How do social needs cluster among low-income individuals?

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How Do Social Needs Cluster Among Low-Income Individuals?

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Abstract

Social needs screening in health care settings reveals that many low-income individuals have multiple unmet social needs at the same time. Having multiple simultaneous social needs greatly increases the odds of experiencing adverse health outcomes. To better understand how and which social needs cluster in these cases, the authors examined data from 14,749 low-income adults who completed a social needs assessment in one of 4 separate studies conducted between 2008 and 2019 in the United States. Participants were Medicaid beneficiaries, helpline callers, and daily smokers. Findings were strikingly consistent across the 4 studies. Participants with ≥2 social needs (n = 5621; 38% of total) experienced more stress, depressive symptoms, sleep problems, and chronic diseases and were more likely to rate their health as fair or poor. Social needs reflecting financial strain were highly correlated, such as needing help paying utility bills and needing money for necessities such as food, shelter, and clothing (r = .49 to .71 across studies). Participants experienced 351 distinct combinations of ≥2 social needs. The 10 most common combinations accounted for more than half of all participants with ≥2 needs. Clusters of social needs varied by subgroups. Women with children were more likely than others to need more space in their home and help paying utility bills; low-income men were more likely to be physically threatened and need a place to stay; older, sicker adults were more likely to need money for necessities and unexpected expenses, as well as transportation. Findings are discussed in the context of creating smarter, more efficient social needs interventions.

Keywords: social needs, health disparities, low income, Medicaid, United States

Introduction

As screening for social needs such as housing, food, utilities, childcare, and transportation becomes more common in health care settings,1 we are learning that: (1) many low-income patients experience multiple social needs simultaneously, and (2) having multiple social needs increases the risk of adverse health
outcomes. Understanding how and which social needs cluster in these cases can inform development of more effective and efficient social needs interventions.

Studies in diverse health care and community settings involving different vulnerable populations have reported a high prevalence of multiple social needs\(^2\)–\(^5\) and a dose-response association between the number or intensity of social needs and many adverse health outcomes.\(^2\)\(^6\)–\(^8\) For example, assessing social needs among adult family members with children at 2 safety net hospitals in California, Gottlieb et al found that 20% reported \(\geq 4\) social needs and the average number of needs was 2.6 to 2.9; as the number of social needs increased, so did the odds of poor child health.\(^9\)

Although recent research has focused on social needs surveillance, epidemiology, and intervention in the context of population health and health care, scientists in other disciplines have examined how people cope with multiple social needs. Studies among diverse samples of low-income Americans find that difficulty paying rent and utility bills on time or in full is nearly ubiquitous,\(^10\)\(^,\)\(^11\) and commonly managed by making trade-offs that satisfy one need while perpetuating or deepening another.\(^10\),\(^12\) The most common strategy for dealing with multiple financial needs is “juggling” – a combination of partial, delayed, or nonpayments designed to pay just enough and just often enough to avoid serious consequences such as eviction.\(^10\),\(^11\),\(^13\),\(^14\)

A few studies have examined whether some social needs are prioritized over others when multiple needs are present. Feeding one's family is a top priority even when people cannot pay other bills,\(^15\) and rent and groceries are higher priorities than debts.\(^11\) Other social needs may rise in priority temporarily when accompanied by serious immediate threats such as eviction or utility disconnection.\(^10\),\(^11\)

Decisions about which social needs to prioritize may be explained, in part, by how scarcity – the state of having less than one feels one needs – causes people to understand and manage problems differently than they would in a state of plenty.\(^16\) The focus on fulfilling a pressing social need can lead people to forgo spending smaller amounts of money or time to mitigate future risks, even if longer term consequences could be severe.

Prioritizing among social needs also may be determined by fluctuations in income and eligibility for benefits. Many seasonal workers, hourly wage workers with inconsistent schedules, and low-income workers who qualify for the Earned Income Tax Credit (and therefore receive a lump sum refund), may prioritize different social needs at different times based on changes in household cash flow.\(^11\),\(^17\),\(^18\) Individuals receiving benefits that address specific social needs such as food, housing, or health insurance might shift their remaining resources to other social needs for which targeted assistance is not readily available.

