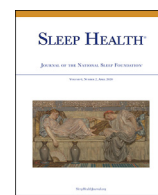


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Adapting sleep hygiene for community interventions: a qualitative investigation of sleep hygiene behaviors among racially/ethnically diverse, low-income adults

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ABSTRACT

Background: Despite the high prevalence of inadequate sleep in racially/ethnically diverse, low-income adults, there is scant research targeting sleep health interventions among underserved populations. Sleep hygiene (SH) recommendations may help promote sleep health for the general population; however, they likely require tailoring to optimize uptake and effectiveness in the “real world” given socio-contextual factors. As an initial step to developing contextually appropriate and effective community-based SH interventions, we conducted qualitative research to understand SH behaviors, beliefs, and barriers in a low-income, ethnically diverse sample of adults.

Methods: We recruited 24 racially/ethnically diverse adults from an affordable housing community who self-reported sleeping ≤ 6 hours on average. Participants were invited to either an individual interview ($n = 5$) or a focus group ($n = 3$). A deductive, thematic-analysis approach was employed. Data collection and interpretation were informed by the Socio-Contextual Model of Behavior Change.

Results: There was evidence of high acceptability of SH and interest in improving sleep health. Barriers to implementing SH were multifaceted, including individual (knowledge, motivation, habits, medical issues, stress, trauma), interpersonal (caregiving), organizational (job strain), and environmental (noise) factors.

Conclusions: Future strategies for adapting behavioral SH interventions should target knowledge, skill development, and behavioral change domains, such as motivation, social support, and self-efficacy. In addition, adapting SH beyond the clinical context for a high-need community population requires attention to multilevel sociocultural factors that contribute to sleep health, particularly chronic stress, prior trauma, and adverse sleeping environments. Development of novel trauma-informed SH interventions may promote effective and safe implementation.

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Introduction

Short sleep duration and poor sleep quality are strongly associated with indices of both poverty and race/ethnicity.^{1,2} Compared to non-Hispanic Whites, racial/ethnic minorities take longer to fall asleep,

have shorter sleep duration, and report higher rates of sleep disturbance.^{2,3} While sleep disparities research has been predominantly conducted among African-American populations, other and potentially overlapping disadvantaged groups, such as low-income groups, report shorter sleep duration compared to higher income groups.⁴ Growing data highlight the role of addressing health disparities and optimizing intervention efficacy by tailoring and targeting behavioral health interventions for priority populations, such as racial/ethnic minorities, low-income individuals, and others.⁵ For example, interventions tailored for low-income communities that

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promote health behaviors other than sleep, such as physical activity and diet, have been widely shown to enhance uptake.^{6–8} Therefore, it is critical to understand the contextual barriers and facilitators to achieving healthy sleep among specific disadvantaged groups.

Despite compelling evidence quantifying the high prevalence of inadequate sleep in minority and low-income adults, as well as the promise of tailored behavioral health interventions, there has been sparse research adapting sleep interventions for these at-risk populations.^{9,10} Sleep interventions, historically, have been designed for and tested in clinical populations; however, there is increasing interest in adapting sleep hygiene (SH) in populations with subclinical sleep problems.¹¹ SH education comprises behavioral and environmental modifications that provide the foundation for healthy sleep,¹² typically recommended as part of clinical insomnia treatment.^{11,13} SH interventions are often delivered by clinicians in the form of a list of optimal behaviors; this delivery method is likely insufficient, given the considerable behavioral change required. Real-world uptake and effectiveness may be optimized by tailoring recommendations and providing behavioral support. This may be especially relevant for mitigating social-contextual barriers to behavior change among racially/ethnically diverse and low-income adults living in the community setting.^{11,13,14} A recent review of culturally tailored behavioral health trials found that gathering knowledge and shared experiences from low-income groups can be effective for building trust and enhancing understanding of behaviors.⁵ For this reason, as an initial step to developing sociocontextually relevant and effective community-based SH interventions specifically targeting adults residing in low-income, racially/ethnically diverse housing communities, we conducted qualitative research to understand SH behaviors, beliefs, and barriers in this specific population.

Methods

Sample and data collection

Study methods are described utilizing the consolidated criteria for reporting qualitative research (COREQ) framework, a reporting checklist for qualitative studies.¹⁵ Interviews and focus groups were conducted at an affordable housing complex in Boston, MA, in 2015–2016. The study team leveraged existing relationships with residents and community leaders to form a Community Partners Advisory Committee, which helped to integrate the study procedures within the existing social context. Resident leaders led recruitment, identifying residents available and interested in the study (purposive sampling), who were then encouraged to invite others to participate (snowball sampling). Recruitment flyers were also posted in public areas of the community (convenience sampling). Eligible participants were ≥ 18 years of age, English-speaking, and reported sleeping ≤ 6 hours on average; short sleep duration was chosen as the main eligibility criterion as it is a marker for other sleep disturbances (e.g., insomnia), it is a prevalent sleep problem in low-income communities, and it is a common target for healthy sleep interventions.¹⁶ Income level was not determined within the sample; however, the majority of tenants in the housing complex qualified for the Housing Choice Voucher Program, commonly known as Section 8, which targets very low- to low-income individuals; of note, a subset of units in the housing complex are occupied by low- to moderate-income households.

