Evaluating Community Health Workers' Attributes, Roles, and Pathways of Action in Immigrant Communities

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Abstract

Community health workers (CHWs) are uniquely positioned to improve health outcomes in immigrant communities; however, research on appropriate metrics for evaluating CHW attributes and mechanisms of effectiveness are limited. The objective of this paper is to characterize CHW attributes and pathways of action using adapted measures, develop a scale using these measures, and explore how findings can inform future CHW research and practice.

The study analyzed pre-and post-intervention group data from one quasi-experimental and three randomized controlled-design parent trials assessing the impact of CHW-led group and individual health coaching on various health outcomes in four New York City immigrant communities. We conducted descriptive, bi-variate and principal components analysis to develop a 13-item scale assessing CHW attributes, roles, and pathways of action. The sample included 437 individuals completing the intervention arm of a CHW study. We found CHWs were reported to affect change through a number of mechanisms and participants expressed substantial communal concordance with the CHWs in terms of country of birth, language, and culture. Principal components analysis with promax rotation identified 13 items with three factors and high Cronbach's alphas: 1) valued interpersonal attributes of the CHW (alpha=0.784); 2) CHW as a bridge to health and non-health resources (alpha=0.857); and 3) providing accessibility beyond health providers (alpha=0.904). Socio-demographic characteristics and differences in CHW pathways of action were identified by community. Study findings can guide improved selection and training of CHWs. Further, measures identified in the principal components analysis can be used to guide future CHW evaluation efforts.

Keywords

community-based participatory research; minority health; immigrant health; program evaluation; health promotion

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INTRODUCTION

Community Health Workers (CHWs), frontline health workers who act as bridges between the community and health systems, have been identified as important members of the health workforce in recent health reform efforts (1). The importance of CHWs in improving health outcomes for underserved and minority communities has long been recognized by federal agencies and organizations (2, 3), and more recently by the Patient Protection and Affordable Care Act (4, 5). A significant body of evidence demonstrates that adding CHWs to the primary care team can improve care for patients with chronic disease at a low cost (2–8).

In order for CHWs to be effective in health promotion and prevention efforts, a shared culture with the communities in which they work is critical (9, 10). However, "it is unclear which elements of culture and social context should be shared for CHWs to be effective (11)." In fact, there are myriad personal characteristics that can potentially impact a CHW's ability to build trust and rapport with a community member (e.g. age, gender, religion, immigration status, personal health); however, few studies have characterized the nature of CHWs communal congruence with community members and the impact of this congruence on outcomes.

Numerous studies and reports have articulated CHW attributes, including a national CHW workforce study which was foundational in establishing a core list of recommended qualities of CHWs (1, 12–14). However, few studies have evaluated the relative importance (e.g. empathy, trust, communication style) of the interpersonal relationship between community members and CHWs. A number of studies have qualitatively explored key roles and activities that CHWs undertake to improve the health of community members (15–17). For example, one study found that sociocultural characteristics of CHWs mattered little, while trust was the most important characteristic of an effective CHW (15). To our knowledge, no studies have articulated potential metrics by which to assess these functions and pathways of action, despite calls to advance both the scientific and programmatic paradigm of CHW approaches (11).

As a growing number of primary care settings consider the integration of CHWs into healthcare teams, it is necessary to understand which CHW attributes will most effectively foster community-clinical linkages, particularly as strategic hiring of CHWs has been noted as an important predictor of program success (3). Further, a better understanding of CHW roles and mechanisms for facilitating change among the clients they serve will further the research agenda and evidence base for CHW effectiveness in improving health outcomes. Using data from four CHW interventions in New York City, the purpose of this study was to 1) quantitatively characterize CHW attributes, roles, and pathways of action; and 2) explore how study findings can inform future programmatic and evaluation efforts in improving health outcomes.

