

A Pilot Community Health Worker Program in Subsidized Housing: The Health + Housing Project

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Abstract

- *Objectives:* We examine the implementation of a community health worker (CHW) program in subsidized housing, describe needs identified and priorities set by residents, and summarize participant-reported outcomes.
- *Methods:* Partnering with a local community-based organization, four bilingual CHWs recruited adult residents in one public housing building and one Section 8 building to participate in a 15-month intervention. Residents set health-related and life-improvement goals and developed an action plan for achieving them. CHWs used a motivational interviewing framework to help residents achieve their goals and connect them to case management, healthcare services, and other community resources. Prior to the intervention, surveyors approached every unit in both buildings for a baseline survey; 390 of an estimated 819 residents responded (47.6 percent). Of the 226 who completed an intake assessment with a CHW, 149 completed the program assessment questionnaire (65.9 percent).
- *Results:* Residents reported high levels of chronic disease, mental health issues, and low satisfaction with social relationships. 226 residents (61.3 percent female,

Abstract (continued)

29.7 percent age 65 years or older, and 68.6 percent Hispanic or Latino) completed an intake assessment with a CHW and received an average of 11 in-person visits. Most program assessment respondents reported partially or completely achieving their most important goal (82.0 percent). They also reported high levels of satisfaction with the CHW program (96.6 percent) and improved overall well-being (78.6 percent).

- *Conclusions: CHWs based in subsidized housing buildings encountered high levels of medical and social needs among residents. Improvements in self-reported well-being and high levels of satisfaction with the program suggest that such place-based initiatives may be effective in addressing health and its determinants.*

Introduction

More than 4 million people live in public housing or project-based Section 8 housing subsidized by the U.S. Department of Housing and Urban Development (HUD). Residents of these buildings are disproportionately racial or ethnic minorities, and more than 70 percent are extremely low income (HUD, 2016).¹ These factors are associated with significant health disparities and needs (Bor, Cohen, and Galea, 2017; Liao et al., 2011). Although recent research demonstrates that housing subsidies deliver health and economic benefits to low-income adults in the United States (Andersson et al., 2016; Fenelon et al., 2017; Simon et al., 2017), subsidized housing residents represent a relatively vulnerable group that experiences high rates of chronic disease (Digenis-Bury et al., 2008; Feinberg et al., 2015; Helms, Sperling, and Steffen, 2017). Some evidence shows that many residents are already sick when they enter subsidized housing (Ruel et al., 2010), and the environmental conditions in aging public housing buildings have been shown to increase the risk of illness, such as pediatric asthma (Northridge et al., 2010). The clustering of significant need in subsidized housing presents a potential opportunity to provide efficient place-based interventions to improve health, as having a high volume of concentrated need can facilitate targeted interventions.

A growing body of literature suggests the effectiveness of community health worker (CHW) models in improving health outcomes among vulnerable populations (Cosgrove et al., 2014; Islam et al., 2014a; Kangovi et al., 2017a; Margellos-Anast, Gutierrez, and Whitman, 2012). CHWs share cultural, linguistic, or other key characteristics with the communities they serve (Love, Gardner, and Legion, 1997). Interventions using CHWs or other lay health workers, such as community health advocates and peer navigators, have been successfully implemented in community and clinic settings alike (Islam et al., 2017; Kangovi et al., 2017a; Kim et al., 2016). However, few CHW programs have been implemented in subsidized housing, and those that exist have focused primarily on specific medical conditions or health behaviors (Brooks et al. 2017; Gutierrez Kapheim et al.,

¹ Defined as families whose incomes do not exceed the higher of the federal poverty level or 30 percent of Area Median Income (AMI).

2015; Levy et al., 2006; Lopez et al., 2017; Quintiliani et al., 2014; Rorie et al., 2011; Scammell et al., 2011; Sikkema et al., 2000; Slater et al., 1998; Zhu et al., 2002). Community-based CHWs are well positioned to help residents with a broader range of issues, especially given that social and economic factors, outside the healthcare system or a narrow disease-focused framework, drive a large share of overall health outcomes (Woolf and Braveman, 2011). For vulnerable low-income populations who experience cultural and communication barriers in accessing healthcare and social services, trusted community-based CHWs can act as a crucial bridge to these resources (Islam et al., 2017) and provide a better understanding of their clients' residential environments, including aspects that might shape health.

To our knowledge, no studies to date have examined a CHW intervention that is co-located in subsidized housing, is open to all residents regardless of health status, and addresses broadly defined resident health-related needs rather than specific diseases or behaviors. The Health + Housing Project was a pilot CHW program in subsidized housing that aimed to improve resident health by providing access to and information about medical care, addressing social determinants of health, and connecting residents to needed community resources. In this article, we answer the following research questions: (1) What were the health-related needs and priorities of subsidized housing residents? (2) Were residents willing to engage with a CHW and set health-related goals? (3) Did residents find the CHW intervention acceptable and helpful for meeting their health-related goals and improving their well-being? (4) What lessons learned can inform implementation of other CHW programs in subsidized housing?

Methods

The Health + Housing CHW intervention was conducted in two subsidized apartment buildings in the Lower East Side neighborhood of Manhattan, New York City (NYC). Community and governmental stakeholders and local housing providers assisted in selecting the buildings. One building is owned and operated by the city public housing authority and the other is a privately owned Section 8 building.² Together, the buildings comprise 450 apartment units (200 units in one building; 250 in the other) with an estimated 819 adult residents. All residents 18 years and older were eligible to participate in the CHW program and invited to complete baseline and postprogram surveys if they spoke English, Spanish, or Chinese (Mandarin or Cantonese). The Institutional Review Board at the New York University (NYU) School of Medicine approved the study.

Baseline Survey

Eight bilingual surveyors conducted baseline surveys between December 2015 and March 2016. Surveys were completed in person during daytime, evening, and weekend hours, and residents were offered a \$5 incentive. Surveyors made multiple attempts to recruit residents in each apartment and kept tracking logs of recruitment attempts to ensure that each apartment was approached

² Eligibility requirements (household earnings less than 80 percent of AMI) are generally the same for both types of building; therefore the residents are similar in terms of income and demographics. However, Section 8 buildings often receive larger operating subsidies from the government, especially in high-cost areas. They also are privately managed and, unlike public housing, have the ability to leverage private capital. For this reason, Section 8 buildings may be better maintained than public housing, although it depends on the quality of the management company.

at least six times at varying hours and days. Additionally, fliers describing the study and inviting residents to call the project director were placed under every apartment door and posted next to elevator banks. Surveyors also recruited residents in front of the intervention buildings and held survey workshops, providing food, to encourage residents to participate. All adults living in each unit were eligible to participate. Surveyors used secure cellular-enabled tablets, entering responses directly into REDCap (Harris et al., 2009) to minimize data entry errors.

