NEW SYSTEMS OF CARE FOR HYPERTENSION

From the ashes of COVID to the rise of the PHOENIX: Implementation of Mobile Health Units for hypertension management

Phillip Levy

MICHAEL J TWINER[1,2], NORA N AKCASU[2], BETHANY FOSTER[1,2], IJEOMA NNODIM OPARA[2,3], ROBERT D BROOK[2,4], AND PHILLIP D LEVY[1,2]

1 Department of Emergency Medicine, Wayne State University, Detroit, MI USA

2 Integrative Biosciences Center, Wayne State University, Detroit, MI USA

3 Department of Internal Medicine, Section of Internal Medicine and Pediatrics, Wayne Health Physician Group, Wayne State University School of Medicine, Detroit, MI USA

4 Division of Cardiovascular Disease, Department of Internal Medicine, Wayne State University, Detroit, MI USA

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality in the United States[1] with hypertension (HTN) being the primary contributor.[2] This is particularly apparent in marginalized communities such metropolitan Detroit, Michigan, USA where our team has led a decades-long program focused on population health research as well as preventive care screenings and chronic disease management. However, due to the recent COVID-19 pandemic, we underwent a major revision in our approach by providing individualized healthcare resources in the communities via mobile health units (MHUs) and are now applying these strategies to investigate new systems of HTN care and CVD risk reduction.

Rising from the ashes of COVID: Outpatient testing and community health

Prior to 2020, our team conducted CVD research by recruiting subjects via urban emergency departments (EDs) but the emergence of COVID effectively halted ED research and thus, subject recruitment. As such, the ever-changing pandemic required innovative and adaptable strategies to continue serving these communities. While we initially began conducting drive-through COVID-19 testing in fixed locations, we quickly learned that social vulnerability, particularly transportation challenges and low socioeconomic status, proved to be a steep barrier, thus increasing risk in this population.[3] To help alleviate these barriers, we formed a partnership with the Ford Motor Company (Dearborn, MI, USA) wherein a fleet of vehicle-based health platforms now known as MHUs were developed to bring our testing services directly to the community, targeting areas of greatest need and social vulnerability.

As the MHU program grew and the pandemic progressed, we expanded its services to provide a wider range of preventive screenings and resources. Currently, the MHUs offer screenings to promote cardiovascular, metabolic, and kidney health including blood pressure (BP) measurement and testing for diabetes, renal function, and hyperlipidemia, as well as immunizations, HIV and hepatitis C testing, and linkages to primary care providers (PCPs).

The Rebirth of HTN research and overcoming negative social determinants of health

Detroit communities suffer from the highest rates of HTN in the state of Michigan (https://www.cdc.gov/places) and starting in 2020 our MHUs began

screening patients for high BP. In the first year, 3039 people were screened for HTN with 63% having an abnormal BP (≥120/80 mmHg), a subset of whom (32%) met criteria for stage-II HTN.[4] These communities are also challenged by numerous social determinants of health (SDoH). Negative SDoH, including low socioeconomic status and poor access to medical care, among others, are important contributing factors to disparities in HTN and CVD across communities.[5-7] In contrast to traditional healthcare models, the mobile nature of the MHU program makes it uniquely capable of directly addressing such determinants and subsequently reducing the burden of CVD in socially vulnerable populations. Mobile, preventive care enables us to fill crucial gaps in the existing healthcare system and promote cardiovascular health equity in the community by meeting people where they work, worship, live, and play.

