

# Using Mobile Technology to Assess the Impact of Home and Neighborhood Context on Sleep Among Urban Teens

## Statement of Problem

More than 75% of high school students in the United States are not getting the recommended 8-10 hours of sleep per night. Insufficient sleep is a critical public health concern as it increases risk for cardiovascular disease, hypertension and type 2 diabetes.

Adolescents from low-income urban communities are especially susceptible to not getting enough sleep. Research suggests that neighborhood stressors, such as crime and physical disorder like litter or vacant lots, may also adversely affect adolescent sleep duration and quality. Greater exposure to these stressors often leads adolescents to engage in less physical activity and more sedentary, screen-based activities, which are linked to poor sleep outcomes. In contrast, green space is a protective neighborhood feature that may buffer stress, lower risk of exposure to violence and support healthy sleep, although few studies have examined this association with sleep specifically. In addition, environmental exposures within the home like noise, light and uncomfortable temperatures may also negatively impact sleep.

While prior studies have focused on where adolescents live, no studies of adolescent sleep have considered neighborhood context dynamically by accounting for all places in which teens spend time. Most urban adolescents spend lots of time outside of their home, limiting our understanding of how their environment impacts sleep. GPS-enabled smartphones offer an innovative opportunity to overcome the limitations of past studies by developing ways to measure adolescent's total exposure to their neighborhood environments across home, school and other locations where they spend time. We can then gain a better understanding of how environmental factors like crime and greenspace affect teen sleep. Smartphones also allow us to obtain information on a daily basis on home environmental factors that might impact sleep, and we can learn how these factors vary between nights.

## Description

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75%  
students in the U.S. are not getting  
8-10 hours of sleep per night



Insufficient sleep among adolescents is a critical public health concern as it increases risk for cardiovascular disease, hypertension and type 2 diabetes.

Dr. Stephanie Mayne and her team are using mobile methods and geographic information systems (GIS) technology—a framework for gathering, mapping and analyzing geographic data such as the locations of crime incidents or parks—to learn more about neighborhood factors impacting teen sleep in the Teen Neighborhood Activity Patterns and Sleep (Teen NAPS) study. In this study, the team will enroll 160 adolescents ages 15-18 throughout Philadelphia and use smartphone GPS tracking to measure their exposure to neighborhood crime, disorder and green space during their daily activities, as well as brief daily surveys to assess home sleep environment problems. The researchers will then examine associations of neighborhood features and home environments with multiple sleep outcomes, including sleep duration, timing and quality.

This project builds on a prior pilot study, known as the Get to Sleep study, which enrolled 25 adolescents. In the Get to Sleep study, the team found that using GPS tracking, GIS, and repeated text message surveys over one week was feasible and acceptable to adolescents.

## Next Steps

Understanding the factors that impact sleep in adolescence is a key public health challenge that we must address to support sleep and improve health. Through this study, we hope to identify factors associated with insufficient sleep, **a growing health concern that is linked with numerous adverse health outcomes among adolescents**. We also aim to develop a model for assessing dynamic neighborhood exposures that researchers and public health practitioners can apply to a wide range of health behaviors and outcomes to inform place-based interventions, population health strategies, or clinical assessments to support health among children and teens within many contexts.

*This project page was last updated in July 2022.*

## Suggested Citation

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## PolicyLab Leads

## **Stephanie Mayne**

### **PhD, MHS**

#### **Faculty Member**

Stephanie Mayne (she/her) is a faculty member at PolicyLab at Children's Hospital of Philadelphia (CHOP), the associate director of Clinical Epidemiology at Clinical Futures at CHOP, and an assistant professor of pediatrics at CHOP and the University of Pennsylvania. Her research focuses on the impact of environmental factors, including home and neighborhood factors on child health and well-being, with a particular focus on health behaviors related to future cardiovascular risk (e.g. sleep, diet). Her recent work focuses on incorporating mobile health techniques, such as GPS tracking and ecological momentary assessment, to understand more granular, time-varying environmental exposures and their health impacts.

Dr. Mayne received her PhD in Epidemiology from Drexel University and completed a postdoctoral training program in cardiovascular disease epidemiology at Northwestern University.



Stephanie Mayne

PhD, MHS

Email: [MayneS@chop.edu](mailto:MayneS@chop.edu)

#### **Team**

## **Alexander Fiks**

### **MD, MSCE**

#### **Faculty Member**

Alex Fiks is a faculty member at PolicyLab at Children's Hospital of Philadelphia (CHOP), an urban primary care pediatrician at CHOP, director of Clinical Futures at CHOP and an associate professor of pediatrics at the Perelman School of Medicine at the University of Pennsylvania. He is also the director of the American Academy of Pediatrics (AAP) Pediatric Research in Office Settings (PROS), a national research network, medical director for the Pediatric Research Consortium (PeRC), CHOP's practice-based research network and co-director of the Possibilities Project, an initiative to innovate primary care delivery. Additionally, Dr. Fiks is a founding member of the hospital's Department of Biomedical and Health Informatics.