The literature on multiple social needs is evolving and has clear gaps. Little is known about interdependencies among social needs. Do certain social needs co-occur in predictable ways? Do some population subgroups experience common clusters of social needs? This paper provides first-of-its-kind findings from 4 separate studies that collected original social needs data from Medicaid beneficiaries, low-income smokers, and helpline callers. Findings are discussed in the context of helping design and deliver more focused, efficient social needs interventions.

**Methods**

The objectives of this study were to: (1) determine which social needs tend to co-occur and how; (2) identify characteristics that distinguish those with multiple social needs from those with \(\leq 1\) social need; (3) identify, among those with multiple social needs, the most commonly occurring clusters of needs; and (4) explore whether social need profiles vary by population subgroups.

**Data sources**
Analyses examined social needs data collected between June 2010 and October 2019 in 4 independent studies. Across studies, 14,749 individuals completed a social needs screener. No prior analyses of these data have examined the 4 research objectives.

**Study 1** From June 2010 to June 2012, a random sample of adult callers to the 2-1-1 helpline in Missouri (n = 1898) completed a social needs assessment in a baseline telephone survey administered to participants in a randomized trial comparing effects of 3 interventions to increase cancer screening and prevention.\(^8\)

**Study 2** From September 2016 to August 2017, a convenience sample of 1214 adult Medicaid beneficiaries from 35 states (predominantly Georgia, California, New Hampshire, and Missouri) completed a social needs assessment in an online survey.\(^19\)

**Study 3** From July 2018 to June 2019, Medicaid managed care plan members in Louisiana (n = 9385) completed a social needs assessment as part of telephone outreach by the plan's care management team. From March 2019 to June 2019, another 882 members with diabetes also completed the assessment. Additional information about these members (combined n = 10,267) was obtained from medical claims data and other health plan assessments.

**Study 4** From June 2017 to October 2019, a total of 1370 low-income smokers who called 2-1-1 in Missouri were recruited into a randomized intervention trial and completed a social needs assessment in a baseline survey.\(^20\) This was an active trial with ongoing recruitment at the time of analysis; participants recruited through October 2019 were included.

Because Studies 1 and 4 are intervention trials, analyses used preintervention baseline data only. Research procedures and materials for all studies were approved by the Human Research Protection Office at Washington University in St. Louis and participating health plans.

**Measures**

**Social needs** In all studies, the assessment included 7 items\(^21\) based on Segal's Personal Empowerment Scale\(^22\) and studies by Blazer et al.\(^6\) Items assessed the likelihood that in the next month the respondent would: (1) have enough money for necessities such as food, shelter, and clothing; (2) have enough money to deal with unexpected expenses; (3) have enough food to feed themselves and others in their home; (4) be threatened physically by another person; and (5) have a place to stay. Response options were very likely/likely/unlikely/very unlikely. Other items assessed were: (6) amount of space in the home (too much/about the right amount/not enough), and (7) neighborhood safety (very unsafe/unsafe/safe/very safe). Minor wording changes to items 1, 3, and 7 were made from the first to last study (eg. “How safe from crime is your neighborhood?” became “How would you rate the safety of your neighborhood?”)

Studies 3 and 4 included additional social needs items assessing the likelihood that in the next month the respondent would: (8) have reliable transportation to get to appointments, meetings, work, and getting the things they need for daily living; (9) be able to pay their current electric, gas, or water bill in full; and (10) have trouble finding or paying for childcare. Response options were very likely/likely/unlikely/very unlikely. The childcare item was asked only of parents and guardians of children aged ≤18 years who needed or used childcare.