METHODS

Study design

Our analysis is generated from three randomized controlled trials and one quasi-experimental CHW parent interventions conducted in partnership with community based organizations serving immigrant populations in New York City. Each of the studies was designed and conducted utilizing a community-based participatory research approach. The studies include: 1) a diabetes management program among Bangladeshi Americans, 2010–2016 (18); 2) a hypertension management program among Filipino Americans, 2010–2014) (19); 3) a diabetes prevention program among Korean Americans, 2011–2014 (20), and 4) a diabetes prevention program among Asian Indian Americans, 2012–2014 (21). CHWs who were identified as community leaders with close connections to the target communities were recruited with input from studies' community advisory boards; across studies, CHWs participated in a standardized core competency training conducted in collaboration with a New York City based CHW trade association (22–24). CHW recruitment and training and the participatory nature of the study, as well as how community members and CHWs were involved in all aspects of study design and implementation, are described in further detail elsewhere (16, 18–21, 25).

An evaluation of the communal congruence of CHWs, CHW functions, and the pathways through which they operate was included in participant questionnaires, collected at baseline and the study endpoint (4- or 6-months) among study participants randomized into treatment and control groups at the individual or recruitment site level. For the current analysis, data from respondents in the treatment group of each parent study was examined, including baseline and follow-up data from the study end-point which included a series of CHW-related questions. All studies received Institutional Review Board approval and study participants provided written informed consent prior to participation. A total of 437 treatment group individuals completed both baseline surveys and CHW questions at study endpoint.

Materials and Procedure

A total of 17 common questions were included at each study endpoint to assess individual respondents' perceptions and understanding of their CHWs' attributes, functions, and activities impacting health behavior or health outcomes; only questions that were asked across all 4 interventions were included. Questions were adapted from the Social Capital Community Benchmark Survey and the Hospital Consumer Assessment of Healthcare Providers and Systems survey (26, 27). In addition, during the formative phase of each CHW study, an external evaluator conducted in-depth qualitative interviews with project CHWs to understand their roles and responsibilities; analysis of this data also informed the development of questions assessing CHW attributes, functions, and activities impacting health behavior or health outcomes (25). Functions were defined as those actions with which CHWs were specifically responsible for as part of their position, including providing health education, facilitating connection to health services, and building connections among community members. Activities were defined as supportive actions that help fulfill functions, including making referrals, conducing home visits, and hosting health education

classes. Surveys were administered in the respondent's primary language by trained, bi-lingual interviewer administrators other than the CHWs.

Statistical Analysis

Questions regarding CHW attributes were scored so that high values reflected high trust, respect, and agreement; question responses ranged from 1 (low) to 4 (high). Questions assessing CHW socio-cultural congruence were answered using yes or no. We ran descriptive analyses on socio-demographic variables; CHW questions were run for the overall sample and by each immigrant subgroup included in the parent study. One-way ANOVAs and Chi-square tests examined significance by group for continuous and categorical variables.

We used principal components analysis to assess the construct validity of the 17 initial scale items selected for analysis, and to further reduce the dimensionality of the items (28). Unlike other types of factor analysis that assume that an underlying causal model exists, we used principal components analysis primarily for variable reduction. We reduced the 17-item scale using a principal components analysis with oblique (promax) rotation. Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Tests were checked, and communalities were retained if 0.4 or higher. Eigenvalues and Screen Plots were used to decide the number of factors to retain. Coefficients in the rotated pattern matrix of 0.6 or higher were retained for the final model. Reliability of each factor (internal consistency) was assessed using Cronbach's α. SPSS Statistics version 21, IBM, Armonk, NY was used for all analyses.

RESULTS

Study Participant Characteristics

Socio-demographic variables by ethnic subgroup and the overall sample are presented in Table 1. The sample included 130 Bangladeshi individuals, 113 Korean individuals, 108 Asian Indian individuals, and 86 Filipino individuals. All differences between subgroups were statistically significant at $p < 0.001$ except for born outside the U.S., which was 100% for all groups. Average age was 54.1 years and average years lived in the U.S. 14.9; Asian Indians were least likely to speak English proficiently, while Filipinos were most likely to speak English very well. Nearly 43% of participants had no health insurance.

CHW Questions

The 17 CHW questions are presented in Table 2. Participants expressed a high level of trust in CHWs; 83.5% trusted CHWs "a lot" when discussing health concerns; this was highest among Bangladeshis and Filipinos. Approximately 72.3% of participants believed CHWs treated them with respect and dignity a "great deal of the time," and this sentiment was particularly strong among Bangladeshis and Filipinos.