Board certified in clinical informatics, Dr. Fiks' research is aimed at improving outcomes for ambulatory pediatric patients through practice-based research with a focus on improving health and health care decision-making through health information technology. To achieve these goals, much of Dr. Fiks' research is focused on fostering shared decision making between clinicians and families, especially in the setting of behavioral health conditions. He is also especially interested in how electronic health record data may best be used to improve primary care, medication use and child health more broadly. As Director of AAP PROS, Dr. Fiks has been involved in building the Collaborative Electronic Reporting for Comparative Effectiveness Research (CER<sup>2</sup>), an electronic health record database designed to support pharmacoepidemiologic and other comparative effectiveness studies that currently includes >2 million U.S. children from across multiple health systems.

Dr. Fiks received his medical degree from Harvard University, and received a Master's of Science in Clinical Epidemiology (MSCE) degree from the University of Pennsylvania. He has received additional training in clinical informatics.



Alexander Fiks

MD, MSCE

Email: [Fiks@chop.edu](mailto:Fiks@chop.edu)

## **Gabrielle DiFiore**

### **MPH**

#### **Clinical Research Coordinator**

Gabrielle DiFiore (she/her) is a clinical research coordinator at PolicyLab and Clinical Futures at Children's Hospital of Philadelphia. She works with Dr. Stephanie Mayne on various projects evaluating the influence of multi-level factors, including neighborhood environments, on health behaviors and chronic disease outcomes. She also works alongside Dr. Alexander Fiks and Dr. Brian Jenssen on primary-care based projects aiming to improve pediatric care and health outcomes.

Ms. DiFiore has experience with both qualitative and quantitative policy-implicated research. She has previously worked with Dr. Aletha Akers on a number of sexual and reproductive health projects, including aiming to improve contraception continuation and adherence and how to better understand how a health coaching approach can be integrated into the clinical care setting. She also coordinated content development and marketing approaches for the ParentsAreTalking website, which aims to provide parents with the information and skills necessary for communicating with their adolescents about various sexual and reproductive health topics.

Ms. DiFiore received her Master of Public Health in Community Health and Prevention with a focus in Maternal and Child Health from Drexel University. Prior to her master's program, she completed her bachelor's degree in neuroscience from the University of Pittsburgh.



Gabrielle DiFiore

MPH

Email: [DIFIOREG@CHOP.EDU](mailto:DIFIOREG@CHOP.EDU)

Vicky Tam, MA

Karen Glanz, PhD, MPH

Eugenia South, MD, MSHP

Tyler Martin

Ian Barnett, PhD

Douglas Wiebe, PhD

Mathias Basner, MD, PhD, MSc

## **Funders of Project**

University of Pennsylvania Leonard Davis Institute

## **Project Contact**

Stephanie Mayne

[maynes@email.chop.edu](mailto:maynes@email.chop.edu)

## **Related Tools & Publications**

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[Using Behavioral Economics to Encourage Parent Behavior Change  
Blog Post](#)

Nov 07, 2018

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[Neighborhood Safety and Social Connections: What's the Potential Impact on Caregiver and Child Diet?  
Blog Post](#)

Apr 14, 2022

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[Using Video from Mobile Phones to Improve Pediatric Phone Triage in an Underserved Population](#)  
[Article](#)

Jun 2016

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[Sleep Problem Trajectories and Cumulative Socio-ecological Risks: Birth to School-age](#)  
[Article](#)

Sep 2019

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[Cumulative Socio-demographic Risk Factors and Sleep Outcomes in Early Childhood](#)  
[Article](#)

Sep 2019

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[Targeting Sleep Duration and Timing for Prevention of Adolescent Obesity](#)  
[Article](#)

Sep 2019

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[Clustering of Unhealthy Behaviors in a Nationally Representative Sample of U.S. Children and Adolescents](#)  
[Article](#)

Jan 2020

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[Feasibility and Acceptability of Mobile Methods to Assess Home and Neighborhood Environments Related to Adolescent Sleep](#)  
[Article](#)

Jun 2023

Related Projects

[Promoting Healthy Sleep Among Low-income Children Presenting to Urban Primary Care Behavioral Health](#)

[How Neighborhood Environments Impact Diet and Obesity Risk Among Low-income Families](#)  
[Population Health Sciences](#)