Participants were invited to participate in focus groups or individual interviews, as necessary given busy schedules. The moderator, EK, was a qualitative researcher with extensive experience implementing community-based health interventions within low-socioeconomic (SES) status and minority communities. Interviews and focus groups were 1–2 hours in length and were conducted until thematic redundancy was detected and data saturation was

reached.¹⁷ The semistructured interview guide (Appendix) was developed utilizing the Social Contextual Model (SCM) of Health Behavior Change¹⁴ and by a research team of experts in behavioral sleep medicine, qualitative research methods, and community-based research. The SCM has previously informed tobacco control and obesity interventions and was utilized here to elicit social-contextual barriers and facilitators to SH behaviors. SH recommendations referenced by the moderator (Figure 1) were determined by consensus from the extant literature and experts in behavioral sleep medicine.^{11,13} Participants were queried about their own practices, beliefs, and knowledge related to sleep and SH behaviors, as well as barriers and motivators to changing behaviors to optimize sleep. The discussion began with open-ended questions such as, “Why do you think you need sleep? What helps you get a good night’s sleep?” Participants were then probed for familiarity with these behaviors, experiences, interest, and potential barriers to performing the behaviors (Appendix, Semistructured interview guide). Participants received a \$25 grocery store gift card as remuneration. Each session was digitally recorded and transcribed. Participants signed informed consent forms and ethics approval was obtained from the Partners HealthCare IRB.

Data analysis

To maximize the utility of the findings for future intervention development, the final codebook was developed deductively to capture major themes surrounding sleep hygiene beliefs, knowledge, behaviors, barriers, and facilitators.^{18,19} Participant interviews were coded using NVivo Software. Emergent themes were identified from coded quotes. Independently, another study author (KL) reviewed the interview transcripts and audited the themes in the analytic table. Discrepancies between themes were discussed, revised, and resolved.^{20,21}

Results

Of the 24 participants, 19 participated in 3 focus groups (3–10 participants in each), and 5 participated in individual interviews. As detailed in Table 1, participants were predominantly female (75%), were 47.9 years old on average (SD = 15.7; range = 20–81 years), and were racially/ethnically diverse (60% racial/ethnic minorities). The majority of participants were employed full-time (50%) and part-time (29%). No substantive differences in sociodemographics were observed between those who participated in interviews and focus groups (data not shown).

To enhance the utility of the findings for the adaptation of a community-based SH intervention, Table 2 provides a summary of the findings in relation to each SH domain, including: a) beliefs and knowledge, b) behaviors, c) barriers, and d) potential strategies for adapted SH interventions generated by the research team.

Get sufficient sleep

Participants felt that achieving adequate sleep promoted health and general functioning. Relatedly, participants expressed that inadequate sleep negatively influenced mental and physical health, emotional stability, memory, ability to multitask, and decision-making: “[Sleep] helps with all your choices throughout the day. Like, if you sleep good, I think that day you’re more apt to make better choices” [Focus Group, FG#1]. Participants discussed mental health and emotional consequences of short sleep; sleeping “relaxes your mind” [Interview, I#4] and lack of sleep resulted in “getting more frustrating [sic] and probably more paranoid and anxiety” [I#2]. Inadequate sleep also had physical consequences: “your body would shut down” [FG#2]. Participants did not acknowledge a link between inadequate

Habits Specifically For Bedtime/Sleep:
Maintain a regular sleep schedule, particularly a usual wake up time <ul style="list-style-type: none"> • Put away all electronics 1-2 hours before bedtime • Reduce light and noise in the bedroom
Listen to your body and go to bed when sleepy <ul style="list-style-type: none"> • Try not to force sleep
Establish a bedtime routine
Sleep as long as necessary to feel rested (usually 7-8 hours)
General Health Habits To Help With Sleep:
Try to reduce stress
Exercise each day (best if in the morning)
Avoid or limit caffeine after lunch
Avoid or limit alcohol before bedtime
Avoid or limit nicotine

Figure 1. Sleep hygiene recommendations (moderator guide).

sleep duration and risk of developing chronic disease and/or decreased longevity.

