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### Authors

Tai-Seale, Ming

Kwak, Jamie

Harris, Victoria

et al.

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## RESEARCH ARTICLE

# Unmet needs for food, medicine, and mental health services among vulnerable older adults during the COVID-19 pandemic

Ming Tai-Seale MPH, PHD<sup>1,2,3</sup>  | Michael W. Cheung BA<sup>1</sup>  |  
Jamie Kwak BSPH<sup>2,3</sup>  | Victoria Harris MPH<sup>2</sup>  |  
Samantha Madonis MSN, RN, PHN<sup>2</sup>  | Lc Russell MSN, BSN, RN<sup>2</sup>  |  
Eileen Haley MSN, RN, CNS, CCM<sup>2</sup>  | Parag Agnihotri MD<sup>2</sup> 

<sup>1</sup>University of California San Diego School of Medicine, Department of Family Medicine, San Diego, California, USA

<sup>2</sup>UC San Diego Health Population Health Services Organization, San Diego, California, USA

<sup>3</sup>UC San Diego Health Center for Health Innovation, San Diego, California, USA

## Correspondence

Ming Tai-Seale, University of California San Diego School of Medicine, 200 West Arbor Drive MC 0807, San Diego, CA 92103-0807, USA.

Email: [mtaiseale@health.ucsd.edu](mailto:mtaiseale@health.ucsd.edu)

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## Abstract

**Objective:** To examine sociodemographic factors associated with having unmet needs in medications, mental health, and food security among older adults during the COVID-19 pandemic.

**Data Sources and Study Setting:** Primary data and secondary data from the electronic health records (EHR) in an age-friendly academic health system in 2020 were used.

**Study Design:** Observational study examining factors associated with having unmet needs in medications, food, and mental health.

**Data Collecting/Extraction Methods:** Data from a computer-assisted telephone interview and EHR on community-dwelling older patients were analyzed.

**Principle Findings:** Among 3400 eligible patients, 1921 (53.3%) (average age 76, SD 11) responded, with 857 (45%) of respondents having at least one unmet need. Unmet needs for medications were present in 595 (31.0%), for food in 196 (10.2%), and for mental health services in 292 (15.2%). Racial minorities had significantly higher probabilities of having unmet needs for medicine and food, and of being referred for services related to medications, food, and mental health. Patients living in more resource-limited neighborhoods had a higher probability of being referred for mental health services.

**Conclusions:** Age-friendly health systems (AFHS) and their recognition should include assessing and addressing social risk factors among older adults. Proactive efforts to address unmet needs should be integral to AFHS.

## KEYWORDS

aging, healthy place index, neighborhood resources, social determinants of health, unmet needs

## What is known on this topic

- Both residential geographical area and person-level sociodemographic factors are associated with having unmet needs for important services.
- Little is known about the association of geographical area resource limitations with unmet needs and the probability of receiving services to address unmet needs after accounting for individual factors.

### What this study adds

- Individual sociodemographic and health risk factors are associated with having unmet needs in what matters to older adults (medications, mental health, and food security).
- Geographical area resource limitations are associated with the probabilities of receiving services to address mental health needs after accounting for the individual-level factors.
- Higher levels of anxiety were associated with having unmet needs for medications and the probability of being referred for services to address food insecurity after accounting for other factors.

## 1 | INTRODUCTION

The age-friendly health systems (AFHS) framework incorporates four elements (What Matters, Medication, Mentation, and Mobility) known as the 4 M's to guide the quality care of older adults.<sup>1</sup> AFHSs face challenges posed by the ongoing COVID-19 pandemic, which has exacerbated multiple barriers to health care for vulnerable community-dwelling older adults. Studies suggest that older adults were more likely to forgo or postpone health services due to fears of contracting the virus.<sup>2,3</sup> They may experience more difficulties in meeting their basic needs for food, medicine, and mental health. While medicine and mental health have become established services of AFHS,<sup>4</sup> discussion regarding food insecurity is sparse in the existing AFHS literature and more connected to the public health system<sup>5</sup> or community-based organizations.<sup>6</sup> As food-insecure older adults have been documented to report fair or poor health status<sup>7</sup> and have limitations in activities of daily living comparable to those of food-secure older adults 14 years older,<sup>8</sup> assessing food security can be important for AFHS. Yet, it is currently not a standard part of becoming AFHS-recognized.

