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Research Article

## The Keep Your Heart Healthy Project: Engaging Medical Students to Reduce Risk of Cardiovascular Disease

Allison Ducharme-Smith<sup>1</sup>, David Alan Klein<sup>1</sup>, Jasmine Rassiwal<sup>1</sup>, Nilay S. Shah<sup>1</sup>, Claudia Leung<sup>1</sup>, Ashley Kim<sup>1</sup>, Rabih Dahdouh<sup>2</sup>, Stephen Havas<sup>2\*</sup>

<sup>1</sup>Feinberg School of Medicine, Chicago, IL

<sup>2</sup>Department of Preventive Medicine, Feinberg School of Medicine, Chicago, IL

\*Corresponding author: Dr. Stephen Havas, MD, MPH, MS, FACP, FAHA, Professor of Preventive Medicine, Department of Preventive Medicine, Northwestern University Feinberg School of Medicine, 680 N. Lake Shore Drive, Suite 1400, Chicago, IL 60611, Tel: (312) 503-2404; Fax: (312) 908-9588; Email: s-havas@northwestern.edu

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### Abstract

**Background:** Keep Your Heart Healthy (KYHH) is a student-driven initiative and represents a collaboration of Northwestern University Feinberg School of Medicine, Chicago Department of Public Health, Local Initiatives Support Corporation of Chicago New Community Partners, and the GE Foundation. The pilot (August 1st-December 31st, 2013) aimed to demonstrate the feasibility of engaging medical students to increase awareness of cardiovascular disease (CVD) risks in low-income communities through screening and consultation.

**Methods:** Fifty-one medical students volunteered. Community health workers recruited a convenience sample of adults in predominantly Hispanic (Humboldt Park) and African American/Black (North Lawndale) Chicago communities. Medical students assessed CVD risk by participant self-report, measured blood pressure and weight, calculated body mass indexes (BMI), and provided counseling. Participants with blood pressure  $\geq 140/90$  were referred to their primary care providers or a Federally Qualified Health Center.

**Results:** Students (mean = 6.8 / event) staffed 31 events and screened 1,161 participants in Humboldt Park (n=877) and North Lawndale (n= 284). Ninety percent of participants had at least one CVD risk factor (e.g., smoking, diabetes, hypertension, less than recommended physical activity level, or obesity). Obesity (47.8%, 53.2%) and elevated blood pressure ( $\geq 140/90$ ) (23.8%, 28.1%) were common. One in seven of these individuals was unaware of his/her elevated blood pressure. Thirteen percent of participants were referred for follow-up care. Students (86%) were satisfied with the experience.

**Conclusion:** CVD risk factor burden is high in low-income Chicago communities. KYHH is a novel model for engaging medical students to advance community health by conducting screening and counseling.

### Keywords:

Hypertension; Risk Reduction; Cardiovascular Diseases; Screening; Public Health; Medical Education

## Introduction

Cardiovascular disease (CVD) is a significant cause of morbidity and mortality in Chicago, especially in minority neighborhoods, yet is largely preventable through lifestyle modification [1, 2]. Lack of access to health care resources and limited health literacy among individuals in the community, combined with insufficient time, incentives, and training to conduct lifestyle counseling by physicians, contribute to the high prevalence of CVD [3-5]. The persistent burden of CVD, especially in vulnerable communities, contributes to increasing healthcare utilization, economic costs, and premature death for thousands of Americans each year [6, 7].

Addressing the many challenges in cardiovascular health requires a multifaceted approach. Effective interventions for improving cardiovascular health are those that both assess individual risk and encourage personal risk reduction [8, 9]. Previous studies utilized community health workers (CHW's) and lay health volunteers, and provided interventions for individuals within their communities [10, 11].

Increasing recognition of the importance of community engagement in medical education has encouraged community-academic partnerships focused on residency training and service [12-14]. However, community engagement among medical students in pre-clinical years as well as clinical years remains low with less than half of graduating medical students reporting experience with community health [15-17]. There is a paucity of literature on community-based CVD prevention interventions that marshal the resources of a medical school to engage both medical students and vulnerable communities.

