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Social Needs Network for Evaluation and Translation

Social Needs and Health Care Utilization Among Older Adults of Kaiser Permanente Northwest

July 2023

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Contents

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Social Needs Network for Evaluation and Translation

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Executive summary

Why we did our project

Social needs like financial strain, housing instability, and social isolation are linked to poor health outcomes and increased health care utilization among older adults.[1-8] Increased social isolation during the COVID-19 pandemic further highlighted the importance of looking at social needs among people age 65 and over.[9-11] Our project used data from the Medicare Total Health Assessment (MTHA) survey (see Appendix A) **to quantify the contribution of the number of social needs to emergency department (ED) and inpatient hospital encounters** and assess which social needs are most significantly linked to ED and inpatient hospital encounters.

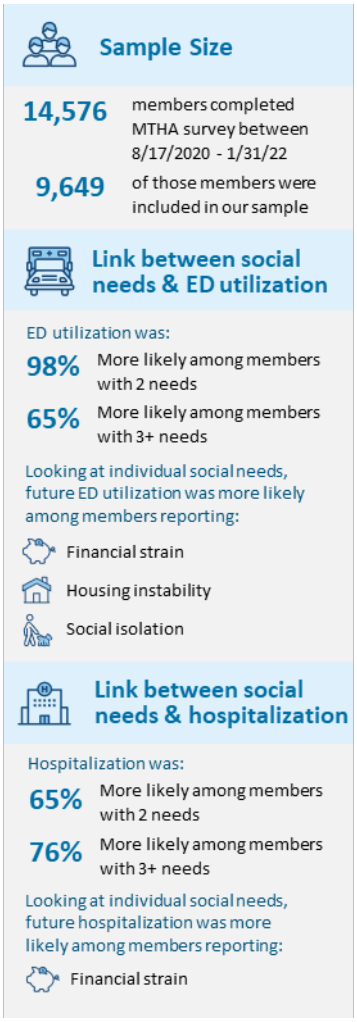
What we did

We linked MTHA surveys and the electronic health record data (EHR) of 9,649 Kaiser Permanente Northwest (KPNW) members with publicly available neighborhood data to understand the relationship between members' social risks and their ED and hospital utilization in the 12 months following the completion of an MTHA survey. Specifically, we:

- Examined the relationship between the **number of social needs** and future health care utilization.
- Analyzed the link between **individual social needs** and future health care utilization.

What we learned

- Members with 2 social needs were **98%** more likely to have an ED visit and **65%** more likely to have one or more hospital admissions.
- Members with 3 or more social needs were **65%** more likely to have an ED visit **and 76%** more likely to have 1 or more hospital admissions.
- Members with more social needs were more likely to have future ED utilization and hospital admissions.
- **Financial strain, housing instability, and social isolation** were significant independent predictors of future ED utilization.
- **Financial strain** was significantly linked to future hospital admissions.



How we can use this work to advance social health practice at KP and beyond

Our findings highlight the potential impact of social needs on emergent health care services that are costly and pose an undue burden on the health system. This report points to potential areas to focus and allocate resources: **populations with 2 or more social needs** and populations who are specifically facing **financial strain, housing instability, or social isolation**. Further, our findings emphasize the importance of routine screening for social needs as part of the standard of care and may help our clinical and health care operations partners to **design and test social care-informed programs** to reduce unnecessary health services use.

Introduction

Why health systems are engaging in social health

Social needs like financial strain and housing instability are associated with poor health outcomes and increased use of health care services among older adults.[1-8] Increased social isolation during the COVID-19 pandemic has further highlighted the importance of examining social needs, specifically within people age 65 and over.[9-11]

How health systems can use our findings

Our study **examines the relationship between social needs and future health care utilization** by linking responses from the Medicare Total Health Assessment (MTHA) Survey with future utilization. Members age 65 and over are invited to complete the MTHA prior to their annual wellness visit, and it is used to assess areas important to overall well-being, including social needs. **Kaiser Permanente and other health care systems can use our findings to:**

1. Identify which populations are more likely to use the ED and hospital in the future.

2. Provide data to develop risk models and programs for patients at high risk of unnecessary and/or excess future utilization. Developing these risk models can help determine if providing necessary services to patients with specific social risk profiles reduces future health care utilization.

Scientific aims

Our primary aim is to evaluate the relationship between **number of social needs** with future health care utilization.

Our secondary aim is to evaluate the relationship between **individual social needs** and future health care utilization.

