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Novel Characterization of Socioecological Determinants of Health in Rural Alabama

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Abstract

Background—Socioecological determinants of health (SEDOHs) influence disparities in surgical outcomes. However, SEDOHs are challenging to measure limiting our ability to address disparities. Using a validated survey (SEDOH-88), we assessed SEDOHs in three rural communities in Alabama. We hypothesized that SEDOHs would vary significantly across sites but measuring them would be acceptable/feasible.

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Materials and methods—This was a retrospective review of a prospectively maintained database involving surgical patients who completed the SEDOH-88 and a secondary survey assessing it's acceptability/feasibility, from August 2021 to July 2023. Included patients underwent endoscopic, minimally invasive, or open surgery at three rural hospitals: Demopolis (DM), Alexander City (AC), and Greenville (GV).

Results—The 107 participants comprised 48 (44.9%) from DM, 27 (25.2%) from AC, and 32 (29.9%) from GV, respectively. The median age was 64-years and 65.6% were female. When comparing DM to AC and GV by individual factors, DM had the largest Black population (78.7 vs. 22.2 vs. 48.3%, p<0.001), and more often required help reading hospital materials (20.5 vs. 3.7 vs. 10.3%, p=0.007). When comparing DM to AC and GV by structural and environmental factors, DM had more Medicaid enrollees (27.3 vs. 3.7 vs. 6.9%, p=0.033), and lacked fresh produce (18.2 vs. 25.9 vs. 39.3%, p=0.033) and internet access (63.6 vs. 100.0 vs. 86.2%, p<0.001). The SEDOH-88 had an overall 90.9% positive acceptability/feasibility score.

Conclusion—SEDOHs varied significantly across rural communities regarding individual (race/health literacy), structural (insurance), and environmental-level factors (nutritious food/internet access). The high acceptability/feasibility of the SEDOH-88 shows it's potential utility in identifying targets for future disparity-reducing interventions.

Keywords

Surgical disparities; Rural; Socioecological

Introduction

Socioecological determinants of health (SEDOHs) are "the conditions in which people are born, grow, live, work and age"[1]. The Healthy People 2030 document categorize these factors into five domains including economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social/community context[2]. Barriers to these social circumstances create societal stratification and contribute to disparities at the individual, interpersonal, organizational, and community-level. These barriers disproportionately affect older, rural, and Black patients[3,4]. As a result, these vulnerable populations suffer worse overall health[5,6] and outcomes when undergoing surgical procedures[7,8]. In Alabama, where 16.2% of the population is impoverished, 26.8% is Black, and 43.6% resides in rural areas[9], SEDOHs are likely a major contributor to health disparities. However, a knowledge gap exists regarding which SEDOHs are pertinent in rural communities and the linkage between SEDOHs and surgical outcomes.

Surgical outcomes are influenced by multiple factors including healthcare access, health literacy[10], insurance coverage[4], and social capital[11]; however, prior studies investigating disparities among surgical populations are limited either by the low number of SEDOHs assessed or by focusing only on individual level factors[3]. As a result, they may not comprehensively assess the complexity of the problem, especially in rural settings, as geospatial disparities are known to be more complex than rurality alone[12]. One reason that many of these studies may not have included comprehensive SEDOH assessments may be due to the challenges of measuring SEDOHs, particularly in resource-constrained

settings such as rural hospitals[13]. First, at the patient-level, marginalized populations may lack awareness of which factors may be impacting their overall health and suffer low health literacy, thereby biasing self-reporting SEDOH assessment results[14]. Second, at the provider-level, thorough assessment of SEDOHs may be challenging due to staff shortages[15,16]. Third, at the system-level, integrating the use of large-scale SEDOH measuring tools[17–19] into the increasingly time-pressured patient-provider consultation may be burdensome. Despite these challenges, it has become increasingly urgent to assess and address SEDOHs within rural communities as health systems transition to value-based care with a more holistic understanding of individual and population health[15].

In an effort to address these challenges, our team recently developed and validated a comprehensive 88-item survey (SEDOH-88)[20] that captures individual, interpersonal, organizational, and community domains of SEDOHs. In this paper we primarily aimed to assess SEDOHs across three rural surgical populations in Alabama using the SEDOH-88 survey. Second, we wished to measure the acceptability and feasibility of using the instrument in rural communities. We hypothesized that significant variation in SEDOH measurements would exist across sites but measuring them would be acceptable and feasible.

Methods

Study population, inclusion, and exclusion criteria

This study was a retrospective review of a prospectively maintained database involving surgical patients from three rural hospitals in Alabama: Whitfield Regional Medical Center in Demopolis, Russell Medical Center in Alexander City, and Regional Medical Center of Central Alabama in Greenville, from August 2021 to July 2023. We included adults (18-years or older), who were English-speaking, had undergone an endoscopic (colonoscopy/gastroscopy), minimally invasive (laparoscopic or robotic assisted), or open surgical procedure at the three sites, and were able to give consent. All included participants (n=107) completed the SEDOH-88 survey. In addition, a secondary survey which assessed the acceptability and feasibility of the SEDOH-88 was administered to a purposively selected group comprised of racial minority and elderly (≥ 65-years) participants (n=27), as these vulnerable populations have been noted to suffer significant disparities[3,4]. We excluded patients who were non-English speaking, less than 18-years old, and those who were unable to give consent. The study protocol was reviewed and approved by the University of Alabama at Birmingham (UAB) Institutional Review Board (IRB) as part of the Deep South Resource Center for Minority Aging Research (RCMAR) project (IRB-300009587).

Study sites

Two of the three rural healthcare facilities (Demopolis in Marengo County and Greenville in Butler County) are located within the Black Belt of Alabama while Alexander City in Tallapoosa County is within close proximity. Formerly named for the color of its fertile soil, and later for the large proportion of Black residents[21], the Black Belt has distinct geographic, social, and cultural boundaries which underpin the high rates of poverty and healthcare disparities in the region[22]. According to the 2020–2022 US Census

Bureau population estimates[23], Marengo, Butler, and Tallapoosa County comprised of 18745, 18650, and 40977 residents, respectively. More granularly, in 2019, the Black Belt comprised of 56% Black residents, and the unemployment rates ranged from 3.0% in Tallapoosa County to 3.6% in Butler County, with nearly 1 in 4 individuals (23.7%) living below the poverty line[21]. Furthermore, according to the 2020 Centers for Disease Control and Prevention (CDC) statistics[24], the Nationwide Social Vulnerability Index (SVI) for Marengo, Butler, and Tallapoosa County was 0.81, 0.68, and 0.89, respectively. With SVI scores approaching 1 indicative of higher social vulnerability, these findings highlight the degree of destitution within these rural communities. These three rural healthcare facilities were selected as they form part of the UAB Surgery Community Network[25].