Items 4 and 10 were reverse coded so that all social needs variables had values ranging from 1–4 (except “space in the home,” which ranged from 0–1), with higher values indicating greater need. Full response scales were used in correlation analyses, and each social need also was classified as met or unmet. Responses of very unlikely and unlikely for items 1, 2, 3, 5, 8, and 9, and responses of very likely or likely for items 4 and 10 were classified as unmet needs, as were responses of “not enough space” in your home
(item 6) and a neighborhood rated as very unsafe or unsafe (item 7). The number of unmet social needs was summed across these variables and dichotomized to distinguish those with ≥2 from those with ≤1.

**Health-related variables** Table 1 shows which variables were measured in which studies, including self-rated health (excellent/very good/good/fair/poor), perceived stress,\textsuperscript{23} depressive symptoms,\textsuperscript{24} and sleep problems (overall sleep quality and frequency of sleep problems in the last month – adapted from the Pittsburgh Sleep Quality Index).\textsuperscript{25} Scores on the Perceived Stress Scale range from 0–16; higher scores indicate greater perceived stress. Patient Health Questionnaire-2 Depression Screener scores range from 0–6; higher scores indicate greater severity of depression symptoms. Sleep quality scores range from 0–6; higher scores indicate lower sleep quality.

### Table 1. Sample Characteristics and Social Needs, by Study (Table view)

<table>
<thead>
<tr>
<th>Sample characteristics and social needs</th>
<th>Study 1 Helpline callers (n = 1898)</th>
<th>Study 2 Medicaid adults (n = 1214)</th>
<th>Study 3 Medicaid adults (n = 10,267)</th>
<th>Study 4 Low-income smokers (n = 1370)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (mean years)</td>
<td>42.5</td>
<td>36.4</td>
<td>42.7</td>
<td>48.1</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (%)</td>
<td>85.3</td>
<td>87.1</td>
<td>71.9</td>
<td>72.2</td>
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<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school (%)</td>
<td>26.4</td>
<td>31.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school/ GED (%)</td>
<td>33.9</td>
<td>29.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than high school (%)</td>
<td>39.7</td>
<td>39.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American (%)</td>
<td>59.0</td>
<td>33.7</td>
<td>57.0</td>
<td>59.7</td>
</tr>
<tr>
<td>White (%)</td>
<td>29.8</td>
<td>49.4</td>
<td>40.3</td>
<td>33.9</td>
</tr>
<tr>
<td>Other (%)</td>
<td>11.1</td>
<td>17.0</td>
<td>2.6</td>
<td>6.4</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic (%)</td>
<td>2.7</td>
<td>16.6</td>
<td>0.9</td>
<td>2.1</td>
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<tr>
<td>Annual pre-tax household income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; $10,000 (%)</td>
<td>45.4</td>
<td>35.6</td>
<td>52.9</td>
<td></td>
</tr>
<tr>
<td>$10,000–$19,999 (%)</td>
<td>36.5</td>
<td>22.7</td>
<td>29.3</td>
<td></td>
</tr>
<tr>
<td>≥ $20,000 (%)</td>
<td>18.1</td>
<td>41.7</td>
<td>17.8</td>
<td></td>
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<tr>
<td>Child ≤18 in the home (%)</td>
<td>54.3</td>
<td>71.3</td>
<td>38.5</td>
<td>34.5</td>
</tr>
<tr>
<td>Unemployed (%)</td>
<td>78.2</td>
<td>52.8</td>
<td>74.2</td>
<td></td>
</tr>
<tr>
<td><strong>Social needs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of social needs assessed</td>
<td>7</td>
<td>7</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Type of need</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not enough money for unexpected expenses</td>
<td>89.4</td>
<td>53.8</td>
<td>46.7</td>
<td>75.3</td>
</tr>
<tr>
<td>Not enough money for necessities</td>
<td>69.8</td>
<td>20.8</td>
<td>13.9</td>
<td>36.0</td>
</tr>
<tr>
<td>Not enough space in your home</td>
<td>26.8</td>
<td>24.6</td>
<td>9.6</td>
<td>21.5</td>
</tr>
<tr>
<td>Unsafe neighborhood</td>
<td>21.7</td>
<td>12.1</td>
<td>6.3</td>
<td>22.2</td>
</tr>
<tr>
<td>Not enough food</td>
<td>14.9</td>
<td>10.2</td>
<td>5.6</td>
<td>15.2</td>
</tr>
<tr>
<td>No place to stay</td>
<td>17.4</td>
<td>5.9</td>
<td>3.2</td>
<td>9.5</td>
</tr>
<tr>
<td>Threatened physically</td>
<td>5.6</td>
<td>7.0</td>
<td>3.2</td>
<td>7.9</td>
</tr>
<tr>
<td>Trouble finding or paying for childcare*</td>
<td></td>
<td></td>
<td></td>
<td>42.9</td>
</tr>
<tr>
<td>Cannot pay utility bills in full</td>
<td></td>
<td></td>
<td></td>
<td>50.4</td>
</tr>
<tr>
<td>No reliable transportation</td>
<td></td>
<td></td>
<td></td>
<td>21.4</td>
</tr>
<tr>
<td>Mean number of social needs</td>
<td>2.4</td>
<td>1.3</td>
<td>1.1</td>
<td>2.5</td>
</tr>
<tr>
<td>0 social needs (%)</td>
<td>5.2</td>
<td>31.8</td>
<td>44.7</td>
<td>12.2</td>
</tr>
<tr>
<td>1 social need (%)</td>
<td>16.0</td>
<td>31.9</td>
<td>28.5</td>
<td>19.9</td>
</tr>
<tr>
<td>2+ social needs (%)</td>
<td>78.8</td>
<td>36.3</td>
<td>26.8</td>
<td>68.0</td>
</tr>
</tbody>
</table>