PRIMARY AIM

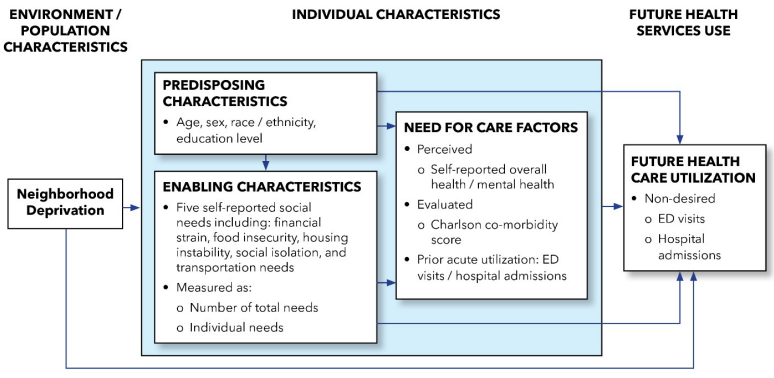
SECONDARY AIM

We hypothesize that members with a higher number of social needs will have higher health care utilization and the relationship between social needs and health care utilization will differ by type of need.

Scientific framework

We applied the Andersen Behavioral Model of Health Services Use (see Figure 1)[12-15] to study the social needs linked to health care utilization among **9,649** KNPW members who filled out the MTHA survey (see Appendix A for survey questions) and had complete utilization and covariate information available. Our analyses looked at how the presence of social needs (the primary enabling characteristic) affected ED utilization and hospital admissions.

Figure 1. Conceptual model linking social needs with health care utilization



Appendix B describes each component of the Andersen Behavioral Model.

Methods

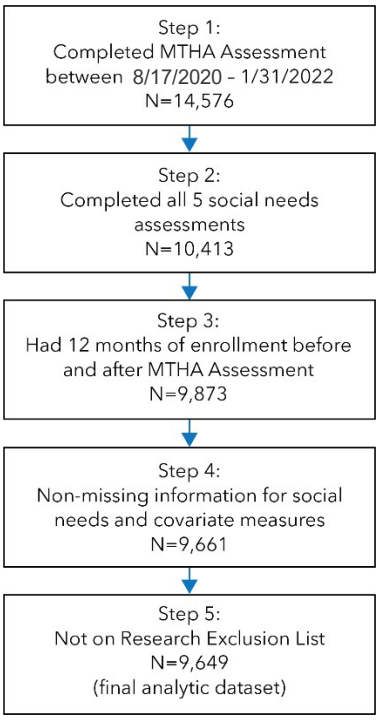
Study design, data sources, and sample

This retrospective cohort study linked data from 3 sources:

1) KPNW's Medicare Total Health Assessment Survey (MTHA)
2) KPNW's electronic health record (EHR) to identify utilization information and patient characteristics
3) Publicly available neighborhood deprivation measures

Our analysis includes **9,649 KPNW members** who were age 65 and over, completed an MTHA survey between **08/17/2020 and 1/31/2022**, and answered questions about social needs (financial strain, food insecurity, housing instability, transportation, and social isolation). We excluded members who did not have 12+ months of continuous health plan coverage before and after their survey date, were missing information for study measures, or were on KPNW's research exclusion list. A detailed flow chart showing how we selected the study population is shown below (see Figure 2).

Figure 2. How the study population was selected



Study variables

Health care utilization

ED visits and hospital admissions were the primary outcome measures for this analysis. Both measures were identified via the Center for Health Research (CHR)'s Research Data Warehouse (RDW) and analyzed in the 12 months following MTHA survey completion. The RDW is a curated clinical database developed to facilitate research and aggregate data on all medical and dental services received by KPNW members via the EpicCare®-EHR. Each outcome measured any use (yes/no) and included all-cause utilization.[16]

Social needs measures

The number of total social needs and the 5 individual social needs measures (see Table 1 on next page) are the primary exposure variables — i.e., the variables we thought would have an effect on future health care utilization. For this analysis, "social needs" are equivalent to "social risks." Our analysis determines whether a member reported having a need (yes/no), and not whether the member made a request for assistance with a need.

- The total number of social needs was categorized as follows: none, 1 need, 2 needs, 3+ needs.
- The MTHA assessed 5 individual social needs: financial strain, food insecurity, housing instability, transportation, and social isolation).

Covariate Measures

Covariate measures were based on the Andersen Behavioral Model of Health Services Use and included predisposing characteristics, need-for-care, and environment factors related to health care utilization (Figure 1).

Predisposing characteristics — including age, sex, race and ethnicity, and education level — were assessed via the MTHA survey and RDW.