Primary Survey: The SEDOH-88

The SEDOH-88[20] was previously developed using a two-phase modified-Delphi method by a group of experts in surgery, sociology, and social determinants of health through a collaborative effort between the UAB Department of Surgery, the UAB Minority Health and Health Disparities Research Center (MHRC), and the Social Determinants of Health (SDH) core, respectively. By incorporating elements from previously validated SEDOH measuring tools[17–19], the 88-item survey captures individual, structural, and environmental health-related factors across multiple socioecological levels[26] including the individual, interpersonal, organization, and community domain (Figure 1).

Secondary Survey: Acceptability and feasibility

To assess the acceptability and feasibility of the SEDOH-88 within a rural context, a 12-item secondary survey based upon the theoretical frameworks by Sekhon[27] and Bowen[28] was administered to selective participants immediately after completing the 88-item survey. All questions were assessed using a 5-item Likert scale except for Burden, which was assessed using a 4-item Likert scale (Table 1).

Data Collection

The SEDOH-88 and secondary survey were uploaded to the Deep South Surgical Equity Research Network (DSERN) RedCap (Research Electronic Data Capture) database hosted/coordinated by UAB RedCap servers. This unique platform, secured through a virtualized environment, is protected by an enterprise grade Palo Alto firewall. The investigators (who were IRB approved) were granted access to the RedCap system through unique passwords and administered the surveys on password protected iPads, thereby enabling real time data capturing. After compiling a list of patients who had undergone an endoscopic, minimally invasive, or open surgical procedure at the three sites up to 6-months preceding the study's starting date, the investigators (who were trained in survey administration) contacted potential participants via phone. In addition, the investigators also visited the three sites at random throughout the study period and approached potential participants during routine pre-operative hospital admissions and post-operative outpatient clinic encounters. After explaining the risks, benefits, and purpose of the study, informed consent was obtained from patients who agreed to participate. Following enrollment, the investigators assisted participants with any difficulties experienced in understanding/answering questions, either via phone for patients recruited remotely (n=64), or in person for patients recruited on-site

(n=43). Each survey was approximately 12–15 minutes in length. The recruitment and survey administration processes aligned with guidelines set out by the American Association for Public Opinion Research (AAPOR) Survey Disclosure Checklist (2009)[29].

Data analysis

Descriptive statistics were conducted using frequencies and percentages for categorical variables, while continuous variables were summarized with means ± standard deviation and/or medians with interquartile values. Bivariate analyses compared differences in SEDOH-88 survey responses across the three sites using the Chi-squared or Fisher's Exact test as appropriate for categorical variables, and the Kruskal-Wallis rank sum test for continuous variables, with a $p < 0.05$ considered statistically significant. In order to perform univariate analysis on the secondary survey data pertaining to each item of acceptability/feasibility (Table 1), the frequencies of 1's, 2's and 3's on the Likert scale were added together and classified as a composite 'negative' score, while the frequencies of 4's and 5's (and for the four-item Likert scale assessing Burden, the frequency of 4's) were added together and classified as a composite 'positive' score. The overall scores for each item were calculated by dividing the summed total of the 'positive' scores by the total number of completed surveys. Finally, bivariate analyses were conducted to compare acceptability and feasibility across sex and racial groups. Data analysis was performed using SAS software version 9.4 (SAS Institute, Cary NC).

Results

Of the 178 patients contacted via phone or approached in person from July 2021 to August 2023, 107 (60%) agreed to participate. Sixty-four completed the SEDOH-88 via phone, while an additional 43 were completed in person. Participants comprised 48 (44.9%) from Demopolis, 27 (25.2%) from Alexander City, and 32 (29.9%) from Greenville. The overall median age was 64 (54.5–71.0) years and 65.4% were female. The majority of patients underwent an endoscopic procedure (80.0%), followed by open (14.2%) and minimally invasive surgery (5.9%) (Table 2).

Individual level factors

When comparing Demopolis, Alexander City and Greenville in terms of individual factors, Demopolis had the largest Black population (78.7 vs. 22.2 vs. 48.3%, $p<0.001$) and the lowest employment rate (11.1 vs. 44.4 vs. 44.8%, $p=0.016$). While 51.1% were high school graduates, the population at Demopolis were least likely to have a university level degree compared to Alexander City and Greenville (4.4 vs. 37.0 vs. 20.6%, $p=0.007$). In addition, the population at Demopolis felt least confident at completing medical forms independently (34.1 vs. 66.7 vs. 42.4%, $p=0.043$) and were more likely to ask for assistance when reading hospital materials (20.5 vs. 3.7 vs. 10.3%, $p=0.007$); however, there was no significant differences between sites with respect to understanding verbal or written medical information ($p>0.05$, respectively) (Table 3).

Interpersonal level factors

A larger proportion of the population at Alexander City lacked confidence in handing personal problems compared to Demopolis and Greenville (29.6 vs. 4.6 vs. 3.6%, p=0.026); however, they were more likely to have someone available 'all of the time' to help if confined to a bed (70.4 vs. 60.6 vs. 57.1%, p=0.02) compared to Demopolis and Greenville, respectively. Overall, the majority of participants (97%) felt physically and emotionally safe in their neighborhoods and most (74.7%) described having trustworthy neighbors in their community, with no significant differences between sites (p>0.05) (Table 4).

Structural (Organizational) level factors

The population at Demopolis were more likely to be insured with Medicaid compared to Alexander City and Greenville (27.3 vs. 3.7 vs. 6.9%, p=0.033), and found scheduling health care appointments the easiest (77.3 vs. 33.3 vs. 65.5%, p=0.004). Overall, 12% of participants delayed seeking medical care due to the cost, with no significant differences between sites (p>0.05) (Table 5).