In 2012, faculty and students from the Northwestern University Feinberg School of Medicine (NUFSM) collaborated with the Chicago Department of Public Health (CDPH) to reduce mortality from CVD in Chicago developing a project called Keep Your Heart Healthy (KYHH). The following report details the results from the five-month pilot study, which aimed to demonstrate the feasibility of engaging an academic partner and community-based organizations to achieve the objectives of improved medical student training in CVD prevention and enhanced CVD risk factor screening and awareness in at risk communities.

## Methods

The GE Foundation provided funding for the pilot study, which began January 1<sup>st</sup>, 2013. An Executive Committee and a Student Advisory Committee were formed with members of the Departments of Preventive Medicine and Medicine at NUFSM, the CDPH, and the medical student body. The CDPH chose the Humboldt Park and North Lawndale Chicago communities for partnership in the pilot program due to their high CVD mortality rates. The communities hired three CHW's who already

were familiar with and worked in the community centers at each community in which the screenings were to take place, the Diabetes Empowerment Center in Humboldt Park and the North Lawndale Christian Center in North Lawndale.

The Student Advisory Committee recruited medical student volunteers from all four classes at the NUFSM and played an active role in the design, coordination, and execution of the project. Recruited medical students completed training provided by members of the Executive Committee. Specifics about student recruitment, training, and faculty involved with KYHH have been detailed in a separate paper submitted for publication [J Rassiwalla, MD, unpublished data, 2014] [18].

The study was approved by the local Institutional Review Board. A convenience sample of adults, 18 years of age and older, was recruited by CHW's for weekly screening events between August 1<sup>st</sup> and December 31<sup>st</sup>, 2013. The CHW's utilized fliers, and actively recruited participants during the week at each community center. A medical student completed the documentation of each encounter using a standardized intake form, which included height, weight, blood pressure measures, and a brief survey described below. Measured height and weight were used to calculate BMI.

Blood pressure cuffs were placed on the participant's left arm at the beginning of the interview with the participant seated in a comfortable chair, both feet on the floor, and arm and back supported. OMRON donated automatic sphygmomanometers (Omron Model BP 760). An initial blood pressure measurement was taken with the automatic sphygmomanometer after at least five minutes of seated discussion. Two additional measures were taken at least one minute apart. The mean of the latter two measurements was recorded and discussed with the participant. Extra-large sphygmomanometers were available for participants as needed.

Participants were asked to complete a brief survey with the interviewer either in English or Spanish (Appendix). Experienced faculty from the Department of Preventive Medicine developed the survey, which assessed demographics (age, race/ethnicity, zip code, physician and insurance status), pertinent medical history (pre-diabetes, diabetes, hypertension, heart disease or heart attack, or stroke), and cardiovascular risk factors. The final question asked participants to identify goals for the conversation from a list - reduce salt intake, increase fruit and vegetable intake, eat a healthier diet, achieve a healthier body weight, be more physically active, and avoid tobacco smoking - in order to guide the discussion. Variables for the encounter were subsequently extracted from the intake form by the research coordinator for analysis. Blood pressure and BMI were categorized according to AHA criteria [19]. The number of risk factors was calculated based on the presence of obesity, history of hypertension, history of diabetes, smoking status, or

fewer than 5 days weekly of recommended physical activity.

Medical students provided brief, personalized counseling for each participant based on the American Heart Association's Life's Simple 7 recommendations [20]. Students were trained to utilize motivational interviewing techniques to elicit patients' desired health goals. A physician faculty member served as an attending at each screening event, answered questions that arose during the consultations, provided feedback to students on their performance, and managed any issues requiring more urgent medical intervention.

Participants with a blood pressure  $\geq 140/90$  mmHg were asked to follow up with their primary care physicians within two weeks of screening. Participants who did not have access to a physician or insurance were referred to a nearby Federally Qualified Health Center (FQHC) and provided with a specific appointment date and time. The CHW's in each community tracked participant referrals. They followed up with the participants via phone call and with the FQHC's for these referrals to determine if the participants with elevated blood pressure ( $\geq 140/90$  mmHg) were following up with a physician.