Need-for-care characteristics were also assessed via the MTHA survey and RDW. These measures included: the Charlson Comorbidity Index (CCI), self-reported general health, and self-reported mental health. ED utilization and hospital admissions in the prior year were also considered as need-for-care factors since they serve as a proxy measure for severity of illness via unmet need and possible delays in care.

Environment characteristics were extracted from publicly available census data and included a neighborhood deprivation measure.

Statistical analysis

We used descriptive statistics to assess predisposing, environment, need for-care, and enabling characteristics. Before building multivariable logistic regression models, we used appropriate diagnostics to assess for collinearity among each of the independent (enabling) and covariate variables (predisposing, environment, and need- for-care characteristics).

We used logistic regression to examine:

- The relationship between the number of social needs and ED utilization and hospital admissions.
- The relationship between individual needs (analyzed collectively) and ED utilization and hospital admissions.

All covariate variables were included in final logistic regression models for both Aim 1 and Aim 2 analyses because no collinearity was found among independent variables and covariate measures.

Table 1. Description of social needs

Social need variable	Description	Categorization
Number of social needs (Aim 1)		
	Count of social needs endorsed on MTHA survey. Needs include any of the following: financial strain, food insecurity, housing instability, social isolation and transportation needs.	None, 1 need, 2 needs, 3+ needs
Individual social needs (Aim 2)		
Financial strain (1 item)	Ability to pay for basics such as food, housing, medical care, and heating rated as “very hard”, “hard” or “somewhat hard”.	Yes, No
Food insecurity (2 items)	In past 12 months, rated the following as “sometimes true” or “often true”: 1) worried food would run out before more could be bought or 2) food bought would not last and did not have money to get more.	Yes, No
Housing instability (3 items)	In the past 12 months, any of the 3 conditions occurred: 1) unable to pay the mortgage or rent on time, 2) lived in 3 or more places or 3) did not have a steady place to sleep or slept in a shelter (including now).	Yes, No
Social isolation (1 item)	Respondent felt lonely or isolated from people around them “sometimes”, “always” or “often”.	Yes, No
Transportation needs (2 items)	In the past 12 months, lack of transportation: 1) kept respondent from medical appointments or from getting medications or 2) kept respondent from meetings, work, or from getting things needed for daily living.	Yes, No

Results

Key findings

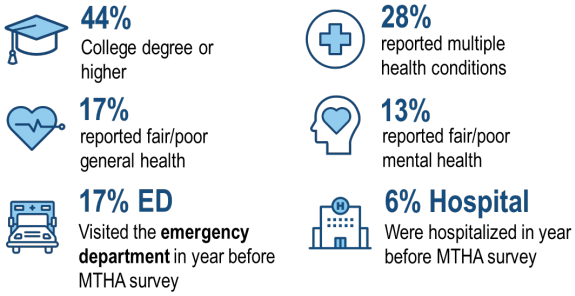
- **One-third** of older adult members (age 65+) utilizing Medicare wellness visits reported at least 1 social need.
- **6.4%** of the study population reported 2 or more social needs. Having 2 or more needs was strongly linked with future ED utilization and hospital admissions.
- **Financial strain, housing instability, and social isolation** were independently linked with future ED utilization.
- **Financial strain** was independently linked with future hospital admissions.

What we learned about members and their social needs

Our sample was primarily made up of members who were white (92%), identified as female (57%), and were 65 to 74 years old (65%).

- 44% had a college degree or higher.
- 17% reported fair or poor general health, and 13% reported fair or poor mental health.
- 28% had multiple health conditions.
- 17% had any ED utilization and 6% had any hospitalization during the year before completing an MTHA survey.

Figure 3. Predisposing and need-for-care factors

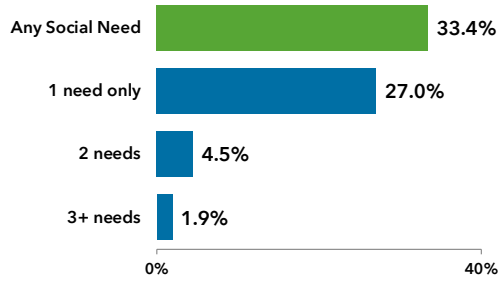


Appendix C Supplemental Table 1 shows descriptive results for predisposing, environment, and need-for-care characteristics.

The primary environmental characteristic — the Neighborhood Deprivation Index (NDI) — showed that about 34% of study members lived in the most deprived neighborhoods.