Environmental (Community) level factors

Demopolis had the largest proportion without transit stops (61.4 vs. 18.5 vs. 32.1%, p<0.001), sidewalks (45.5 vs. 7.4 vs. 28.6%, p=0.026), and bicycle lanes in their neighborhood (50 vs. 11.1 vs. 32.1%, p=0.022) compared to Alexander City and Greenville, respectively. Overall, while 80% of participants had access to the Internet, 36.4% at Demopolis did not (p<0.001). While the majority of participants across all three sites (85.9%) described not being a member of a political organization (p>0.05), Demopolis also had the largest proportion of active church members (84.1 vs. 48.2 vs. 71.4% p=0.009) compared to Alexander City and Greenville, respectively. Furthermore, Demopolis had the largest proportion without neighborhood recreational facilities (50.0 vs. 18.5 vs. 28.6%, p=0.042), and the lowest proportion of fresh fruit and vegetables in their community (18.2 vs. 25.9 vs. 39.3%, p=0.033) compared to Alexander City and Greenville, respectively (Table 6).

Acceptability and feasibility of SEDOH-88 administration

Across all sites, the SEDOH-88 had a 90.9% positive score for all domains of acceptability and feasibility. Furthermore, 81.5% found it easy to complete (Implementation) and 96.3% felt it captured important health-related aspects (Perceived Effectiveness) (Figure 2).

Acceptability and feasibility by sex

When stratified by sex, positive scores ranged from 75.0% to 100%, while negative scores ranged from 0% to 25%. These findings demonstrate homogeneity in responses between male and female participants with an overall positive score of 91.2% and no statistically significant differences noted across domains (p>0.05) (Figure 3).

Acceptability and feasibility by race/ethnicity

When stratified by race/ethnicity, positive scores ranged from 50% to 100%, while negative scores ranged from 0% to 100%. Despite Asian participants' (n=1) responses contributing

majority of the negative scores, all were neutral/option '3' (Table 1). Furthermore, these findings demonstrate homogeneity in responses across racial groups with an overall positive score of 78% and no statistically significant differences noted across domains ($p>0.05$) (Figure 4).

Discussion

This retrospective study measured and characterized SEDOHs across three rural health facilities in Alabama using the SEDOH-88 survey. High acceptability and feasibility of the survey was found among elderly minority participants across gender, race/ethnicity, and location as 81.5% found it easy to complete and 96.3% agreed that it captured important health-related aspects. Our study demonstrates that the population at Demopolis had significantly worse SEDOHs at every socioecological level compared to Alexander City and Greenville. Specifically, at the individual level, Demopolis had the largest Black population, in addition to the lowest rates of employment, tertiary-level education, and health literacy. At the organizational level, those at Demopolis had the lowest rate of private health insurance and finally, at the community level, those at Demopolis were least likely to have access to transit stops and sidewalks, in addition to lacking recreational facilities, fresh produce and internet access in their community. Together, these findings indicate that while health disparities are ubiquitous in resource-limited areas, significant variability exist among rural surgical populations.

Rural residents have significantly lower health status compared their urban counterparts[30,31] and this is related to increasing age, poor healthcare access, and higher rates of high-risk behavior such as physical inactivity, poor diet, and smoking[32]. While there are "clear regional patterns of rural disadvantage"[33], our study aligns with Stone et al. who highlights a paradigm shift away from a monolithic approach to rural health research in recognizing the heterogeneity of rural communities[34]. In terms of individual factors, Demopolis had the oldest population with the lowest rates of employment, tertiary-level education, and health literacy compared to Alexander City and Greenville. It is known that lower education levels and unemployment are associated with poor health, the inability to access high quality nutritious food, and social isolation[35]. We demonstrated that more than 25% of the overall cohort felt that the fresh produce in their community was not of a high quality, in addition to 50% of the population at Demopolis not having recreational facilities in their neighborhood. While physical activity and healthy eating habits are influenced by self-efficacy[36] and behavioral knowledge[37], these findings align with previous studies noting that physical inactivity and poor nutrition are influenced by social and economic factors and are more common among individuals with lower socioeconomic status[38].

Our study additionally found that the population at Demopolis comprised of disproportionately more Black residents ($p<0.001$) and had significantly more patients insured with Medicaid ($p=0.033$) compared to Alexander City and Greenville, respectively. Factors influencing health insurance coverage are complex and affect health seeking behavior[39]. Both national and state-based analyses of claims data show that individuals insured with Medicaid have lower rates of preventative care such as cancer screening compared to privately insured individuals[40]. These findings have been thought to be

influenced by multiple factors including Medicaid enrollees possibly placing a lower value on preventative care than commercially insured individuals[41] and area-level deprivation impacting employment-based coverage, as low-income workers are least likely to be eligible for insurance, rural job categories lacking unionization, and minimal employer contributions towards coverage[42]. Furthermore, Pan et al. investigated differences in cancer-specific mortality (CSM) within insurance subgroups and found that patients insured with Medicaid had a higher risk of death compared to non-Medicaid patients (HR = 1.42; 95% CI, 1.40–1.44; p<0.0001), and after adjusting for multiple covariates including age, sex, area-level, disease site, and insurance status, demonstrated that Black patients had a higher CSM compared to White patients (HR = 1.10; 95% CI, 1.08 – 1.12, p<0.001)[4]. Despite these disparities, the population at Demopolis found it the easiest scheduling medical appointments compared to those at Alexander City and Greenville (p=0.004), a finding that may have been mediated by efforts of the Patient Protection and Affordable Care Act (ACA)[43] which included increasing Medicaid payment rates to providers and eliminating out-of-pocket costs for over 40 United States Preventative Services Task Force (USPSTF) recommended services[40].

While policy reform such as the ACA[43] and programs incorporating telemedicine[44] have helped address disparities in rural communities including specialists' geographic misdistribution[45] and low health literacy, inequalities still exist due to a lack of internet access. We noted that while 80% of patients across all three facilities had access to the internet, the population at Demopolis were least likely to have internet access compared to Alexander City and Greenville (p<0.001). As online healthcare information is increasingly being utilized[46], these underserviced communities cannot leverage the benefits of internet-based health provision and promotion initiatives[34]. Compounding these tele-communicative barriers are the findings that patients at Demopolis were more likely to always require help reading hospital materials (p=0.007) and felt least confident at completing medical forms independently (p=0.043), highlighting the variability of health literacy across sites, with particular concerns for Demopolis as low health literacy has been associated with a higher incidence of surgical complications[10], longer lengths-of-stay[8], and increased healthcare costs[47].