The baseline survey consisted of 149 questions on demographics, general health status, chronic disease, healthcare access and utilization, housing conditions, social service needs, social support, and food security. Questions were drawn from commonly used and validated questionnaires when possible, including PROMIS-10 (general health, satisfaction with social activities, pain rating; Cella et al., 2010); NHANES (chronic disease, insurance coverage, visits to primary care, overall diet; CDC, 2014); PHQ-2 and GAD-2 (depression and anxiety screening; Kroenke, Spitzer, and Williams, 2003; Skapinakis, 2007); and U.S. Department of Agriculture (food security; Gundersen et al., 2017). Surveys were translated into Spanish and Chinese and back translated to check for accuracy.

Health + Housing CHW Program Description

Health + Housing partnered with a local community-based organization—Henry Street Settlement (HSS)—to assist with the hiring and supervision of field staff and to serve as a primary referral site for case management, health enrollment, and parent support services. Prior to program launch, the study team solicited input about program design and outreach strategies from stakeholders, including local community-based organizations, building residents and management, city agencies, and other academic colleagues.

The program attempted to hire bilingual (Spanish/English and Chinese/English) CHWs from the same neighborhood as the intervention buildings. Although only one of the four that were hired was a local resident, all CHWs shared linguistic and cultural characteristics with building residents. CHWs completed a 35-hour training that focused on core competencies that included CHW identity and roles, social determinants of health, models of behavioral change, and communication skills. CHWs subsequently received additional training on study protocol, chronic disease management, motivational interviewing, mental health first aid, and smoking cessation.

CHWs attempted to recruit residents from all apartments, and each CHW was initially assigned 90 to 100 individuals who had completed the baseline survey prior to the start of the program. Residents who were “frequent users” of health care (defined as three or more self-reported emergency department visits, or one or more hospitalizations, in the past year) were prioritized for recruitment. Subsequent waves of recruitment were conducted for residents who had not completed the baseline survey, until all 450 apartments had been attempted. Residents were not offered an incentive to participate in the program beyond the services offered by the CHW.

Once a building resident agreed to participate in the program, the CHW worked with him or her in sequential visits to complete a baseline survey (if not already done), an intake assessment, a goal-setting exercise, and an action plan that outlined steps for working on each goal (Islam et al., 2014b; Kangovi et al., 2017b). The intake assessment included demographic information, history of physical and mental health issues, medications, and primary health-related concerns. For the

goal-setting activity, residents selected up to 5 goals from a pre-established list of 23 suggested goals (residents could also write in their own goals). The list was developed by reviewing goal-setting forms used by other programs and anticipating a range of social determinants of health that might be important to residents' well-being. After ranking their goals in order of importance, participants rated their motivation level for completing each goal and then, with CHW guidance, developed an action plan for reaching their goals.

Following completion of this process, CHWs met with residents as frequently as needed and used motivational interviewing³ to help residents achieve their goals. Activities included connecting residents to case management at HSS (for example, benefits screening and enrollment), assisting with care coordination, and linking residents to services in the community. CHWs also offered health education related to chronic disease management, nutrition, physical activity, smoking cessation, and stress reduction (NYU CSAAH and NYU-CUNY Prevention Research Center, 2015). CHWs met weekly with the supervisor at HSS, a licensed clinical social worker, and the study project director to troubleshoot cases; and weekly with the project director and data manager to review progress and complete data entry. The CHW intervention period ran for 15 months (April 2016 through June 2017).

Program Assessment

After the program ended, residents who reported working with a CHW were asked to complete a 20-item program assessment questionnaire to assess change in overall wellness, connection to community resources, their experience working with the CHW, satisfaction with the program, and whether they felt they had achieved their primary goal. Only respondents who reported their most important goal in a prior question were asked if they felt they had achieved that goal. The questionnaire was translated into Spanish and Chinese and administered by six bilingual surveyors using the same protocol that was used for the baseline survey. New surveyors were hired (instead of using CHWs) to avoid desirability bias in participants' responses. After one month of data collection, the financial incentive to participate was increased from \$5 to \$20 in an effort to improve response rates.

Data Analysis

Univariate analyses of baseline survey variables were performed to describe characteristics of CHW program participants and nonparticipants. For analytical purposes, participants were defined as residents who completed an intake assessment with a CHW. Differences between participants and nonparticipants were examined using *t*-tests for continuous variables and χ^2 or Fisher's exact tests for categorical variables. Post-hoc pairwise comparisons were performed and Bonferroni's correction used to adjust for multiple comparisons. The program assessment questionnaire was analyzed using descriptive statistics.

³ "Motivational interviewing is a directive, client-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence. Compared with nondirective counselling, it is more focused and goal-directed" (Rollnick and Miller, 1995: 326).

Results

In this study, we looked at data collected prior to and as part of the CHW intervention to assess the acceptability and potential impact of the Health + Housing Project. We analyzed results of the baseline survey, intake assessments, participant goal setting data, and the program assessment questionnaire.