At the end of the encounter, participants were randomly selected to provide anonymous post-event feedback through a survey that assessed participant satisfaction with the screening events and motivation to change. After the completion of the pilot program, KYHH-trained medical students were invited to complete an anonymous feedback survey regarding their satisfaction and experience with the program. Variables regarding participant satisfaction were binary, with the exception of a 10-point Likert scale-based assessment of the value of the KYHH program. Variables regarding student satisfaction with KYHH were based on a 5-point Likert scale.

Mean and standard deviation (SD) or frequency (n) and percent were calculated for participant and student data. Participants were stratified by their reported history to determine the proportion of participants who were unaware of their hypertension or who were aware of their hypertension but did not have it under control defined as  $<140/<90$  mmHg. All analyses were performed between January 1<sup>st</sup> and May 31<sup>st</sup> 2014 using Stata v. 12 (StataCorp, College Station, Texas).

## Results

A total of 1,161 participants were screened in the Humboldt Park (n=877) and North Lawndale (n= 284) communities. Fifty-one students completed KYHH training sessions and staffed 31 twice-weekly screening events. Individual students volunteered on average (SD) once per 7.9 (5.9) events, or approximately every four weeks. Each event was staffed by a mean of 6.8 (2.4) students and monitored by one of 15 attending physicians who volunteered during the pilot.

Participants were most commonly between 40 and 60 years old, and were more likely to be women than men. Twenty-nine percent of participants did not have a usual source of medical care. Sample characteristics, including self-reported and measured CVD risk factors, are shown by community in Table 1.

	Humboldt Park (n =877)	North Lawndale (n = 284)
<b>Demographic and Socioeconomic Factors</b>		
Age, years	49.7 (14.8)	44.9 (12.5)
Women	511 (59.1%)	194 (68.3%)
<b>Race/Ethnicity</b>		
African American / Black	141 (14.1%)	264 (93.0%)
Hispanic / Latino	692 (80.7%)	7 (2.5%)
White	39 (4.5%)	5 (1.8%)
Other	6 (0.7%)	8 (2.8%)
Missing	19 (2.2%)	0 (0.0%)
<b>Usual Source of Care</b>		
Yes	600 (68.4%)	221 (77.8%)
No usual doctor	90 (10.3%)	20 (7.0%)
No insurance	115 (13.1%)	32 (11.3%)
No usual doctor nor insurance	65 (8.3%)	9 (3.4%)
Missing	7 (0.8%)	2 (0.7%)
<b>Self-Reported CVD Risk Factors</b>		
Current Smoker	289 (33.5%)	76 (26.9%)
Did not meet weekly exercise recommendation	479 (54.6%)	187 (65.8%)
Did not meet $\geq 1$ dietary recommendation	772 (88%)	253 (89.1%)
<b>Number of Risk Factors<sup>b</sup></b>		
0	70 (8.0%)	30 (10.6%)
1	267 (30.4%)	75 (26.4%)
2	273 (31.1%)	92 (32.4%)
$\geq 3$	266 (30.5%)	87 (30.6%)
<b>BMI Status</b>		
Obesity Class II or III (BMI $\geq 35$ )	184 (21.0%)	96 (33.8%)
Obesity Class I (30 $\leq$ BMI $< 35$ )	186 (26.8%)	55 (19.4%)
Overweight (25 $\leq$ BMI $< 30$ )	303 (34.8%)	80 (28.2%)
Low or Normal weight (BMI $< 25$ )	204 (23.4%)	53 (18.7%)
<b>Blood Pressure Status<sup>c</sup></b>		
Normotensive	354 (40.6%)	91 (34.1%)
Prehypertension	310 (35.6%)	101 (37.8%)
Hypertension I	139 (15.9%)	56 (21.0%)
Hypertension II	48 (5.5%)	14 (5.2%)
Hypertensive Urgency	21 (2.4%)	5 (1.9%)

Self-reported medical history in Humboldt Park and North Lawndale included diabetes (22.8%, 9.5%), hypertension (40.4%, 34.2%), heart disease or heart attack (7.0%, 6.0%), and stroke (4.33%, 1.4%). Measured obesity rates were high with approximately 50% of participants having a BMI  $\geq 30$ . Participants with elevated blood pressure (systolic  $\geq 140$  mm Hg, or diastolic  $\geq 90$  mm Hg) or self-reported diabetes were more likely to be obese ( $p < 0.05$ ).