Healthcare access is a major issue in rural communities[48] and is modulated by structural and logistical factors including distance, travel time, transportation, and affordability[49,50]. With respect to transportation, 41.4% of the cohort strongly disagreed to having a bus or train stop within a 10–15-minute walk from their home. Furthermore, significantly more patients at Demopolis strongly disagreed to having sidewalks (p=0.026) and bicycle lanes (p=0.022) in their community compared to Alexander City and Greenville, respectively. These findings support previous publications noting that rural patients face a lack of public transportation, and may travel 59% more miles to receive health care than their urban counterparts[44,51]. However, while further travelling distances have been associated with increased cost[52,53], the majority of patients in our study did not delay seeking medical care due to a lack of transportation or travel cost, which may have been mediated by the facilitating effect of a supportive social environment[50] as patients at Demopolis were more likely to be active church members (p=0.009) and agree to having a close-knit community (p=0.002) compared to Alexander City and Greenville, respectively.

An integral step towards ameliorating health inequality among vulnerable populations is being able to measure the degree of disparities experienced. However, prior studies have reported multiple barriers with respect to survey administration among minority, “hard-to-survey” populations[54] including rarity of the population[55], reluctance to participate due to researcher mistrust, in addition to interview difficulty secondary to language barriers or low health literacy. In contrast to these barriers which portend an unfavorable survey climate[54], we have demonstrated high acceptability and feasibility of the SEDOH-88 among older, rural, and Black patients as 81.5% found it easy to complete and 96.3% agreed that it captured important health-related aspects. These findings underscore the novelty of the SEDOH-88 for measuring SEDOHs in underserved, resource-constrained settings, among populations known to suffer significant disparities[3,4].

Our study findings supports extant literature related to disparities that demonstrates that geographic location matters[56,57] and inequalities vary between different regions within a specific area[58]. We noted significant variation in SEDOHs across sites located within a region of Alabama imbued with economic hardship and disparities. In addition, while previous studies have investigated the “neighborhood effect” on medical conditions in urban areas[59,60], our study addresses the paucity of data on surgical populations in rural areas. While this study primarily aimed to measure and characterize SEDOHs across rural Alabama, future work is planned to assess the associations of these SEDOHs to surgical outcomes.

Our study has several limitations. First, our sample comprised entirely of patients with an average age > 60-years. Consequently, the generalizability of the results to younger or middle-aged rural adults may be limited. Second, while a strength of the study includes that the SEDOH-88 was developed from previously validated sources, the somewhat less extensive, more efficient construction may not have gathered all potentially important SEDOHs. Third, as we intentionally administered the secondary survey assessing acceptability and feasibility to a smaller subset of the overall cohort, specifically racial minority, and elderly participants, we recognize that the results may be biased due to the low number of participants from Greenville (n=6) and Alexander City (n=2), respectively. However, a reassuring observation includes the overall 90.9% positive score for all domains of acceptability/feasibility among those traditionally at highest risk of surgical disparities.

Conclusion

We demonstrated that significant variations in SEDOHs exist across rural communities with respect to individual (education, race, and health literacy), structural (insurance coverage and community involvement), and environmental-level factors (availability of nutritious food, healthcare, and internet access). In addition, the SEDOH-88 was shown to be highly acceptable and feasible for rural populations to measure SEDOHs. These findings show the potential utility of the SEDOH-88 in identifying targets for future disparity-reducing interventions.

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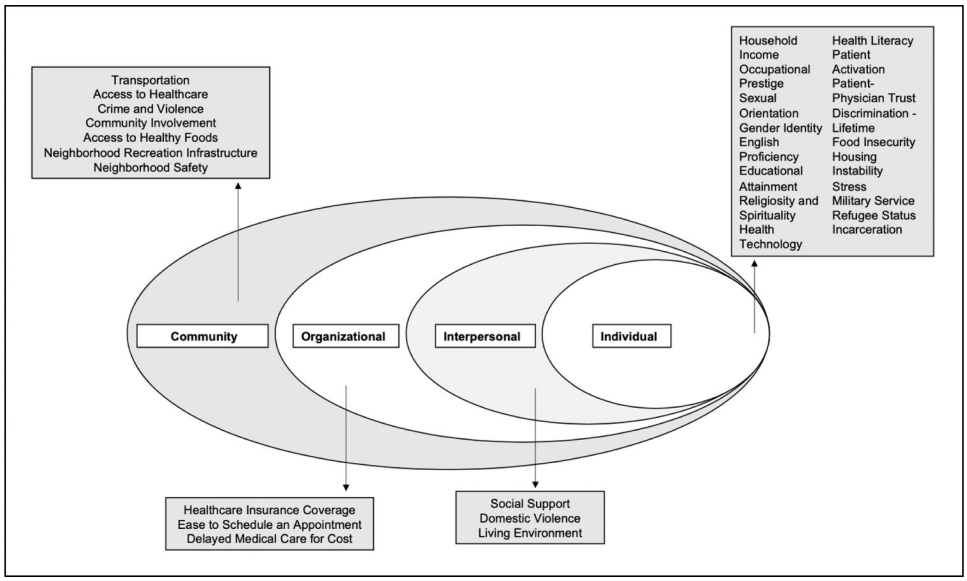

Figure 1.

SEDOH-88 Survey Components Mapped to the Socioecological Model

Adapted from Smith B, Smith BP, Hollis RH, Jones BA, Shao C, Katta M, et al. Development of a comprehensive survey to assess key socioecological determinants of health. Surgery [Internet]. 2023; Available from: https://doi.org/10.1016/j.surg.2023.11.011