We are an academic health system with three of our component entities (a multispecialty medical center, a critical intensive care unit, and a Medicine for Seniors service) recognized as level 2 AFHS by the Institute for health improvement. In order to identify high-risk, community-dwelling older adults with unmet needs and refer them for follow-up services<sup>9</sup> during the COVID-19 pandemic, we proactively contacted older patients soon after the California stay-at-home order was implemented. We were particularly interested in understanding the characteristics of older adults that were associated with high needs for services during the pandemic.<sup>10-12</sup> Given the reported association of geography-based social vulnerability, we also explored the relationship between a patient's address mapped onto the Health Place Index (HPI) and their needs for services.<sup>13,14</sup> We acknowledge that all health systems are facing challenges with respect to social determinants of health, not just those that are AFHS-recognized. We hope to contribute new insights to AFHS and other health systems.

## 2 | METHODS

Using a computer-assisted telephone interview approach, nursing trainees<sup>9</sup> called patients meeting the following criteria: (1) served by

the health system's primary care providers between April and December 2020, (2) belonged to the health systems' Medicare Accountable Care Organization or a Medicare Advantage plan, (3) community-dwelling inclusive of those living in communal environments such as assisted living facilities, residential care facilities, and (4) had a risk score of 11 or greater. This risk score was customized by the health system to capture a patient's general health risk-based several dimensions: patient age, previous hospitalizations or emergency department visits, chronic conditions (including cancer, heart failure, chronic kidney disease, hypertension, chronic obstructive pulmonary disease, cardiovascular disease, diabetes, on dialysis, depression, schizophrenia, bipolar disorder, substance dependence, substance abuse, HIV, and major organ transplant), and empanelment in primary care. Except for primary care empanelment, all the aforementioned factors additively contribute to the risk score (i.e., a higher score indicates higher risk). One point is subtracted from the aggregate if the patient has a designated primary care provider.

People with dementia or those already enrolled in the Complex Case Management (CCM) Program were excluded. The CCM serves eligible patients based on their risk score and history of using emergency department or inpatient services for advanced stages of heart failure, diabetes, and chronic obstructive pulmonary disease. CCM staff conducts ongoing comprehensive assessments of enrollees' health and social needs, which include food security, medications, transportation, and social support. Therefore, those enrolled in CCM were excluded from this outreach. We asked a question near the end of the interview, however, on if they wanted a nurse to follow up with them. Those patients who wanted a follow-up call were referred to CCM for further assessments and follow-up.

Applying the inclusion and exclusion criteria resulted in the identification of 3400 eligible patients. Nursing students were trained to follow a standardized script and record patient responses in Qualtrics (Qualtrics, Provo, UT), a survey platform. Details of the interview approach and training of callers are described elsewhere.<sup>9</sup>

The interview asked patients about their access to food and medicine and their mental health. Unmet need for food was identified if a patient had less than 3 days of food in their home, reported having financial barriers to buying groceries, or responded "no" to "are you able to access groceries ok?" Unmet need for medications was defined as present if a patient had 30 or less days of medication or responded "yes" to having concerns about financial hardship, polypharmacy, or questions about medication. Unmet need for mental

health services was defined as present if a patient reported not having stress management strategies (e.g., doing physical activities or creative activities, playing with pets), or scored 3 or higher on PHQ-2 or on GAD-2.<sup>15</sup> Some patients declined to answer PHQ or GAD resulting in missing data and possibly underestimating the unmet needs for mental health. Recognizing this communication challenge, we conducted more coaching and role-playing during the orientation of nursing students to prepare them better in asking questions about mental health before they started calling patients. Patients identified as having unmet needs were referred to additional services.

The interviewers were trained to also pay attention to how the patient was communicating. In cases where their scores did not match the concerns they were expressing verbally, callers would still refer these patients for additional services. For example, if a patient talked about not being able to get out of bed, even if their PHQ2 score was lower than 3, the patient would be referred to licensed clinical social worker for further assessment. Forty-six individuals (13, 15, and 18 for follow-up services for medication, food, and mental health services, respectively) were referred, although they did not meet the thresholds for having unmet needs for those services based strictly on the numeric values of their answers.

