Referrals to Community and State Agencies to Address Social Determinants of Health for Improving Mental Health, Functioning, and Quality of Care Outcomes for Diverse Adults

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Objectives. To examine whether referral for social determinants of health (SDH) needs decreases psychological distress and posttraumatic stress disorder (PTSD) symptoms and improves level of functioning and quality of care among diverse adults.

Methods. Data are from control participants (n = 503 adults) in a randomized controlled trial testing a mental health intervention in North Carolina and Massachusetts. We fitted multilevel mixed-effects models to repeated assessments (baseline, 3, 6, and 12 months) collected between September 2019 and January 2023.

Results. After referral to services for trouble paying utility bills, participants reported lower PTSD symptoms. Participants reported better quality of care when receiving referrals to mental health care. After adjusting for income and employment status, we found that participants who were referred more often also had lower PTSD symptoms and better levels of functioning.

Conclusions. Referrals for certain SDH needs might decrease PTSD symptoms and improve self-reported quality of care and functioning. However, referrals alone, without ensuring receipt of services, might be insufficient to affect other mental health outcomes. Research is needed on training and providing care managers time for offering interpersonal support, securing services, and understanding agencies' contexts for addressing high SDH needs. (*Am J Public Health*. 2024;114(S3):S278–S288. https://doi.org/10.2105/AJPH.2023.307442)

The link of hardship in social determinants of health (SDH) with adverse health and mental health outcomes is well established.[1] As a result, community and state agencies are trying approaches to address patients' SDH needs,[2] many paying for screening for SDH.[3] Previous research on SDH interventions has focused on inputs rather than health outcomes,[4–7] reporting on process measures, such as numbers referred[2] and characteristics of people utilizing services,[8] but little on the mental health impact of referrals. Studies that have evaluated

health and mental health outcomes have found mixed results.

The effectiveness of mental health interventions in underserved communities is difficult to study, partly because residents simultaneously experience many SDH needs. Although there is vast literature[9,10] on traditional and intensive case management, assertive community treatment, and other models to address the social needs of behavioral health patients, there is limited information on these services' impact on mental health outcomes, impact of SDH referrals, and whether the form of referral differentially affects mental health outcomes for those with mental health conditions. Addressing this knowledge gap is the purpose of this study.

We investigated how SDH needs could be addressed in an enhanced control group in a community-based randomized clinical trial (RCT) testing the Strong Minds–Strong Communities mental health intervention. This 10-session psychosocial intervention provided by community health workers uses strategies adapted from cognitive behavioral therapy to improve mental health symptoms for racial/ethnic and linguistic minoritized participants. Although RCT designs are considered the gold standard methodology, the interpretation of findings can be obscured if the treatment is confounded by nonscripted incidental aid for SDH problems.[11] We offered SDH support to all RCT participants in the treatment and control arms, meaning we could interpret any treatment group effects as attributable to the psychosocial intervention in the context of SDH support. Care managers assessed SDH needs throughout the 6-month treatment protocol and provided community-appropriate referrals.

In this *AJPH* special issue, we report insights from our SDH approach in the Strong Minds–Strong Communities control arm. For 3 years, including during the COVID-19 pandemic, we documented the SDH needs and referrals of participants across 2 sites (Massachusetts and North Carolina) that differ in the Centers for Disease Control and Prevention (CDC)–defined social vulnerability index.[12] In the current article, we provide details of SDH needs and related factors reported over time, the relation of reports to referral behaviors, and the longitudinal relation of SDH referrals to mental health symptoms (i.e., psychological distress and posttraumatic stress disorder [PTSD] symptoms), level of functioning, and quality of care of participants in the control arm.

Our work builds on preliminary results from the Strong Minds–Strong Communities study of Alegría et al.[13] There, baseline measures of SDH needs predicted the level and slope of anxiety and depression symptoms over 20 weeks after the baseline. We found that food insecurity was related to higher levels of anxiety and depression symptoms, that utility payment problems were related to higher levels of depression (but not anxiety), and that child or family care demands were related to a less steep decrease of depression symptoms. We did not report how SDH referrals to deal with these issues relate to mental health and functioning outcomes. We do so in the current article.

We addressed 5 questions:

1. What SDH needs were reported during the study, and how did these vary by site?
2. What factors, including mental health, were related to SDH needs?
3. What predicted care managers' referral actions over the 6 months of the protocol?
4. What was the relation of SDH referral to mental health and functioning outcomes over 12 months, and how was the relation different when considering variation within versus between participants?
5. Which specific types of SDH referrals were most related to mental health and functioning outcomes?