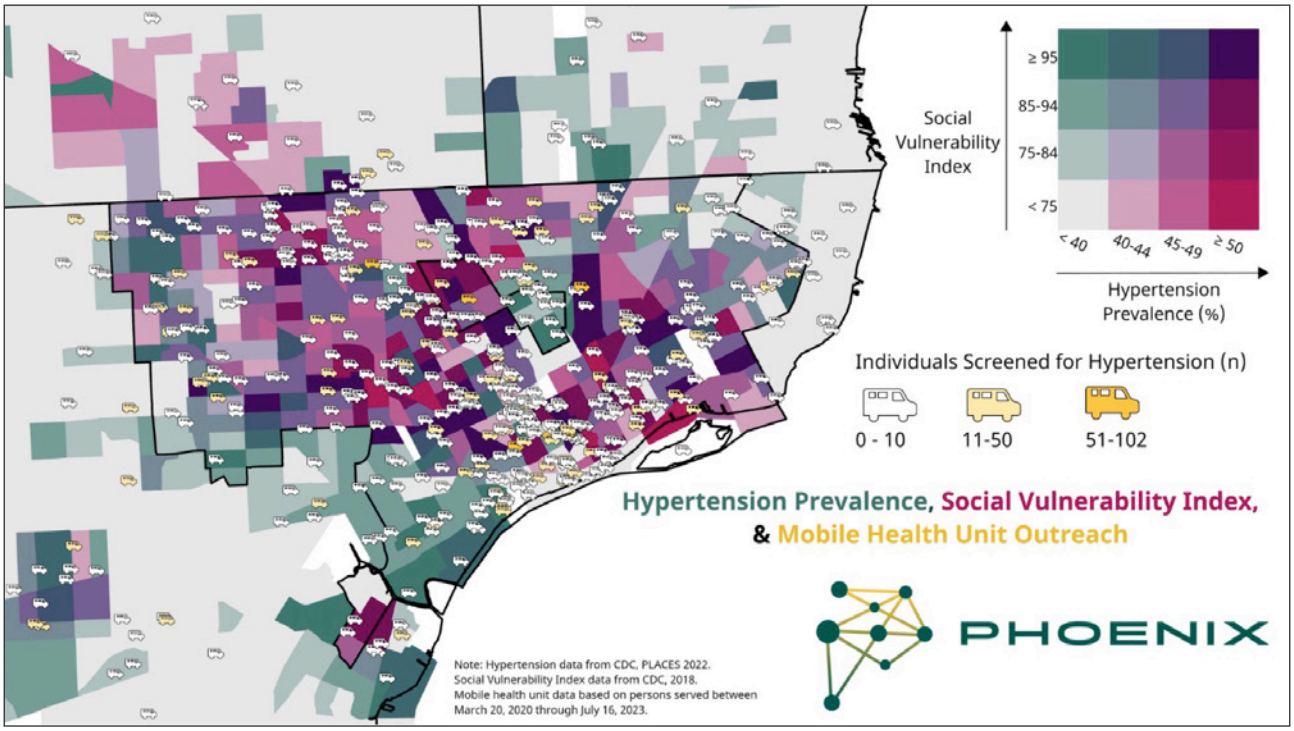
Rise of the PHOENIX: Directing MHUs to socially vulnerable communities

Given our mission to increase access to preventive care in socially vulnerable populations, geographic deployment of the MHU program is strategic and data driven. We leverage Wayne State University's (Detroit, MI, USA) Population Health OutcomEs aNd Information eXchange (PHOENIX) program, which aggregates publicly available data, to map out "hotspots" of high social vulnerability and chronic disease burden. As a result of spatial analysis and data driven vehicle deployment, 41% of MHU patients live in communities in the top quartile of social vulnerability.[3] As shown in **Figure 1**, this approach also allows us to cross matrix SDoH and CVD risk at a census tract level, and directly target outreach to communities that need it most.

A LEAP of Faith to ACHIEVE GREATER: Using MHUs for HTN research

One of our first studies that transitioned from ED to MHU-focused recruitment was "Bring it Down". This state funded project enrolled patients with systolic BPs ≥130 mmHg and connected them to PCPs and social services with follow-up health information captured for quality improvement. Of these participants, 42% had no previous diagnosis of HTN, illustrating the urgent need for continued screening and disease identification in the community.[4] Thereafter, the MHUs were deployed to enroll patients into "Linkage, Empowerment, and Access to Prevent Hypertension" (LEAP-HTN), a program that is part of the American Heart Association Funded RESTORE Health Equity Research Network, with a goal to halt

Figure 1: Social vulnerability and hypertension prevalence in Detroit with overlay of MHU deployment.



disease progression in Black Detroiters at risk of developing HTN.[8] Uniquely, LEAP-HTN engages community health workers (CHWs) to directly address negative SDoH, alleviating the impacts of social vulnerability on HTN risk.[8] We have also received funding from the National Institute of Minority Health and Health Disparities (NIMHD) Health Equity Action Network for ACHIEVE GREATER (Addressing Cardiometabolic Health Inequities by Early preVEntion in the GREAT lakEs Region) which is dedicated to reducing cardiometabolic health disparities in Detroit, MI and Cleveland, OH. Both programs recruit exclusively through our MHUs and utilize CHWs to directly address individualized, negative SDoH. The intervention groups are part of a collaborative care program called PAL2 (Personalized, Pragmatic, Adaptable Approaches to Lifestyle and Life circumstances) that uses team-based care, with CHWs and clinical pharmacists, to manage HTN and prevent disease progression. Given the widespread shortage of PCPs and the promising role of CHWs in HTN management, we believe that the PAL2 template may pave the way for a more efficacious and cost-effective alternative care model for HTN.[9,10]