When asked, "For which of the following do you think you and the CHW are similar?" participants expressed the greatest concordance in terms of ethnicity (country of birth – 89.9%, language – 96.3%, and culture – 94.0%). Results varied by subgroup. For example, Bangladeshis, Koreans and Filipinos expressed the greatest concordance with country of

birth, language and culture, while Asian Indians expressed the greatest concordance with language and culture, despite the fact that all CHWs were concordant with respondents by language and country of birth. Bangladeshis also expressed the greatest concordance with gender. When asked, "For which of the following do you think it is important for you and the CHW to be similar?" participant responses were similar to the identified areas of concordance (country of birth – 75.6%, language – 91.9%, and culture – 84.2%), with variation by subgroup. Similarly, 99.8% of the participants agreed or strongly agreed with the statement, "The CHW understands my culture."

In terms of CHW role and function, 95.2% of participants agreed or strongly agreed with the statement, "I am able to speak with my CHW about issues other than [diabetes/hypertension] and 61.8% agreed or strongly agreed with the statement, "The CHW referred me to people who could help me with problems other than health issues." Referral was highest among Asian Indians and Filipinos. Additionally, and 83% agreed or strongly agreed with the statement, "I am able to tell my CHW things that I cannot tell my doctor," and 87.2% agreed or strongly agreed with the statement, "The CHW helped connect me with other people in my community" (this was highest among Asian Indians and Filipinos).

Participants also reported that CHWs influenced their behaviors and access to resources, particularly in linking individuals to healthcare providers and systems. Approximately 70.4% agreed or strongly agreed with the statement, "I see a doctor more often because of my CHW" (this was highest among Asian Indians and Filipinos), while, 81.7% of participants agreed or strongly agreed with the statement, "I feel more confident asking my doctor questions because of the CHW" (this was highest among Asian Indians and Filipinos). A larger percentage of Bangladeshis and Koreans disagreed with these statements, while Korean respondents reported a high percentage of "don't know" responses. Beyond playing a bridging role to health systems, participants reported that CHWs' actions directly changed their health behaviors. For example, nearly all agreed or strongly agreed with the statements, "The CHW answered my questions and concerns" and "The CHW helped to change my behaviors." Additionally, 88.1% of participants agreed with the statement, "I would not have been able to control [diabetes/hypertension] without the help of my CHW."

Psychometric analysis

We performed a principal components analysis with promax rotation in order to reduce the 17 total questions asked among all interventions and determine the optimal number of factors to retain. Factor loadings for concordance and overall satisfaction were low; these items were removed. Item factor loadings for the final three-factor solution are shown in Table 3, and include: valued interpersonal attributes of the CHW (six questions, Cronbach's α of 0.784), CHW as a bridge to health and non-health resources (five questions, Cronbach's α of 0.857), and providing accessibility beyond health providers (two questions, Cronbach's α of 0.904). This three-factor solution explained 66.3% of the variance and had a Kaiser-Meyer-Olkin Measure of Sampling Adequacy of 0.846.

DISCUSSION

Assessment of CHW Attributes and Pathways of Action: Implications for CHW Programs

Respondents reported high favorability of CHWs and self-reported effectiveness, consistent with behavior and clinical changes previously reported for each program (19–21, 25). For example, we found that CHWs are trusted by their communities and treat individuals with respect. Trust is a key mechanism underlying social capital (29), and a growing body of research has found trust to be connected to a multiplicity of health outcomes (30). Trust in and respect for health care providers can be especially important for the health of vulnerable populations such as immigrants served by CHWs (31, 32). Potential pathways by which CHWs engage in action were identified, for example by facilitating behavior change, a finding consistent with prior research (16). In addition, our findings provide evidence that CHWs influence patient empowerment, both by increasing knowledge and strategies to effectively engage in health promotion and interact with the healthcare system, and by directly enhancing patients' self-efficacy (20, 21, 25).

Indirect effects of engaging with CHWs were also identified. For example, CHWs were able to provide assistance with additional health issues, including control of chronic disease, as well as non-health issues, including providing emotional support, connecting to others in the community, and facilitating referrals for non-health related issues such as housing or transportation. CHWs may also play a complementary role to health providers; our findings suggest that CHWs promote increased use of doctors and empower patients to initiate dialogue with their providers. The group responses provide descriptive evidence that CHWs enhance participant self-efficacy in dealing with the healthcare system. In addition, the Korean and Filipino respondents in our sample reported high rates of being uninsured and were less likely to have a regular provider; the CHWs helped provide some services that these individuals might otherwise not have otherwise have utilized; for example, facilitating low-cost and culturally appropriate services in primary care practices with linguistically concordant physicians or access to low-cost medications through connections to community pharmacies.