* Applies only to those with children aged ≤18 years who report needing or using childcare (Study 3, n = 579; Study 4, n = 126).
Disease history was measured in Studies 2, 3, and 4. Studies 2 and 4 included items inquiring if participants had ever been told by a doctor they had each of several chronic conditions (yes/no); Study 3 obtained disease diagnoses from claims data. All 3 studies obtained data on heart disease, chronic obstructive pulmonary disease, depression, and diabetes (claims for ischemic heart disease, hyperlipidemia, and heart failure were counted separately in Study 3). Studies 2 and 3 also obtained data on hypertension, arthritis, and osteoporosis. Studies 2 and 4 also obtained data on cancer. Studies 3 and 4 also included data on asthma, attention deficit hyperactivity disorder, bipolar disorder, generalized anxiety disorder, post-traumatic stress disorder, schizophrenia, and drug and alcohol use disorder. Study 2 was the only study to include stroke or vision and hearing problems. For analyses, number of chronic conditions was summed and represented as a single variable with ranges of 0–11 for Study 2, 0–16 for Study 3, and 0–12 for Study 4.

Tobacco use (smoke cigarettes daily/some days/not at all) was assessed in Studies 1 and 2; all participants in Study 4 were daily smokers. In Study 3, claims data for nicotine dependence are reported.

**Demographics** All studies assessed age, sex, race/ethnicity, and whether there were minor children living in the home. Studies 1, 2, and 4 assessed annual pre-tax household income and employment status. Studies 1 and 4 assessed years of education completed.

**Analyses**

To identify patterns of social needs that might be shared across different populations, settings, and years, analyses were conducted separately for each study except the analysis of common combinations of social needs. Data were pooled across the studies for that analysis to get more stable estimates of low frequency combinations. Analyses of data from Studies 1, 2, and 4 used R (R Foundation for Statistical Computing, Vienna, Austria); data from Study 3 were analyzed with SAS, version 9.4 (SAS Institute Inc., Cary, NC). Visualizations for Figure 1 were produced using the “corrplot” package in R.
**How are social needs correlated?** Using the full sample from each study, the research team examined Spearman correlations for all pairs of social needs.

**What characteristics distinguish those with ≤1 and ≥2 social needs?** Bivariate analyses examined differences in health and demographic characteristics of participants with ≤1 or ≥2 social needs. *t* tests were used to compare mean differences and chi-square tests were used to compare proportions.