The answers will inform public health prevention science and researchers planning effectiveness RCTs in contexts with high SDH needs as well as agencies establishing screening and referral services.

METHODS

Data came from the ongoing RCT Strong Minds–Strong Communities study, an evidence-based psychosocial intervention offered to adults aged 18 years and older in North Carolina and Massachusetts with untreated or undertreated symptoms of anxiety or depression unrelated to psychosis or substance abuse.[13] We screened potential participants for capacity to consent and eligibility, including fluency in English, Spanish, Mandarin, or Cantonese, and elevated symptoms of depression or anxiety measured using the CAT–MH (computer adaptive tests–mental health), a suite of validated assesments.[14]

We excluded participants if they reported receiving psychotherapy or counseling in the past 3 months or having an appointment in the upcoming month; had a history of psychosis, mania, or psychotic symptoms, assessed using the Improving Mood: Promoting Access to Collaborative

Treatment (IMPACT) screener[15]; or had severe alcohol or substance dependance as defined by the CAT–MH.[14] We did not exclude participants for use of pharmacological treatments and related psychiatry appointments. Participants reporting a suicidal plan or attempt on the Paykel Suicide Risk Questionnaire[16] took part in an emergency protocol and 30-day rescreening.

Eligible participants completed a baseline assessment before randomization to either the intervention or control condition. We administered follow-up questionnaires at 3, 6, and 12 months after the baseline. Because the trial is ongoing, we did not include participants in the intervention condition in this study. Trained staff administered the measures.

Control Condition

Control participants received 4 postbaseline calls by a care manager to monitor symptoms. Care managers informed participants that they could request assistance for the following SDH needs: food insecurity, housing instability, utilities insecurity, lack of transportation, trouble paying for medications, unemployment, child or family care demands, and receipt of mental health care. Participants could also contact the care manager to request assistance.

Measures

When applicable, adequate internal consistency (Cronbach α) was observed for all measures across languages and follow-up assessments (see Table B, available as a supplement to the online version of this article at http://www.ajph.org).

We evaluated psychological distress using the Hopkins Symptom Checklist-25 (HSCL-25),[17] a self-report of anxiety (first 10 items) and depression (last 15 items) symptoms in the past 2 weeks rated on a 4-point scale from 1 "not at all" to 4 "extremely" (score range = 1–4). We evaluated PTSD symptoms using the PCL-5 (Posttraumatic Stress Disorder Checklist for *DSM-5*), the PTSD checklist for the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (Washington, DC: American Psychiatric Publishing; 2013 [*DSM-5*]),[18] a self-report of the 20 *DSM-5* symptoms of PTSD in the past month. Each item was rated on a 5-point scale from 0 "not at all" to 4 "extremely" (range = 0–80).

We measured level of functioning using the 12-item World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0),[19] a self-report assessing 6 domains of functioning. Participants rated difficulties performing activities per domain in the past 30 days using a 5-point scale from 1 "none" to 5 "extremely or cannot do" (range = 12−60). We evaluated quality of care using the Global Evaluation of Care domain of the Perceptions of Care Outpatient Survey (PoC-OP),[20] a clinical-care oriented, self-report satisfaction scale. The Global Evaluation of Care domain includes 3 items rated on a 4-point scale from 1 "never" to 4 "always." Because each outcome measure was on a different scale, we rescaled all to range from 0 to 4 to facilitate interpretation and comparisons.

We evaluated the number of SDH needs using a count of self-reported difficulties per area (range = 0–7) drawn from the Medicaid ACO (accountable care organization) Social Determinants of Health Screening Tool[21] (details in section A, available as a supplement to the online version of this article at http://www.ajph.org).

The main exposures were indicators of referral receipt from the care manager to address SDH and mental health needs. We constructed the indicator variables so that the referral was made before the time at which the outcomes were measured (details in section B, available as a supplement to the online version of this article at http://www.ajph.org).

Sociodemographic variables collected at baseline included self-reported age (i.e., 18–83 years), gender (i.e., male, female), race/ethnicity (i.e., White, Black, Asian, Latino, American Indian, and multiracial categories), birthplace (i.e., US born, foreign born), education (i.e., less than high school, high school and above), employment status (i.e., unemployed, employed, not in the labor force), income (i.e., $0 to < $35 000, $35 000 to < $75 000, ≥ $75 000), and marital status (i.e., married/cohabitating, separated/divorced/widowed, never married). Because of small numbers, we excluded participants who self-identified as either American Indian (n = 1) or multiracial (n = 3).