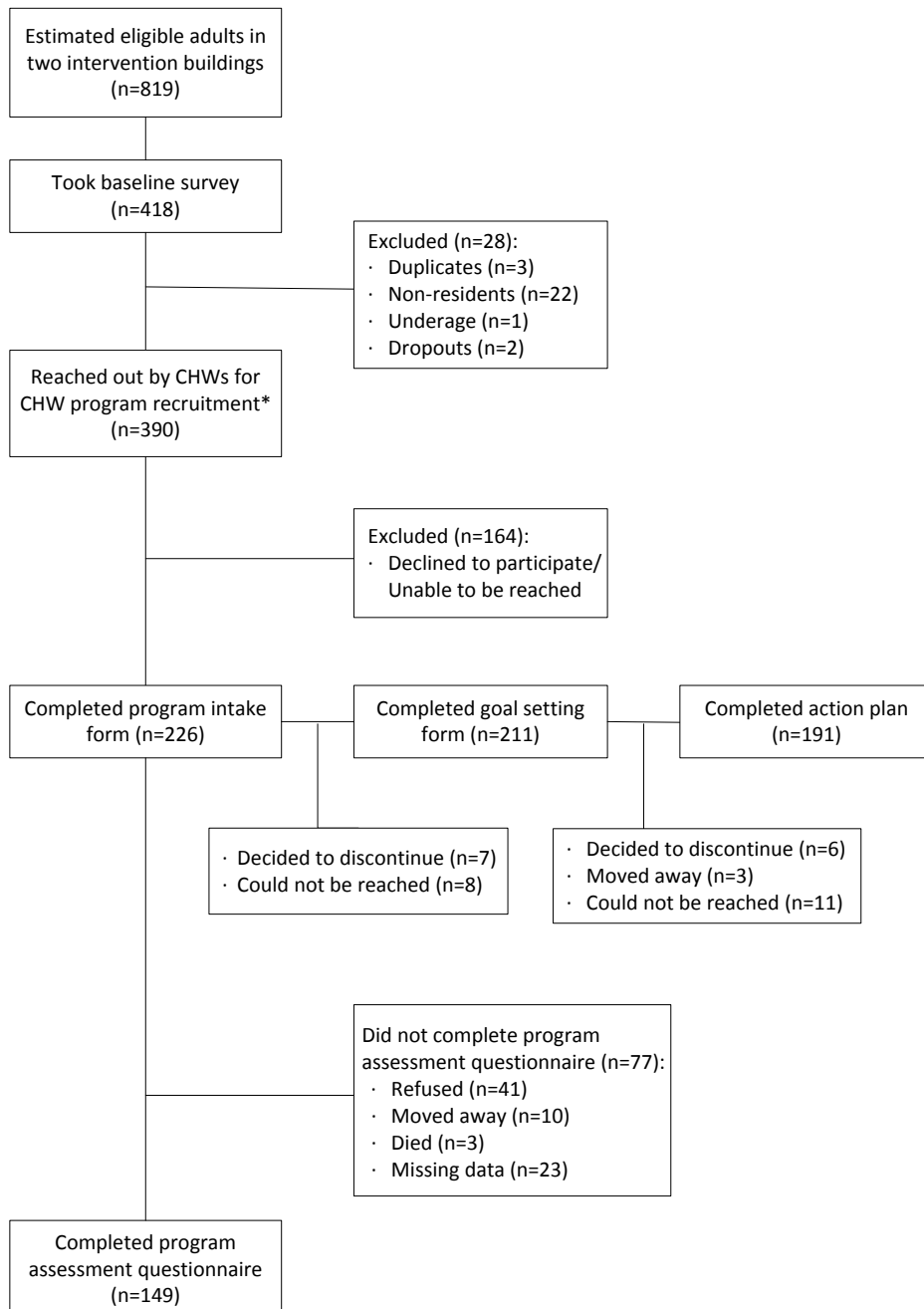
Health Needs of Residents

Of the 819 adults estimated to be living in the two intervention buildings, valid baseline surveys were conducted with 390 residents (47.6 percent response rate; see exhibit 1). At least one resident completed the baseline survey in 266 of the 450 apartment units (59.1 percent unit response rate). Based on available data provided by building management, survey respondents appeared similar to building residents overall in age, gender, and race/ethnicity. Exhibit 2 shows that most respondents were female (62.5 percent) and born in the United States (59.9 percent). Nearly 57 percent had a household income of less than \$20,000 per year. Nearly all (94.6 percent) said they had health insurance, and 86.0 percent had seen a primary care physician in the past 6 months. In terms of health in the past 12 months, 9.0 percent reported that they had visited an emergency department three or more times and 14.9 percent reported one or more hospitalizations. Slightly more than 40 percent reported their general health status as fair or poor. Chronic diseases, anxiety, and depression were common. More than one-third (37.7 percent) rated their diet as fair or poor, and 47.4 percent reported food insecurity. Nearly a one-fourth (22.5 percent) rated their satisfaction with social activities as fair or poor.

A total of 226 residents of the 390 baseline survey takers (57.9 percent) completed an intake assessment with a CHW. Compared with nonparticipants (n = 164), CHW program participants were significantly older and had higher levels of social disadvantage and health-related needs (exhibit 2). Participants were more likely than nonparticipants to have a household income less than \$20,000 (62.7 versus 47.2 percent) and to be unemployed or unable to work (32.0 versus 17.6 percent). A higher percentage of participants had three or more visits to the emergency department (13.3 versus 3.1 percent), and one or more hospitalizations (18.7 versus 9.8 percent) in the past year. Participants were more likely to report their general health as fair or poor (44.9 versus 34.2 percent), and to screen positive for depression (22.5 versus 8.3 percent) and anxiety (21.1 versus 7.0 percent). They were also more likely to report their diet as fair or poor (44.3 versus 28.7 percent) and to suffer from food insecurity (52.4 versus 40.3 percent). A larger percentage reported their satisfaction with social activities and relationships as fair or poor (27.7 versus 15.4 percent).

Exhibit 1

Health + Housing Project Flow Diagram



CHW = community health worker.

* Although most baseline surveys were completed prior to CHW recruitment attempts, some were completed by CHWs for residents who agreed to participate in the CHW program but had not completed a baseline survey in the preprogram period.

Exhibit 2

Baseline Characteristics of Health + Housing Project Program Participants Versus Nonparticipants (1 of 2)

Characteristic	Total (N = 390) n (%)	Participants ^a (n = 226) n (%)	Nonparticipants (n = 164) n (%)	p
Demographics				
Female	243 (62.5)	138 (61.3)	105 (64.0)	0.59
Age, years				< 0.001
18–44	159 (41.3)	72 (32.4)	87 (53.4)	
45–64	126 (32.7)	84 (37.8)	42 (25.8)	
65+	100 (26.0)	66 (29.7)	34 (20.9)	
Country of birth				< 0.05
United States—50 states	182 (46.8)	98 (43.4)	84 (51.5)	
United States—Puerto Rico	51 (13.1)	39 (17.3)	12 (7.4)	
Dominican Republic	75 (19.3)	41 (18.1)	34 (20.9)	
China	56 (14.4)	35 (15.5)	21 (12.9)	
Race/ethnicity				0.42
Hispanic or Latino	252 (64.8)	155 (68.6)	97 (59.5)	
Asian	84 (21.6)	45 (19.9)	39 (23.9)	
Black or African-American	35 (9.0)	17 (7.5)	18 (11.0)	
White	9 (2.3)	4 (1.8)	5 (3.1)	
Education				0.94
Less than HS degree	164 (42.4)	97 (43.3)	67 (41.1)	
HS degree or equivalent	81 (20.9)	47 (21.0)	34 (20.9)	
Some college education	94 (24.3)	54 (24.1)	40 (24.5)	
College degree or higher	48 (12.4)	26 (11.6)	22 (13.5)	
Annual household income				< 0.05
< \$20,000	155 (56.6)	104 (62.7)	51 (47.2)	
\$20,000–\$39,999	65 (23.7)	33 (19.9)	32 (29.6)	
\$40,000+	54 (19.7)	29 (17.5)	25 (23.2)	
Current work situation				< 0.001
Employed	154 (40.0)	69 (30.7)	85 (53.1)	
Unemployed	53 (13.8)	39 (17.3)	14 (8.8)	
Homemaker, student	38 (9.9)	17 (7.6)	21 (13.1)	
Retired	93 (24.2)	67 (29.8)	26 (16.3)	
Unable to work	47 (12.2)	33 (14.7)	14 (8.8)	
Physical and mental health				
Hypertension	131 (33.7)	84 (37.3)	47 (28.7)	0.07
Diabetes	60 (15.4)	40 (17.7)	20 (12.2)	0.14
Asthma	82 (21.2)	55 (24.4)	27 (16.7)	0.06
Positive depression screening	63 (16.6)	50 (22.5)	13 (8.3)	< 0.001
Positive anxiety screening	57 (15.2)	46 (21.1)	11 (7.0)	< 0.001
Severe pain ^b	79 (20.6)	54 (24.2)	25 (15.5)	< 0.05
General health (fair or poor)	157 (40.4)	101 (44.9)	56 (34.2)	< 0.05
Poor health self-efficacy ^c	61 (15.6)	40 (17.7)	21 (12.8)	0.19
Overall diet (fair or poor)	147 (37.7)	100 (44.3)	47 (28.7)	< 0.01
Insurance and healthcare utilization				
Currently insured	366 (94.6)	211 (94.2)	155 (95.1)	0.70
Time without insurance ^d	42 (11.5)	24 (11.4)	18 (11.7)	0.93
Visited primary care provider ^d	270 (86.0)	168 (89.4)	102 (81.0)	< 0.05
Needed medical care but didn't get it ^d	32 (8.3)	26 (11.6)	6 (3.7)	< 0.01
3+ ED visits in past 12 months	35 (9.0)	30 (13.3)	5 (3.1)	< 0.001
1+ hospitalization in past 12 months	58 (14.9)	42 (18.7)	16 (9.8)	< 0.05