Despite knowledge about the benefits of sleep and consequences of insufficient sleep, there were mixed responses when participants were asked if they actively prioritized sleep. Participants described many barriers, with caregiving cited as the most common. Parents valued sleep, but the demands of childcare throughout the evening and night had deleterious impacts on sleep: “As long as everything’s smooth, nobody’s sick, nobody has no fever, then I’ll sleep. And eventually I wake up in the middle of the night to do a diaper change” [I#3]. There was a suggestion to “try to sleep when [the kids] sleep...Or if not, then seek some medical help” [I#3]. Another common barrier was demanding work schedules, such as working multiple jobs or overtime: “I work two jobs, so sometimes, it’s just really hard” [I#5]. Participants also shared a variety of health issues that affected their sleep including sleep apnea, hot flashes, pregnancy, nocturia, and headaches.

Manage stress ¹¹

Participants reported stress and rumination as pervasive barriers to sleep: “[My] brain doesn’t shut down” [FG#1], and “I’m always thinking” [FG#2]. A participant disclosed that stressful life events, including past traumas, made it difficult for her to relax and sleep: “I guess my brain is in protective-safe mode, and I’m always in protective-safe mode” [I#2]. Another common cause of stress was financial insecurity: “Bills, my worries, you know, money problems” [FG#3]. For some, worrying about work interfered with sleep: “I have to wake up for work in a couple hours. So, it’s like, my body is relaxed, but my mind isn’t” [I#1]. Finally, parents reported that the stress of caregiving due to worrying about children at night or sleeping lightly to listen for their children directly interfered with sleep.

Establish a bedtime routine ¹³

Several participants felt that a bedtime routine was very important for promoting healthy sleep. Participants saw value in going to sleep early and relaxing before bed: “Stop thinking anything, let it go through the back...Don’t say anything, don’t say anything” [FG#2]. Relaxation practices before bed included taking a shower or hot bath, exercising, breathing, praying, meditating, reading, doing a puzzle, putting on white noise, or drinking a warm beverage. Despite acknowledging that a bedtime routine was beneficial, most reported not having consistent nighttime patterns, noting multiple barriers and competing priorities previously mentioned (parenting and work). For example, some parents were motivated to have a regular bedtime routine, but conceded that adhering to routines, “all depends on [my child]” [FG#3].

Sleep timing regularity ¹¹

Participants did not spontaneously discuss the importance of sleep timing regularity; however, it was included in the list of SH behaviors referenced by the moderator (Figure 1). Most participants did not keep a consistent sleep schedule. As noted earlier, parents reported that their sleep patterns depended largely on their children’s schedules and for some participants, shift work and variation in work schedules impeded their ability to follow consistent sleep schedules. Participants described time constraints and just not enough “hours in the day” [FG#1] to keep a regular sleep schedule: “I can try [keeping a regular sleep schedule] but it doesn’t always work for me just because there’s just a lot going on” [I#5]. Finally, habit and decision control were reported as additional barriers to adhering to

Table 1
Overall participant characteristics

Characteristic	N	%
Sex		
Female	18	75.0
Male	6	25.0
Education		
High school or less	7	29.2
Some college	9	37.5
College graduate and higher	7	29.2
No report	1	4.1
Employment		
Employed full-time	12	50.0
Employed part-time	7	29.2
Retired	2	8.3
Disabled	2	8.3
No report	1	4.2
Ethnic category		
Hispanic or Latino	3	12.5
Not Hispanic or Latino	21	87.5
Racial Categories		
American Indian/Alaska Native	0	0
Asian	4	16.7
Native Hawaiian or Other Pacific Islander	0	0
Black or African American	6	25
White	10	41.7
Other	4	4.2

Table 2
Summary table: Beliefs, barriers, and potential strategies for adapted behavioral SH intervention domains

