

# PATIENT-LEVEL PREDICTORS OF EXTENT OF EXPOSURE TO A COMMUNITY HEALTH WORKER INTERVENTION IN A RANDOMIZED CONTROLLED TRIAL

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**Objective:** Community health worker (CHW) interventions have been cited as a best practice for reducing health disparities, but patient-level attributes may contribute to differential uptake. We examined patient characteristics associated with the extent of exposure to a CHW coaching intervention among a predominantly low-income, African American population participating in a randomized controlled trial of hypertension interventions.

**Design:** We conducted a within-group longitudinal analysis of those receiving a CHW intervention from a study conducted between September 2003 and August 2005. We employed mixed effects models to ascertain relationships between patients' characteristics, length of time spent with the CHW, and the number of topics discussed during the intervention.

**Setting:** Baltimore, MD

**Participants:** 140 patients with a diagnosis of hypertension in the CHW intervention arm.

**Results:** Marital status, stress, depression symptomology, and having multiple comorbid conditions were each independently and positively related to the length of time patients spent with CHWs. An indirect relationship between higher perceived physical health and time spent with the CHW was observed. Patients with multiple comorbid conditions discussed more intervention-related topics, while patients who perceived themselves as being healthier discussed fewer topics. Marital status and extreme poverty were the strongest predictors of the length of time spent with the CHW, while having multiple comorbid conditions was the strongest predictor of the number of coaching topics discussed.

## INTRODUCTION

The use of community health workers (CHWs) has been endorsed as a culturally sensitive, effective modality for reducing well-documented health and process of care disparities.<sup>1-3</sup> CHWs represent a bridge between socially and medically vulnerable communities and the health care system.<sup>4</sup> They are typically indigenous to these communities – presumably sharing ethnic, linguistic, socioeconomic, and experiential ties – which makes them particularly well-suited to assist members of at-risk populations.<sup>5,6</sup> In the context of health care delivery and public health systems, this is accomplished through provid-

ing health education, informal counseling, social support, resource navigation and acquisition, and advocacy for patients and families.<sup>7-9</sup> These activities may mitigate the impact of low socioeconomic position by addressing the social determinants of health precluding successful management of acute and chronic conditions.<sup>10</sup> CHWs have become incorporated into mainstream care as key members of multidisciplinary care teams.<sup>11-13</sup> However, gaps remain in our understanding of the mechanisms underlying their effectiveness,<sup>14</sup> including inadequate exploration into individual-level characteristics that may shape patient engagement with CHWs. This article's objective is to

**Conclusions:** Differential exposure to a CHW intervention is influenced by patients' physical, psychosocial, and sociodemographic characteristics. *Ethn Dis.* 2019;29(2):261-266; doi:10.18865/ed.29.2.261

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elucidate which patient sociodemographic, psychosocial, and health status characteristics are associated with exposure to a CHW intervention targeting poor blood pressure control among a predominantly low-income, African-American population.

## METHODS

### Study Context

Our study population is drawn from the patient intervention arm of the Patient-Physician Partnership (Triple P) Study conducted from September 2003 to August 2005. The study was approved by the Johns Hopkins Medicine Institutional Review Board. All patients provided written informed consent to participate. The Triple P Study was a randomized controlled trial that applied a two-by-two factorial design to concurrently evaluate the effect of a provider and a patient intervention on patient adherence to recommended hypertension treatment.<sup>15,16</sup> Providers were randomly assigned to receive a computerized, self-study communication skills training program that incorporated individualized feedback to physicians for their visits with a simulated patient, or to receive a minimal intervention. Patients of participating providers were recruited and randomly assigned to the CHW intervention or to a minimal intervention. The minimal intervention consisted of providing patients with an educational pamphlet about high blood pressure. Those assigned to the intensive CHW intervention arm received patient-centered coaching and activation from a

CHW over a 12-month period. The Triple P Study purposively sampled community-based primary care practices with predominantly low-income and/or ethnic minority patients. This yielded a study population of 279 patients, 140 of whom were assigned to the CHW intervention.