Statistical Analysis

To address the 5 study questions, we first described the site-specific distributions of study measures, including outcome scores and the exposure at all follow-up assessments for control participants from North Carolina and Massachusetts. We then described differences in the distribution of each SDH need reported at baseline between North Carolina and Massachusetts (question 1).

Next, we examined which psychological factors (i.e., distress, PTSD symptoms, functioning, quality of care) were associated with reports of time-varying SDH needs (question 2).

Because assessments were at 3, 6, and 12 months nested within

participants, we employed a multilevel modeling framework, allowing us to distinguish between-participant variation from within-participant variation over time. Moreover, we were able to construct the within-participant predictor to represent the level of the factor at the previous (lagged) assessment. For example, in the model with psychological distress as the predictor, the within-participant effect reflects whether a control participant who reported higher distress in the previous assessment reports greater SDH needs in the following assessment. The between-participant effect measures whether the participants who report higher distress generally differ in their reports of SDH needs than do participants who generally report lower distress.

Because the psychological factors were highly correlated, we first examined the association of each to SDH needs in isolation (models 1–4) and next fitted a model that included all 4 factors (model 5). All models adjusted for time and baseline sociodemographic variables. Details on the specific models that were estimated are reported in section D (available as a supplement to the online version of this article at http://www.ajph.org).

To verify that study care managers made referrals based on SDH needs rather than on other factors such as age and race/ethnicity (question 3), we predicted the binary indicator of referral at each assessment as a function of time, psychological factors (i.e., distress, PTSD symptoms, functioning, quality of care), reported SDH needs, and baseline sociodemographic variables. We employed the same multilevel modeling framework and distinguished between-participant variation from within-participant variation over time

(except for baseline sociodemographic variables, which did not vary). We examined the association of each psychological factor to care managers' referrals without adjusting for the others in separate models. Additional details are reported in section E (available as a supplement to the online version of this article at http://www.ajph.org).

Our next analyses examined whether referrals for SDH needs and mental health care were associated with improvements in mental health (HSCL-25 and PCL-5), functioning (WHODAS 2.0), and care outcome scores (PoC-OP; question 4). We modeled these 4 outcomes separately in multilevel models, treating SDH referrals and mental health referrals as both between-participant and within-participant explanatory effects. The between-participant effect reflected whether the average referral for participants was associated with reports of outcomes such as psychological distress. The within-participant effect, on the other hand, reflected whether a referral in the previous assessment was associated with psychological distress in the following assessment, adjusting for overall average referral for the participant.

All models adjusted for time effects, baseline outcome scores, and baseline sociodemographic variables. We hypothesized that between participants, referral would be inversely related to outcomes because of higher need among those being referred. By contrast, within participants, we hypothesized that the referrals would be positively related to outcomes. Details on how the within- and between-participant effects were captured are in section F (available as a supplement to the online version of this article at http://www.ajph.org).

Our final set of analyses studied which specific types of referrals were related to outcomes (question 5). These used the same approach as described in the previous paragraph, substituting indicators of specific referral types (i.e., food, housing, utilities, and unemployment) for the global SDH referral variables. We did not examine other referral types because there were too few referrals.

We used Stata version 17[22] and R-Studio version 2022.07.2 + 576 for all analyses.[23] Analyses of missing data indicated that participants who completed all follow-up assessments were similar to those who missed at least 1 (see section C, available as a supplement to the online version of this article at http://www.ajph.org). We treated data as missing at random. As recommended in a multilevel modeling framework under the assumption of data missing at random, we handled missing data using model-based multiple imputation[24] (details provided in section C).

RESULTS

We describe the distribution of outcomes and baseline sociodemographic variables in North Carolina and Massachusetts in Table 1. Participants at both sites were similar in levels of psychological distress (HSCL-25), functioning (WHODAS 2.0), quality of care (PoC-OP), and count of SDH needs across all assessments. Those in North Carolina reported somewhat higher PTSD symptoms than did those in Massachusetts at baseline (1.8 vs 1.7) but similar levels at follow-up. Participants in North Carolina were also less likely to be referred to mental health care between the baseline and 3-month follow-up (6.9% vs 14.7%) and to be referred for SDH

TABLE 1— Distribution of Study Measures in the Total Sample: North Carolina and Massachusetts, September 2019–January 2023