In each of our parent studies, CHWs were trained in a core competency curriculum (22) to deliver a standardized protocol related to disease management or prevention. Our study findings provide important evidence on the ways in which CHWs address upstream factors related to health, even when beyond the particular scope of their job description or title. As models like Accountable Healthcare Communities attempt to improve the quality of care by ensuring consumers' social needs and well-being are addressed, our findings can provide important evidence on the ways in which CHWs can effectively play a role in these types of models (33).

When examining concordant characteristics between participants and CHWs, participants expressed the greatest concordance with ethnicity-related dimensions, including language, culture, and country of birth. They also reported these dimensions of concordance to be the most important. However, variance by subgroup was found, suggesting that different groups view different CHW characteristics as important and/or necessary. Future analysis should

assess the importance of ethnicity and other cultural characteristics and how they impact health outcomes.

Implications for CHW Research

CHWs have been effective in a variety of programs that prevent and manage chronic diseases among vulnerable populations (18–21, 25). Results from the principal components analysis allowed us to distill the key measures of CHW characteristics and mechanisms of change that were relevant across our diverse study sample. Using these findings, we have developed a 13-item scale that can be used to measure important underlying causal mechanisms for CHWs, with a three-factor solution. To our knowledge, this is the first scale to do so. The scale can be validated in future analyses with other immigrant and minority populations and used to determine mechanisms of effectiveness underlying health outcomes for community members who receive CHW services.

Our study findings build upon Katigbak and colleagues' previous work which utilized qualitative methods to propose a conceptual framework for how CHWs impact the health of community members (16). In this model, key elements for how CHWs facilitate behavior change and improve health outcomes include: 1) Assisting clients with making healthy behaviors; 2) Leveraging cultural congruence with clients; 3) Providing social support; and 4) Employing interpersonal communication techniques to build trust and rapport. The factors identified in our final 13-item scale align with the dimensions of this framework, and bolster previous findings by offering objective, quantitative measures that can be used in future studies to assess CHW characteristics, attributes, and impact on health.

Implications for CHW Policy, Training, and Hiring

To date, policy and administrative efforts have focused on CHW training, credentialing, and scope of service. Our findings suggest that additional criteria and metrics should be used in recruiting and assessing CHW effectiveness and qualifications. These could include communal congruence, trust, respect, referral and resource knowledge, and CHWs' ability to engender participant empowerment and social support. Though ensuring CHWs are trained in a set of core competencies is critical (22), it has been suggested that the initial selection of CHW candidates during the hiring process may be a more important indicator of program success (3). The selection criteria may vary based on the specific needs of the program, and should be adapted to the needs of the target population. Given that there is inconsistent reporting of the selection processes for CHWs in the literature, future studies involving CHWs should include a clear rationale for ways in which concordance was determined (34). Our findings also suggest that training topics should include building trust and empathy and increasing patient empowerment. Proper selection, training, and evaluation of CHWs are especially timely given renewed interest in CHW integration into clinical systems and primary care (5).

Limitations

The study was cross-sectional and based on self-reported data, thus limiting generalizability of findings and our ability to make causal associations with the data. Responses may be subject to social desirability bias, but were minimized to the extent possible using trained,

independent survey administrators. There were a large number of missing responses for questions related to healthcare system providers, especially among Koreans and Filipinos; this might be associated with the large percentages of uninsured in these groups. In addition, these missing responses lowered the subgroup sizes for some of the questions. Future analyses should examine whether healthcare-related questions are a better fit for racial/ ethnic populations that are more likely to be insured.