SH domain	Beliefs and knowledge	Behaviors	Barriers	Potential strategies for adapted behavioral SH interventions*
Sleep duration	<ul style="list-style-type: none"> - Beliefs that sleep is very important - Required for basic physical functioning - Promotes emotional and cognitive health: <ul style="list-style-type: none"> • Stability • Multitasking • Productivity • Decision-making • Memory • Diet • Mood (anxiety, anger) 	<ul style="list-style-type: none"> - All participants slept 6 hours or less (inclusion criteria) - Sleep was only a priority for some 	<ul style="list-style-type: none"> - Caregiving (childcare) - Job strain and work–life balance - Worrying, stress, and rumination (see next section) - Habitual behaviors - Health factors: <ul style="list-style-type: none"> • Menopause/hot flashes • Pregnancy • Headaches • Circadian misalignment 	<ul style="list-style-type: none"> - Motivation: leverage existing concerns to motivate behavior changes - Education: impact of sleep duration on chronic diseases and mortality - Circadian realignment behavioral interventions - Screening and referral for comorbidities - Recognition of structural barriers
Bedtime routine	Belief that a bedtime routine is very important Knowledge and acceptability of diverse relaxing evening activities: <ul style="list-style-type: none"> - Meal preparation - Shower or hot bath - Exercising - Breathing, meditating - Praying - Reading, sudoku - Drinking a warm beverage 	Mixed responses: most did not keep a regular bedtime routine	<ul style="list-style-type: none"> - Caregiving (childcare) - Work/family demands 	<ul style="list-style-type: none"> - Education: role of hyperarousal and sleep - Skills: relaxation before bed (ex. yoga, meditation) - Recognition of structural barriers to reducing stress - Engage family members in mutually supportive activities
Sleep timing regularity	A consistent bedtime was perceived to be important No discussion of importance of regular wake time	Mixed responses: most did not keep a regular sleep schedule	<ul style="list-style-type: none"> - Caregiving (childcare) - Job strain and work schedules (especially shift work) - Busyness - Habit and decision control 	<ul style="list-style-type: none"> - Education: importance of circadian rhythms and impact of meals, activities, and light exposure - Skills: circadian coaching - Community adapted brief behavioral treatment for insomnia (BBTI) - Behavioral coaching to improve decision control and to support habit changes through the provision of monitoring logs, text message reminders - Behavioral coaching to improve decision control and change habits - Knowledge: nonstimulating sound-masking and sound-reducing options - Recognition of structural barriers to blocking-out environmental noise
Avoiding electronics in bed	Belief that avoiding electronics benefits sleep	Majority did not adhere to this behavior - Perceived as the hardest SH recommendation	<ul style="list-style-type: none"> - Habit - Environmental noise 	<ul style="list-style-type: none"> - Behavioral coaching to improve decision control and change habits - Knowledge: nonstimulating sound-masking and sound-reducing options - Recognition of structural barriers to blocking-out environmental noise
Bedroom environment				
Light	None reported	Mixed behaviors: some slept in a dark room, some lowered lights, some kept lights on	<ul style="list-style-type: none"> - Fear of the dark 	<ul style="list-style-type: none"> - Education: role of light in sleep physiology - Behavioral coaching to address fear of dark (use of “trauma-informed” intervention approaches, such as promoting incremental changes) - Introduce/provide light reducing strategies (eye masks) coupled with desensitizing procedures to reduce fear of the dark - Engage landlords and neighboring light polluters to provide black-out window shades
Noise	Limited knowledge of strategies to mask or reduce noise	Sound-masking with TV, radio, white noise	Nonmodifiable environmental noise <ul style="list-style-type: none"> - Hospital - Neighbors - Construction 	<ul style="list-style-type: none"> - Promote knowledge, skills, and resources to block-out noise: promote ear plugs, white noise, etc.; introduce cognitive techniques - Recognition of structural barriers and use of “trauma-informed” intervention approaches - Education: role of temperature in sleep physiology
Temperature	Very limited knowledge of recommendation to cool bedroom	None reported	<ul style="list-style-type: none"> - Little reported - Some issues with menopause (hot flashes); open windows to cool room “I just ended up sick” (FG#1) 	<ul style="list-style-type: none"> - Education: role of temperature in sleep physiology
Limit caffeine, alcohol, nicotine				
Caffeine	<ul style="list-style-type: none"> - General knowledge that caffeine interfered with sleep. - Some knowledge gaps about hidden caffeine (ex. types tea) 	Mixed responses	<ul style="list-style-type: none"> - Habitual behaviors - Lack of knowledge about hidden caffeine - Assumptions about tolerance responses and physiological impacts of caffeine 	<ul style="list-style-type: none"> - Education: how caffeine disrupts sleep, habitual caffeine intake and sleep disruption sensitivity, acceptable timing of caffeine intake, and acceptable caffeine doses - Skills: identifying caffeinated products and alternatives
Alcohol	Limited findings: belief that alcohol can improve sleep	Limited findings	None reported	<ul style="list-style-type: none"> - Education: how alcohol disrupts sleep (physiology) - Education: intake recommendations

Table 2 (continued)

SH domain	Beliefs and knowledge	Behaviors	Barriers	Potential strategies for adapted behavioral SH interventions*
Nicotine	Limited findings: participant who smoked felt nicotine should be avoided	Limited findings: one reported smoker	Limited findings: difficulty quitting smoking	- May provide resources on quitting smoking and education on impact of nicotine on sleep
Daily exercise	Participants believed that exercise improved sleep. Additional benefits: - Getting in shape - Building muscle - Enjoyment - Socializing	Most aspired to exercise or currently exercised	Lack of motivation/prioritization	- Behavioral coaching: bolster motivation (promoting incremental changes) - Motivation: emphasize social and physical benefits of exercise
Stress	General awareness that stress disrupts sleep	Feeling that stress is impossible to manage	- Persistent rumination - Trauma - Financial stress - Busyness: caregiving, work	- Education: role of hyperarousal on sleep onset latency - Skill, motivation, and support: stress reduction practices, including mind–body techniques - Use of “trauma-informed” intervention approaches
Other	Beliefs in non-evidence-based sleep remedies	Many participants promote consuming tea, food, supplements	Knowledge and beliefs	- Recognize the utility of placebo effect - Education: share available evidence on foods and supplements for sleep