Elevated systolic ( $\geq 140$  mm Hg), diastolic ( $\geq 90$  mm Hg) blood pressure, or both, was observed in 24.4% of participants. In both communities, approximately one in seven of these in-

dividuals was unaware of his/her elevated blood pressure. Among those reporting a history of hypertension, participants in Humboldt Park were less likely to demonstrate high blood pressure at screening (37.8% vs. 48.5%).

Participant-selected goals were similar between communities. Participants in Humboldt Park and North Lawndale most commonly chose “reach a healthier body weight” (52.1% vs. 53.9%, respectively), followed by “eat a healthier diet” (43.1% vs. 40.0%) and “increase dietary fruit and vegetable intake” (33.7% vs. 29.1%). “Reduce dietary salt intake” (26.2% vs. 27.9%), “be more physically active” (22.9% vs. 22.8%), and “avoid tobacco smoking” (26.3% vs. 18.9%) were less frequently selected.

Of the 1,161 participants screened, 99 (8.5%) were provided with a specific referral to a nearby FQHC and 55 (4.7%) encouraged to follow up with their own primary care provider within the next two weeks. The remaining 136 participants who were found to have elevated blood pressure but did not have referral represent either participants who refused follow up or missing data. Of the participants who were provided follow up with a nearby FQHC, 13 (18%) completed their first appointment, 27 (37%) refused, missed, or cancelled their appointments, and 32 (44%) were unreachable for scheduling an appointment either because the telephone number provided was disconnected or incorrect. Two participants were taken emergently to a local ED after screening evaluation: one for suspected decompensated heart failure and another for findings consistent with thyroid storm.

Of 504 participants who provided post-event feedback, 87% indicated they learned something new about their heart health, 90% made goals to improve it, 99.2% indicated they understood their own personal risks, and 99% indicated they would recommend the screening to others. Participants rated the value of the KYHH program as a 9.4 out of 10.

Fifty of a total of 51 medical students (98%) provided post-pilot feedback on the KYHH program. The majority of students were somewhat (30%) or extremely (56%) satisfied with the KYHH program. Ninety-six percent of surveyed students felt that the program improved their confidence in speaking with individuals from diverse backgrounds a little (36%) or a lot (60%). Ninety-six percent of surveyed students indicated that the program strengthened their motivational interviewing skills a little (28%) or a lot (68%). Eighty-six percent of the students felt that participation in the KYHH program increased their interest in CVD prevention and 86% of students indicated that it increased their interest in community and public health. At the pilot’s end, 16 eligible students (40%) applied for leadership positions within the KYHH Student Advisory Committee.

## Conclusions

The KYHH pilot program demonstrated the feasibility of engaging medical students to advance community health by conducting personalized risk factor screening and consultation. The program was well received by both medical students and community residents. Students indicated that KYHH increased their exposure to health-vulnerable populations and enhanced their skills in motivational interviewing, and risk factor counseling. Furthermore, participant responses suggest that there is a substantial burden of disease in the two Chicago communities with minimal access to care. The KYHH program has the potential to increase awareness of CVD risk and improve health behaviors in these low-income participants.

Whereas there have been many reports detailing community-based cardiovascular risk reduction programs utilizing community health workers, and lay health advisors, there is limited research on programs that utilized medical students [8, 10, 11, 21]. Previous programs that have attempted to engage medical students in community health focused on residents or third and fourth year students in clinical rotation electives at community hospitals [12, 22]. However, data are sparse regarding community-based intervention programs involving preclinical, as well as clinical students and few focusing on CVD risk reduction [23]. Our review of the literature did find one program involving preclinical students in risk factor screening at annual rural health fairs; however student participation was low with an average involvement of one screening event over their first two years of medical school [24]. KYHH is unique in leveraging (predominantly) first-year medical students in a longitudinal academic medical school-community collaboration for CVD prevention, working collaboratively with second and clinical year students as well as faculty.

