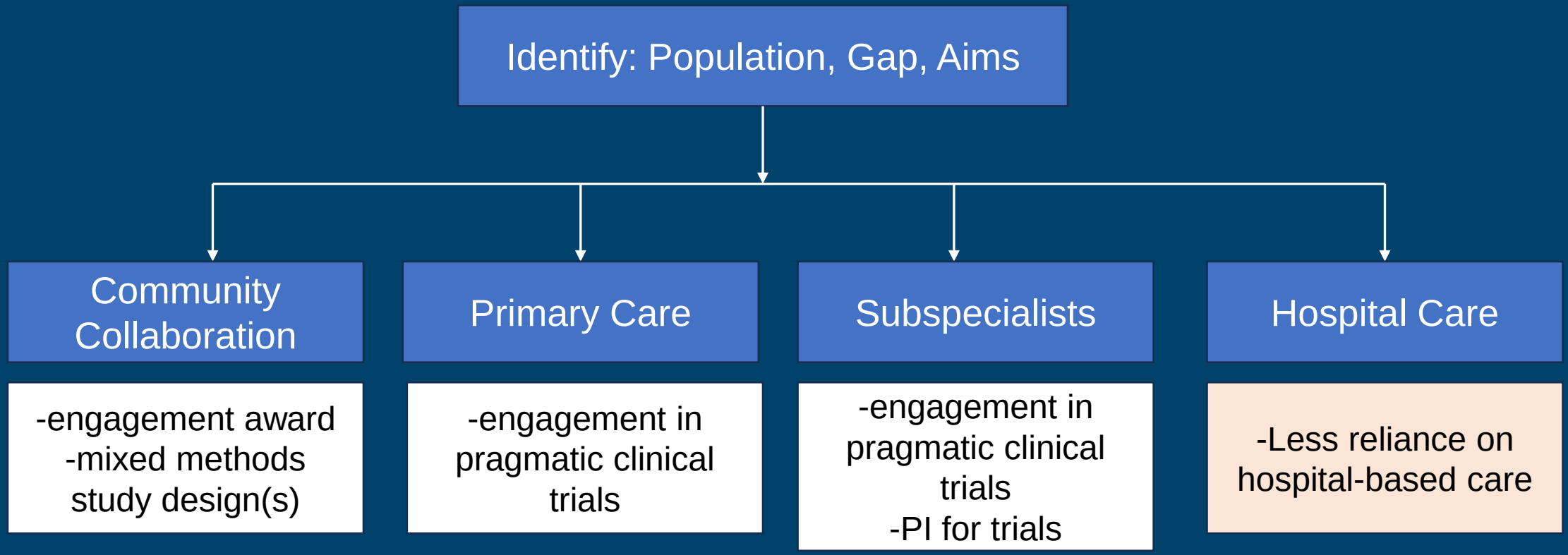
“Wrap Around-Research and Clinical Care Model”



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Conclusion:

- Variety of indices for characterizing deprivation.
- Framework of “whole child health” is critical.
- Developing intervention strategies that meet the needs of the population served (e.g., address access) is necessary.
- Creative solutions are being developed and are worth exploring.

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Thank you!