* Strategies were generated by the research team and, as a result, were not subject to member checking or community input.

a regular sleep schedule. One participant did not go to bed “on-time” because, “I’m my worst enemy” [I#5].

Reduce use of electronics at bedtime

Most participants reported using electronic devices in the evening, despite being aware that avoiding electronics at bedtime benefits sleep. Participants commonly reported use of phones and TV viewing in bed, as well as leaving the TV or radio on all night. Numerous participants felt that avoiding electronic devices at bedtime was among the most difficult SH behaviors: “I always have the computer or TV on...or I look at the emails or whatever...so [stopping] seems kind of almost impossible” [FG#1]. Some participants described the challenge of breaking this habit: “[Going on Facebook in the middle of the night is] not good, but it’s just like a habit now. So, I have to break it” [FG#2]. It should be noted that some used the TV or radio to drown out environmental disturbances, such as neighborhood noise.

Optimize the bedroom environment for sleep¹¹

Sleeping in a dark, cool, and quiet bedroom is a standard SH recommendation; however, only one participant indicated knowledge of this recommendation and reported learning about it on YouTube. In terms of light, some participants slept in a dark room, while others merely lowered the lights, and some kept the lights on all night. Though some reported that they found a dark room to be calming and helpful for sleep, concerns about sleeping in the dark was a minor theme. One participant explained: *I’m scared of the dark, so I always have to have some kind of light on*” [FG#1]; this may indicate safety concerns.

Participants discussed several sources of noise pollution: “... There’s the hospital noise. There’s the service center. There’s my upstairs neighbor” [FG#1] and “[the construction] went 23 hours a day, seven days a week” [FG#1]. The moderator probed about the use of adaptive behaviors, such as wearing earplugs: “I never thought about earplugs” [FG#1].

Avoid caffeine, alcohol, nicotine^{11,13}

Adherence to the recommendation to avoid caffeine or only consume caffeine in the morning was variable. In some cases, participants were not aware of the caffeine content in products. One participant reported drinking green tea as a sleeping aid and when probed about the caffeine content of green tea, the participant

responded: “I just figured all tea was soothing and made you sleep” [FG#1]. There was also the perception that habitual caffeine intake builds tolerance to its effect on arousal and sleep: “I usually go to bed with a two-liter of Pepsi, but I’ve been drinking it so long, it’s not like caffeine is going to keep me up” [FG#1].

While no participants disclosed that they used alcohol to help sleep, one believed it could help improve sleep: “[To make sure I got a good night sleep] I thought about taking up [drinking], but I don’t have the stamina for it” [FG#1]. Others avoided drinking alcohol at night. Only one participant currently smoked; they felt nicotine should be avoided, especially in bed.

Exercise regularly^{11,13}

Several participants wanted to try exercising or were currently exercising and believed that exercise improved sleep. They were also motivated to exercise to improve overall health, to “get in shape” [I#1], for enjoyment, or to socialize. One participant explained that she goes to spin class only because her sister is the instructor and pushes her to go. However, not all participants were motivated to exercise. A participant conceded that she would like to walk with friends, but “I don’t like to commit...because... I’m not at the area where it’s a priority” [FG#2].

Additional sleep beliefs and behaviors reported by participants

When participants were asked about strategies they used or recommended for getting a good night’s sleep, several behaviors that are not typically regarded as SH were suggested. Most suggestions involved ingesting a food or substance to induce sleepiness, for example, taking magnesium, green tea, honey, yogurt, a banana, warm milk, cocoa, a heavy dinner, or herbal tea. One participant told her grandchild to “put lavender oil on a little piece of cotton and stick it in her pillow” [FG#1]. Two others recommended reading. One qualified that reading sometimes helps, but sometimes, “you can get, like, so into the book or something...and then you don’t want to put it down” [FG#1].