Cardiovascular risk factor reduction and prevention interventions have been shown to improve the health of at risk populations and reduce CVD mortality rates [8]. The North Karelia project in Finland demonstrated the effectiveness of this type of community-level intervention with nearly an 80% reduction in CVD mortality rates over 35 years, which was mainly attributed to the reduction in CVD risk factors [25]. The Finnish experience and subsequent community CVD prevention programs in the United States demonstrated that focusing on personal risk reduction can produce significant reductions in CVD mortality in a population [9].

Our pilot demonstrated high CVD risk factor burden in the recruited participants with 90% having at least one risk factor, 30% of participants reporting three or more risk factors, and nearly a quarter of the participants having elevated blood pressure, reflecting either uncontrolled or previously undetected hypertension. The literature indicates that there is a high prevalence of undiagnosed and uncontrolled hyperten-

sion in minority communities [26]. In our study, 14% of participants found to have elevated blood pressure were previously unaware that their blood pressure was abnormal. Therefore, community-based risk factor screening in high-risk communities is likely to detect a significant percentage of persons with elevated blood pressure. The prevalence of risk factors in the participants highlights the need for CVD prevention programs in at-risk Chicago communities and elsewhere.

In the pilot, 13% of participants were referred for follow-up for their elevated blood pressure and nearly half of these did not have a physician or insurance. Through partnerships with nearby FQHC's we were able to provide same-month follow up for these participants with a primary care provider. However, outcomes from the pilot indicate that only 18% of referred participants completed their appointments at the FQHC and the remaining 82% of referred participants were either unreachable, or refused or unable to make their appointments. Issues with follow-up in adult patients new to a primary care provider are common. Barriers cited include patient financial constraints, miscommunication, access and transportation limitations, forgetfulness, and long intervals between the day the appointment was made and the actual appointment date [27].

Studies have shown that patients who miss appointments are less likely to have received preventive health services, and more likely to have lower socioeconomic status and have poorly controlled hypertension [27]. Efforts are being made in the next phase of the KYHH program to address issues in reaching participants via telephone and the limited follow-up by participants. We are working with our community partners and the CDPH to waive all co-pays for the initial referral appointments and in this way hope to increase participant follow-up.

There is increasing recognition of the importance of community engagement in medical education for developing community-responsive and responsible physicians [28]. It is a well-known phenomenon that medical students lose their sense of idealism in medicine and have decreased interest in serving underserved populations as they progress in their training and face declining resources and increasing burdens [23, 24]. However, exposure of medical students to community service and training can empower students in their careers and give them a sense of professional responsibility to their communities [17]. Physicians who receive training in community-based settings are more likely to be involved in community health in their medical practice [29]. Involvement of medical students in community outreach may play a significant role in addressing CVD risk factors and preparing our future generation of physicians. Our finding that 86% of students reported increased interest in CVD prevention and community and public health supports the literature about the positive impact of community health experiences in medical student training [17]. Fur-

thermore, it demonstrates that students can be engaged and actively participate in public health efforts.

Based on our positive experience in the pilot, the GE Foundation provided funding to continue the program for another three years and to expand the program into two additional Chicago communities. Additionally, students proposed integrating the KYHH model into the curriculum at NUFMS. In order to ensure sustainability of the KYHH program in the Chicago communities served, students developed a community health worker training in these communities and are currently designing an evaluation system to assess behavioral modifications in participants post-screening. In addition, they are developing potential follow up interventions for interested community participants to continue working on lifestyle modifications for risk factor reduction with medical students.

Several limitations exist within this study. First, the participant selection was based on a convenience sample. Community residents who choose to participate in our screenings may not be representative of the communities at large and could have greater or less health-awareness and overall be healthier or sicker than the general community population [30]. Second, we had no way to validate self-reported participant data such as previous medical history, weekly dietary intake, and weekly physical exercise activity. Thus, there is likely to be some misclassification of CVD risk factors in this analysis. However, baseline intake information would not interfere with a participant's potential for positive behavior change. Therefore, the program can still result in positive CVD risk reduction through brief intervention counseling. Third, in our study we classified participants as having high blood pressure after just one encounter, which is not usually what is done in practice. Fourth, the program depends heavily on the support and continued engagement of community partners, medical school faculty, and medical students. With twice-weekly screening events, KYHH experienced some difficulties in adequate physician and medical student staffing. However, we anticipate that with integration of this program into the NUFMS curriculum issues with physician staffing and student attendance will be solved. In addition, KYHH has already been successfully implemented in two health-vulnerable Chicago communities will expand into two additional communities this year, and continues to be jointly led by NUFMS and the CDPH as part of a city-wide initiative for better health.