Exhibit 2

Baseline Characteristics of Health + Housing Project Program Participants Versus Nonparticipants (2 of 2)

Characteristic	Total (N = 390) n (%)	Participants ^a (n = 226) n (%)	Nonparticipants (n = 164) n (%)	p
Social needs and social satisfaction				
Food insecurity ^d	182 (47.4)	118 (52.4)	64 (40.3)	< 0.05
Unmet social service needs ^e	200 (52.4)	127 (57.0)	73 (45.9)	< 0.05
Unable to pay rent on time ^d	69 (18.2)	47 (21.4)	22 (13.8)	0.06
Satisfaction w/ social activities (fair/poor)	87 (22.5)	62 (27.7)	25 (15.4)	< 0.01

ED = emergency department. HS = high school.

^a Participant defined as a resident who completed an intake assessment with a community health worker.

^b Defined as rating of ≥ 7 on scale of 0–10 to question, “How would you rate your pain on average (where 0 is no pain and 10 is the worst pain imaginable)?”

^c Defined as “a little” or “not at all” confident in ability to take good care of health.

^d Within past 6 months.

^e Defined as responding yes to 1 or more out of 10 social, financial, or other services needed but not received during the past 6 months.

Resident Engagement and Goal Setting

During the course of the 15-month intervention, CHWs recorded more than 2,400 in-person visits with participants, averaging 11 visits per participant (median = 8, range = 1–81). Residents 65 years and older had a higher mean number of visits than residents 18 to 64 years (16 versus 9). CHWs managed a caseload at any given time of 40 to 53 residents. Residents worked with CHWs for 8 months on average and left the caseload when they decided they no longer wanted to receive visits or when the overall intervention period ended.

CHWs engaged in a wide range of activities with residents depending on their needs and goals. Of the 226 residents who completed a CHW program intake assessment, 211 (93.4 percent) completed the goal-setting activity, and 191 (84.5 percent) completed an action plan (see exhibit 1). Exhibit 3 shows the goals on which residents chose to focus by frequency and self-rated order of importance. “Be physically active” or “exercise regularly” were the most frequent goals set, and “get my illness under control” or “take my medicine” were the goals most frequently ranked as most important. CHW activities included communicating with healthcare providers and family members; making and attending medical appointments; assisting with transportation; completing benefits applications; enrolling in Health Homes, Meals-on-Wheels, and low-cost fitness classes; and contacting or following up with housing management for repairs or complaints. In addition, CHWs referred residents to HSS for case management services (for example, assistance with Medicaid or food stamp applications), legal assistance for eviction or rent arrears, and workforce development or English as a Second Language classes. CHWs recorded 428 referrals for participants, nearly one-half of which were to HSS (48.0 percent). The remaining referrals were made to services such as medical, eye, or dentist visits; senior centers; exercise classes or gyms; and food pantries.

Exhibit 3

Health + Housing Project Participant Goals

Goals Set by Participants^a	Count	%	Goal Ranked #1 in Importance by Participants	Count	%
Be physically active/exercise regularly	130	17	Get my illness under control/take my medicine	46	22
Find or change job/job readiness skills	96	12	Find/change job/job readiness skills	38	18
Eat a healthy diet	87	11	Access to healthcare/mental healthcare	17	8
Get my illness under control/take my medicine	83	11	Access—other (benefits, financial services, other)	16	8
Lose weight	47	6	Housing	16	8
Housing	45	6	Eat a healthy diet	14	7
Access to healthcare/mental healthcare	45	6	Family goal/get help for family member	12	6
Family goal/get help for family member	44	6	Be physically active/exercise regularly	10	5
Access—other (benefits, financial services, other)	41	5	Resolve legal problem	9	4
Cope with stress	39	5	Cope with stress	8	4
Cut down/quit alcohol/smoking	38	5	Access to food	6	3
Access to food	27	3	Cut down/quit alcohol/smoking	5	2
Resolve legal problem	21	3	Lose weight	5	2
Minor/major apartment repairs	18	2	Minor/major apartment repairs	4	2
Education goal (not job related)	14	2	Other	3	1
Other	11	1	Education goal (not job related)	2	1
Total goals set	786	100	Total	211	100

Note: n = 211, because 15 people who completed an intake assessment (n = 226) chose not to set goals.

^a Participants could select up to five goals. Goals are clustered into similar categories for the exhibit (see appendix A for full list of goals). Percentages on the left panel represent the number of goals selected by participants in each category divided by the total number of all goals set (N = 786).

Participant Assessment of the CHW Program and Self-Reported Outcomes

At the conclusion of the intervention, 149 residents out of 226 who completed an intake assessment with a CHW (65.9 percent) completed the program assessment questionnaire (exhibit 4). Residents reported high levels of satisfaction with the CHW program. More than three-fourths said they were “very comfortable” or “extremely comfortable” speaking with their CHW about their issues (76.5 percent), and nearly all were “satisfied” or “very satisfied” with their individual CHW (96.6 percent) and the CHW program overall (96.6 percent).