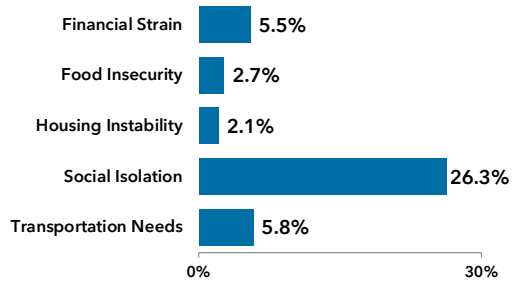
For enabling factors, about 33% of study members reported any social need, 27% reported 1 social need, and 6.4% reported 2 or more needs.

Figure 4. Count of aggregate social needs



The most common needs were social isolation (26.3%), transportation (5.8%), and financial strain (5.5%).

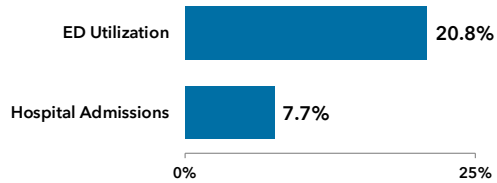
Figure 5. Frequency of Individual Social Needs



In the year after completing an MTHA survey:

- 20.8% had any ED utilization
- 7.7% had any hospital admissions

Figure 6. Frequency of Individual Social Needs



Appendix C Supplemental Table 2 shows descriptive results for enabling characteristics.

Relationship between number of social needs and future heath care utilization

Table 2 presents full results of the adjusted odds ratios (ORs) of future ED utilization and hospital admissions by number of social needs. The adjusted ORs control for predisposing, environmental, and need characteristics known to influence health care utilization.

Adjusted ORs and ED utilization

Compared to members with no socials needs, **ED utilization** in the year after completing an MTHA survey was:

- **98%** more likely for members with 2 needs
- **65%** more likely for members with 3+ needs

Adjusted ORs and hospital admission

Compared to members with no socials needs, **any hospital admission** in the year after completing an MTHA survey was:

- **65%** more likely for members with 2 needs
- **76%** more likely for members with 3+ needs

Table 2. Logistic regression results: Relationship between number of social needs with ED utilization and hospital admissions*

Number of Social Needs	ED Utilization	Hospital Admissions
	Adjusted OR (95% CI)	Adjusted OR (95% CI)
0 (reference group)	1.00 ---	1.00 ---
1	1.11 (0.98-1.25)	1.05 (0.88-1.26)
2	**1.98 (1.59-2.48)**	**1.65 (1.22-2.25)**
3+	**1.65 (1.18-2.31)**	**1.76 (1.15-2.71)**

Relationship between individual social needs and future heath care utilization

Table 3 shows full results of the adjusted odds ratios (ORs) of future ED utilization and hospital admissions by type of social need. The adjusted ORs control for predisposing, environmental, and need characteristics known to influence health care utilization.

Adjusted ORs and ED utilization

The likelihood of **future ED utilization** increases significantly when members experience: financial strain (+40%), housing instability (+43%), and social isolation (+19%).

Adjusted ORs and hospital admission

The likelihood of **future hospital admission** increases significantly only when members experience financial strain (+66%).

Logistic regression results for these analyses are shown in Appendix C Supplemental Tables 3 and 4.

Table 3. Logistic regression results: Relationship between individual social needs with ED utilization and hospital admissions*

Individual Social Needs	ED Utilization	Hospital Admissions
	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Financial strain (yes vs. no)	**1.40 (1.11-1.76)**	**1.66 (1.23-2.23)**
Food insecurity (yes vs. no)	1.07 (0.78-1.48)	1.16 (0.76-1.78)
Housing instability (yes vs. no)	**1.43 (1.02-1.99)**	0.76 (0.46-1.27)
Social isolation (yes vs. no)	**1.19 (1.05-1.34)**	1.14 (0.95-1.37)
Transportation needs (yes vs. no)	1.16 (0.94-1.43)	1.03 (0.75-1.39)

***** Models adjusted for predisposing characteristics: age, sex, race/ethnicity, education level; environment characteristics: NDI; and need factors: self-reported general (overall) health, self-reported mental health, CCI, prior ED utilization and prior hospital admissions.

Conclusions and future directions

Summary of key findings

Social needs are common among members age 65 and older

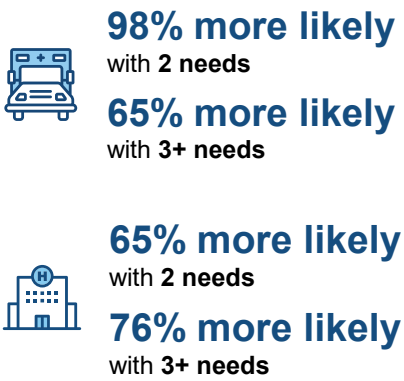
About **1 in 3** members reported any social need on the MTHA survey. The percentage reporting social needs ranged from **2.1%** (housing instability) to **26.3%** (social isolation). **6.4%** of members had 2 or more social needs.