In conclusion, the KYHH pilot program is a model for engaging medical students to provide a community-based program for CVD risk reduction and prevention. The program was well received by students, community partner organizations and residents, the CDPH, and the GE Foundation. Further research is needed to determine the sustainability of the program and its effectiveness in reducing CVD risk factors in Chicago communities.

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# Keep Your Heart Healthy!

We want to help you learn more about keeping your heart healthy. There will be 3 steps:

- 1) **Assess:** answer some questions and we will check your blood pressure & body weight
- 2) **Discuss:** we will talk to you about the things you can do to avoid a heart attack or stroke
- 3) **Act:** we will help you set goals for healthy living and connect you with resources to help you

Please answer the questions below. This will help us to discuss your heart health

<p>What is your age? ____ years</p> <p>How do you identify yourself?</p> <p><input type="checkbox"/> Male <input type="checkbox"/> Female</p> <p>What would you say is your race / ethnicity (check all that apply):</p> <p><input type="checkbox"/> African American / Black <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> White <input type="checkbox"/> Asian <input type="checkbox"/> Other: _____</p> <p>What is your zip code? _____</p> <p>Is there a usual place you receive healthcare? (check all that apply):</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No, I have no insurance <input type="checkbox"/> No, I have no doctor</p>	<p>Have you <u>ever</u> been told by a doctor or nurse that you have or had any of the following?</p> <p><input type="checkbox"/> Pre-diabetes <input type="checkbox"/> Diabetes <input type="checkbox"/> High blood pressure <input type="checkbox"/> Heart disease or heart attack <input type="checkbox"/> Stroke</p> <p>Are you currently a smoker? In other words, did you smoke any cigarettes in the past month?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>During a typical week, how many days do you take part in at least 30 minutes of physical activity? (Examples include brisk walking, dancing, swimming, or using a home exercise video)</p> <p style="text-align: center;">0 1 2 3 4 5 6 7</p>	<p>In a typical week, how often do you...</p> <p><i>Eat 3 or more servings of fruit in a day?</i></p> <p><input type="checkbox"/> Rarely or never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually or often</p> <p><i>Eat 3 or more servings of vegetables in a day? (don't count French fries)</i></p> <p><input type="checkbox"/> Rarely or never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually or often</p> <p><i>Eat high sodium foods like cold cuts, sausages, hot dogs, canned soups, salted nuts, pretzels, or other snack chips?</i></p> <p><input type="checkbox"/> Rarely or never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually or often</p>
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Would you like to discuss any of the strategies below to improve your health? (check all that interest you)

<input type="checkbox"/> Cut back on the salt (sodium) in your diet	<input type="checkbox"/> Get to a healthier body weight
<input type="checkbox"/> Increase fruits and vegetables in your diet	<input type="checkbox"/> Be more physically active
<input type="checkbox"/> Eat a healthier diet	<input type="checkbox"/> Avoid tobacco smoking

<p><b>STAFF USE ONLY: XXXXXX</b></p> <p>Body Weight : _____</p> <p>Height without shoes: _____ feet, _____ inches</p> <p>BMI: _____ kg/m<sup>2</sup></p>	<p><b>Blood Pressures:</b></p> <p>_____ / _____ mmHg</p> <p>_____ / _____ mmHg</p> <p>_____ / _____ mmHg</p>	<p><b>Recommendations:</b></p> <p><input type="checkbox"/> Delivered brief advice <input type="checkbox"/> Provided written information <input type="checkbox"/> Linkage to CHW <input type="checkbox"/> Follow up by PCP (complete follow-up coordination form)</p>
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