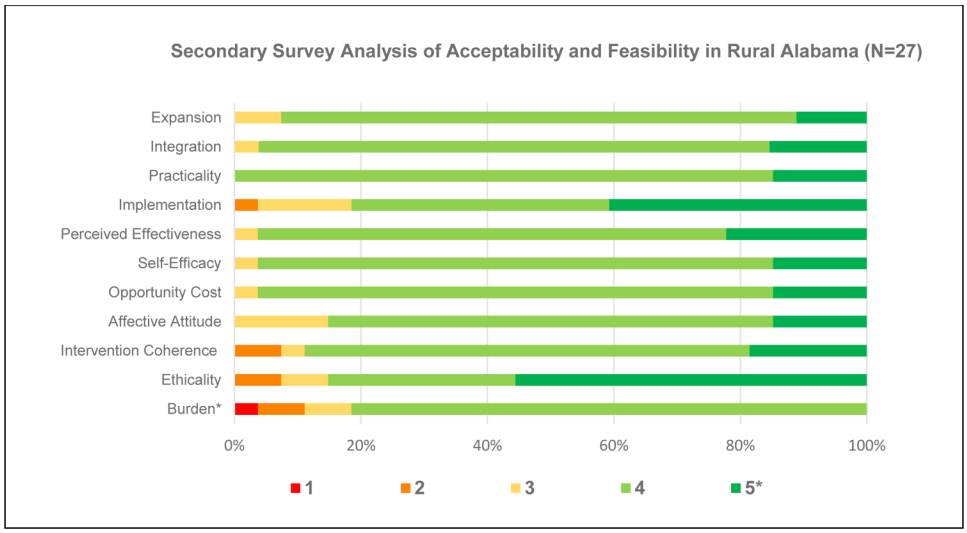

Figure 2.

Secondary Survey Analysis of Acceptability and Feasibility in Rural Alabama

Specific responses correlating to the legend numbers (‘1’, ‘2’, ‘3’, ‘4’ and ‘5’) for each domain are displayed in the 3rd column of Table 1.

*’5’: not applicable to Burden as it was assessed using a 4-item Likert scale.

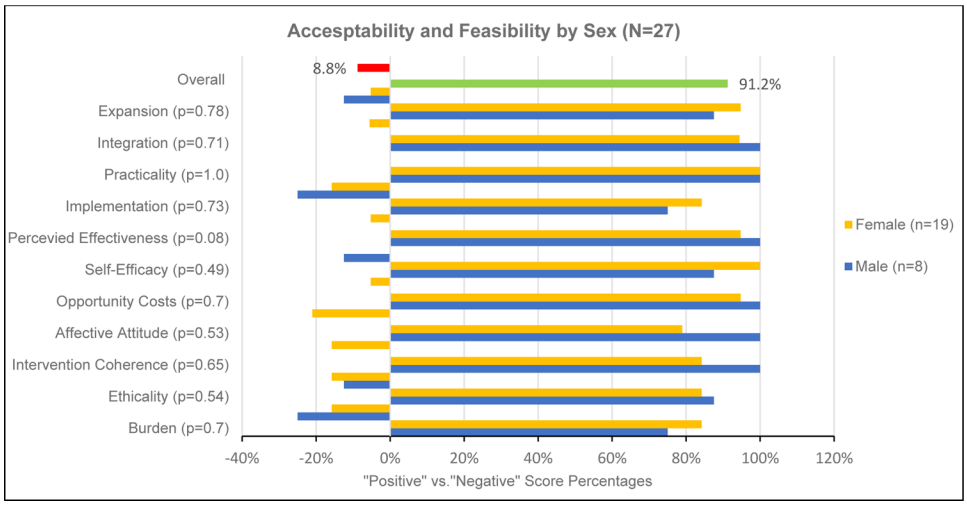

Figure 3.

Acceptability and Feasibility by Sex

The frequencies of 1's, 2's and 3's on the Likert scale were added together and classified as a composite 'negative' score, while the frequencies of 4's and 5's (and for the four-item Likert scale, the frequency of 4's) were added together and classified as a composite 'positive' score.

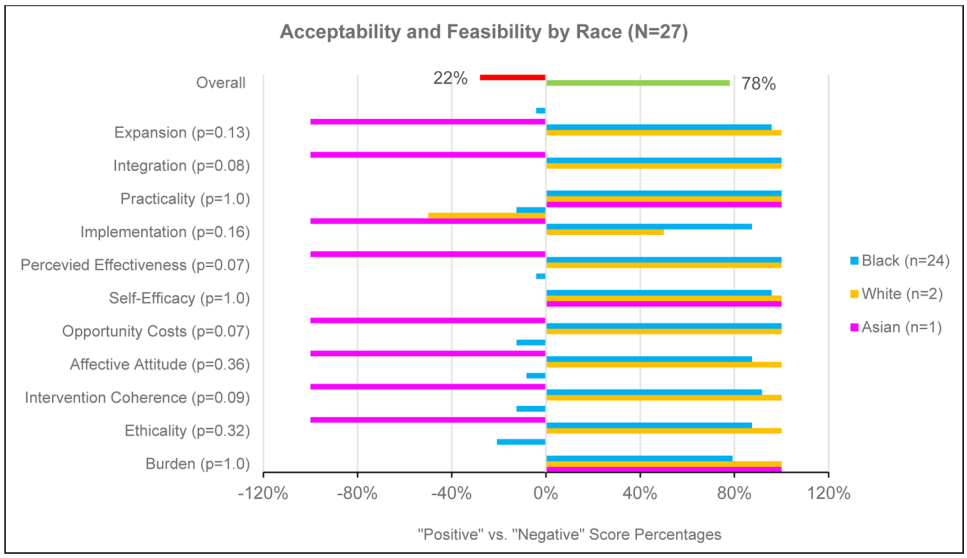

Figure 4.

Acceptability and Feasibility by Race

The frequencies of 1's, 2's and 3's on the Likert scale were added together and classified as a composite 'negative' score, while the frequencies of 4's and 5's (and for the four-item Likert scale, the frequency of 4's) were added together and classified as a composite 'positive' score.

Table 1.