Having 2 or more social needs was linked to increased ED utilization and hospital admissions

Compared to members with no social needs:

- Members with **2 social needs** were:
  - **98%** more likely to have any ED utilization in the 12 months after completing an MTHA survey
  - **65%** more likely to have any hospital admissions in the 12 months after completing an MTHA survey
- Members with **3+ social needs** were:
  - **65%** more likely to have any ED utilization in the 12 months after completing an MTHA survey
  - **76%** more likely to have any hospital admissions in the 12 months after completing an MTHA survey

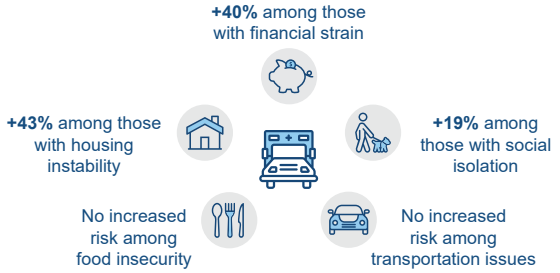
Figure 7. Likelihood of ED utilization or hospital admission by number of social needs



Financial strain, housing instability, and social isolation were independently linked to future ED utilization

The presence of **financial strain, housing instability** or **social isolation** was **independently** linked to increased ED utilization in the 12 months after completing an MTHA survey.

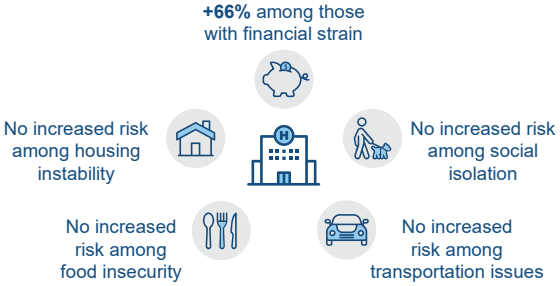
Figure 8. Likelihood of future ED utilization by individual social needs



Financial strain was independently linked to future hospital admissions

The presence of **financial strain** was **independently** linked to increased hospital admissions in the 12 months after completing an MTHA survey.

Figure 9. Likelihood of future hospital admission by individual social needs



A small percentage of the study population is driving future health care utilization

Although members with **2 or more social needs** account for only 6.4% of the study population, this subgroup is a strong driver of future ED utilization and hospital admissions.

Conclusions

This innovative study examined the relationship between social needs and future health care utilization among KPNW members age 65 and over who completed the MTHA survey. Our results suggest that having **2 or more social needs** is the critical cut point in predicting future health care utilization. We also found several relationships between independent needs and ED utilization and hospital admissions.

Compared to members with no needs:

- Members reporting financial strain were more likely to **use the ED and be admitted to the hospital.**
- Members reporting financial strain, housing instability, or social isolation were significantly more likely to **use the ED.**

These study results identify potential members for whom health systems can develop programs to decrease future health care utilization among older adults with social needs.

Limitations

Although our study was strong from a methods standpoint, it has some limitations. The study population only included members from the KPNW region. Second, although members who complete the MTHA are likely representative of a Medicare-eligible population seeking wellness visits, it may not be representative of the general Medicare population. Lastly, the study population was not racially or ethnically diverse, with less than 10% being Hispanic or a race other than white. (See Appendix C Supplemental Table 1 for a full breakdown of race and ethnicity among the study population.)

Recommendations for health systems

Based on our study findings, we have 3 general recommendations for health care systems:

1. Focus on populations with 2 or more social needs

   To maximize efficiency of resources and reduce health care utilization, future programs should focus on populations age 65 and older with 2 or more socials needs. Such programs can be developed on a population level.

2. Prioritize financial strain, housing needs, and social isolation in programs to reduce future utilization

   To reduce ED utilization among members aged 65 and over, programs should prioritize assistance with financial strain, housing needs and social isolation. Similarly, to reduce hospital admissions, future programs should address financial strain concerns.

3. Develop risk profiles based on member-level profiles

   Health systems should develop “real-time” risk profiles based on members’ specific social needs. Such information could be used to develop and test programs to decrease future health care utilization among older adults with social needs.