**Among participants with multiple social needs, which combinations occur most commonly?** Examining participants with ≥2 unmet social needs, the research team identified every unique combination of social needs experienced by a participant and determined the frequency distribution of these combinations. The team reports the number of unique combinations of social needs across the 4 studies combined, the distribution of participants across those combinations, the social needs that make up the 10 most commonly occurring combinations, and for each of those 10, the number and proportion of participants who have that combination.

**Do social needs profiles differ for distinct population subgroups?** To explore whether and how social needs might vary in different population subgroups, the research team constructed 3 mutually-exclusive groups that could be easily identified in clinical, community, or other population settings and could be formed using predictor variables available in the studies. The groups were: (a) women aged <50 years with children aged ≤18 years living in their home; (b) men aged <50 years with annual pre-tax household income <$10,000; and (c) men and women aged ≥50 years who rated their health as fair or poor. The team uses the shorthand of “women with children,” “low-income men,” and “older sicker adults” for these groups, respectively.
Analyses compared the proportions of participants having each social need among those within and outside each subgroup. Findings are reported separately for each study. Chi-square tests identified significant differences. Because Study 3 did not collect data on 2 grouping variables (income, self-rated health), it is not included in these analyses.

**Results**

**Sample characteristics and social needs**

Table 1 shows demographic characteristics and social needs of participants in each study. All samples were disproportionately women, racially diverse, and poor; mean ages ranged from 36 to 48 years.

The proportions of participants reporting multiple social needs were 79% and 68% in the 2 helpline samples (Studies 1 and 4, respectively), and 36% and 27% in the 2 Medicaid samples (Studies 2 and 3, respectively). The most commonly reported social needs were not having enough money for unexpected expenses, trouble finding or paying for childcare, not having enough money for necessities, and paying utility bills in full. Less common, but still affecting up to one quarter of participants were not having enough space in the home, living in an unsafe neighborhood, and having no reliable transportation (Table 1).

**Correlations among social needs**

Figure 1A–D illustrate correlations among social needs for each study. Color indicates whether each association is positive (blue) or negative (red) and darker shading of each color indicates greater values of Spearman's rho. The pattern of correlations was consistent across studies. The largest correlations were between needs for utility payment assistance and having enough money for daily necessities such as food, shelter, and clothing \( r = .49 \) to .71 and between having enough money for unexpected expenses and necessities \( r = .47 \) to .63. Other pairs ranking among the highest correlations in every study included food insecurity and having a place to stay \( r = .28 \) to .64), food insecurity and money for necessities \( r = .25 \) to .65), and having a place to stay and money for necessities \( r = .23 \) to .52). The 8 pairs with the highest correlations across studies involved different combinations of 5 social needs: food insecurity, a place to stay, utility payment assistance, money for necessities, and money for unexpected expenses.

**Characteristics associated with multiple social needs**

Across studies, participants with ≥2 unmet social needs had worse health profiles (Table 2). Compared to those with ≤1 social need, they reported more stress, depressive symptoms, sleep problems, and chronic diseases, and were less likely to rate their health as excellent or very good. Age, sex, race, ethnicity, education, employment, and having children in the home were not significantly different between those with ≤1 vs. ≥2 social needs, but participants with very low household income (<$10,000 per year) were more likely to report multiple social needs.
Common combinations of social needs

Across the 4 studies, 5621 participants had ≥2 social needs. Among them were 351 different combinations of social needs. The frequency of each combination followed a long tail distribution: a small number of common combinations followed by hundreds of combinations experienced by only a few to a few dozen participants. Figure 2 highlights the 10 most common combinations (A-J), which collectively accounted for 52% of all participants with multiple social needs.
The most common combination involved not having enough money for unexpected expenses and not having enough money for necessities (n = 839, 14.9% of all participants). The inset chart in Figure 2 shows which social needs make up the 10 most common combinations, and the number and proportion of participants having that exact combination. The frequencies and percentages in Figure 2 reflect that exact combination only. For example, in addition to the 839 participants whose only 2 needs were not having enough money for unexpected expenses and not having enough money for necessities, there were an additional 2453 participants who had both of those needs plus at least 1 other social need.