From the electronic health records (EHR), we obtained data on patient age, gender, race/ethnicity, health status, insurance, and social vulnerability. Age was measured by years since birth while gender was female versus nonfemale (including male, transgender male/male-to-female, transgender female/female-to-male, and others). Based on self-report, the patient's race/ethnicity was measured by binary variables for Asian, Black/African American, Hispanic/Latino, and other (American Indian/Alaska Native, Native Hawaiian or Other Pacific Islander, and other). Health status was measured by the risk score described earlier. Medicare Accountable Care Organization (ACO) status was measured as a binary variable to differentiate members of a Medicare ACO or a Medicare Advantage plan. Social vulnerability was measured by the Healthy Places Index (HPI) percentile, a composite index of community well-being for California from publicly available census-tract data on 25 place-based community characteristics, including economic (e.g., per capita income), education, social, transportation, and health insurance coverage.<sup>13,14</sup> California's over 1650 zip codes have been divided into four quarters based on the HPI Index.<sup>13,14</sup> Our organization had incorporated the HPI into the EHR, so the information is readily available to clinicians and data analysts. We extracted that data from the EHR and assigned patients to quartiles according to scores on the California Healthy Places Index,<sup>13,14</sup> with quartile 1 indicating least advantaged and quartile 4 indicating most advantaged.

Statistical Analysis: Univariate and bivariate analyses and the margins package in R version 4.0.4 were used. Two sets of regression analyses were done. The first set examined the factors associated with the probability of having unmet needs for food, medication, or mental health services. The second set consisted of conditional logistic regression analyses to examine the factors associated with the probability of being referred for services to address each unmet need, conditional upon having unmet needs for food, medicine, or mental

health services, respectively. The 41 patients who received a referral for services but did not report having unmet needs were excluded from this analysis. The covariates included age, gender, race/ethnicity, Medicare ACO status, risk score, and HPI quartile. Sensitivity analyses examined the HPI quartile as a covariate to evaluate the degree of model fit. The results supported, including the HPI quartile as a covariate in all models in the regression analyses.

This quality improvement study was approved by the University of California San Diego Aligning and Coordinating Quality Improvement, Research, and Evaluation Committee and was deemed exempt from institutional review board approval.

### 3 | RESULTS

Among the approximately 19,903 patients served by the health system, 3400 met the inclusion criteria and had been attempted for outreach. Among those, 1479 either declined or were unable to be reached after two attempts, and 1921 unique patients completed the interview. Among the latter, 206 were interviewed multiple times due to their requests for follow-up. This analysis only included responses to the initial interviews.

Table 1 displays characteristics of the respondents ( $N = 1921$ ) and the underlying covered population ( $N = 19,903$ ). Unmet needs for medications existed among 595 (31.0%) patients, among whom 98 (16.5%) were referred to nurses or pharmacists for services to address their medication needs. Regarding food, 196 (10.2%) faced food insecurity, among whom 30 (15.3%) were referred to social workers in the health system to improve their access to food. Regarding mental health, 292 (15.2%) had unmet needs, among whom 70 (24%) were referred to social workers to address their mental health needs. While 857 (45%) had at least one unmet need, 73 had unmet needs for medications and food, 131 had unmet needs for medications and mental health, 41 for food and mental health, and 19 had unmet needs in all three areas. All patients with unmet needs were offered the opportunity to talk to a care team member for additional services. Some declined the offer. Only those who accepted the offer were referred for additional services, including being assessed by a member of the CCM team for CCM eligibility assessment.

Demographically, the average age of participants was 76 (SD 10.5); 52% were female and 48% nonfemale (including male, transgender male/female, and other). The racial composition was 74% White, 7% Asian, 7% Hispanic, 3% Black, and 8% others. Medicare ACO members accounted for 83.0% of the patients. Patients in higher quartiles of HPI were over-represented than patients in lower HPI quartiles. The 1920 patients lived in 608 unique HPI percentile values: 78 (12.8%) in the first quartile, 132 (21.7%) in the second, 193 (31.7%) in the third, and 205 (33.7%) in the fourth quartile. The larger underlying population was younger, and the average age was 46 (SD21.1), with a higher proportion of Asians (17.5%), Blacks (4.1%), Hispanics (16.8%), and others (23.3%) and a lower proportion of Whites (38.3%). They also had lower risk scores. The distribution across the HPI quartiles was similar between the participants and the