Study Measure	Total Sample (n = 503), Mean ±SD or No. (%)	North Carolina (n = 246), Mean ±SD or No. (%)	Massachusetts (n = 257), Mean ±SD or No. (%)	P
Primary outcomes				
Psychological distress (HSCL-25)				
Baseline	1.9 ±2.7	1.9 ±1.9	1.9 ±2.0	.69
3-mo follow-up	1.7 ±3.3	1.7 ±2.2	1.6 ±2.6	.35
6-mo follow-up	1.7 ±3.4	1.6 ±2.4	1.7 ±2.6	.82
12-mo follow-up	1.6 ±3.6	1.6 ±2.5	1.6 ±2.6	.99
PTSD symptoms (PCL-5)				
Baseline	1.8 ±4.7	1.8 ±3.2	1.7 ±3.4	.021
3-mo follow-up	1.6 ±4.2	1.7 ±2.9	1.6 ±3.1	.11
6-mo follow-up	1.6 ±4.1	1.6 ±2.9	1.6 ±2.9	.56
12-mo follow-up	1.6 ±3.8	1.6 ±2.6	1.5 ±2.8	.56
Level of functioning (WHODAS 2.0)				
Baseline	1.7 ±4.5	1.7 ±3.0	1.6 ±3.3	.13
3-mo follow-up	1.5 ±4.6	1.6 ±3.2	1.5 ±3.3	.19
6-mo follow-up	1.5 ±4.5	1.5 ±3.3	1.5 ±3.1	.89
12-mo follow-up	1.5 ±4.2	1.6 ±3.1	1.5 ±2.9	.64
Perceptions of care (PoC-OP)				
Baseline	NA	NA	NA	NA
3-mo follow-up	2.1 ±5.2	2.1 ±3.6	2.1 ±3.7	.75
6-mo follow-up	2.2 ±5.2	2.2 ±3.8	2.1 ±3.7	.50
12-mo follow-up	2.1 ±5.2	2.2 ±3.8	2.1 ±3.6	.38
No. social determinants needs				
Baseline	2.2 ±1.8	2.3 ±1.7	2.2 ±1.8	.71
3-mo follow-up	2.1 ±2.0	2.1 ±2.0	2.1 ±2.0	.99
6-mo follow-up	2.0 ±1.9	2.0 ±1.9	2.0 ±1.9	.76
12-mo follow-up	1.9 ±2.0	2.0 ±2.2	1.9 ±1.9	.50
Referral for mental health				
3-mo follow-up	55 (10.9)	17 (6.9)	38 (14.7)	.011
6-mo follow-up	37 (7.3)	11 (4.4)	26 (10.1)	.054
12-mo follow-up	27 (5.3)	9 (3.5)	18 (7.2)	.17
Referral for social determinants				
3-mo follow-up	190 (37.8)	67 (27.4)	123 (47.7)	<.001
6-mo follow-up	72 (14.4)	21 (8.6)	51 (20.0)	.002
12-mo follow-up	60 (12.0)	21 (8.6)	39 (15.2)	.09
Baseline demographic characteristics				
Age, y	42.8 ±13.4	43.2 ±13.7	42.4 ±13.1	.52
Gender				.15
Male	87 (17.3)	36 (14.8)	51 (19.7)	
Female	416 (82.7)	210 (85.2)	206 (80.3)	
Race/ethnicity				<.001
White	46 (9.1)	24 (9.8)	22 (8.6)	
Black	79 (15.7)	59 (24.0)	20 (7.8)	

Continued

TABLE 1— Continued

Study Measure	Total Sample (n = 503), Mean ±SD or No. (%)	North Carolina (n = 246), Mean ±SD or No. (%)	Massachusetts (n = 257), Mean ±SD or No. (%)	P
Asian	68 (13.5)	1 (0.4)	67 (26.1)	
Latino	310 (61.6)	162 (65.9)	148 (57.6)	
Birthplace				.016
US-born	176 (35.0)	99 (40.2)	77 (30.0)	
Foreign-born	327 (65.0)	147 (59.8)	180 (70.0)	
Education				<.001
Less than high school	181 (36.0)	109 (44.3)	72 (28.0)	
High school and more	322 (64.0)	137 (55.7)	185 (72.0)	
Employment status				<.001
Unemployed	244 (48.6)	119 (48.4)	125 (48.8)	
Employed	128 (25.5)	42 (17.0)	87 (33.7)	
Not in the labor force	130 (25.9)	85 (34.6)	45 (17.6)	
Income, $				<.001
0 to <35 000	335 (66.7)	187 (75.9)	149 (57.9)	
35 000 to <75 000	114 (22.7)	45 (18.3)	69 (26.9)	
≥75 000	53 (10.6)	14 (5.8)	39 (15.2)	
Marital status				.05
Married or cohabitating	269 (53.5)	136 (55.3)	133 (51.9)	
Separated, widowed, or divorced	107 (21.2)	59 (24.0)	48 (18.5)	
Never married	127 (25.3)	51 (20.7)	76 (29.6)	