Social needs profiles of women with children, low-income men, and older sicker adults

Social needs varied by subgroups in ways that were highly consistent across studies (Table 3A–C). Significant differences between each subgroup and all others in the sample are noted in bold (subgroup proportion > others) or italics (subgroup proportion < others).

<table>
<thead>
<tr>
<th>Social needs profile</th>
<th>Study 1 Helpline callers</th>
<th>Study 2 Medicaid adults</th>
<th>Study 4 Low-income smokers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women with kids</td>
<td>Others</td>
<td>Women with kids</td>
</tr>
<tr>
<td></td>
<td>(n = 816)</td>
<td>(n = 1082)</td>
<td>(n = 761)</td>
</tr>
<tr>
<td>Type of need</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not enough money for unexpected expenses</td>
<td>89.2</td>
<td>89.5</td>
<td>53.5</td>
</tr>
<tr>
<td>Not enough money for necessities</td>
<td>66.0</td>
<td>72.6**</td>
<td>19.8</td>
</tr>
<tr>
<td>Not enough space in your home</td>
<td>34.9</td>
<td>20.6***</td>
<td>26.4</td>
</tr>
<tr>
<td>Unsafe neighborhood</td>
<td>21.7</td>
<td>21.7</td>
<td>11.2</td>
</tr>
<tr>
<td>Not enough food</td>
<td>11.3</td>
<td>17.6***</td>
<td>9.2</td>
</tr>
<tr>
<td>No place to stay</td>
<td>17.6</td>
<td>17.3</td>
<td>5.8</td>
</tr>
<tr>
<td>Threatened physically</td>
<td>5.2</td>
<td>5.9</td>
<td>4.9</td>
</tr>
<tr>
<td>Trouble finding or paying for childcare</td>
<td>50.0</td>
<td>52.0</td>
<td>54.1</td>
</tr>
<tr>
<td>Can't pay utility bills in full</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No reliable transportation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Men aged <50 years old with annual household income <$10,000 per year.
Women with children were more likely to report not having enough space in the home and not being able to pay utility bills in full; they were less likely to report social needs for food, transportation, and money for necessities (Table 3A). Low-income men were more likely to report being threatened physically or needing a place to stay (Table 3B). Older sicker adults were more likely to report not having enough money for unexpected expenses, not enough money for necessities, not enough food, and no reliable transportation; they were less likely to report not having enough space in their home (Table 3C).

Discussion
These findings inform 4 key aspects of social needs among low-income populations: associations among different needs, characteristics of those with multiple social needs, common combinations of social needs, and differences in the social needs of population subgroups. Collectively, these findings expand knowledge about social needs and suggest promising directions for future research and action.

Across 4 studies in different low-income populations, participants who were less healthy, had lower incomes, and higher levels of stress and depressive symptoms were consistently more likely to have multiple social needs than those who were healthier, had higher incomes, lower stress, and fewer depressive symptoms. The mean stress scores for those with multiple social needs were much higher than population norms\(^{29}\) and their mean scores for depressive symptoms exceed established thresholds indicating a need for further depression screening\(^{30}\). Causality cannot be established from these cross-sectional associations and is likely bidirectional\(^{20}\); for example, longitudinal studies have shown basic needs predict depressive symptoms\(^{31}\), but also vice versa\(^{32}\).

The rate of having multiple social needs ranged from 27% to 36% in 2 Medicaid samples and 68% to 79% among helpline callers. These differences are expected, given that helpline callers are actively seeking assistance for social needs\(^{33}\). Despite the prevalence differences, the strongest correlations among social needs were quite consistent across studies and samples. Social needs reflecting financial strain – not having enough money for unexpected expenses, necessities, and paying utility bills – were especially common among highly correlated pairs, as was needing a place to stay. These findings suggest potential groupings of social needs that could be explored further in future research using more sophisticated clustering techniques.