**TABLE 1** Characteristics of patient participants and covered patient population

Participants (N = 1921)		Covered patient population (N = 19,903)			
N (%) or Mean (SD)		N (%) or Mean (SD)		N (%) or Mean (SD)	
With unmet needs for medications		Age	76 (10.5)	Age	46 (21.1)
Yes	595 (31.0%)	Gender		Gender	
No	979 (51.0%)	Female	995 (51.8%)	Female	11,004 (55.3%)
Missing	347 (18.1%)	Nonfemale	926 (48.2%)	Nonfemale	8899 (44.7%)
With unmet needs for food		Race/Ethnicity		Race/Ethnicity	
Yes	196 (10.2%)	Asian	135 (7.0%)	Asian	3489 (17.5%)
No	1368 (71.2%)	Black	66 (3.4%)	Black	805 (4.1%)
Missing	357 (18.6%)	Caucasian/White	1428 (74.3%)	Caucasian/White	7623 (38.3%)
With unmet needs for mental health services		Hispanic/Latino	132 (6.9%)	Hispanic/Latino	3351 (16.8%)
Yes	292 (15.2%)	Other	160 (8.3%)	Other	4635 (23.3%)
No	1196 (62.3%)	Medicare ACO		Medicare ACO	
Missing	433 (22.5%)	Yes	1595 (83.0%)	Yes	9968 (50.1%)
Referred for medication services		No	269 (14.0%)	No	4836 (24.3%)
Yes	98 (16.5%)	Missing	57 (3.0%)	Missing	5099 (25.6%)
No	398 (66.9%)	Risk score		Risk score	
Missing	99 (16.6%)	Mean (SD)	13.4 (5.3)	Mean (SD)	3.2 (4.5)
Referred for food security services		Median [Min, Max]	13 [0, 33]	Median [Min, Max]	1 [0, 36]
Yes	30 (15.3%)	Missing	199 (10.4%)	Missing	0 (0.0%)
No	146 (74.5%)	HPI percentile (individual patients)		HPI percentile (individual patients)	
Missing	20 (10.2%)	1st quartile	123 (6.4%)	1st quartile	1360 (6.8%)
Referred for mental health services		2nd quartile	264 (13.7%)	2nd quartile	2896 (14.6%)
Yes	70 (24.0%)	3rd quartile	574 (29.9%)	3rd quartile	6185 (31.1%)
No	186 (63.7%)	4th quartile	875 (45.5%)	4th quartile	9119 (45.8%)
Missing	36 (12.3%)	Missing	85 (4.4%)	Missing	343 (1.7%)
PHQ-2 score					
At least 3	105 (5.47%)				
Less than 3	1309 (68.1%)				
Missing	507 (26.4%)				
GAD-2 score					
At least 3	145 (7.6%)				
Less than 3	1271 (66.2%)				
Missing	505 (26.3%)				

Abbreviations: ACO, accountable care organization; GAD, general anxiety disorder; HPI, healthy place index; PHQ, personal health questionnaire.

larger population. Because the goal of the project was to reach vulnerable older adults rather than a representative sample of the underlying covered population, the dissimilarities in some characteristics did not cause concern.

Bivariate analyses suggest variations in rates of unmet needs for medication, food, or mental health services across patient age and race/ethnicity (Table 2). For example, those with unmet needs for mental health services were younger, with an average age of 72.8, compared to those without unmet mental health needs, with an average age of 76.1. Blacks (51.7%) and Latinos (45.9%) led in rates of having unmet medication needs compared to Whites (36.1%) and Asians (33.3%). Latinos (22.5%) and Blacks (22.4%) also led in rates of

food insecurity compared to Asians (16.2%) and Whites (10.6%). Additional bivariate results suggested that patients in Medicare ACO had a lower rate of having unmet needs for mental health services (18.8%) compared with patients in Medicare Advantage plans (25.3%). Patients whose PHQ-2 scored 3 or higher had a higher rate of having unmet needs for medications compared to those whose PHQ-2 score was 2 or lower (37.1%). Patients whose GAD-2 scored 3 or higher had a higher rate (53.2%) of having unmet needs for medications compared to those with GAD-2 score at 2 or lower (36.6%). Patients with a GAD-2 score greater or equal to 3 also had a higher rate of food insecurity (18.1%) compared to those whose GAD-2 was 2 or lower (11.8%). Furthermore, while HPI was not associated with significant

**TABLE 2** Bivariate statistics on patient characteristics associated with unmet needs and referral for additional services