Secondary Survey Assessment of Acceptability and Feasibility

Domain	Question	Response Options
Burden	Thinking about the number of questions on this survey, did you feel that the survey was:	1]. Very burdensome
		2]. Somewhat burdensome
		3]. A little burdensome
		4]. Not al all burdensome
Ethicality	Do you think it is appropriate to be asked about your social and economic needs at this clinic?	1]. Very inappropriate
		2]. Somewhat inappropriate
		3]. Neither appropriate nor inappropriate
		4]. Somewhat appropriate
		5]. Very appropriate
Intervention Coherence	How much do you agree with the following statement? I feel that my doctors are able to provide better care for me when they know this information about me.	1]. Strongly disagree
		2]. Disagree
		3]. Neutral
		4]. Agree
		5]. Strongly agree
Affective Attitude	How does it make you feel that your healthcare team wants to collect this information?	1]. Strong negative feelings
		2]. Negative feelings
		3]. Neutral
		4]. Positive feelings
		5]. Strong positive feelings
Opportunity Cost	How much do you agree with the following statement? I feel that providing this information to my healthcare team was worth my time.	1]. Strongly disagree
		2]. Disagree
		3]. Neutral
		4]. Agree
		5]. Strongly agree
Self-Efficacy	How much do you agree with the following statement? The questions in this survey were asked in a way that I could understand.	1]. Strongly disagree
		2]. Disagree
		3]. Neutral
		4]. Agree
		5]. Strongly agree
Perceived Effectiveness	How much do you agree with the following statement? This survey captured details about my life that are important for my health.	1]. Strongly disagree
		2]. Disagree
		3]. Neutral
		4]. Agree

Domain	Question	Response Options
		5]. Strongly agree
Implementation	Thinking about taking this survey on the iPad, how easy was it for you to complete?	1]. Extremely difficult
		2]. Somewhat difficult
		3]. Neutral
		4]. Somewhat easy
		5]. Extremely easy
Practicality	How much do you agree with the following statement? I had enough time to complete the full length of the survey during today's visit.	1]. Strongly disagree
		2]. Disagree
		3]. Neutral
		4]. Agree
		5]. Strongly agree
Integration	How much do you agree with the following statement? I feel that this survey was smoothly integrated into today's visit.	1]. Strongly disagree
		2]. Disagree
		3]. Neutral
		4]. Agree
		5]. Strongly agree
Expansion	How much do you agree with the following statement? All in all, I feel that most patients would have no trouble completing this survey.	1]. Strongly disagree
		2]. Disagree
		3]. Neutral
		4]. Agree
		5]. Strongly agree

Table 2.

Basic demographics

Variable	Overall (N=107)	Demopolis (n=48)	Alexander City (n=27)	Greenville (n=32)	p-value
Age (years)					0.21
Median (Q1, Q3)	64 (54.5 – 70)	68 (58 – 71)	60.5 (53 – 68.5)	63 (55 – 68)	
Race, n (%)					<.001
White	45 (43.7)	9 (19.2)	21 (77.8)	15 (51.7)	
Black	57 (55.3)	37 (78.7)	6 (22.2)	14 (48.3)	
Asian	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Gender, n (%)					0.88
Male	35 (34.7)	16 (35.6)	10 (37.0)	9 (31.0)	
Female	66 (65.4)	29 (64.4)	17 (63.0)	20 (69.0)	
Surgical procedure					
Endoscopy, n (%)					N/A
Colonoscopy	85 (79.4)	31 (64.6)	27 (100.0)	27 (84.4)	
Gastroscopy	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
MIS, n (%)					N/A
Laparoscopic cholecystectomy	2 (1.9)	2 (4.2)	0 (0.0)	0 (0.0)	
Laparoscopic ventral hernia repair	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Laparoscopic left hemi-colectomy	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Robotic sigmoidectomy	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Radiofrequency ablation	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Open surgery, n (%)					N/A
Excisional haemorrhoidectomy	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Excision posterior thigh mass	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Excision sternal sebaceous cyst	1 (1.0)	1 (2.1)	0 (0.0)	0 (0.0)	
Right hemi-colectomy	3 (2.8)	2 (4.2)	0 (0.0)	1 (3.1)	
Unknown	9 (8.4)	5 (10.4)	0 (0.0)	4 (12.5)	

MIS - minimally invasive surgery, N/A - not applicable

Table 3.

Individual Level Factors

Variable	Overall (N=107)	Demopolis (n=48)	Alexander City (n=27)	Greenville (n=32)	p-value
Employment, n (%)					0.016
Employed	30 (29.7)	5 (11.1)	12 (44.4)	13 (44.8)	
Unemployed	3 (3.0)	3 (6.7)	0 (0.0)	0 (0.0)	
Retired	37 (36.6)	22 (48.9)	7 (25.9)	8 (27.6)	
Student	2 (2.0)	2 (4.4)	0 (0.0)	0 (0.0)	
Disabled	26 (25.7)	12 (26.7)	8 (29.6)	6 (20.7)	
Other	3 (3.0)	1 (2.2)	0 (0.0)	2 (6.9)	
Education level, n (%)					0.007
Never attended or some schooling	17 (16.8)	10 (22.2)	0 (0.0)	7 (24.1)	
High school graduate or GED	43 (42.6)	23 (51.1)	9 (33.3)	11 (37.9)	
Some college, no degree	20 (19.8)	7 (15.6)	8 (29.6)	5 (17.2)	
College graduate (Bachelor's or Associate degree)	12 (11.9)	2 (4.4)	6 (22.2)	4 (13.8)	
Professional school (Masters or Doctoral degree)	6 (5.9)	0 (0.0)	4 (14.8)	2 (6.9)	
Other	3 (3.0)	3 (6.7)	0 (0.0)	0 (0.0)	
Income > 200% of Federal Poverty Level, n (%)					0.008
No	30 (39.5)	8 (22.2)	11 (64.7)	11 (47.8)	
Yes	46 (60.5)	28 (77.8)	6 (35.3)	12 (52.2)	
Are you a veteran of the United States armed forces?, n (%)					0.018
No	92 (91.1)	43 (95.6)	21 (77.8)	28 (96.6)	
Yes	9 (8.9)	2 (4.4)	6 (22.2)	1 (3.5)	
Do you have a problem understanding what is told to you about your medical condition?, n (%)					0.37
Always	13 (13.0)	9 (20.5)	1 (3.7)	3 (10.3)	
Sometimes	13 (13.0)	6 (13.6)	2 (7.4)	5 (17.2)	
Occasionally	12 (12.0)	5 (11.4)	3 (11.1)	4 (13.8)	
Never	62 (62.0)	24 (54.6)	21 (77.8)	17 (58.6)	
Do you have difficulty understanding written medical information?, n (%)					0.24
Always	9 (9.0)	7 (15.9)	1 (3.7)	1 (3.5)	
Often	5 (5.0)	2 (4.6)	0 (0.0)	3 (10.3)	
Sometimes	12 (12.0)	7 (15.9)	2 (7.4)	3 (10.3)	
Occasionally	9 (9.0)	4 (9.1)	2 (7.4)	3 (10.3)	
Never	65 (65.0)	24 (54.6)	22 (81.5)	19 (65.5)	
How confident are you filling out medical forms by yourself?, n (%)					0.043
Not at all	8 (8.0)	3 (6.8)	1 (3.7)	4 (13.8)	
A little bit	10 (10.0)	4 (9.1)	1 (3.7)	5 (17.2)	