The most commonly occurring combination of social needs involved the 2 most prevalent needs: money for unexpected expenses and necessities. However, the diversity of combinations was considerable, with 351 unique combinations in total, 244 of which were each experienced by <.1% of all participants with ≥2 needs. This “long-tail” distribution\(^{34}\) demonstrates that although a large proportion of low-income individuals might be served well by interventions addressing a few common combinations of social needs, about the same number of people would need interventions that few others share. Better understanding the shape of demand for different interventions is an important aspect of addressing health disparities\(^{35}\).

This exploration of selected subgroups of participants revealed different social needs profiles. Three mutually exclusive subgroups were constructed – women with children, low-income men, older sicker adults – who could be easily identified and targeted for intervention in clinical, community, or other population settings. Other groupings may be more helpful in different service delivery contexts; these subgroups are illustrative only. Findings were strikingly consistent across separate samples from independent studies spanning 10 years.

Women with children were more likely to need more space in their home and help paying utility bills. They were less likely to need food, transportation, or money for necessities. These findings align closely with both prior research showing that those with children prioritize feeding their families over competing demands\(^{11,15}\) and social service policies that assure many low-income women with children are eligible for food programs such as WIC (Women, Infants, and Children) and the Supplemental Nutrition Assistance Program (SNAP). In other words, this pattern of met and unmet social needs can be understood at least in part as a product of life priorities and available resources for a particular group. Understanding group members' priorities and the social service ecosystem around them can inform targeting and implementation of social needs interventions.

Similarly, the subgroup of older (≥50) sicker adults needed food, transportation, and money for necessities and unexpected expenses. Given their fair-to-poor health, it is possible that “necessities” and “unexpected expenses” included medication, co-pays, and medical bills. Seeing the social needs profile of this subgroup, the research team wondered whether those aged ≥65 years – thus eligible for Medicare – might have a different profile than those aged 50–64 years, because more medical expenses would be
covered. Although only 102 participants were ≥65, the proportion needing money for necessities or unexpected expenses was 13%-25% lower than for those 50–64 (data not shown).

By examining these aspects of multiple social needs across 4 studies in different low-income populations over a decade's time, recurring patterns were identified that could inform future social needs research and interventions. Although important limitations of this work will be discussed, the research team nonetheless suggests 4 ways that the findings reported here – if supported by future research – might inform efforts to address social needs.

1. Greater focus on those with multiple social needs. These findings reinforce a growing body of evidence that many key health indicators decline as the number of social needs increases. With screening for social needs becoming more commonplace in health care organizations serving low-income populations, so too will use of the resulting data to prioritize patients for intervention. A simple algorithm that identifies the number of social needs experienced by patients could quickly identify individuals who might benefit most from effective social needs interventions.

2. Identify high-risk population subgroups. Audience segmentation is commonly used to identify homogeneous subgroups for whom a particular product or service may be needed, or for developing new products or services to meet subgroup members' needs. The most promising segments are those with members that can be quickly and reliably identified, and large enough in number to justify investing in specialized approaches to reach them and address their needs. Findings from the subgroup analyses provide an initial proof-of-concept for applying this approach to social needs: women with children comprised 44% of the sample and older sicker adults comprised 20%. Each had a distinct pattern of social needs, suggesting a targeted approach may have value. The long-tail distribution of social needs combinations in Figure 2 also supports specialized interventions that can address unique clusters of social needs.

3. Develop more sophisticated social needs interventions. At present, patients screened for social needs and identified as having needs X, Y, and Z likely would receive separate referrals or interventions for each. In other words, social needs are commonly addressed as if each is an independent challenge for the patient. Study findings show that some social needs tend to co-occur, suggesting that combining interventions in strategic ways might improve outcomes and efficiency. For example, participants needing food also tended to need a place to stay (Figure 1). This is an example of the economic concept of complementarity, when 2 “products” meet different components of a composite need. Assuring food and a place to stay could help address a composite need such as preventing potential homelessness. Certain individuals may benefit from “packages” of social needs interventions designed specifically for them.