Future research should aim to:

1. Replicate study findings in populations with chronic conditions and racially and ethnically diverse populations — both under age 65 and age 65 and older.
2. Evaluate the effectiveness of programs to resolve social needs — and examine whether resolution of social needs is linked to subsequent reductions in ED utilization and hospital admissions.

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Appendices

Appendix A. Medicare Total Health Assessment (MTHA) Survey Questions

Social Needs Questions

1. Financial Strain (1 item)

How hard is for you to pay for the very basics like food, housing, medical care and heating?

_ Very Hard _Hard _ Somewhat hard _Not very hard _Not hard at all

2. Food Insecurity (2 items)

Within the past 12 months, you worried that your food would run out before you got money to buy more.

_ Never true _Sometimes true _ Often true

Within the past 12 months, the food you bought didn't last and you didn't have money to get more.

_ Never true _Sometimes true _ Often true

3. *Housing Instability (3 items)*

In the past 12 months, was there a time when you were not able to pay the mortgage or rent on time?

_ Yes _ No

In the last 12 months, how many places have you lived?

_ 1 _2 _ 3 or more

In the past 12 months, was there a time when you did not have a steady place to sleep or slept in a shelter (including now) ?

_ Yes _ No

4. *Social Isolation (1 item)*

How often do you feel lonely or isolated from those around you?

_ Never _Rarely _ Sometimes _Often _Always

5. *Transportation Needs (2 items)*

In the last 12 months, has lack of transportation kept you from medical appointments or from getting medications?

_ Yes _ No

In the last 12 months, has lack of transportation kept you from meetings, work or from getting things needed for daily living?

_ Yes _ No

Education

What was the highest grade or level of school that you have completed?

__ 8th grade or less

__ Some high school, but did not graduate

__ High school graduate or GED

__ Some college or 2-year degree

__ 4-year college graduate (B.A., B.S., etc.)

__ More than a 4-year college degree

General (Overall) Health

In general, would you say your health is:

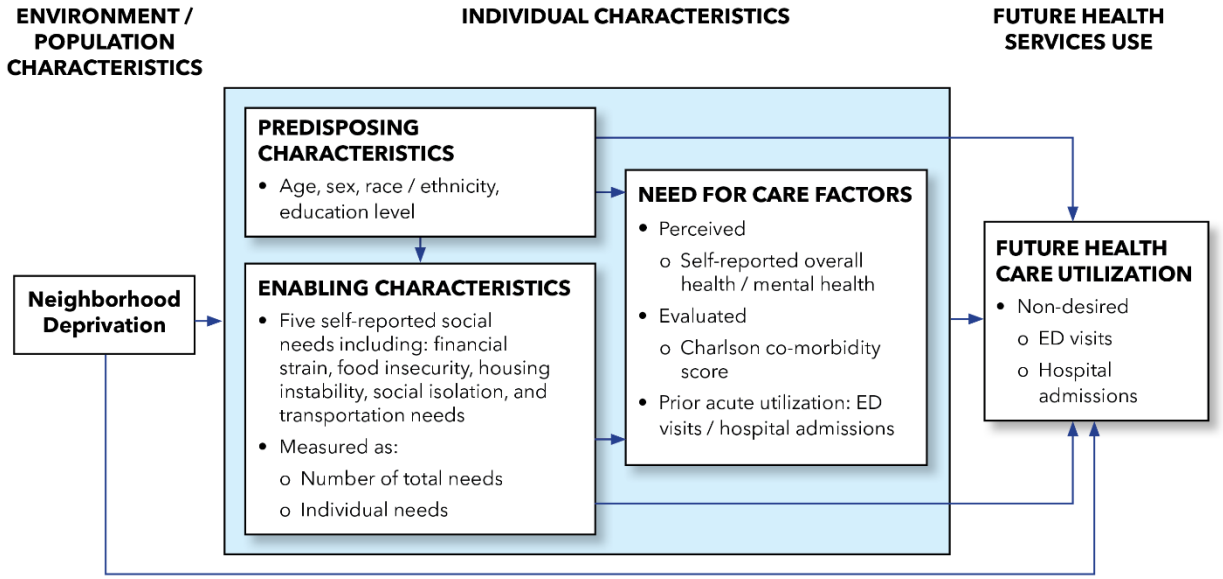
_ Excellent _Very Good _ Good _Fair _Poor

Mental Health

In general, would you rate your overall mental or emotional health?

_ Excellent _Very Good _ Good _Fair _Poor

Appendix B. Andersen Behavioral Model of Health Services Utilization



- Enabling resources include resources available to community that enable access to health care (e.g., health insurance coverage). For this study, self-reported social needs were the primary enabling variables and included: financial strain, food insecurity, housing instability, social isolation and transportation needs.