A potential limitation in the generalizability of findings is that study samples consisted of Asian immigrant communities, all of whom are residing in New York City with access to its inherent health care and public health systems. Given the unique cultural and social characteristics of immigrant populations, it is conceivable that our findings are more relevant to Asian populations. Differences found between ethnic groups could be attributed to cultural characteristics of the populations or because of differences in characteristics of the CHWs serving them. Analyzing these hypotheses was beyond the scope of our study, but future research can help shed light on these issues. However, principal components analysis uncovered key dimensions related to CHW attributes and mechanism of change that were relevant across diverse Asian subgroups. While the generalizability of the findings to other immigrant populations and CHWs in health care systems other than NYC was not examined, the internal validity of the data collection methods and analysis are very high. Future scale validation efforts conducted in other immigrant communities or other vulnerable populations may provide further validation of the relevance of this scale.

Despite these limitations, our study enhances the growing literature and practice on the CHW workforce in several ways. First, the published literature on the perceived helpfulness of CHWs from the perspective of the community recipient voice is very limited. Our study complements ongoing national efforts to advance consensus on common elements of CHW Scope of Practice and Core Competencies in the United State (35). Second, our research utilized a standardized approach to data collection in immigrant populations using culturally appropriate methods, and yielded analyses with a large sample. Third, our analyses has generated a relatively brief and simple scale that can be replicated in other populations and settings, and is likely to motivate research in other locales

Conclusion

CHWs can play an important role in improving the health of and reducing health inequalities for vulnerable populations such as immigrants. Given the rapid incorporation of CHWs into the healthcare system, it is of value to better understand the mechanisms by which they have a positive impact on health, such as trust, respect, and cultural congruence across several categories. This has important policy implications for factors such as improved selection and training which are critical to CHW success.

The CHW model is not a "one-size fits all" approach. As CHWs continue to be integrated into healthcare teams, program planners should think strategically about the extent and types of congruence of characteristics and attributes of individual CHWs within the communities served, particularly in urban settings with diverse populations. Additionally, it is important to understand health care system pathways of action and the roles and attributes of individual CHWs that lead to successful outcomes, both perceived by the receivers of care

and objectively in health outcome measures and utilization. Such broadened understanding of the CHW workforce will allow for more meaningful and sustained efforts to promote health equity among populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

Characteristics of Respondents by Intervention Group, New York City, 2010–2016, n (%)

	Bangladeshi n=130	Korean n=113	Asian Indian n=108	Filipino n=86	Overall n=437	p-value
Gender						<0.001
Male	69 (53.1)	48 (42.5)	26 (24.1)	32 (37.2)	175 (40.0)	
Female	61 (46.9)	65 (57.5)	82 (75.9)	54 (62.8)	262 (60.0)	
Age, mean (SD)	54.4 (10.3)	62.4 (7.6)	45.6 (10.4)	53.2 (10.2)	54.1 (11.4)	<0.001
Born Outside the US	130 (100.0)	113 (100.0)	108 (100.0)	86 (100.0)	419 (100.0)	1.000
Years in the US, Mean (SD)	11.9 (8.6)	22.4 (9.7)	13.3 (7.5)	11.2 (9.9)	14.9 (10.0)	<0.001
Marital Status						<0.001
Married/living with partner	122 (93.8)	93 (82.3)	104 (97.2)	48 (56.5)	367 (84.4)	
Widowed/Divorced/ Separated	7 (5.4)	17 (15.0)	3 (2.8)	24 (28.2)	51 (11.7)	
Never Married	1 (0.8)	3 (2.7)	0 (0.0)	13 (15.3)	17 (3.9)	
Employment Status						<0.001
Employed	53 (40.8)	52 (46.8)	18 (22.0)	70 (85.4)	193 (47.7)	
Unemployed	28 (21.5)	36 (32.4)	35 (42.7)	12 (14.6)	111 (27.4)	
Housewife/Homemaker	49 (37.7)	23 (20.7)	29 (35.4)	0 (0.0)	101 (24.9)	
Highest level of education						<0.001
< high school	38 (29.9)	10 (9.2)	20 (18.9)	1 (1.2)	69 (16.3)	
High school	35 (27.6)	45 (41.3)	46 (43.4)	4 (4.9)	130 (30.7)	
Some college/ Vocational school	13 (10.2)	14 (12.8)	23 (21.7)	14 (17.3)	64 (15.1)	
College graduate	41 (32.3)	40 (36.7)	17 (16.0)	62 (76.5)	160 (37.8)	
Health insurance						<0.001
Public	102 (79.1)	49 (43.8)	49 (48.5)	13 (15.1)	213 (49.8)	
Private	3 (2.3)	14 (12.5)	4 (4.0)	10 (11.6)	31 (7.2)	
None	24 (18.6)	49 (43.8)	48 (47.5)	63 (73.3)	184 (43.0)	
How well do you speak English?						<0.001
Very well	9 (7.0)	1 (0.9)	7 (6.6)	57 (67.9)	74 (17.2)	
Well	45 (34.9)	30 (26.8)	45 (42.5)	26 (31.0)	146 (33.9)	
Not well	58 (45.0)	77 (68.8)	48 (45.3)	1 (1.2)	184 (42.7)	
Not at all	17 (13.2)	4 (3.6)	6 (5.7)	0 (0.0)	27 (6.3)	