4. Such approaches would benefit from future research to determine whether some social needs are stronger determinants of some health outcomes. Perhaps transportation needs are the strongest predictor of missed appointments, but food insecurity is the best predictor of dietary outcomes. Although not the focus of this study, answers to such questions would complement the findings here in helping inform combination interventions.

5. At a community level, addressing common clusters of social needs might benefit from new partnerships among agencies providing different types of complementary services. Integration across social service sectors and agencies – such as Community Information Exchange systems now being implementing in some communities – could increase responsiveness to those with distinct patterns of needs. Because the social service safety net often lacks the capacity to meet population demand for social needs such as those experienced by participants in the 4 studies, increased coordination across agencies will need to be paired with policy efforts to modernize, strengthen, and support the safety net.
which services to combine should be informed by research documenting how different social needs profiles are distributed across populations.

4. Recognize dynamic relationships among social needs. Research must move beyond identifying co-occurring social needs to gaining a deeper understanding of the relationships among them. Cross-sectional analyses such as those reported in this paper cannot capture associations that might lag temporally. For example, this study found that neighborhood safety was unrelated to transportation. But moving to a safer neighborhood today might result in increased future transportation costs if the new location is farther from one's work or childcare provider.41

7. Nor can cross-sectional analyses determine whether strategies that prioritize and sequence social needs interventions work better than all-at-once interventions. When food and transportation needs were both assessed, they were positively associated. However, from an intervention planning standpoint, it may not always be necessary to address both. It is possible that addressing a person's transportation needs would free up enough of the person's limited resources to address their own food needs. Alternatively, enrolling them in SNAP might free up money for a bus pass. Either approach may be more efficient and sustainable on a population basis than intervening on transportation and food needs for everyone who needs both.

Interventions also might be guided by strategies low-income families already use to cope with multiple needs. If most low-income women with children prioritize feeding their family over other needs,11,15 perhaps interventions should focus on other social needs that tend to co-occur with food insecurity but are often postponed or ignored. Alternatively, focusing on food interventions could free up cash or material resources to address other needs, and cognitive bandwidth to make decisions about longer-term priorities. Comparing alternative approaches for addressing multiple social needs is worthy of further research.

Limitations

The social needs experiences of participants in these studies may not be representative of all low-income populations in the United States, and certainly are not representative of the general population. As an example, 41% of American households would not be able to cover a small ($400) unexpected expense and 1 in 5 cannot cover their current month's bills.42 In Study 4 from this paper, which coincides most closely in time to data collection in the US study, 75% of participants did not have enough money for unexpected expenses and 48% could not pay their bills in full and on time.

Participants in Studies 1 and 4 were callers to a helpline. Although selected at random for possible study participation, all were actively seeking help, making them different from some other low-income individuals. This may account for the higher number of social needs they reported. Nor are participants in Study 2 representative of all Medicaid populations, even though they were drawn from many different states. They were motivated enough to read and respond to member outreach, and the vast majority who did had computer access and skills to complete a survey online. These attributes are not universally shared in Medicaid populations.43 Although each sample has limitations, the limitations are not the same and bias may even be in different directions.

The social needs measured in these studies covered multiple domains and evolved over a decade of research, but did not assess employment or housing quality, which are now included in other screening tools. Understanding how other needs are associated with the ones reported in this paper is important and should be integrated in future research. Additionally, future studies might collect data on types of household income and other resources that could help address social needs.

Conclusion
Current approaches to intervening on social needs are not particularly sophisticated. Having a more scientific basis for decisions and actions should improve intervention effectiveness and efficiency. These analyses were conducted to gain deeper insights into the connections among social needs that can inform the particular challenge of addressing multiple social needs. The ultimate goal is to provide new knowledge that can be applied to enhance the effectiveness and efficiency of social needs interventions to improve the lives and health of low-income individuals and families. The research team hopes this approach and findings provide a useful model for others and help generate new ideas and questions to advance the scientific understanding of social needs and health disparities.

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