As a result of their participation in the CHW program, participants reported improvement in their overall well-being and achievement of their most important goal. When asked to what degree things had gotten better for them since working with their CHW, 78.6 percent responded “moderate,” “high,” or “very high” degree. Most said the program met their needs “quite a bit” or “completely” (59.6 percent). Most (80.6 percent) reported that they would “definitely” or “probably” take part in the program again if given the opportunity. In terms of goal achievement, 82.0 percent responded that they either “partially” or “completely” achieved their most important goal, and 91.5 percent said that setting goals and creating an action plan was “somewhat” or “extremely” helpful. Of the 77 respondents who said that they had been referred to HSS to see a case manager, 46 (60.5 percent) said they had followed up and met with a case manager there. Most (70.5 percent) said they felt more connected to services in the community because of the work they did with their CHW.

Exhibit 4

Health + Housing Project Program Assessment Questionnaire Results

Questions	n (%)
How comfortable felt speaking with CHW about issues	
Very/extremely comfortable	114 (76.5)
Somewhat comfortable	31 (20.8)
Not very/not at all comfortable	4 (2.7)
Overall was satisfied or very satisfied with CHW	142 (96.6)
Overall was satisfied or very satisfied with CHW program as a whole	142 (96.6)
To what degree have things gotten better since started working with CHW	
Moderate/high/very high degree	114 (78.6)
Small degree/not at all	31 (21.4)
To what degree did program meet needs	
Quite a bit/completely	87 (59.6)
Somewhat	27 (18.5)
A little/not at all	32 (21.9)
Would choose to participate in program again	
Probably/definitely	120 (80.6)
Maybe	20 (13.4)
Probably not/definitely not	9 (6.0)
If set goals, success in completing most important one	
Partially/completely achieved the goal	105 (82.0)
Made no progress on the goal	16 (12.5)
Did not try to achieve the goal	7 (5.5)
Setting goals and making an action plan was somewhat or extremely helpful to improving overall wellness	118 (91.5)
Was referred by CHW to case manager at Henry Street Settlement	77 (55.0)
Met with case manager at Henry Street Settlement	46 (60.5)
Experience working with the case manager at Henry Street Settlement was good, very good, or excellent	40 (87.0)
Felt more connected to services in community because of work with CHW	105 (70.5)
Frequency of CHW meetings was about right	125 (84.5)
CHW explained what program was about clearly or very clearly	128 (86.5)
How well CHW helped with issues	
Very/extremely well	104 (70.8)
Somewhat well	35 (23.8)
Not very well/not at all well	8 (5.4)

CHW = community health worker.

Notes: N = 149, because 77 people who completed an intake assessment (n = 226) did not complete the program assessment. The denominator is less than 149 for some questions because of branching logic and/or missing data.

Discussion

The Health + Housing Project was a place-based pilot project aimed at testing the feasibility, acceptability, and potential impact of a CHW intervention co-located in subsidized housing. Prior housing-based CHW or CHW-like interventions have focused on breast cancer screening (Slater et al., 1998; Zhu et al., 2002); pediatric asthma (Gutierrez Kapheim et al., 2015; Levy et al., 2006; Scammell et al., 2011); diabetes, hypertension, and asthma (Lopez et al., 2017); chronic disease screening and follow-up (Rorie et al., 2011); HIV prevention (Sikkema et al., 2000); smoking cessation (Brooks et al., 2017); and obesity (Quintiliani et al., 2014). This study differed in its emphasis on enabling residents to determine on which aspects of their broadly defined health to focus for improvement.

Similar to residents living in subsidized buildings elsewhere in the United States, the program found that residents living in the two intervention buildings had a high prevalence of physical and mental illness (Feinberg et al., 2015; Helms, Sperling, and Steffen, 2017) and also expressed high rates of food insecurity and other needs. For example, residents had higher rates of diabetes, hypertension, asthma, depression, and self-reported fair or poor general health than the overall population in NYC (NYC DOHMH, 2017). This high concentration of multiple health needs among building residents suggests that subsidized low-income buildings may indeed be good targets for CHW programs. This finding may be all the more relevant in contexts such as NYC, where rapid development of market-rate housing is juxtaposed with pockets of concentrated need (such as those found in subsidized housing) that may be lost within apparent improvements in overall neighborhood health when using data aggregated at the neighborhood level or higher. CHW programs targeted at a building level may be one way to respond to increased income and health disparities in local communities.

Across several measures, the Health + Housing program found that residents who participated in the CHW program were at higher risk and had greater needs than residents who did not. Program participants were not only less well-off financially and more likely to be unemployed than nonparticipants, but they also reported significantly greater mental health problems and healthcare utilization, greater food insecurity, and less satisfaction with their social activities. This finding, particularly regarding the higher healthcare use of participants, can be partially explained by the fact that CHWs made additional attempts to recruit residents identified as “frequent users” of acute healthcare services. The differences observed between participants and nonparticipants, however, may also have illustrated some degree of “self-selection” into the CHW program by residents who needed it most. In sum, our findings indicate that a place-based CHW program in subsidized housing will find a population in significant need and willing to engage.

The protocol developed for the Health + Housing Project pilot was designed to be participant led; participants identified and prioritized their health-related goals with support and motivation from the CHWs. CHWs were able to encourage most participants to set goals and establish a related action plan to accomplish them. This type of client-centered protocol has been effective in helping patients make behavior changes (MacGregor et al., 2005) and has been successfully used in other CHW studies (Islam et al., 2014b; Kangovi et al., 2017b). Of the respondents who reported setting goals, most said they partially or completely achieved their most important goal. CHWs were also successful at making appropriate referrals as needed, especially to the program partner’s case management services (at HSS). It appears that residents, with guidance from a CHW, will follow through on referrals to neighborhood resources and make progress in achieving health-related goals.

Lessons Learned

Although subsidized housing buildings present unique opportunities for CHW programs, they also pose specific challenges. For example, compared with conducting CHW programs in health clinics with a “captive audience,” Health + Housing surveyors and CHWs attempted to engage people as they went about their daily lives. Having surveyors and CHWs available at varied hours and days of the week was important. The program also found that word of mouth became a useful

recruitment tool. When residents worked with CHWs and found them helpful, they often told their neighbors, who subsequently engaged with the program. Partnering with a community-based organization that offers a range of services in the languages spoken by residents was also crucial. In addition to the high percentage of referrals that CHWs made to HSS, the partnership provided additional legitimacy to the project, licensed clinical supervision of CHWs, and a space for team meetings.

The experience working in the two intervention buildings challenged the assumption that all subsidized housing residents are stably housed. A surprising number of residents set goals related to housing, as many adult children struggled to find independent housing in NYC's tight housing market. Although Health + Housing CHWs were adept at assisting with housing applications, because more than 400,000 families are on waiting lists for public or Section 8 housing in NYC (NYCHA, 2017), the prospects of securing affordable housing are low. As a result, CHWs assisted a handful of residents experiencing acute family conflict with placement in homeless shelters. Subsidized housing-based CHW programs in high-cost cities should anticipate such requests and consider incorporating a housing specialist into the project.