Preferences for SH community intervention program

In addition to discussing SH recommendations and barriers, participants provided input on how SH education could be provided in

their community. When asked how they would like to receive SH information, there was a diversity of opinions, including a group class, a one-on-one session, receiving a pamphlet or website, or “*all of the above*” [FG#2]. Most participants, however, preferred a group format where they could receive peer support: “*I think it’s better if there are other people because when you hear somebody else is waking up every morning at 3 o’clock in the morning, you don’t feel so bad all the time*” [FG#2]. In contrast, a few participants preferred a more private one-on-one format “*because then you can talk about it a little bit more in-depth*” [I#3]. Participants wanted the interventionist to be someone “*trained*” who had “*a lot of knowledge*” [I#1]. There was no explicit preference to have someone from their own community or with specific professional credentials: “*I mean, it really doesn’t matter, as long as they know what they’re talking about*” [I#5].

Discussion

While there is widespread clinical recognition of the importance of promoting healthy sleep practices, there are key knowledge gaps in how to translate sleep hygiene recommendations to behavioral interventions. The present research provides rarely available qualitative data exploring SH behaviors, beliefs, and barriers among low-income, racially/ethnically diverse adults to inform the adaptation of SH recommendations in the community setting. The results provide evidence of high acceptability of SH behaviors and broad interest in improving sleep health. Participants expressed interest in group or individual sessions led by a sleep expert. They also highlight several key barriers to enacting SH, including knowledge, motivation, stress, caregiving, work strain, and environmental disturbances.

Barriers to implementing SH behaviors were multifaceted and multilevel, including individual factors (knowledge, motivation, habits, medical issues, stress), interpersonal factors (family caregiving), organizational factors (job strain, work–life balance), and environmental factors (noise and safety). These qualitative insights are consistent with previous survey findings that showed working more than 40 hours/week, caregiving to family/friends, and lack of social and emotional supports to be among the salient factors associated with insufficient sleep.²² In particular, our data emphasize that caregiving interferes with multiple aspects of sleep health: adequate sleep duration, bedtime routine, sleep timing regularity, as well as stress management, highlighting the need to explicitly consider parenting demands when designing sleep interventions. This is consistent with previous qualitative research with low-SES African-American mothers that found that managing work and household commitments, along with anxiety, were major contributors to poor sleep quality, independent of the babies’ sleep patterns.²³ Additionally, participants’ value for sleep health, yet their low prioritization of SH due to competing priorities, underscores the need to develop SH interventions with implementation strategies that support stress coping and empower individuals with relevant knowledge, applied skills, and behavioral supports.

Recommendations for community-adapted behavioral SH interventions for low-SES adults

Potential strategies for adapted behavioral SH interventions are described further and summarized in the final column of [Table 2](#).

Knowledge

Education can broadly target key behavioral drivers, with attention to capabilities, opportunities, and motivations for behavior change.²⁴ Participants generally endorsed the value of sleep and were knowledgeable about core SH behaviors. Nonetheless, the results indicated some important gaps that could be addressed in future interventions. As shown in [Table 2](#), knowledge gaps were

identified in nearly every SH domain. The impact of inadequate sleep on chronic illness and links with mortality was underrecognized; raising awareness regarding the deleterious health impacts of poor sleep may serve as motivation for engagement in healthy sleep behaviors. Providing education about how caffeine disrupts sleep, acceptable timing and dose of caffeine intake, and support to accurately identify caffeinated products and reliably choose alternatives may also be helpful. While participants recognized the negative influence of noise on sleep, there was limited knowledge of effective coping strategies. In addition, more education is warranted about the rationale for sleeping in a cool, dark room and how to implement this. Participants generally had positive attitudes toward exercise; however, they did not report consistently exercising. Providing additional education on the benefits of exercise, such as physical fitness and socialization, may bolster motivation to exercise consistently. Participants appeared to have little knowledge about the importance of the body’s circadian rhythms on sleep and health. Sharing evidence on the importance of consistent sleep, eating, and light exposure timing may enhance motivation to follow consistent schedules. Given the pervasive problems related to stress, it also may be beneficial to provide education on the role of hyperarousal on sleep.

Skill development and behavioral change

As SH is translated for use in community populations, there is a need for more than educating individuals about the standard list of SH behaviors.¹¹ Our analysis highlights that while there is general awareness of many SH recommendations, individuals face multiple barriers to implementing them consistently. Successful uptake and sustainability of SH may call for adapted interventions that target contextually appropriate behavior change. Consistent with existing research on successful program implementation for low-income, diverse adults,^{24,25} behavioral coaching to improve decision control, skill building, and stress management may be useful intervention attributes.

Our findings highlighted the importance of developing skills and behavioral approaches that address caregiving challenges, which were prominent barriers to healthy sleep behaviors among our respondents. A qualitative study on sleep among low-income African-American mothers identified time management and family support as key facilitators to getting a good night’s sleep.²³ Family-based interventions that leverage family support and include skill-building for parents to prioritize sleep in the context of their family’s schedule may be both practical and efficacious. Given variable and demanding work schedules, the scheduling, timing, location, and burden of intervention visits could be adjusted to promote inclusion of working, low-income adults. SH interventions could be offered several times a week and at convenient locations such as housing complexes, churches, or social clubs.²⁶ A community setting and use of group sessions that promote social support may also help address the lack of social and emotional support, which has previously been associated with insufficient sleep.²² Behavioral tools, such as interactive self-monitoring sleep diaries and text message reminders, may improve motivation and capability to adhere to SH recommendations. Providing resources such as eye masks and earplugs may also help address nonmodifiable environmental barriers.