This article focuses on an ancillary, within-group analysis of those assigned to the CHW intervention arm. Patients had to be aged  $\geq 18$

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years, had a hypertension diagnosis, and consented to participate in the study. Exclusion criteria included likelihood of moving away from Baltimore City within a year of study entry; enrollment in a disease management program or study addressing hypertension, kidney disease, or diabetes; physical or cognitive impairment that would hinder completion of the baseline assessment; and having a medical condition (eg, dementia) that could potentially limit participation.

### Community Health Worker Intervention

The CHW intervention provided support and encouragement for participants to communicate concerns, barriers, and needs to his or her primary care physician; and it reinforced adherence to recommended treatments (lifestyle modifications and medications) for hypertension.<sup>17</sup> Its principal components were face-to-face coaching, which was conducted during patients' baseline encounters with their CHWs, prior to their appointments with their providers; follow-up telephone coaching calls occurring 2 weeks, 3 months, 6 months, 9 months, and 12 months after the baseline visits with the CHW; provision of a community resource guide; receipt of a newsletter containing educational information about hypertension and the Triple P Study; and the dissemination of a photo-novel depicting CHWs and patients in scenarios related to hypertension self-management. Each interaction between the CHW and the patient was guided by a structured protocol comprising questions and statements that elicited patients' thoughts around general medical concerns, including: disease-specific hypertension issues (eg, high blood pressure knowledge, and beliefs); adherence to medication; lifestyle modification issues, ie, diet, physical activity, smoking, and alcohol; and psychosocial issues, eg, self-reported stress. CHWs recorded the length of each encounter with the patient and noted which coaching topics were discussed during their session.

**Measures**

We collected patients' sociodemographic, health status, and psychosocial data from baseline surveys. Sociodemographic data consisted of age, sex, race/ethnicity, educational exposure, marital status, and household income. We measured depression symptomology through the Center Epidemiologic Studies Depression Scale (CES-D)<sup>18</sup> and physical health through the physical component of the Medical Outcomes Study (MOS) Short Form-12 (SF-12).<sup>19</sup> Patients reported the number of health conditions they had, which we classified as their disease burden. We also asked patients to report the frequency with which they experienced

stress from daily hassles or personal problems in the preceding month.

We captured two dimensions of exposure to the CHW: the total length of time spent during coaching encounters (a summary score of the length of the coaching interaction from baseline to 12-month follow up); and the total number of topics discussed during the 12-month period (a summary score of the total number of coaching-related topics discussed per coaching interaction over the course of the patient's involvement in the study).

**Statistical Analysis**

Baseline characteristics were summarized using means and standard

deviations (SDs) for continuous data and counts and percentages for categorical data. Patients were nested within the group whose physicians received the minimal intervention or the patient-centered communication intervention. We used mixed effects models to adjust for intra-cluster correlation between patients with the same physician<sup>20</sup> and to control for the possibility that those whose physicians were trained in patient-centered communication may be activated toward stronger engagement with their CHW. Similarly, we controlled for CHW assignment through the inclusion of indicator variables to account for the possibility that outcomes of patients who had the same

**Table 1. Relationship between patient characteristics and extent of exposure to CHW from baseline to 12 months, unadjusted; N = 134<sup>a</sup>**

Patients' characteristics	Length of time spent with CHW <sup>b</sup>		Number of coaching topics discussed <sup>b</sup>	
	Mean estimate	P	Mean estimate	P
	$\beta$ (95% CI)		$\beta$ (95% CI)	
Age, years	.12 (-.12, .37)	.99	-.13 (-.23, -.03)	.01
Sex				
Male	(reference)	-	(reference)	-
Female	2.22 (-4.30, 8.75)	.51	1.08 (-1.78, 3.94)	.46
Race/ethnicity <sup>c</sup>				
Non-Hispanic White	-		(reference)	-
Non-Hispanic Black	-3.10 (-9.78, 3.58)	.36	-2.99 (-5.83, -.16)	.04
Marital status				
Unmarried	(reference)	-	(reference)	-
Married	-7.86 (-14.05, -1.66)	.01	-1.72 (-4.50, 1.05)	.22
Income <\$10,000				
No (>\$10,000)	(reference)	-	(reference)	-
Yes	4.13 (-2.41, 10.68)	.22	-.92 (-3.92, 2.08)	.55
Education, years	.99 (-.26, 2.24)	.12	.51 (-.04, 1.05)	.07
Stress from daily hassles/personal problems				
No	(reference)	-	(reference)	-
Yes	6.63 (.61, 12.65)	.03	4.21 (1.62, 6.79)	.001
Depression symptomology, CES-D	.32 (.02, .63)	.04	.16 (.03, .29)	.02
Disease burden	2.80 (.99, 4.60)	.002	1.40 (.62, 2.18)	.000
MOS-SF-12 physical component	-.38 (-.63, -.12)	.004	-.15 (-.26, -.04)	.009