	Had Unmet Needs						Referred for Services to Address Unmet Needs					
	Medication		Food		Mental Health		Medication		Food		Mental Health	
	Yes (N = 595) N (%) or Mean (SD)	No (N = 979) N (%) or Mean (SD)	Yes (N = 196) N (%) or Mean (SD)	No (N = 1368) N (%) or Mean (SD)	Yes (N = 292) N (%) or Mean (SD)	No (N = 1196) N (%) or Mean (SD)	Yes (N = 98) N (%) or Mean (SD)	No (N = 398) N (%) or Mean (SD)	Yes (N = 30) N (%) or Mean (SD)	No (N = 146) N (%) or Mean (SD)	Yes (N = 70) N (%) or Mean (SD)	No (N = 186) N (%) or Mean (SD)
Age	74.8 (11.0)	76.1 (10.2)	74.3 (12.1)	75.8 (10.3)	72.8 (11.5)	76.1 (10.2)	74.3 (10.1)	75.1 (11.1)	65.3 (14.4)	76.5 (10.6)	69.3 (12.0)	74.3 (10.9)
Gender												
Female	298 (36.3%)	524 (63.7%)	113 (13.9%)	701 (86.1%)	150 (19.4%)	623 (80.6%)	47 (19.2%)	198 (80.8%)	10 (9.80%)	92 (90.2%)	31 (24.2%)	97 (75.8%)
Nonfemale	297 (39.5%)	455 (60.5%)	83 (11.1%)	667 (88.9%)	142 (19.9%)	573 (80.1%)	51 (20.3%)	200 (79.7%)	20 (27.0%)	54 (73.0%)	39 (30.5%)	89 (69.5%)
Race/Ethnicity												
Asian	428 (36.1%)	759 (63.9%)	125 (10.6%)	1051 (89.4%)	227 (20.3%)	892 (79.7%)	67 (18.1%)	304 (81.9%)	13 (11.1%)	104 (88.9%)	46 (22.8%)	156 (77.2%)
Black/African American	32 (33.3%)	64 (66.7%)	16 (16.2%)	83 (83.8%)	14 (15.1%)	79 (84.9%)	8 (36.4%)	14 (63.6%)	2 (16.7%)	10 (83.3%)	3 (30.0%)	7 (70.0%)
Caucasian/White	30 (51.7%)	28 (48.3%)	13 (22.4%)	45 (77.6%)	9 (16.1%)	47 (83.9%)	6 (26.1%)	17 (73.9%)	5 (50.0%)	5 (50.0%)	7 (77.8%)	2 (22.2%)
Hispanic/Latino	50 (45.9%)	59 (54.1%)	25 (22.5%)	86 (77.5%)	20 (18.7%)	87 (81.3%)	9 (23.7%)	29 (76.3%)	9 (40.9%)	13 (59.1%)	9 (52.9%)	8 (47.1%)
Other	55 (44.4%)	69 (55.6%)	17 (14.2%)	103 (85.8%)	22 (19.5%)	91 (80.5%)	8 (19.0%)	34 (81.0%)	1 (6.67%)	14 (93.3%)	5 (27.8%)	13 (72.2%)
Medicare ACO												
No	85 (42.1%)	117 (57.9%)	29 (14.3%)	174 (85.7%)	48 (25.3%)	142 (74.7%)	9 (14.8%)	52 (85.2%)	10 (35.7%)	18 (64.3%)	11 (34.4%)	21 (65.6%)
Yes	488 (36.8%)	838 (63.2%)	159 (12.1%)	1158 (87.9%)	236 (18.8%)	1020 (81.2%)	89 (21.2%)	330 (78.8%)	18 (12.7%)	124 (87.3%)	57 (26.3%)	160 (73.7%)
Missing	22 (47.8%)	24 (52.2%)	8 (18.2%)	36 (81.8%)	8 (19.0%)	34 (81.0%)	0 (0%)	16 (100%)	2 (33.3%)	4 (66.7%)	2 (28.6%)	5 (71.4%)
PHQ-2 score												
At least 3	50 (49.0%)	52 (51.0%)	18 (17.3%)	86 (82.7%)			12 (29.3%)	29 (70.7%)	5 (38.5%)	8 (61.5%)		
Less than 3	481 (37.1%)	814 (62.9%)	157 (12.0%)	1148 (88.0%)			69 (17.2%)	331 (82.8%)	22 (15.2%)	123 (84.8%)		
Missing	64 (36.2%)	113 (63.8%)	21 (13.5%)	134 (86.5%)			17 (30.9%)	38 (69.1%)	3 (16.7%)	15 (83.3%)		
GAD-2 score												
At least 3	75 (53.2%)	66 (46.8%)	26 (18.1%)	118 (81.9%)			16 (27.1%)	43 (72.9%)	9 (45.0%)	11 (55.0%)		
Less than 3	460 (36.6%)	797 (63.4%)	150 (11.8%)	1117 (88.2%)			65 (16.8%)	321 (83.2%)	18 (12.9%)	121 (87.1%)		
Missing	60 (34.1%)	116 (65.9%)	20 (13.1%)	133 (86.9%)			17 (33.3%)	34 (66.7%)	3 (17.6%)	14 (82.4%)		
HPI percentile												
1st quartile	45 (42.9%)	60 (57.1%)	16 (15.5%)	87 (84.5%)	27 (27.6%)	71 (72.4%)	9 (25.7%)	26 (74.3%)	3 (25.0%)	9 (75.0%)	9 (42.9%)	12 (57.1%)
2nd quartile	73 (34.0%)	142 (66.0%)	33 (15.6%)	178 (84.4%)	39 (19.5%)	161 (80.5%)	14 (22.2%)	49 (77.8%)	6 (19.4%)	25 (80.6%)	14 (41.2%)	20 (58.8%)
3rd quartile	190 (39.9%)	286 (60.1%)	64 (13.3%)	417 (86.7%)	95 (21.0%)	358 (79.0%)	29 (18.5%)	128 (81.5%)	12 (20.7%)	46 (79.3%)	25 (30.5%)	57 (69.5%)
4th quartile	255 (35.8%)	457 (64.2%)	72 (10.2%)	633 (89.8%)	119 (17.6%)	557 (82.4%)	44 (20.2%)	174 (79.8%)	6 (9.09%)	60 (90.9%)	20 (18.5%)	88 (81.5%)