Though stress management is not a traditional SH recommendation, our sample identified stress as a key barrier to obtaining healthy sleep, and prior literature suggests that stress reduction and relaxation before bed are important components of healthy sleep.¹¹ Our participants communicated interest in multiple relaxation practices, such as yoga and meditation, which may help individuals cope with stress that may be interfering with sleep. In our previous qualitative research in this sample, participants felt that yoga would be an acceptable sleep intervention.¹⁰

In addition to individual level modifications, to further address environmental barriers to poor sleep, community- and policy-level interventions may engage landlords and neighboring businesses to reduce noise and light pollution, as well as to improve housing quality.

Trauma-informed interventions

Existing research on trauma, sleep, and sleep-related behaviors, together with nascent findings in our data, suggests that interventions that seek to address SH in populations with high levels of stress and prior trauma may need to be tailored. While it is important to promote SH behaviors that address the disparate levels of sleep disturbance associated with environmental factors such as light and noise in disadvantaged neighborhoods,^{3,27,28} sleeping in total darkness and quiet or doing stress reduction practices may be threatening to individuals with histories of trauma, as it may produce untoward side effects or be unsafe for those who live in environments where hypervigilance can be an asset. Due to the preliminary nature of our investigation, trauma was not probed for a priori and was only a minor theme, potentially due to the sensitive subject matter; however, several participant reports raised concerns about the adverse effects of prior trauma on sleep. One participant disclosed that past traumatic experiences led to hypervigilance and rumination, making it difficult to fall asleep. Another reported fear of the dark, explaining that the TV was left on all night as a light source.

Anecdotally, while delivering subsequent sleep health interventions in this community, several participants described barriers to adhering to SH recommendations as a result of engaging in protective behaviors to address perceived safety issues. For example, one woman reported difficulty sleeping because she was concerned about someone breaking into her bedroom window. Several participants feared sleeping in darkness (turning off the TV, lights, or closing window shades), some noting that they wanted to be able to see potential intruders. These barriers to SH may be consistent with existing research demonstrating links between poor sleep and experiences of trauma, which is highly prevalent in low-SES communities. Gillespie et al. found that 88% of adults “within an urban, impoverished, population” had experienced significant trauma.²⁹ Elsewhere, posttraumatic stress symptom severity has been independently associated with insomnia severity.³⁰ Research has also previously linked fear of the dark, experiences of trauma, and poor sleep.³⁰ These studies are predominantly to exclusively among African-American populations; more research is needed to assess relevance to low-SES populations broadly. Together with our preliminary findings and anecdotal evidence, research has shown important links between trauma, stress, sleep, and SH behaviors associated with heightened vigilance and darkness. Future research should investigate and test relevant, safe, and efficacious “trauma-informed” SH interventions for underserved populations, with sensitivity in collecting and interpreting such data. As a start, trauma-informed interventions should be sensitive to concerns about darkness and sensory deprivation; promoting recommendations such as avoiding electronics, sleeping in a dark, quiet room, and reducing stress may not be safe or effective without special precautions.

Limitations and strengths

Our qualitative study has several important strengths. First, the findings provide useful insights for adapting SH recommendations beyond the clinical context,¹¹ providing qualitative insights into how SH is perceived, valued, and understood in the community. Second, several studies have demonstrated the effectiveness of SH in low-income infant, child, and adolescent populations;^{31–33} however, adults are less studied. Third, while previous findings have identified key barriers to sleep,³⁴ there is scant research exploring barriers to SH behaviors in the general population or in high-need populations in particular. Finally, while not classical community-based participatory

research (CBPR), our study drew on many key principles of CBPR,^{35,36} building community partnerships and seeking community input. Future intervention studies should incorporate further community input and repeatedly assess acceptability and relevance in the community.