a This sample size reflects the number of observations included in most of the multivariable analyses (within 1%).

b Accounts for clustering within CHWs (via indicator variables) and providers (through mixed effects models)

c Of the 93 patients whose racial/ethnic self-identification is that of an ethnic minority, 90 self-identified as Non-Hispanic Black. Based on the distribution of the responses, the item was recoded into two categories: 0 = Non-Hispanic White, 1 = Non-Hispanic Black. Due to their small numbers, those who self-identified as Asian only were excluded from the analysis.

CHW could be correlated, as well as to control for potential differential intervention delivery among the 3 CHWs employed in the study. Participants' baseline measures and outcomes, and intervention-delivery data were merged into a dataset that was exported into Stata 11.1 (Stata Corp, College Station, TX) for statistical analysis. All tests were two-sided and statistical significance was set at  $P < .05$ .

### RESULTS

Patients were predominantly female (67.9%), non-Hispanic Black (64.3%), unmarried (61.9%), unemployed (77%), hypertensive (59.4%), and reported experiencing daily hassles and/or personal problems (57.1%). Patients reported an average of 3 health conditions. The mean (SD) CES-D and MOS-SF-12 Physical Component scores were 11.8 ( $\pm 10.5$ ) and 40.1 ( $\pm 12.2$ ), respectively. Patients spent an average of 36.2 ( $\pm 18.3$ ) minutes with the CHW over the 12-month intervention period. The total number of coaching-related topics discussed ranged from 4 to 35, with a median (interquartile range) of 8 (10). Table 1 contains the results of mixed effects linear regression models exploring the relationship of specific patient characteristics to dimensions of exposure to the CHW. We observed that age was inversely associated with the total number of coaching topics discussed. African Americans discussed fewer topics than their non-African American counterparts. Married patients spent less time with the CHW than patients who were unmarried. Those

who reported stress from daily hassles or concerns in the preceding month spent more time with the CHW and discussed more topics. Similarly, an increase in depression symptomology was positively associated with more time spent with the CHW, and more coaching topics discussed. In contrast, an increase in perceived physical health was associated with less time spent with the CHW and fewer coaching-related topics discussed.

In multivariable mixed effects models controlling for patients' age, race, sex, marital status, educational attainment, and annual income  $< \$10,000$ , patients who reported being stressed discussed significantly more coaching intervention-related topics with the CHW ( $\beta = 2.97$ ;  $P = .048$ ; [95% CI, .03–5.91]). Patients who perceived themselves as being healthier at baseline spent less time with the CHW over the course of the study ( $\beta = -.41$ ;  $P = .004$ ; [95% CI, -.68 – -.13]) and discussed fewer coaching topics ( $\beta = -.15$ ;  $P = .02$ ; [95% CI, -.28 – -.02]); while an increase in disease burden was positively associated with more time spent with the CHW ( $\beta = 2.34$ ;  $P = .02$ ; [95% CI, .45–4.23]) and more coaching topics discussed ( $\beta = 1.34$ ;  $P = .002$ ; [95% CI, .48–2.20]). (data not shown in table) To discern which characteristics were the strongest predictors of dimensions of exposure to the CHW, we constructed models including all clinical and psychosocial attributes found to be significantly related to each intervention exposure outcome. We observed that, holding all patient attributes constant, marital status ( $\beta = -10.24$ ;  $P = .01$ ; [95% CI, -17.90 – -2.59]) and income

$< \$10,000$  ( $\beta = 8.79$ ;  $P = .02$ ; [95% CI, 1.47–16.10]) were the patient-level factors most significantly associated with the total length of time that a patient spent with the CHW. Disease burden ( $\beta = 1.01$ ;  $P = .04$ ; [95% CI, .06–1.97]) was the strongest predictor of the number of coaching-related topics discussed.