(Continues)

TABLE 2 (Continued)

	Had Unmet Needs				Referred for Services to Address Unmet Needs					
	Medication		Food		Medication		Food		Mental Health	
	Yes (N = 595) N (%) or Mean (SD)	No (N = 979) N (%) or Mean (SD)	Yes (N = 196) N (%) or Mean (SD)	No (N = 1368) N (%) or Mean (SD)	Yes (N = 98) N (%) or Mean (SD)	No (N = 1196) N (%) or Mean (SD)	Yes (N = 30) N (%) or Mean (SD)	No (N = 146) N (%) or Mean (SD)	Yes (N = 70) N (%) or Mean (SD)	No (N = 186) N (%) or Mean (SD)
Missing	32 (48.5%)	34 (51.5%)	11 (17.2%)	53 (82.8%)	2 (8.7%)	21 (91.3%)	3 (33.3%)	6 (66.7%)	2 (18.2%)	9 (81.8%)
Risk score	14.1 (5.08)	13.3 (5.19)	13.9 (5.32)	13.6 (5.16)	13.6 (5.01)	14.0 (5.13)	16.4 (5.36)	13.1 (5.23)	13.6 (5.17)	13.8 (4.72)
Missing	53 (37.1%)	90 (62.9%)	18 (13.4%)	116 (86.6%)	2 (4.7%)	41 (95.3%)	4 (25.0%)	12 (75.0%)	2 (10.5%)	17 (89.5%)

Abbreviations: ACO, accountable care organization; GAD, general anxiety disorder; HPI, healthy place index; PHQ, Personal health questionnaire.

differences in having unmet needs for any of the three services at the conventional level ( $p < 0.05$ ), those in the first (15.5%) and second (15.6%) quartiles and those missing address data to calculate HPI (17.2%) had higher rates of food insecurity compared to those in the third (13.3%) and fourth (10.2%) quartiles. Those in the first HPI quartile (42.9%) and missing HPI data (48.5%) also had a higher probability of having unmet needs for medicine than those in the other quartiles (2nd 34.0%, 3rd 39.9%, 4th 35.8%). Furthermore, those referred for food insecurity were younger, nonfemale, Black, and Hispanic. The same groups also had higher rates of referrals for mental health services.

Regression analyses showed racial factors significantly associated with the average marginal effects (ME) of having unmet needs and of being referred for additional services (Table 3). Compared with Whites, Black patients (ME 0.14, 90% CI:  $-0.0029$ , 0.29) had 0.14 percentage points higher probability of being at risk of not having enough medications. Those with anxiety ( $GAD2 > 2$ ) (ME 0.13, 90% CI: 0.04, 0.23) and a higher risk score (ME 0.0059, 90% CI: 0.00069, 0.011) were associated with a slightly higher probability of not having enough medications. Blacks (ME 0.11, 90% CI:  $-0.01$ , 0.22), and Hispanics (ME 0.11, 90% CI: 0.02, 0.2) had a significantly higher probability of food insecurity. While older age, Blacks and Hispanics were associated with lower probabilities of having unmet needs for mental health services, higher risk scores were associated with a higher probability of having unmet needs for mental health services.