- Predisposing characteristics include factors that historically "predispose" use of health services. For this study, these measures include age, sex, race/ethnicity and levels of education attainment.

- Environment/population health characteristics include community and neighborhood-level measures that are associated with health care utilization. For this study, the neighborhood deprivation index (NDI) is the primary environment level measure.

- Need-for-care factors include individual-level perceived health status (e.g. member's self-reported health) and evaluated health status (e.g. health status documented in electronic health record [EHR]). For this analysis, two perceived health status measures include: a) self-reported overall health and b) self-reported mental health. Two evaluated health status measures include: a) Charlson co-morbidity score (CCI) and 2) prior health acute care utilization (ED visits and hospital admissions). Prior health care utilization (ED visits and hospital admissions) are new measures of evaluated health status for this study; often since these visits represent need for care – in acute care settings.

- Future health care utilization includes both desirable and undesirable health care utilization. For this study, ED utilization and hospital admissions in the 1-year after MTHA assessment.

Appendix C. Supplemental Tables

Supplemental Table 1. Population description: Predisposing, environment, and need characteristics

Population measures	Total population (N=9,649)
Predisposing characteristics	
Age, N (%)	
65-74	6,268 (65.0%)
75-84	2,897(30.0%)
85+	484 (5.0%)
Mean +/- SD	73.4 +/- 5.8
Sex, N (%)	
Female (vs. male)	5,463 (56.6%)
Race and ethnicity, N (%)	
Asian or Asian-American	197 (2.0%)
Black or African American	107 (1.1%)
Hawaiian or Pacific Islander	18 (0.2%)
Hispanic/Latinx	196 (2.0%)
Native American or Alaska Native	20 (0.2%)
White	8,906 (92.3%)
More than one race or "other" race	205 (2.1%)
Highest education level, N (%)	
High school or less	1,934 (20.1%)
Some college/2-year degree	3,521 (36.5%)
College graduate or higher	4,194 (43.5%)
Environment characteristics	
Neighborhood Deprivation Index (NDI, mean +/- SD; min = -1.78, max=2.96)	-0.3 +/- 0.6
NDI, N (%)	
Least deprivation (-1.7788 through -0.6141)	3,214 (33.3%)
Moderate deprivation (-0.6136 through -0.1673)	3,205 (33.2%)
Highest deprivation (-0.1667 through 2.9605)	3,230 (33.5%)
Need characteristics	
Self-reported general health (fair/poor vs. good, very good, excellent), N (%)	1,605 (16.6%)
Self-reported mental health (fair/poor vs. good, very good, excellent), N (%)	1,207 (12.5%)
Charlson Co-morbidity Index, N (%)	
0	5,527 (57.3%)
1	1,429 (14.8%)
2+	2,693 (27.9%)
Any prior ED utilization (any vs. none), N (%)	1,594 (16.5%)
Any prior hospital admissions (any vs. none), N (%)	544 (5.6%)

Supplemental Table 2. Description of social needs (enabling characteristics)

Enabling characteristics: Social needs	Total population (N=9,649)
Number of social needs, N (%)	
0	6,431(66.3%)
1	2,601 (27.0%)
2	437 (4.5%)
3+	180 (1.9%)
Individual social needs, N (%)	
Financial strain	529 (5.5%)
Food insecurity	261 (2.7%)
Housing instability	198 (2.1%)
Social isolation	2,534 (26.3%)
Transportation needs	555 (5.8%)

Supplemental Table 3. Full logistic regression model results: Association of number of social needs with ED visits and hospital admissions