Finally, the high rates of mental health issues reported among residents point to an area in particular need of further attention in subsidized housing. Although the program anticipated significant mental health needs among residents, and CHWs attended an 8-hour mental health first aid training course offered by the NYC Health Department, the shortage of high-quality mental health resources with open availability limited the ability of CHWs to successfully navigate participants to care. Future programs would benefit from establishing direct relationships with mental health providers to facilitate access to treatment. Additionally, the high percentage of program participants who rated their satisfaction with social activities and relationships as fair or poor may be connected to their poor physical and mental health (Thoits, 2011) and points to the potential for CHWs to have a positive impact on residents' lives by providing meaningful social interaction.

Limitations

Although participant-reported outcomes were overwhelmingly positive, this pilot study had limitations. First, the program was conducted in only two subsidized housing buildings on the Lower East Side of NYC and may not be generalizable to other communities. Second, the baseline survey sample size of 390 and program assessment questionnaire sample size of 149 are relatively small and limit our ability to show statistical significance for some outcomes or to perform subgroup analyses. The baseline survey response rate was lower than anticipated (47.6 percent of individuals, 59.1 percent of apartment units), but slightly higher than response rates from other surveys conducted in NYC public housing (Feinberg et al., 2015). We do not know how survey respondents differed from nonrespondents; however, based on available data, respondents appeared similar to building residents overall in age, gender, and race/ethnicity. Third, selection bias may have been present specifically for the residents who agreed to complete the program assessment questionnaire, limiting the ability to fully evaluate the effectiveness of the CHW program. Fourth, the program analyzed only self-reported outcomes, which may have been affected by reporting bias. Lastly, although the program monitored CHW performance regularly and attempted to address noticeable differences in resident engagement, the relatively open-ended nature of the

intervention protocol made it difficult to standardize CHW activities, leading to variability among the four CHWs. Program participants may, therefore, have had variable experiences depending on the CHW with whom they worked, which is likely true for CHW programs in general; the sample size did not allow for results to be stratified by individual CHW.

Conclusion

Our article contributes to the literature on place-based CHW programs by demonstrating that subsidized housing buildings are promising sites for CHW interventions. We found that building residents in general and program participants in particular had very high levels of medical, mental health, and health-related social needs. Further, residents responded positively to a program that enabled them to determine what types of health-related goals to set, expressing a high rate of satisfaction with the CHW program and reporting improvements in overall well-being.

Appendix A: List of 23 Goals From Which Participants Chose

Choose up to five goals from the list below that you would like to work on (ST = short-term; LT = long-term).

Disease Management Goals		Diet/Exercise Goals		Smoking/Alcohol Goals		Access Goals	
<input type="checkbox"/>	Take my medicine (ST)	<input type="checkbox"/>	Eat a healthy diet (LT)	<input type="checkbox"/>	Cut down on smoking (ST)	<input type="checkbox"/>	Access to health care (ST)
<input type="checkbox"/>	Get my illness under control (LT)	<input type="checkbox"/>	Lose weight (LT)	<input type="checkbox"/>	Cut down on alcohol (ST)	<input type="checkbox"/>	Access to food (ST)
		<input type="checkbox"/>	Be physically active (ST)	<input type="checkbox"/>	Quit smoking (LT)	<input type="checkbox"/>	Access—other (ST)
		<input type="checkbox"/>	Exercise regularly (LT)	<input type="checkbox"/>	Quit drinking alcohol (LT)		

Family Goals		Employment Goals		Apartment Goals		Other Goals	
<input type="checkbox"/>	Get help for a family member (ST/LT)	<input type="checkbox"/>	Job readiness skills (ST)	<input type="checkbox"/>	Minor apartment repairs (ST)	<input type="checkbox"/>	Cope with stress (ST)
<input type="checkbox"/>	Family goal—other (ST/LT)	<input type="checkbox"/>	Find/change job (LT)	<input type="checkbox"/>	Major apartment repairs (LT)	<input type="checkbox"/>	Resolve legal problem (LT)
				<input type="checkbox"/>	Apartment goal—other (ST/LT)	<input type="checkbox"/>	Other (ST/LT)

If any checked are “Other,” specify here: _____

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References

Andersson, Fredrik, John C. Haltiwanger, Mark J. Kutzbach, Giordano R. Palloni, Henry O. Pollakowski, and Daniel H. Weinberg. 2016. *Childhood Housing and Adult Earnings: A Between-Siblings Analysis of Housing Vouchers and Public Housing*. NBER Working Paper No. 22721. Cambridge, MA: National Bureau of Economic Research.

Bor, Jacob, Gregory H. Cohen, and Sandro Galea. 2017. "Population Health in an Era of Rising Income Inequality: USA, 1980–2015," *Lancet* 389 (10077): 1475–1490. DOI: 10.1016/S0140-6736(17)30571-8.

Brooks, Daniel R., Joanna L. Burtner, Belinda Borrelli, Timothy C. Heeren, Tegan Evans, Jessica A. Davine, Jonathan Greenbaum, Matthew Scarpaci, John Kane, Vaughn Wallis Rees, and Alan C. Geller. 2017. "Twelve-Month Outcomes of a Group-Randomized Community Health Advocate-Led Smoking Cessation Intervention in Public Housing," *Nicotine & Tobacco Research*. DOI: 10.1093/ntr/ntx193.

Centers for Disease Control and Prevention (CDC). 2014. *National Health and Nutrition Examination Survey Questionnaire*. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. <https://www.cdc.gov/nchs/nhanes/index.htm>.

Cella, David, William Riley, Arthur Stone, Nan Rothrock, Bryce Reeve, Susan Yount, Dagmar Amtmann, Rita Bode, Daniel Buysse, Seung Choi, Karon Cook, Robert Devellis, Darren DeWalt, James F. Fries, Richard Gershon, Elizabeth A. Hahn, Jin Shei Lai, Paul Pilkonis, Dennis Revicki, Matthias Rose, Kevin Weinfurt, Ron Hays, and Promis Cooperative Group. 2010. "The Patient-Reported Outcomes Measurement Information System (PROMIS) Developed and Tested Its First Wave of Adult Self-Reported Health Outcome Item Banks: 2005–2008," *Journal of Clinical Epidemiology* 63 (11): 1179–1194. DOI: 10.1016/j.jclinepi.2010.04.011.

Cosgrove, Shannon, Martha Moore-Monroy, Carolyn Jenkins, Sheila R. Castillo, Charles Williams, Erlinda Parris, Jacqueline H. Tran, Mark D. Rivera, and J. Neil Brownstein. 2014. "Community Health Workers as an Integral Strategy in the REACH U.S. Program to Eliminate Health Inequities," *Health Promotion Practice* 15 (6): 795–802. DOI: 10.1177/1524839914541442.