Table 3 also displays the factors associated with being referred for additional services. Among them, Asians had 0.30 percentage points higher probability for being referred for medication services (ME 0.30, 90% CI: 0.06, 0.54). A lower probability for food insecurity referral was found among those in Medicare ACO (ME  $-0.19$ , 90% CI:  $-0.37$ ,  $-0.008$ ), while higher probabilities were found among non-females (ME 0.15, 90% CI: 0.04, 0.26), and those with anxiety ( $GAD2 > 2$ ) (ME 0.15, 90% CI:  $-0.008$ , 0.31). A lower probability for mental health services referral was found among older age (ME  $-0.007$ , 90% CI:  $-0.013$ ,  $-0.0019$ ). Groups with higher probabilities for mental health services referral were Blacks (ME 0.53, 90% CI: 0.25, 0.81) and those living in the 2nd quartile of HPI (ME 0.19, 90% CI:  $-0.0029$ , 0.38) when compared with Whites and those living in the 4th quartile of HPI, respectively.

## 4 | DISCUSSION

Overall, 45% of older adults reached by this effort had at least one unmet need. This proactive outreach to identify and address these unmet needs highlighted the imperative for AFHS to integrate social determinants of health in serving its patients, besides having highly ranked medicine for seniors, geriatric emergency departments, and inpatient hospitals. It also uncovered the association between anxiety symptoms and a higher probability of unmet needs for medication and of referral for food insecurity, whereas depression symptoms did not appear to be a significant factor. Had we only asked about depression, we would have missed the influence of anxiety and lost some

**TABLE 3** Factors associated with having unmet needs and with being referred for services to address unmet needs

	Having unmet needs (Average marginal effect, 90% CI)			Being referred for services to address unmet needs (Average marginal effect, 90% CI)		
	Medication	Food	Mental health	Medication	Food	Mental health
Age	-0.00087 [-0.0036, 0.0018]	-0.00096 [-0.0027, 0.00081]	-0.0044*** [-0.0063, -0.0024]	0.00042 [-0.0036, 0.0044]	-0.0043** [-0.0083, -0.00026]	-0.0074*** [-0.013, -0.0019]
Gender: Nonfemale	0.019 [-0.036, 0.073]	-0.029 [-0.066, 0.0072]	-0.0096 [-0.052, 0.033]	0.027 [-0.052, 0.11]	0.15*** [0.04, 0.26]	0.066 [-0.049, 0.18]
Race/Ethnicity: Asian	-0.011 [-0.12, 0.1]	0.048 [-0.036, 0.13]	-0.058 [-0.14, 0.023]	0.30** [0.06, 0.54]	0.13 [-0.1, 0.37]	0.04 [-0.29, 0.37]
Race/Ethnicity: African American	0.14* [-0.0029, 0.29]	0.11* [-0.01, 0.22]	-0.076* [-0.16, 0.012]	0.06 [-0.14, 0.26]	0.24 [-0.067, 0.55]	0.53*** [0.25, 0.81]
Race/Ethnicity: Hispanic/Latino	0.073 [-0.037, 0.18]	0.11** [0.023, 0.2]	-0.066* [-0.14, 0.003]	0.057 [-0.094, 0.21]	0.084 [-0.088, 0.25]	0.12 [-0.12, 0.36]
Race/Ethnicity: Other	0.029 [-0.075, 0.13]	0.039 [-0.036, 0.11]	-0.029 [-0.11, 0.048]	0.034 [-0.12, 0.18]	-0.14*** [-0.21, -0.077]	0.11 [-0.14, 0.37]
Medicare ACO	-0.054 [-0.14, 0.035]	0.00076 [-0.055, 0.057]	-0.037 [-0.11, 0.033]	0.036 [-0.083, 0.16]	-0.19** [-0.37, -0.008]	-0.16 [-0.37, 0.051]
PHQ-2 score at least 3	0.04 [-0.073, 0.15]	0.036 [-0.034, 0.1]	0.061 [-0.07, 0.19]	0.061 [-0.07, 0.19]	0.011 [-0.18, 0.2]	0.011 [-0.18, 0.2]
GAD-2 score at least 3	0.13*** [0.04, 0.23]	0.031 [-0.03, 0.091]	0.095 [-0.019, 0.21]	0.095 [-0.019, 0.21]	0.15* [-0.0083, 0.31]	0.19* [-0.02, 0.21]
HPI percentile: 1st quartile	0.0016 [-0.11, 0.11]	-0.017 [-0.079, 0.046]	0.065 [-0.031, 0.16]	0.026 [-0.14, 0.19]	-0.014 [-0.18, 0.15]	0.0071 [-0.2, 0.21]
HPI percentile: 2nd quartile	-0.06 [-0.14, 0.021]	0.027 [-0.032, 0.085]	0.011 [-0.053, 0.076]	0.029 [-0.1, 0.16]	0.024 [-0.11, 0.15]	0.19* [-0.0029, 0.38]
HPI percentile: 3rd quartile	0.017 [-0.046, 0.079]	0.022 [-0.021, 0.065]	0.023 [-0.026, 0.071]	-0.033 [-0.12, 0.053]	0.076 [-0.044, 0.2]	0.081 [-0.052, 0.21]
Risk score	0.0059** [0.00069, 0.011]	0.0013 [-0.0022, 0.0048]	0.0039* [-0.00019, 0.008]	-0.0036 [-0.011, 0.0043]	0.0046 [-0.0036, 0.013]	-0.0043 [-0.016, 0.008]
N	1255	1266	1344	399	140	233
AIC	1660.93	942.19	1327.17	404.07	94.74	271.37
BIC	1732.82	1014.20	1389.61	459.92	135.93	312.78
Pseudo R2	0.04	0.04	0.04	0.06	0.58	0.19