Note. HSCL-25 = Hopkins Symptom Checklist-25; NA = not applicable; PCL-5 = PTSD checklist for *DSM-5* (*Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* [Washington, DC: American Psychiatric Publishing; 2013]); PoC-OP = Perceptions of Care Outpatient Survey; PTSD = posttraumatic stress disorder; WHODAS 2.0 = World Health Organization Disability Assessment Schedule 2.0.

needs between the baseline and 3-month follow-up (27.4% vs 47.7%) and between the 3- and 6-month follow-ups (8.6% vs 20.0%).

Participants were similar in age and gender composition but differed in several other characteristics. Those in North Carolina (vs MA) were more likely to be Black participants (24.0% vs 7.8%), US born (40.2% vs 30.0%), not in the labor force (34.6% vs 17.6%), and in the lowest income category (75.9% vs 57.9%). Those in Massachusetts (vs NC) were more likely to be Asian participants (26.1% vs 0.4%), unemployed (33.7% vs 17.0%), and in the highest income category (15.2% vs 5.8%).

Prevalence of Needs

Food insecurity was the need most often reported; more than half of respondents in both sites expressed this concern, but it was especially common in North Carolina (61.7% vs 52.1% in MA; *P* = .04). The next most common were housing instability (NC: 30.7%; MA: 39.4%; *P* = .04), utilities insecurity (NC: 32.5%; MA: 39.3%), and unemployment (NC: 31.1%; MA: 41.3%; *P* = .02). Trouble paying for medications was reported by more than a quarter of those in North Carolina (28.4%) and by somewhat less in Massachusetts (15.2%; *P* < .001). The least reported SDH needs were lack of

transportation (NC: 23.2%; MA: 19.5%) and child or family care demands (NC: 19.9%; MA: 16.1%), but even these were reported by more than 15% of the participants.

Factors Associated With Reports of Needs

None of the lagged within-participant variables reflecting psychological distress, PTSD symptoms, functioning, or quality of care were significantly related to a count of SDH needs reported at the 3-, 6-, or 12-month assessments (see Table D, available as a supplement to the online version of this article

TABLE 2— Predictors of Number of SDH Needs at 3 Time Points: North Carolina and Massachusetts, September 2019–January 2023

Lagged Predictors, Between-Participant Effects	Model 1		Model 2		Model 3		Model 4		Model 5	
	b (SE)	P > |t|	b (SE)	P > |t|	b (SE)	P > |t|	b (SE)	P > |t|	b (SE)	P > |t|
Psychological distress (HSCL-25)	0.79 (0.13)	< .001							0.05 (0.26)	.86
PTSD symptoms (PCL-5)			0.80 (0.13)	< .001					0.47 (0.25)	.06
Level of functioning (WHODAS 2.0)					0.92 (0.14)	< .001			0.50 (0.21)	.017
Perceptions of care (PoC-OP)							−0.05 (0.18)	.76	0.10 (0.16)	.53

Note. HSCL-25 = Hopkins Symptom Checklist-25; PCL-5 = PTSD checklist for *DSM-5* (*Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* [Washington, DC: American Psychiatric Publishing; 2013]); PoC-OP = Perceptions of Care Outpatient Survey; PTSD = posttraumatic stress disorder; SDH = social determinants of health; WHODAS 2.0 = World Health Organization Disability Assessment Schedule 2.0. Models 1–5 varied with regard to psychological predictors included in the multilevel models. Model 1 included psychological distress (HSCL-25 scores) and adjustments for sociodemographic measures. Model 2 included only PTSD symptoms (PCL-5 scores) and adjustment variables. Model 3 included only level of functioning (WHODAS 2.0 scores) and adjustment variables. Model 4 included only perceptions of care (PoC-OP scores) and adjustment variables. Model 5 included psychological distress (HSCL-25 scores), PTSD symptoms (PCL-5 scores), level of functioning (WHODAS 2.0 scores), and perceptions of care (PoC-OP scores) as well as baseline sociodemographic measures. All models were fit in a multilevel context and included within-participant forms of time-varying variables as well as between-participant forms. None of the within-participant effects were significant and are consequently omitted from the table (see Table D, available as a supplement to the online version of this article at http://www.ajph.org). All models included a random intercept term. Models with random effects for time-varying variables did not converge, and therefore we eliminated those random effects from models reported here.

at http://www.ajph.org). There was no evidence that higher levels of these factors at 1 assessment were related to more SDH needs in the later assessments.