Table 2:

CHW Questions by Intervention Group, New York City, 2010–2016, n (%)

	Bangladeshi n=130	Korean n=113	Asian Indian n=108	Filipino n=86	Overall n=437
How much do you trust the CHW when discussing health concerns?					
Trust them a lot	105 (94.6)	79 (69.9)	81 (75.0)	82 (95.3)	365 (83.5)
Trust them some	7 (5.4)	33 (29.2)	26 (24.1)	3 (3.5)	69 (15.8)
Trust them only a little	0 (0.0)	1 (0.9)	0 (0.0)	0 (0.0)	1 (0.2)
Skipped	0 (0.0)	0 (0.0)	1 (0.9)	1 (1.2)	2 (0.5)
How much of the time does the CHW treat you with respect?					
Great deal of the time	128 (99.2)	24 (21.2)	81 (75.0)	83 (96.5)	316 (72.3)
A fair amount	1 (0.8)	88 (77.9)	26 (24.1)	2 (2.3)	117 (26.8)
Skipped	1 (0.9)	1 (0.9)	1 (0.9)	1 (1.2)	4 (0.9)
For which of the following do you think you and the CHW are similar?					
Country of birth	128 (99.2)	109 (96.5)	69 (64.5)	85 (98.8)	391 (89.9)
Region of birth	40 (31.0)	52 (46.0)	67 (62.6)	48 (55.8)	207 (47.6)
Language	126 (97.7)	101 (89.4)	107 (100.0)	85 (98.8)	419 (96.3
Culture	123 (95.3)	101 (89.4)	101 (94.4)	84 (97.7)	409 (94.0)
Being an immigrant	108 (83.7)	38 (33.6)	52 (48.6)	69 (80.2)	267 (61.4)
Gender	118 (91.5)	27 (23.9)	71 (66.4)	60 (69.8)	276 (63.4)
Religion	91 (70.5)	27 (23.9)	70 (65.4)	40 (46.5)	228 (52.4)
Health problems	14 (10.9)	34 (30.1)	9 (8.4)	13 (15.1)	70 (16.1)
Total answering questions	129	113	107	86	435
For which of the following do you think it is important for you and the CHW to be similar?					
Country of birth	103 (81.7)	95 (85.6)	59 (55.1)	68 (79.1)	325 (75.6)
Region of birth	30 (23.8)	56 (50.5)	55 (51.4)	36 (41.9)	177 (41.2)
Language	117 (92.9)	98 (88.3)	103 (96.3)	77 (89.5)	395 (91.9)
Culture	96 (76.2)	101 (91.0)	95 (88.8)	70 (81.4)	362 (84.2)
Being an immigrant	66 (52.4)	31 (27.9)	18 (16.8)	44 (51.2)	159 (37.0)
Gender	89 (70.6)	24 (21.6)	71 (66.4)	40 (46.5)	224 (52.1)
Religion	58 (46.0)	24 (21.6)	74 (69.2)	26 (30.2)	182 (42.3)
Health problems	7 (5.6)	45 (40.5)	9 (8.4)	12 (14.0)	73 (17.0)
Total answering questions	126	111	107	86	430
The CHW understands my culture					
Strongly agree	122 (93.8)	76 (67.3)	69 (69.9)	83 (96.5)	350 (80.1)
Agree	8 (6.2)	37 (32.7)	39 (36.1)	2 (2.3)	86 (19.7)
Disagree/Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.2)	1 (0.2)
I can be honest with my CHW					
Strongly agree	125 (96.2)	77 (68.1)	62 (57.4)	81 (94.2)	345 (78.9)
Agree	4 (3.1)	36 (31.9)	46 (42.6)	4 (4.7)	90 (20.6)