Variable	Overall (N=107)	Demopolis (n=48)	Alexander City (n=27)	Greenville (n=32)	p-value
Somewhat	20 (20.0)	9 (20.5)	5 (18.5)	6 (20.7)	
Quite a bit	17 (17.0)	13 (29.6)	2 (7.4)	2 (6.9)	
Extremely	45 (45.0)	15 (34.1)	18 (66.7)	12 (41.4)	
How often do you have someone help you read the hospital materials?, n (%)					0.007
Always	13 (13.0)	9 (20.5)	1 (3.7)	3 (10.3)	
Often	7 (7.0)	5 (11.4)	0 (0.0)	2 (6.9)	
Sometimes	14 (14.0)	11 (25.0)	1 (3.7)	2 (6.9)	
Occasionally	13 (13.0)	4 (9.1)	4 (14.8)	5 (17.2)	
Never	53 (53.0)	15 (34.1)	21 (77.8)	17 (58.6)	
Sometimes your doctor cares more about what is convenient for him/her than about your medical need?, n (%)					0.02
Strongly disagree	16 (16.0)	1 (2.3)	6 (22.2)	9 (31.0)	
Disagree	54 (54.0)	27 (61.4)	13 (48.2)	14 (48.3)	
Neutral	15 (15.0)	8 (18.2)	4 (14.8)	3 (10.3)	
Agree	9 (9.0)	2 (4.6)	4 (14.8)	3 (10.3)	
Strongly Agree	4 (4.0)	4 (9.1)	0 (0.0)	0 (0.0)	
Unsure	2 (2.0)	2 (4.6)	0 (0.0)	0 (0.0)	
Your doctor's medical skills are not as they should be?, n (%)					0.029
Strongly disagree	19 (19.0)	3 (6.8)	8 (29.6)	8 (27.6)	
Disagree	66 (66.0)	36 (81.8)	15 (55.6)	15 (51.7)	
Neutral	8 (8.0)	4 (9.1)	2 (7.4)	2 (6.9)	
Agree	5 (5.0)	0 (0.0)	1 (3.7)	4 (13.8)	
Strongly Agree	1 (1.0)	1 (2.3)	0 (0.0)	0 (0.0)	
Unsure	1 (1.0)	0 (0.0)	1 (3.7)	0 (0.0)	

Table 4.

Interpersonal Level Factors

Variable	Overall (N=107)	Demopolis (n=48)	Alexander City (n=27)	Greenville (n=32)	p-value
In the last month, how often have you felt confident about handling your personal problems?, n (%)					0.026
Very Often	52 (52.5)	26 (59.1)	10 (37.0)	16 (57.1)	
Fairly Often	20 (20.2)	10 (22.7)	6 (22.2)	4 (14.3)	
Sometimes	14 (14.1)	6 (13.6)	2 (7.4)	6 (21.4)	
Almost Never	2 (2.0)	0 (0.0)	1 (3.7)	1 (3.6)	
Never	11 (11.1)	2 (4.6)	8 (29.6)	1 (3.6)	
How often is someone available to help you if you were confined to bed?, n (%)					0.02
None of the time	2 (2.0)	0 (0.0)	0 (0.0)	2 (7.1)	
A little of the time	6 (6.1)	1 (2.3)	4 (14.8)	1 (3.6)	
Some of the time	16 (16.2)	7 (15.9)	2 (7.4)	7 (25.0)	
Most of the time	15 (15.2)	11 (25.0)	2 (7.4)	2 (7.1)	
All of the time	60 (60.6)	25 (56.8)	19 (70.4)	16 (57.1)	
Do you feel physically and emotionally safe where you currently live?, n (%)					0.5
Yes	97 (97.0)	43 (97.7)	27 (100.0)	27 (93.1)	
No	2 (2.0)	1 (2.3)	0 (0.0)	1 (3.5)	
Unsure	1 (1.0)	0 (0.0)	0 (0.0)	1 (3.5)	
People in my neighborhood can be trusted?, n (%)					0.09
Strongly agree	12 (12.1)	2 (4.6)	3 (11.1)	7 (25.0)	
Agree	62 (62.6)	31 (70.5)	19 (70.4)	12 (42.9)	
Neither agree nor disagree	10 (10.1)	5 (11.4)	1 (3.7)	4 (14.3)	
Disagree	7 (7.1)	1 (2.3)	2 (7.4)	4 (14.3)	
Strongly disagree	2 (2.0)	2 (4.6)	0 (0.0)	0 (0.0)	
Don’t know	6 (6.1)	3 (6.8)	2 (7.4)	1 (3.6)	

Table 5.

Structural (Organizational) Level Factors

Variable	Overall (N=107)	Demopolis (n=48)	Alexander City (n=27)	Greenville (n=32)	p-value
Type of health insurance, n (%)					0.033
Medicare	34 (34.0)	16 (36.4)	7 (25.9)	11 (37.9)	
Medicaid	15 (15.0)	12 (27.3)	1 (3.7)	2 (6.9)	
Blue Cross/Blue Shield of Alabama	31 (31.0)	8 (18.2)	12 (44.4)	11 (37.9)	
Other private insurance	20 (20.0)	8 (18.2)	7 (25.9)	5 (17.2)	
How easy is it for you to make an appointment if you are sick and need health care?, n (%)					0.004
Very Easy	62 (62.0)	34 (77.3)	9 (33.3)	19 (65.5)	
Easy	35 (35.0)	9 (20.5)	16 (59.3)	10 (34.5)	
Neither easy nor difficult	2 (2.0)	0 (0.0)	2 (7.4)	0 (0.0)	
Difficult	1 (10.0)	1 (2.3)	0 (0.0)	0 (0.0)	
During the past 12 months have you delayed getting medical care because of the cost?, n (%)					0.86
No	88 (88.0)	39 (88.6)	23 (85.2)	26 (89.7)	
Yes	12 (12.0)	5 (11.4)	4 (14.8)	3 (10.3)	

Table 6.