Note: \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.10$ . Comparison groups were: female, White, Non-Medicare ACO, PHQ-2 less than 3, GAD-2 less than 3, HPI in 4th quartile. Abbreviations: ACO, accountable care organization; GAD, general anxiety disorder; HPI, healthy place index; PHQ, personal health questionnaire.



opportunities. This is an actionable observation for health care providers to recognize unmet mental health needs that include anxiety and to ask about medications or food needs.

Racial minority patients had a significantly higher probability of having unmet needs for medicine, food, and mental health services. They also had a higher probability of being referred for services to address those unmet needs. Furthermore, patients living in areas with lower resources (lower quartiles of HPI distribution) had higher rates of experiencing food insecurity, insufficient medication supplies, and higher probabilities of being referred for mental health services. These findings resonate with a recent report on the CMS accountable health community initiative aimed at addressing the critical gap between clinical care and community services in a health delivery system.<sup>6</sup> Community-based organizations partnering with a health system identified remarkable health-related social needs and provided a multitude of support services among Medicare and Medicaid beneficiaries, including food and housing assistance.<sup>6</sup>

This study has several limitations. First, the study partially addresses two components of the 4Ms of AFHS<sup>1</sup> related to medications and some mentation (depression, not dementia or delirium). While food security clearly matters to older adults, the study lacks direct measure of their health care wishes and mobility, the other 2Ms. However, these readily available measures, although imperfect, can be used by health systems to improve their age-friendliness.<sup>1</sup> Second, minority and more disadvantaged patients were underrepresented. It is plausible that a higher proportion of those patients were working during the day and were not able to answer the call. Oversampling of minoritized and disadvantaged patients should be attempted in the future. Third, the sample size was relatively small, and because HPI is derived from census tract data and multiple patients can live in the same tract, variations in HPI may be more limited than variations in smaller geographic units, such as census block group or block. Therefore, it may be reasonable to reduce the confidence interval to 90% from the conventional 95% confidence interval. Furthermore, some patients did not have address data and HPI. They could possibly be patients without stable housing or were unhoused and should be prioritized for more follow-up. Fourth, persons with dementia were excluded as participation in a telephone interview could be difficult for those patients. Last, this project was conducted in one academic health system (among over 2700 health systems) with age-friendly recognitions in a large urban area during an unprecedented time – COVID lockdown. Results may not be generalizable.

## 5 | CONCLUSION

Significant disparities existed across gender, race, and community resource groups in their needs for food, medication, and mental health services among vulnerable older adults during the COVID-19 pandemic. This outreach effort enabled us to identify those with such unmet needs and refer them for additional services that could address select components of the 4Ms.

The findings of the study suggest that future efforts of AFHS and health systems, in general, should consider HPI in addition to race and ethnicity. Such targeted approaches can play a role in changing the course of a troubling historical trajectory of inequity. Resource allocation frameworks that increase the chances of older adults from more disadvantaged communities—and particularly those of color—to be provided services to address their unmet needs for all components of the 4Ms can help to reduce inequity and can be one way of mitigating the consequences of past, and in many ways, still ongoing wrongs.<sup>14</sup>

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University of California San Diego Health System Population Health Services.

## ORCID

Ming Tai-Seale  <https://orcid.org/0000-0001-9272-066X>

Michael W. Cheung  <https://orcid.org/0000-0003-2913-7265>

Jamie Kwak  <https://orcid.org/0000-0003-3842-9980>

Victoria Harris  <https://orcid.org/0000-0003-2299-044X>

Samantha Madonis  <https://orcid.org/0000-0003-2235-6510>

Lc Russell  <https://orcid.org/0000-0001-6505-3531>

Eileen Haley  <https://orcid.org/0000-0003-1253-2998>

Parag Agnihotri  <https://orcid.org/0000-0002-6798-5671>

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