	Bangladeshi n=130	Korean n=113	Asian Indian n=108	Filipino n=86	Overall n=437
Disagree/Strongly disagree	1 (0.8)	0 (0.0)	0 (0.0)	1 (1.2)	2 (0.5)
I am able to tell my CHW things that I cannot tell my doctor					
Strongly agree	76 (58.4)	41 (36.3)	54 (50.0)	66 (76.7)	237 (54.2)
Agree	23 (17.7)	38 (33.6)	53 (49.1)	12 (14.0)	126 (28.8)
Disagree/Strongly disagree	29 (22.3)	18 (15.9)	1 (0.9)	4 (4.7)	52 (11.9)
Don't know	1 (0.8)	15 (13.3)	0 (0.0)	2 (2.3)	18 (4.1)
Skipped	1 (0.8)	1 (0.9)	0 (0.0)	2 (2.3)	4 (1.0)
I am able to tell my CHW things that I cannot tell the person who provides me health education, such a nurse					
Strongly agree	73 (56.2)	35 (31.0)	49 (45.4)	64 (74.4)	221 (50.6)
Agree	27 (20.8)	41 (36.3)	58 (53.7)	18 (20.9)	144 (33.0)
Disagree/Strongly disagree	24 (18.4)	17 (15.0)	1 (0.9)	2 (2.4)	44 (10.1)
Don't know	2 (1.5)	19 (16.8)	0 (0.0)	1 (1.2)	22 (5.0)
Skipped	4 (3.1)	1 (0.9)	0 (0.0)	1 (1.2)	6 (1.4)
The CHW answered my concerns and questions					
Strongly agree	112 (86.2)	66 (58.4)	65 (60.2)	81 (94.2)	324 (74.1)
Agree	18 (13.8)	44 (38.9)	43 (39.8)	4 (4.6)	109 (24.9)
Disagree/Strongly disagree	0 (0.0)	1 (0.9)	0 (0.0)	1 (1.2)	2 (0.5)
Don't know	0 (0.0)	2 (1.8)	0 (0.0)	0 (0.0)	2 (0.5)
The CHW helped to change my behaviors					
Strongly agree	112 (86.2)	61 (54.0)	65 (60.2)	64 (74.4)	302 (69.1)
Agree	15 (11.5)	47 (41.6)	43 (39.8)	21 (24.4)	126 (28.8)
Disagree/Strongly disagree	1 (0.8)	3 (2.7)	0 (0.0)	1 (1.2)	5 (1.1)
Don't know	0 (0.0)	2 (1.8)	0 (0.0)	0 (0.0)	2 (0.5)
Skipped	2 (1.5)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.5)
I see a doctor more often because of my CHW					
Strongly agree	45 (34.6)	11 (9.7)	42 (38.9)	35 (40.7)	133 (30.4)
Agree	29 (22.3)	46 (40.7)	66 (61.1)	34 (39.5)	175 (40.0)
Disagree/Strongly disagree	50 (38.5)	25 (22.1)	0 (0.0)	7 (8.2)	82 (18.7)
Don't know	4 (3.1)	30 (26.5)	0 (0.0)	0 (0.0)	34 (7.8)
Skipped	2 (1.5)	1 (0.9)	0 (0.0)	10 (11.6)	13 (3.0)
I feel more confident asking my doctor questions because of the CHW					
Strongly agree	77 (59.2)	16 (14.2)	43 (39.8)	48 (55.8)	184 (42.1)
Agree	34 (26.2)	50 (44.2)	65 (60.2)	24 (27.9)	173 (39.6)
Disagree/Strongly disagree	15 (11.6)	12 (10.6)	0 (0.0)	6 (8.0)	33 (7.5)
Don't know	2 (1.5)	33 (29.2)	0 (0.0)	0 (0.0)	35 (8.0)
Skipped	2 (1.5)	2 (1.8)	0 (0.0)	8 (9.3)	12 (2.7)
I would not have been able to control diabetes/hypertension without the help of my CHW					