Environmental (Community) Level Factors

Variable	Overall (N=107)	Demopolis (n=48)	Alexander City (n=27)	Greenville (n=32)	p-value
Is your neighborhood close-knit?, n (%)					0.002
Strongly agree	18 (19.6)	3 (7.7)	2 (7.7)	13 (48.2)	
Agree	42 (45.7)	22 (56.4)	12 (46.2)	8 (29.6)	
Neutral	11 (12.0)	4 (10.3)	6 (23.1)	1 (3.7)	
Disagree	13 (14.1)	6 (15.4)	3 (11.5)	4 (14.8)	
Strongly disagree	8 (8.7)	4 (10.3)	3 (11.5)	1 (3.7)	
It is within a 10–15-minute walk to a transit (bus, train etc.) stop from my home. Would you say that you…, n (%)					<.001
Strongly agree	1 (1.0)	0 (0.0)	0 (0.0)	1 (3.6)	
Somewhat disagree	4 (4.0)	2 (4.6)	2 (7.4)	0 (0.0)	
Strongly disagree	41 (41.4)	27 (61.4)	5 (18.5)	9 (32.1)	
Does not apply to my neighborhood	49 (49.5)	11 (25.0)	20 (74.1)	18 (64.3)	
Don’t know/not sure	4 (4.0)	4 (9.1)	0 (0.0)	0 (0.0)	
There are sidewalks on most of the streets in my neighborhood. Would you say that you…, n (%)					0.026
Strongly agree	14 (14.1)	5 (11.4)	4 (14.8)	5 (17.9)	
Somewhat agree	6 (6.1)	4 (9.1)	1 (3.7)	1 (3.6)	
Somewhat disagree	4 (4.0)	2 (4.6)	1 (3.7)	1 (3.6)	
Strongly disagree	30 (30.3)	20 (45.5)	2 (7.4)	8 (28.6)	
Does not apply to my neighborhood	43 (43.4)	11 (25.0)	19 (70.4)	13 (46.4)	
Don’t know/not sure	2 (2.0)	2 (4.6)	0 (0.0)	0 (0.0)	
There are facilities to bicycle in or near my neighborhood, such as special lanes, separate paths or trails, shared use paths for cycles and pedestrians. Would you say that you…, n (%)					0.022
Strongly agree	5 (5.1)	1 (2.3)	3 (11.1)	1 (3.6)	
Somewhat agree	4 (4.0)	2 (4.6)	1 (3.7)	1 (3.6)	
Somewhat disagree	3 (3.0)	2 (4.6)	1 (3.7)	0 (0.0)	
Strongly disagree	34 (34.3)	22 (50.0)	3 (11.1)	9 (32.1)	
Does not apply to my neighborhood	50 (50.5)	14 (31.8)	19 (70.4)	17 (60.7)	
Don’t know/not sure	3 (3.0)	3 (6.8)	0 (0.0)	0 (0.0)	
Within the past 12 months, has a lack of transportation kept you from medical appointments or from doing things needed for daily living?, n (%)					0.49
No	96 (97.0)	43 (97.7)	25 (96.2)	28 (96.6)	
Yes, has kept me from general activities	1 (1.0)	0 (0.0)	0 (0.0)	1 (3.5)	
Yes, has kept me from medical care	2 (2.0)	1 (2.3)	1 (3.9)	0 (0.0)	
Do you have internet access in your household?, n (%)					<.001
No	20 (20.0)	16 (36.4)	0 (0.0)	4 (13.8)	

Variable	Overall (N=107)	Demopolis (n=48)	Alexander City (n=27)	Greenville (n=32)	p-value
Yes	80 (80.0)	28 (63.6)	27 (100.0)	25 (86.2)	
Political organization involvement, n (%)					0.56
Active member	4 (4.0)	2 (4.6)	2 (7.4)	0 (0.0)	
Inactive member	10 (10.1)	3 (6.8)	3 (11.1)	4 (14.3)	
Not a member	85 (85.9)	39 (88.6)	22 (81.5)	24 (85.7)	
Church organization involvement, n (%)					0.009
Active member	70 (70.7)	37 (84.1)	13 (48.2)	20 (71.4)	
Inactive member	15 (15.2)	6 (13.6)	6 (22.2)	3 (10.7)	
Not a member	14 (14.1)	1 (2.3)	8 (29.6)	5 (17.9)	
A large selection of fresh fruits and vegetables is available in my neighborhood?, n (%)					0.022
Strongly agree	26 (26.3)	8 (18.2)	7 (25.9)	11 (39.3)	
Agree	25 (25.3)	15 (34.1)	5 (18.5)	5 (17.9)	
Neither agree nor disagree	10 (10.1)	7 (15.9)	1 (3.7)	2 (7.1)	
Disagree	24 (24.2)	11 (25.0)	9 (33.3)	4 (14.3)	
Strongly disagree	10 (10.1)	0 (0.0)	4 (14.8)	6 (21.4)	
Don’t know	4 (4.0)	3 (6.8)	1 (3.7)	0 (0.0)	
The fresh fruits and vegetables in my neighborhood are of high quality?, n (%)					0.033
Strongly agree	25 (25.3)	7 (15.9)	7 (25.9)	11 (39.3)	
Agree	22 (22.2)	15 (34.1)	4 (14.8)	3 (10.7)	
Neither agree nor disagree	7 (7.1)	5 (11.4)	1 (3.7)	1 (3.6)	
Disagree	29 (29.3)	12 (27.3)	9 (33.3)	8 (28.6)	
Strongly disagree	11 (11.1)	1 (2.3)	5 (18.5)	5 (17.9)	
Don’t know	5 (5.1)	4 (9.1)	1 (3.7)	0 (0.0)	
My neighborhood has several free or low-cost recreation facilities (parks, pools, playgrounds, etc.). Would you say that you…, n (%)					0.042
Strongly agree	9 (9.1)	2 (4.6)	4 (14.8)	3 (10.7)	
Agree	19 (19.2)	5 (11.4)	6 (22.2)	8 (28.6)	
Neither agree nor disagree	2 (2.0)	2 (4.6)	0 (0.0)	0 (0.0)	
Disagree	35 (35.4)	22 (50.0)	5 (18.5)	8 (28.6)	
Strongly disagree	31 (31.3)	10 (22.7)	12 (44.4)	9 (32.1)	
Don’t know	3 (3.0)	3 (6.8)	0 (0.0)	0 (0.0)	