### DISCUSSION

We examined the patient-level determinants of exposure to a CHW intervention designed to promote self-management of blood pressure and greater engagement in therapeutic encounters among low-income African American patients with hypertension. To our knowledge, only one other study has reported which patients' characteristics are predictive of exposure to, or engagement with, CHWs during receipt of a CHW intervention. When Fisher and associates used CHWs as coaches for low-income African American parents of asthmatic children to reduce re-hospitalization over a two-year period,<sup>21</sup> they found that patients' contacts with coaches were predicted by greater need for the coaches, indicated by concurrent hospitalizations and previous encounters with the CHW during the intervention. They did not observe any relationship between sociodemographic characteristics and the number of patient-coach contacts. Our results reflect the possibility that the perceived utility of the CHW intervention may be based on patients' feelings of stress, their perceived and actual health, their marital status,

their level of educational attainment, and/or the realities of navigating extreme poverty, which may fundamentally shape the extent to which a patient engages with a CHW. Given the need for the types of material and psychosocial supports provided by CHWs for particularly vulner-

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able populations, our findings support the population health approach guiding CHW deployment and indicate that, even among at-risk populations, there are those whose circumstances necessitate even deeper engagement with the CHW.

### Limitations

The majority of the study's participants had health insurance, received care in primary care settings, and were low-income, female African Americans from one urban area of the country. These results may not be generalizable to populations that do not share similar characteristics. We did not have objective measures of CHW-patient interactions and relied on CHWs' activity logs to measure patients' exposure to the intervention. This introduces the risk of bias and the potential for inaccuracy into our measures of exposure to the intervention and fails to include patients' perceptions of the CHWs themselves. We attempted to control for differences in intervention delivery by including CHWs as dummy variables, but this approach hinders our ability to discern how CHWs' own characteristics influence their encounters with patients. Differential exposure to, or engagement with, the coaching intervention could have been influenced by: 1) "nonspecific treatment effects,"<sup>22</sup> or factors such as the perceived warmth and credibility of the CHWs; and 2) participant responsiveness, which not only encompasses the extent to which individuals receiving the intervention engage in it, but also, the enthusiasm felt and exhibited by those responsible for its deployment.<sup>23</sup>

Despite these limitations, this study possesses several strengths. We used an analytical framework to examine individual-level correlates of exposure to a CHW intervention. Operationalizing exposure to the CHW as two distinct indicators allowed us to discern their independent associations with patients' character-

istics. Our study suggests that identifying the characteristics influencing patients' exposure to a CHW may facilitate an even deeper tailoring of these interventions to support specific sub-groups of vulnerable populations.

### CONCLUSIONS

CHW interventions are often implemented in socially and economically vulnerable communities. We found that differential uptake of a CHW intervention is influenced by physical, psychosocial, and sociodemographic characteristics of their intended recipients. An understanding of these attributes may strengthen the development and implementation of CHW interventions to reduce disparities observed among low-income, ethnic minority populations.

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### CONFLICT OF INTEREST

No conflicts of interest to report.

### AUTHOR CONTRIBUTIONS

Research design and concept of study: Ibe, Bowie, Roter, Cooper; Acquisition of

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data: Ibe, Carson, Monroe, Cooper; Data analysis and Interpretation: Ibe, Bowie, Carson, Cooper; Manuscript draft: Ibe, Bowie, Carson, Bone, Monroe, Roter, Cooper; Statistical expertise: Ibe, Carson; Acquisition of funding: Ibe, Cooper, Roter; Administrative support or supervision: Ibe, Monroe, Cooper

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