	Bangladeshi n=130	Korean n=113	Asian Indian n=108	Filipino n=86	Overall n=437
Strongly agree	59 (45.4)	50 (44.2)	56 (51.9)	37 (43.0)	202 (46.2)
Agree	43 (33.1)	46 (40.7)	52 (48.1)	42 (48.8)	183 (41.9)
Disagree/Strongly disagree	23 (17.7)	10 (8.8)	0 (0.0)	7 (8.2)	40 (9.2)
Don't know	3 (2.3)	4 (3.5)	0 (0.0)	0 (0.0)	7 (1.6)
Skipped	2 (1.5)	3 (2.7)	0 (0.0)	0 (0.0)	5 (1.1)
The CHW helped connect me with other people in my community					
Strongly agree	63 (48.5)	35 (31.0)	53 (49.1)	46 (53.5)	197 (45.1)
Agree	38 (29.2)	61 (54.0)	55 (50.9)	30 (34.9)	184 (42.1)
Disagree/Strongly disagree	20 (15.4)	7 (6.2)	0 (0.0)	7 (8.1)	34 (7.8)
Don't know	4 (3.1)	7 (6.2)	0 (0.0)	1 (1.2)	12 (2.7)
Skipped	5 (3.8)	3 (2.7)	0 (0.0)	2 (2.3)	10 (2.3)
I am able to speak with my CHW about issues other than diabetes/ hypertension					
Strongly agree	96 (73.9)	37 (32.7)	69 (63.9)	68 (79.1)	270 (61.8)
Agree	23 (17.7)	68 (60.2)	38 (35.2)	17 (19.8)	146 (33.4)
Disagree/Strongly disagree	7 (5.4)	4 (3.5)	0 (0.0)	1 (1.2)	12 (2.7)
Don't know	2 (1.5)	4 (3.5)	0 (0.0)	0 (0.0)	6 (1.4)
Skipped	2 (1.5)	0 (0.0)	1 (0.9)	0 (0.0)	3 (0.7)
The CHW referred me to people who could help me with problems other than health issues					
Strongly agree	31 (23.8)	6 (5.3)	68 (63.0)	38 (44.2)	143 (32.7)
Agree	17 (13.1)	36 (31.9)	39 (36.1)	35 (40.7)	127 (29.1)
Disagree/Strongly disagree	70 (53.9)	17 (15.0)	0 (0.0)	8 (9.3)	95 (21.8)
Don't know	3 (4.6)	49 (43.4)	0 (0.0)	2 (2.3)	57 (13.0)
Skipped	5 (4.6)	5 (4.4)	1 (0.9)	3 (3.5)	15 (3.4)
Overall, how satisfied were you with the CHW?					
10 - totally satisfied	102 (78.5)	31 (27.4)	51 (47.2)	55 (64.0)	239 (54.7)
9	16 (12.3)	33 (29.2)	40 (37.0)	10 (11.6)	99 (22.6)
8 - Very satisfied	9 (6.9)	39 (34.5)	16 (14.8)	21 (24.4)	85 (19.5)
7 (Less than very satisfied)	3 (2.3)	8 (7.1)	0 (0.0)	0 (0.0)	11 (2.5)
Skipped	0 (0.0)	2 (1.8)	1 (0.9)	0 (0.0)	3 (0.7)

Table 3.

Principal Components Analysis of Combined Intervention Groups, New York City, 2010–2016, n=321

	1 – Valued interpersonal attributes of the CHW	2 –CHW as a bridge to health and non-health resources	3 – Providing accessibility beyond health providers
How much did you trust the CHW when discussing health problems?	0.743		
How much of the time does the CHW treat you with respect and dignity?	0.662		
The CHW understand my culture	0.864		
I can be honest with my CHW	0.883		
I am able to tell my CHW things that I cannot tell my doctor			0.881
I am able to tell my CHW things that I cannot tell the person who provides me health education such as a nurse			0.892
The CHW answered all my concerns and questions	0.817		
The CHW helped me to change my behaviors	0.638		
I see a doctor more often because of the CHW		0.691	
I feel more confident asking my doctor questions because of the CHW		0.622	
I would not have been able to control my diabetes/hypertension without the help of my CHW		0.828	
The CHW helped connect me with other people in my community		0.734	
The CHW referred me to people who could help me with problems other than health issues		0.658	
Cronbach's Alphas	0.784	0.857	0.904