From the Flames to the Rise of the PHOENIX: The future of MHUs

Just as the myth goes and the Phoenix was consumed by the flames before it was reborn again from the ashes, our historic research program that has addressed HTN and CVD was forced out of our urban EDs and has been reborn in the form of MHUs and active community engagement and early identification of social vulnerability. As we continue to grow and evolve, we continuously seek innovative ways to improve cardiovascular health in community settings. While we do not know if our program's successes are generalizable to other communities, we believe that the MHU program provides a framework for a nationwide mobile health program dedicated to filling gaps in preventive care and promoting health equity in socially vulnerable communities.

Acknowledgments:

The authors wish to thank Dr. Steven Korzeniewski for his help in data analytics.

Phillip Levy – plevy@med.wayne.edu

References:

1. Murphy SL, Xu JQ, Kochanek KD, Arias E, Tejada-Vera B. Deaths: Final data for 2018. National Vital Statistics Reports; vol 69 no 13. Hyattsville, MD: National Center for Health Statistics. 2020.

2. Whelton PK, Carey RM, Aronow WS, Casey DE, Collin KJ, Himmelfarb CD, DePalma SM, Gidding S, Jamerson KA, Jones DW, et al. 2017 ACC/ AHA/AAPA/ABC/ACPM/AGS/ APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: executive summary: a report of the American college of cardiology/American heart association task force on clinical practice guidelines. Hypertension. 2018;71:1269–1324. doi: 10.1161/HYP.0000000000000066

3. Levy P, McGlynn E, Hill AB, Zhang L, Korzeniewski SJ, Foster B, et al. (2021) From pandemic response to portable population health: A formative evaluation of the Detroit mobile health unit program. PLoS ONE 16(11): e0256908. https://doi.org/10.1371/journal.pone.0256908

4. Brook RD, Dawood K, Foster B, Foust RM, Gaughan C, Kurian P, et al. (2022) Utilizing mobile health units for mass hypertension screening in socially vulnerable communities across Detroit. Hypertension 79: e106-e108. https://doi.org/10.1161/HYPERTENSIONAHA.122.19088

5. Havranek EP, Mujahid MS, Barr DA, Blair IV, Chen MS, Cruz-Flores S, Davey-Smth G, Dennison-Himmelfarb CR, Lauer M, Lockwood DW, Rosal M, Yancy CW. Social Determinants of risk and outcomes for cardiovascular disease: a scientific statement from the American Heart Association. Circulation 2015; 132:873–898.

6. Commodore-Mensah Y, Turkson-Ocran R-A, Foti K, Copper LA, Himmelfarb CD. Associations between social determinants and hypertension, stage 2 hypertension and controlled blood pressure among men and women in the US. Am J Hypertens 2021; 34:707–717.

7. Carey RM, Muntner P, Bosworth HB, Whelton PK. Prevention and control of hypertension: JACC Health Promotion Series. J Am Coll Cardiol 2018; 72:1278–1293.

8. Opara IN, Brook RD, Twiner MJ, Dawood K, and Levy PD. (2023) Linkage, empowerment, and access to prevent hypertension: A novel program to prevent hypertension and reduce cardiovascular health disparities in Detroit, MI. American Journal of Hypertension 36(5): 264-272. https://doi.org/10.1093/ajh/hpad009

9. Brook RD, Scirica BM, and Levy PD. (2022) "The doctor is out": New tactics and soldiers for our losing battle against hypertension. Circulation 145(22): 1629-1631. https://doi.org/10.1161/CIRCULATIONAHA.122.059674

10. Brook RD, Levy PD, Brook AJ, and Opara IN. (2023) Community health workers as key allies in the global battle against hypertension: Current roles and future possibilities. Circulation Cardiovascular Quality and Outcomes 16: e009900. https://doi.org/10.1161/CIRCOUTCOMES.123.009900