Digenis-Bury, Eleni C., Daniel R. Brooks, Leslie Chen, Mary Ostrem, and C. Robert Horsburgh. 2008. "Use of a Population-Based Survey To Describe the Health of Boston Public Housing Residents," *American Journal of Public Health* 98 (1): 85–91. DOI: 10.2105/AJPH.2006.094912.

Feinberg, Alexia, Lois Seidl, Amber Levanon Seligson, Juan Pinzon, Andrea Mata, L. Gray, Christa Myers, Elizabeth Drackett, Nadia Islam, Lindsey Riley, E. Cromeyer, Priscilla Lopez, Javier Lopez, Karen Althea Maybank, and Lorna Thorpe. 2015. *Launching a Neighborhood-Based Community Health Worker Initiative: Harlem Health Advocacy Partners (HHAP) Community Health Needs Assessment*. New York: NYU-CUNY Prevention Research Center, New York City Department of Health and Mental Hygiene; New York City Housing Authority; Community Service Society.

Fenelon, Andrew, Patrick Mayne, Alan E. Simon, Lauren M. Rossen, Veronica Helms, Patricia Lloyd, Jon Sperling, and Barry L. Steffen. 2017. "Housing Assistance Programs and Adult Health in the United States," *American Journal of Public Health* 107 (4): 571–578. DOI: 10.2105/AJPH.2016.303649.

Gundersen, Craig, Emily E. Engelhard, Amy S. Crumbaugh, and Hilary K. Seligman. 2017. "Brief Assessment of Food Insecurity Accurately Identifies High-Risk U.S. Adults," *Public Health Nutrition* 20 (8): 1367–1371. DOI: 10.1017/S1368980017000180.

Gutierrez Kapheim, Melissa, Jessica Ramsay, Tala Schwindt, Bijou R. Hunt, and Helen Margellos-Anast. 2015. "Utilizing the Community Health Worker Model To Communicate Strategies for Asthma Self-Management and Self-Advocacy Among Public Housing Residents," *Journal of Communication in Healthcare* 8 (2): 95–105. DOI: 10.1179/1753807615y.0000000011.

Harris, Paul A., Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, and Jose G. Conde. 2009. "Research Electronic Data Capture (REDCap)—A Metadata-Driven Methodology and Workflow Process for Providing Translational Research Informatics Support," *Journal of Biomedical Informatics* 42 (2): 377–381. DOI: 10.1016/j.jbi.2008.08.010.

Helms, Veronica, Jon Sperling, and Barry L. Steffen. 2017. *A Health Picture of HUD-Assisted Adults, 2006–2012*. Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research.

U.S. Department of Housing and Urban Development (HUD). 2016. *A Picture of Subsidized Households*. Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research. huduser.gov/portal/datasets/asshsg.html.

Islam, Nadia Shilpi, Lindsey Riley, Laura Wyatt, S. Darius Tandon, Michael Tanner, Runi Mukherji-Ratnam, Mariano Rey, and Chau Trinh-Shevrin. 2014. "Protocol for the DREAM Project (Diabetes Research, Education, and Action for Minorities): A Randomized Trial of a Community Health Worker Intervention To Improve Diabetic Management and Control Among Bangladeshi Adults in NYC," *BMC Public Health* 14: 177. DOI: 10.1186/1471-2458-14-177.

Islam, Nadia Shilpi, Ephraim Shapiro, Laura Wyatt, Lindsey Riley, Jennifer Zanolwiak, Rhodora Ursua, and Chau Trinh-Shevrin. 2017. "Evaluating Community Health Workers' Attributes, Roles, and Pathways of Action in Immigrant Communities," *Preventative Medicine* 103: 1–7. DOI: 10.1016/j.ypmed.2017.07.020.

Islam, Nadia Shilpi, Jennifer M. Zanolwiak, Laura C. Wyatt, Rucha Kavathe, Hardayal Singh, Simona C. Kwon, and Chau Trinh-Shevrin. 2014. "Diabetes Prevention in the New York City Sikh Asian Indian Community: A Pilot Study," *International Journal of Environmental Research and Public Health* 11 (5): 5462–5486. DOI: 10.3390/ijerph110505462.

Kangovi, Shreya, Nandita Mitra, David Grande, Hairong Huo, Robyn A. Smith, and Judith A. Long. 2017a. "Community Health Worker Support for Disadvantaged Patients With Multiple Chronic Diseases: A Randomized Clinical Trial," *American Journal of Public Health* 107 (10): 1660–1667. DOI: 10.2105/AJPH.2017.303985.

Kangovi, Shreya, Nandita Mitra, Robyn A. Smith, Raina Kulkarni, Lindsey Turr, Hairong Huo, Karen Glanz, David Grande, and Judith A. Long. 2017b. "Decision-Making and Goal-Setting in Chronic Disease Management: Baseline Findings of a Randomized Controlled Trial," *Patient Education and Counseling* 100 (3): 449–455. DOI: 10.1016/j.pec.2016.09.019.

Kim, Kyounghae, Janet S. Choi, Eunsuk Choi, Carrie L. Nieman, Jin Hui Joo, Frank R. Lin, Laura N. Gitlin, and Hae-Ra Han. 2016. "Effects of Community-Based Health Worker Interventions To Improve Chronic Disease Management and Care Among Vulnerable Populations: A Systematic Review," *American Journal of Public Health* 106 (4): e3–e28. DOI: 10.2105/AJPH.2015.302987.

Kroenke, Kurt, Robert L. Spitzer, and Janet B.W. Williams. 2003. "The Patient Health Questionnaire-2: Validity of a Two-Item Depression Screener," *Medical Care* 41 (11): 1284–1292. DOI: 10.1097/01.MLR.0000093487.78664.3C.

Levy, Jonathan I., Doug Brugge, Junette L. Peters, Jane E. Clougherty, and Shawnette S. Saddler. 2006. "A Community-Based Participatory Research Study of Multifaceted In-Home Environmental Interventions for Pediatric Asthmatics in Public Housing," *Social Science & Medicine* 63 (8): 2191–2203. DOI: 10.1016/j.socscimed.2006.05.006.

Liao, Youlian, David Bang, Shannon Cosgrove, Rick Dulin, Zachery Harris, Alexandria Stewart, April Taylor, Shannon White, Graydon Yatabe, Leandria Liburd, and Wayne Giles. 2011. "Surveillance of Health Status in Minority Communities—Racial and Ethnic Approaches to Community Health Across the U.S. (REACH U.S.) Risk Factor Survey, United States, 2009," *MMWR Surveillance Summaries* 60 (6): 1–44.