Several limitations of this qualitative study should be considered. First, the sample was predominantly female, so these findings may not adequately capture factors specific to men. The sample was recruited from an affordable housing community with an on-site community center that offered health promoting programs. This context may have heightened participants’ values and knowledge of healthy behaviors, including sleep. Results may have differed with inclusion of individuals from a wider range of housing communities and geographic sites, underscoring the need for ongoing research in multiple settings. Neighborhood safety and discrimination were not explicitly discussed. It is possible that a richer discussion of issues of trauma, marginalization, racial discrimination, and neighborhood safety may have occurred if the moderator was a racial/ethnic minority^{37,38} and the group was more racially homogeneous. In addition, the study was not designed to assess the specific influences of gender, family structure, occupation, and other sociocultural factors (individually or across several dimensions) on sleep perceptions and behaviors. Future research may benefit from more in-depth consideration of how sleep health varies across multiple exposures, roles, and identities. In addition, this study was conducted for the purposes of informing the adaptation of individual-level behavioral SH interventions. Aspects of the physical environment, including climate control, pests, density, noise, and light exposure are important factors that also need to be addressed as part of strategies to improve sleep, especially in low-resource settings. Finally, the adaptation strategies listed in Table 2 were generated by the research team in response to the study results. Future strategies may be codeveloped with target community members to further improve acceptability and effectiveness.

Conclusions

We found that participants valued sleep and felt it was important for their daily functioning and health; however, they encountered several competing demands and stressors that were barriers for implementing SH behavioral change. Given these barriers, there is a need to deliver SH as a multifaceted, contextually appropriate community-based intervention that addresses structural and sociocontextual barriers to healthy sleep that are prevalent in socioeconomically disadvantaged communities. Skills, motivations, and self-efficacy can be improved to promote behavior change by providing education, tools, and support that leverage community strengths and accommodate sociocontextual factors. For example, interventions where participants develop incremental, personalized SH goals may bolster programmatic success, given busy and stressful lives and competing priorities. Given nonmodifiable causes of stress, rumination, and hypervigilance, interventions that improve stress coping and relaxation may be crucial. Finally, more research is needed to adapt SH interventions that are sensitive to the pervasive experiences of discrimination and trauma in low-income, racially/ethnically diverse communities.

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Appendix

Semistructured interview and focus group guide

Theme 1: Beliefs and attitudes toward sleep

1. Why do you think you need sleep?
PROBE: link between sleep and health
2. How important is sleep to you?
PROBE: do you change your schedule, do you ask for assistance, do you see a doctor about it?
3. How much sleep do you get at night?
PROBE: Does it vary night to night? Do you think that is “enough” for you? Do you feel that you need “more” sleep or “better” sleep?
4. What happens if you don't get enough sleep?

Theme 2: Barriers and facilitators to healthy sleep

5. What do you do to make sure that you get a good night's sleep? What helps you get a good night's sleep?
6. What do you tell others to do if they are having difficulty sleeping?
7. What keeps you from getting a good night's sleep?

Theme 3: Knowledge and beliefs about sleep hygiene recommendations

8. Have you ever heard of tips or recommendations on how to get better sleep?
PROBE: What have you heard? Where have you gotten this information (magazines, TV, etc.)?
9. Have any of these tips worked for you?
PROBE: Why or why not?

That is a great list. Here are some additional tips that have been suggested for good sleep

POST LIST:

Habits specifically for BEDTIME/SLEEP

- Maintain a regular sleep schedule, particularly a usual wakeup time.
 - PUT AWAY ALL ELECTRONICS 1–2 hours before bedtime.
 - REDUCE LIGHT AND NOISE in the bedroom.
- Listen to your body and GO TO BED WHEN SLEEPY.
 - Try not to force sleep.
- Establish a bedtime routine.
- Sleep as long as necessary to feel rested (usually 7–8 hours.)

General health habits to help with sleep

- Try to REDUCE STRESS.
 - EXERCISE each day (best if in the morning).
 - AVOID OR LIMIT CAFFEINE after lunch.
 - AVOID OR LIMIT ALCOHOL before bedtime.
 - AVOID OR LIMIT NICOTINE.
10. Do you think that there is anything missing from this list? What?
NOTE: Be sure to integrate anything that was on their list.
PROBE: Why do you think XX will help you get good sleep?
 11. Have any of you tried doing some or all of these things?
PROBE: Where you successful? Why If not successful, why?
 12. Which, if any, of these changes would you be interested in trying?
 13. If you were to try making some of these changes, which do you think would be the hardest for you to do?
PROBE: Why?
 14. Some of these tips/suggestions for better sleep were new to some of you. How would you like to learn or hear about tips like this? Who would you want to hear the information from? How do you think they should share that information with you?
- As part of the program that we are developing, we will share these sleep suggestions with people and we may remind them about these behaviors throughout the day. If you were to participate in a program like this...
15. Would you like to receive reminders about the sleep tips/suggestions?
 16. For those of you that would like to receive the reminders, would you prefer tips like “turn off the TV” or to hear things like “time to read a book” as an example of something that you could do in place of watching TV, drinking caffeine, etc.
 17. How would you like to receive these reminders or messages?
PROBE: Email, text, phone alarm, paper reminders like post-its

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