By contrast, we found that individual differences (between-participant) in psychological distress, PTSD, and functioning were positively associated with higher SDH needs (Table 2) when considered separately (models 1–4). For example, if participants had a 1-unit increase in psychological distress, they are expected to have an increase of 0.79 SDH needs (model 1: $b_1 = 0.79$; $P < .001$). Similar increases are expected for a unit increase in PTSD (model 2: $b_2 = 0.80$; $P < .001$) and for WHODAS functioning (model 3: $b_3 = 0.92$; $P < .001$). There was no estimated effect of perceptions of care (model 4: $b_4 = -0.05$; not statistically significant).

We estimated model 5, which included all 4 factors simultaneously. After adjusting for other factors, only WHODAS functioning remained significant (model 5: $b_3 = 0.50$; $P < .02$), although the effect for PTSD symptoms was not much smaller (model 5: $b_2 = 0.47$; $P < .06$).

Several other variables were significantly related to SDH needs, including time, race/ethnicity, being foreign born, and education (see Table D). The number of SDH needs reported fell slightly over time. Asian participants reported fewer SDH needs, whereas Black and Latino participants reported higher SDH needs. Foreign-born participants reported higher SDH needs than did US-born participants. Participants with less than a high school education (relative to high school or more) were more likely to report SDH needs, as were participants who were separated, divorced, or widowed (relative to those who were married or cohabitating). Participants in Massachusetts reported more needs than did those in North Carolina. There were no statistically significant effects of age or gender.

Administrative Check on Referrals

When participants reported an SDH or mental health need, care managers provided and tracked a referral. We examined predictors of referral actions by care managers. As expected, the strongest predictors of SDH needs referral were lagged within-participant SDH needs as well as level of SDH needs (between-participant). There was no evidence that gender, age, or race/ethnicity was associated with referral after adjusting for measures of need (see Tables E and F, available as supplements to the online version of this article at http://www.ajph.org).

Effect of Referrals on Outcome Scores

Contrary to our hypotheses, there were no significant effects of SDH referrals on psychological distress, PTSD

TABLE 3— Effect of Time-Varying Referral for Mental Health and Referral for SDH Needs on Time-Varying Psychological Distress, PTSD Symptoms, Functioning, and Quality of Care: North Carolina and Massachusetts, September 2019–January 2023

Lagged Predictors	Model 1[a]		Model 2[b]		Model 3[c]		Model 4[d]	
	b (SE)	P > |t|	b (SE)	P > |t|	b (SE)	P > |t|	b (SE)	P > |t|
Time	−0.01 (0.00)	.014	−0.01 (0.00)	<.001	0.00 (0.00)	.31	0.01 (0.00)	.11
Baseline severity	0.50 (0.04)	<.001	0.48 (0.03)	<.001	0.49 (0.04)	<.001	NA	NA
Within-participant effects								
Referral for mental health	0.00 (0.06)	.99	−0.07 (0.06)	.22	−0.04 (0.06)	.45	0.18 (0.08)	.025
Referral for SDH needs	0.01 (0.04)	.79	0.01 (0.04)	.74	0.03 (0.04)	.41	−0.04 (0.05)	.41
Between-participant effects								
Referral for mental health	0.20 (0.13)	.12	0.14 (0.13)	.26	0.07 (0.11)	.54	0.17 (0.16)	.26
Referral for SDH needs	0.11 (0.09)	.22	0.03 (0.08)	.73	0.03 (0.08)	.72	0.12 (0.12)	.3