Lopez, Priscilla M., Nadia Islam, Alexis Feinberg, Christa Myers, Lois Seidl, Elizabeth Drackett, Lindsey Riley, Andrea Mata, Juan Pinzon, Elisabeth Benjamin, Katarzyna Wyka, Rachel Dannefer, Javier Lopez, Chau Trinh-Shevrin, Karen Aletha Maybank, and Lorna E. Thorpe. 2017. "A Place-Based Community Health Worker Program: Feasibility and Early Outcomes, New York City, 2015," *American Journal of Preventative Medicine* 52 (3S3): S284–S289. DOI: 10.1016/j.amepre.2016.08.034.

Love, Mary Beth, Kristen Gardner, and Vicki Legion. 1997. "Community Health Workers: Who They Are and What They Do," *Health Education & Behavior* 24 (4): 510–522. DOI: 10.1177/109019819702400409.

MacGregor, Kate, Sharon Wong, Claire Sharifi, Margaret Handley, and Thomas Bodenheimer. 2005. "The Action Plan Project: Discussing Behavior Change in the Primary Care Visit," *Annals of Family Medicine* 3 (Suppl 2): S39–S40. DOI: 10.1370/afm.353.

Margellos-Anast, Helen, Melissa A. Gutierrez, and Steven Whitman. 2012. "Improving Asthma Management Among African-American Children via a Community Health Worker Model: Findings From a Chicago-Based Pilot Intervention," *Journal of Asthma* 49 (4): 380–389. DOI: 10.3109/02770903.2012.660295.

Northridge, Jennifer, O. Francesco Ramirez, Jeanette A. Stingone, and Luz Claudio. 2010. "The Role of Housing Type and Housing Quality in Urban Children With Asthma," *Journal of Urban Health* 87 (2): 211–224. DOI: 10.1007/s11524-009-9404-1.

New York City Department of Health and Mental Hygiene (NYC DOHMH). 2017. "Epiquery: NYC Interactive Health Data System—Community Health Survey 2013." <https://nyc.gov/health/epiquery>.

New York City Housing Authority (NYCHA). 2017. "NYCHA 2017 Fact Sheet." <https://www1.nyc.gov/assets/nycha/downloads/pdf/factsheet.pdf>.

New York University (NYU) Center for the Study of Asian American Health (CSAAH), and NYU-City University of New York (CUNY) Prevention Research Center. 2015. *Harlem Health Advocacy Partnership: Protocol and Curriculum*. New York.

Quintiliani, Lisa M., Michele A. DeBiase, Jamie M. Branco, Sarah G. Bhosrekar, Jo-Anna Rorie, and Deborah J. Bowen. 2014. "Enhancing Physical and Social Environments To Reduce Obesity Among Public Housing Residents: Rationale, Trial Design, and Baseline Data for the Healthy Families Study," *Contemporary Clinical Trials* 39 (2): 201–210. DOI: 10.1016/j.cct.2014.08.005.

Rollnick, Stephen, and William R. Miller. 1995. "What Is Motivational Interviewing?" *Behavioural and Cognitive Psychotherapy* 23 (4): 325–334.

- Rorie, Jo-Anna, Adriana Smith, Tegan Evans, C. Robert Horsburgh, Jr., Daniel R. Brooks, Rachel Goodman, Doris Bunte, Lee Strunin, Daisy de la Rosa, and Alan Geller. 2011. "Using Resident Health Advocates To Improve Public Health Screening and Follow-Up Among Public Housing Residents, Boston, 2007–2008," *Preventing Chronic Disease* 8 (1): A15.
- Ruel, Erin, Deidre Oakley, Graham E. Wilson, and Robert Maddox. 2010. "Is Public Housing the Cause of Poor Health or a Safety Net for the Unhealthy Poor?" *Journal of Urban Health* 87 (5): 827–838. DOI: 10.1007/s11524-010-9484-y.
- Scammell, Madeline K., Laurie Duro, Emily Litonjua, Lilly Berry, and Margaret Reid. 2011. "Meeting People Where They Are: Engaging Public Housing Residents for Integrated Pest Management," *Progress in Community Health Partnerships* 5 (2): 177–182. DOI: 10.1353/cpr.2011.0017.
- Sikkema, Kathleen J., Jeffrey A. Kelly, Richard A. Winett, Laura J. Solomon, Victoria A. Cargill, Roger A. Roffman, Timothy L. McAuliffe, Timothy G. Heckman, Evan J. Anderson, Duncan A. Wagstaff, Aaron D. Norman, Maria de Jesus Perry, D.A. Crumble, and Mark B. Mercer. 2000. "Outcomes of a Randomized Community-Level HIV Prevention Intervention for Women Living in 18 Low-Income Housing Developments," *American Journal of Public Health* 90 (1): 57–63.
- Simon, Alan E., Andrew Fenelon, Veronica Helms, Patricia C. Lloyd, and Lauren M. Rossen. 2017. "HUD Housing Assistance Associated With Lower Uninsurance Rates and Unmet Medical Need," *Health Affairs (Millwood)* 36 (6): 1016–1023. DOI: 10.1377/hlthaff.2016.1152.
- Skapinakis, Petros. 2007. "The 2-Item Generalized Anxiety Disorder Scale Had High Sensitivity and Specificity for Detecting GAD in Primary Care," *Evidence-Based Medicine* 12 (5): 149. DOI: 10.1136/ebm.12.5.149.
- Slater, Jonathan S., Chung Nim Ha, Michael E. Malone, Paul McGovern, Shelly D. Madigan, John R. Finnegan, Amy L. Casey-Paal, Karen L. Margolis, and Nicole Lurie. 1998. "A Randomized Community Trial To Increase Mammography Utilization Among Low-Income Women Living in Public Housing," *Preventative Medicine* 27 (6): 862–870.
- Thoits, Peggy A. 2011. "Mechanisms Linking Social Ties and Support to Physical and Mental Health," *Journal of Health and Social Behavior* 52 (2): 145–161. DOI: 10.1177/0022146510395592.
- Wolf, Steven H., and Paula Braveman. 2011. "Where Health Disparities Begin: The Role of Social and Economic Determinants—and Why Current Policies May Make Matters Worse," *Health Affairs (Millwood)* 30 (10): 1852–1859. DOI: 10.1377/hlthaff.2011.0685.
- Zhu, Kangmin, Sandra Hunter, Louis J. Bernard, Kathleen Payne-Wilks, Chanel L. Roland, Lloyd C. Elam, Ziding Feng, and Robert S. Levine. 2002. "An Intervention Study on Screening for Breast Cancer Among Single African-American Women Aged 65 and Older," *Preventative Medicine* 34 (5): 536–545. DOI: 10.1006/pmed.2002.1016.