Logistic regression models	ED utilization		Hospital admissions	
	OR	95% CI	OR	95% CI
Number of social needs				
0 (ref. group)		1.00		1.00
1	1.11	0.98-1.25	1.05	0.88-1.26
2	**1.98**	**1.59-2.48**	**1.65**	**1.22-2.25**
3+	**1.65**	**1.18-2.31**	**1.76**	**1.15-2.71**
Predisposing characteristics				
Age				
65-74 (ref. group)		1.00		1.00
75-84	**1.31**	**1.17-1.47**	**1.40**	**1.19-1.66**
85+	**2.38**	**1.94-2.92**	**1.82**	**1.37-2.42**
Sex				
Male (ref. group)		1.00		1.00
Female	0.95	0.86-1.06	**0.84**	**0.71-0.98**
Race and ethnicity				
White (ref. group)		1.00		1.00
Hispanic or a race other than white	0.95	0.78-1.15	0.73	0.53-1.01
Highest education level				
High school or less (ref. group)		1.00		1.00
Some college or 2-year degree	0.91	0.79-1.05	0.95	0.78-1.15
College graduate or beyond	**0.84**	**0.73-0.97**	**0.74**	**0.60-0.91**
Environment characteristics				
Neighborhood Deprivation Index (NDI), N (%)				
Least deprivation (-1.7788 through -0.6141; ref. group)		1.00		1.00
Moderate deprivation (-0.6136 through -0.1673)	1.02	0.90-1.17	0.99	0.82-1.21
Highest deprivation (-0.1667 through 2.9605)	1.08	0.95-1.23	1.05	0.87-1.27
Need characteristics				
Self-reported general (overall) health				
Good/Very Good/Excellent (ref. group)		1.00		1.00
Fair/Poor	**1.56**	**1.36-1.80**	**1.75**	**1.45-2.12**
Self-reported mental health				
Good/Very Good/Excellent (ref. group)		1.00		1.00
Fair/Poor	**1.18**	**1.00-1.38**	1.00	0.80-1.27
Charlson Co-morbidity Index (CCI)				
0 (ref. group)		1.00		1.00
1	**1.36**	**1.16-1.58**	**1.35**	**1.06-1.71**
2+	**1.95**	**1.72-2.20**	**2.09**	**1.73-2.52**
Any prior ED utilization				
No (ref. group)		1.00		1.00
Yes	**2.06**	**1.79-2.36**	**1.62**	**1.33-1.98**
Any prior hospital admissions				
No (ref. group)		1.00		1.00
Yes	1.16	0.94-1.43	**1.62**	**1.25-2.11**

Supplemental Table 4. Full logistic regression model results: Association of individual social needs (analyzed together) with ED visits and hospital admissions

Logistic regression models	ED utilization		Hospital admissions	
	OR	95% CI	OR	95% CI
Individual social needs				
Financial strain (yes vs. no)	**1.40**	**1.11-1.76**	**1.66**	**1.23-2.23**
Food insecurity (yes vs. no)	1.07	0.78-1.48	1.16	0.76-1.78
Housing instability (yes vs. no)	**1.43**	**1.02-1.99**	0.76	0.46-1.27
Social isolation (yes vs. no)	**1.19**	**1.05-1.34**	1.14	0.95-1.37
Transportation needs (yes vs. no)	1.16	0.94-1.43	1.03	0.75-1.39
Predisposing characteristics				
Age				
65-74 (ref. group)		1.00		1.00
75-84	**1.31**	**1.17-1.47**	**1.41**	**1.19-1.66**
85+	**2.40**	**1.95-2.94**	**1.85**	**1.39-2.47**
Sex				
Male (ref. group)		1.00		1.00
Female	0.95	0.86-1.06	**0.84**	**0.71-0.98**
Race and ethnicity				
White (ref. group)		1.00		1.00
Hispanic or a race other than white	0.95	0.76-1.16	0.73	0.53-1.00
Highest education level				
High school or less (ref. group)		1.00		1.00
Some college or 2-year degree	0.92	0.80-1.05	0.95	0.78-1.16
College graduate or beyond	**0.85**	**0.74-0.98**	**0.75**	**0.61-0.92**
Environment characteristics				
Neighborhood Deprivation Index (NDI), N (%)				
Least deprivation (-1.7788 through -0.6141; ref. group)		1.00		1.00
Moderate deprivation (-0.6136 through -0.1673)	1.02	0.90-1.17	0.99	0.81-1.20
Highest deprivation (-0.1667 through 2.9605)	1.08	0.95-1.23	1.05	0.86-1.27
Need characteristics				
Self-reported general (overall) health				
Good/Very Good/Excellent (ref. group)		1.00		1.00
Fair/Poor	**1.55**	**1.35-1.79**	**1.74**	**1.44-2.11**
Self-reported mental health				
Good/Very Good/Excellent (ref. group)		1.00		1.00
Fair/Poor	**1.18**	**1.00-1.38**	1.01	0.80-1.27
Charlson Co-morbidity Index (CCI)				
0 (ref. group)		1.00		1.00
1	**1.35**	**1.16-1.57**	**1.34**	**1.05-1.70**
2+	**1.94**	**1.71-2.19**	**2.08**	**1.72-2.50**
Any prior ED utilization				
No (ref. group)		1.00		1.00
Yes	**2.06**	**1.79-2.36**	**1.62**	**1.33-1.98**
Any prior hospital admissions				
No (ref. group)		1.00		1.00
Yes	1.17	0.94-1.44	**1.63**	**1.26-2.13**