Note. HSCL-25 = Hopkins Symptom Checklist-25; NA = not applicable; PCL-5 = PTSD checklist for *DSM-5* (*Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* [Washington, DC: American Psychiatric Publishing; 2013]); PoC-OP = Perceptions of Care Outpatient Survey; PTSD = posttraumatic stress disorder; SDH = social determinants of health; WHODAS 2.0 = World Health Organization Disability Assessment Schedule 2.0. All models adjusted for race/ethnicity, age, sex, birthplace, education level, marital status, and state of recruitment.
[a]Model 1 estimated the effect of time-varying referral for mental health and time-varying referral for SDH needs on time-varying psychological distress (HSCL-25 scores).
[b]Model 2 estimated the effect of time-varying referral for mental health and time-varying referral for SDH needs on time-varying PTSD symptoms (PCL-5 scores).
[c]Model 3 estimated the effect of time-varying referral for mental health and time-varying referral for SDH needs on time-varying level of functioning (WHODAS 2.0 scores).
[d]Model 4 estimated the effect of time-varying referral for mental health and time-varying referral for SDH needs on time-varying quality of care (PoC-OP scores).

symptoms, or functioning at either the within- or between-participant level (Table 3). However, we observed a significant within-participant effect of mental health referrals on quality of care, indicating that participants had higher self-reported quality of care in the following assessment after being referred for mental health care in the previous assessment. The best predictors of psychological distress, PTSD symptoms, and functioning were the measures of these outcomes at baseline, indicating the chronicity of these needs. There was a significant decrease in psychological distress and PTSD symptoms over time.

Effect of Specific Referrals

We examined whether referral type mattered. We estimated separate models for each of 4 types of needs: food, housing, utilities, and unemployment (Table 4). Medication, transportation, and child or family care demands had too few referrals to examine separately. We found a significant within-participant effect, indicating that a participant who was more likely to be referred for services because of trouble paying utility bills had lower self-reported PTSD symptoms in the following assessment.

Our models did not adjust for baseline employment status and income because they are a fundamental cause of the study variables (see section G, available as a supplement to the online version of this article at http://www.ajph. org). In sensitivity analyses, we examined whether our results were relatively unaffected by adjustment for employment status and income, which they were (see Tables G and H, available as a supplement to the online version of this article at http://www.ajph.org). However, we found a significant between-participant effect of referrals for unemployment on PTSD symptoms and level of functioning, so participants who were more likely to be referred because of unemployment had lower self-reported PTSD symptoms and higher self-reported levels of functioning in the following assessment than did participants who were referred less often.

DISCUSSION

Health and mental health interventions must address SDH needs, as health care alone might not guarantee optimal outcomes.[25] Therefore, we sought to answer whether referrals by care managers to address SDH needs were associated with improved mental health,

TABLE 4— Effect of Time-Varying Referral for SDH Need Type on Time-Varying Psychological Distress, PTSD Symptoms, Functioning, and Quality of Care: North Carolina and Massachusetts, September 2019–January 2023

	Model 1[a]		Model 2[b]		Model 3[c]		Model 4[d]	
Lagged Predictors	**b (SE)**	**P > |t|**	**b (SE)**	**P > |t|**	**b (SE)**	**P > |t|**	**b (SE)**	**P > |t|**
Within-participant effects								
Food	0.10 (0.06)	.14	0.08 (0.06)	.17	0.06 (0.06)	.30	−0.02 (0.08)	.78
Housing	0.00 (0.06)	.95	0.01 (0.06)	.82	0.03 (0.06)	.57	−0.07 (0.08)	.43
Utilities	−0.07 (0.07)	.31	−0.13 (0.06)	.042	−0.06 (0.07)	.36	−0.11 (0.09)	.23
Unemployment	−0.06 (0.08)	.47	−0.11 (0.08)	.14	0.07 (0.08)	.40	0.04 (0.11)	.68
Between-participant effects								
Food	−0.06 (0.13)	.61	−0.15 (0.12)	.21	−0.06 (0.11)	.57	0.03 (0.15)	.86
Housing	0.10 (0.12)	.39	0.02 (0.12)	.86	0.04 (0.10)	.71	0.13 (0.14)	.35
Utilities	0.14 (0.12)	.26	−0.02 (0.13)	.87	0.02 (0.11)	.85	0.05 (0.16)	.76
Unemployment	−0.18 (0.13)	.18	−0.19 (0.14)	.17	−0.21 (0.12)	.06	−0.01 (0.16)	.95

Note. HSCL-25 = Hopkins Symptom Checklist-25; PCL-5 = PTSD checklist for *DSM-5* (*Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* [Washington, DC: American Psychiatric Publishing; 2013]); PoC-OP = Perceptions of Care Outpatient Survey; PTSD = posttraumatic stress disorder; SDH = social determinants of health; WHODAS 2.0 = World Health Organization Disability Assessment Schedule 2.0. All models included time, baseline severity, within- and between-participant mental health referral, race/ethnicity, age, sex, birthplace, education level, marital status, and state of recruitment.

[a]Model 1 estimated the effect of each specific type of time-varying referral for SDH needs on time-varying psychological distress (HSCL-25 scores).
[b]Model 2 estimated the effect of each specific type of time-varying referral for SDH needs on time-varying PTSD symptoms (PCL-5 scores).
[c]Model 3 estimated the effect of each specific type of time-varying referral for SDH needs on time-varying level of functioning (WHODAS 2.0 scores).
[d]Model 4 estimated the effect of each specific type of time-varying referral for SDH needs on time-varying quality of care (PoC-OP scores).

functioning, and self-reported quality of care.

Consistent with previous studies,[26] the most frequently reported SDH needs were food insecurity, housing instability, utilities insecurity, and job insecurity or unemployment. In response to question 1, SDH needs were highly prevalent in both sites (NC and MA), likely driven by the RCT's focus on communities with an overrepresentation of racial and ethnic minoritized groups, immigrant populations, and undertreated and underserved populations. A greater number of SDH needs has been reported in racial and ethnic minoritized[27] and immigrant populations.[28] Although the CDC social vulnerability index finds lower social vulnerability in Massachusetts than in North Carolina,[12] several SDH needs were more prevalent in Massachusetts. A possible

explanation could be greater perceived availability of resources in Massachusetts because of the governor's multilingual campaign advertising sites to obtain SDH.

Related to question 3, a greater number of reported needs predicted care manager referrals, with referral rates not varying by age, gender, or race/ethnicity. This result is consistent with the design of the study protocol and with a previous study[29] showing that greater SDH needs were associated with higher odds of referral to health care and social services. Unsurprisingly, our results for question 2 showed that participants with higher levels of psychological distress, higher PTSD symptoms, and lower levels of functioning reported greater SDH needs than did participants with lower distress and higher levels of

functioning. Our finding that Asian participants reported fewer SDH needs aligns with previous findings that fewer Asian older adults reported unmet medication and food insecurity needs than did Black and Hispanic older adults.[30] However, researchers have speculated that even when conducting interviews in Chinese, dialect, level of literacy, and cultural experiences could lead to differential SDH needs reporting among Asian populations because of culturally and linguistically bound interpretations of concepts such as hunger or "eating less than you should."[31]

With regard to question 4, we found the relation of SDH referral to mental health and functioning consistent with some previous studies,[32] whereby referrals did not significantly improve mental health–related outcomes, except for PTSD symptoms and

functioning. The lack of systematic effects of referrals on mental health outcomes might be owing to referral context, given that combining social and health care services can lead to "operational challenges, regulatory barriers, and coordination limitations."[33(p1)] Participants with SDH needs were referred to agencies stressed by the COVID-19 pandemic, which might not have been able to fulfill the desired needs, offering a cautionary note that referrals alone are unlikely to help. What is important is the services a person receives in connection to the referral. Other studies have reported inconsistent results[5] because care managers may need time to offer interpersonal support and direct assistance.[34] More research is needed to understand how psychological, interpersonal, and social challenges during the COVID-19 pandemic may have been associated with mental health symptoms, attenuating potential benefits of referral for SDH needs.[35–38]

Analyzing results for question 5 showed the significance of the type of referral in affecting mental health. The decrease in PTSD symptoms associated with utilities insecurity referrals can be explained by potential reduction in chronic stress from economic hardships and poor living conditions.[39–41] Referrals for utilities and employment appear to have a substantial impact on mental health, suggesting that they should be prioritized. Consistent with previous work,[42] patients receiving referrals for mental health services reported higher perceived quality of care.[43]

PUBLIC HEALTH IMPLICATIONS

The evaluation of policies that directly address the receipt of help for SDH needs shows promise for improving mental health outcomes; however, referral alone is likely to be insufficient apart from reducing PTSD symptoms and improving functioning. Given unique needs and the heterogeneity with which marginalized communities are affected by social systems and determinants, emphasis needs to be shifted from screening to ensuring receipt of help for SDH needs. Direct intervention, addressing SDH issues in combination with social support, and structural interventions affecting access to resources, services, and mental health services[44] are key. AJPH

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CONFLICTS OF INTEREST

The authors report no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

The study was approved by the Mass General Brigham institutional review board for oversight of Massachusetts and North Carolina activities.

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