

Healthy balance in physical activity, sedentary behavior, and sleep in older adults and people with limited mobility

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Abstract

Objective. To explore barriers and facilitators to physical activity, sedentary behavior, and sleep among low-income older adults (OA) and people with limited mobility (PLM) in urban and rural Mexico. **Materials and methods.** A cross-sectional study with twelve focus groups. **Results.** OA and PLM shared barriers and facilitators. Participants perceived more barriers than facilitators to physical activity, largely due to poor infrastructure, medical indications, physical fatigue, and safety concerns. Environmental factors such as noise, hot weather, insects, and screen use were shared barriers for sleep. However, social support encouraged physical activity, active breaks limited sedentary behavior, and relaxation techniques, and consistent bedtime routines enhanced sleep. For OA, personal motivation and green spaces were also physical activity facilitators. For PLM, family overprotection contributed to increased sedentary behaviors. **Conclusions.** This study highlights the need for inclusive public health initiatives that address structural and social barriers, fostering more active and healthier lifestyles for these populations.

Keywords: physical activity; sedentary behavior; sleep; older adult; people with limited mobility; barriers and facilitators

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Resumen

Objetivo. Explorar las barreras y facilitadores para actividad física, comportamiento sedentario y sueño en personas adultas mayores (AM) y personas con movilidad limitada (PML) de bajos ingresos en zonas urbanas y rurales de México. **Material y métodos.** Este estudio transversal analizó datos de doce grupos focales. **Resultados.** AM y PML compartieron barreras y facilitadores. Los participantes percibieron más barreras que facilitadores para la actividad física, principalmente debido a la mala infraestructura, indicaciones médicas, fatiga física y preocupaciones de seguridad. Factores ambientales como ruido, clima caluroso, insectos y uso de pantallas fueron barreras comunes para el sueño. Sin embargo, el apoyo social incentivó la actividad física, las pausas activas ayudaron a reducir el comportamiento sedentario y las técnicas de relajación, junto con rutinas consistentes para dormir, mejoraron el sueño. En AM, la motivación personal y los espacios verdes también facilitaron la actividad física. En PML, la sobreprotección familiar contribuyó inadvertidamente al aumento del comportamiento sedentario. **Conclusiones.** Este estudio resalta la necesidad de iniciativas de salud pública inclusivas que aborden barreras estructurales y sociales, fomentando estilos de vida más activos y saludables para estas poblaciones.

Palabras clave: actividad física; comportamiento sedentario; sueño; adultos mayores; personas con movilidad limitada; barreras y facilitadores

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Physical inactivity, excessive sedentary behavior, and insufficient sleep are increasingly recognized as interrelated public health concerns, contributing substantially to higher risks of cardiovascular diseases,¹ diabetes,^{2,3} and mental health disorders.¹ Among older adults (OA) and people with limited mobility (PLM) living in low-income conditions, these risks are exacerbated by shared conditions,⁴ including reduced functional ability, along with other intersecting barriers such as limited access to healthcare, unsafe environments, and lower levels of social support.⁵⁻⁸ While physical activity and sedentary behavior are sometimes considered opposing constructs, together with sleep, these behaviors are interconnected components of a finite 24-hour period.⁹ Healthy and active lifestyles in older adults may lead to greater vitality, a lower risk of falls and frailty, and a reduction in the duration of ill-health periods in later life.¹⁰ Similar benefits can be observed among people with limited mobility, despite the additional challenges they may face.^{10,11}

Time spent in one behavior necessarily displaces time spent in another, and evidence increasingly highlights the importance of achieving a healthy balance across all three behaviors rather than focusing on each in isolation.^{9,12-14} In Mexico, fewer than 5% of OA achieve a healthy balance of physical activity, sedentary behavior, and sleep.¹⁴ For PLM, national data on these behaviors are lacking, despite the fact that 6.8% of Mexicans live with disabilities that restrict mobility.¹⁵ Whereas, data in different settings suggest that sedentary behaviors are higher in socioeconomically deprived settings which is a key driver of health inequalities and may differ in the context of Mexico.¹⁶ This new paradigm has been adopted in recent 24-hour movement guidelines for optimal health across the life course.^{9,17-21}

Enhancing a healthy balance on physical activity, sleep and sedentary behavior among older adults and people with limited mobility demands extra efforts, including the adequate implementation of these behaviors' international recommendations for health.²¹ In Mexico, this is especially important due to national policies to promote their health. Data from high-income countries (HIC) is dominant on physical activity including barriers such as encompass fear of injury, time constraints, limited availability of physical activity programs, a shortage of trained personnel, and inadequate social support among OA.²²⁻²⁴ Whereas, inadequate built environment design, high transportation costs, limited access to specialized guidance and trained personnel, perceived rejection, and insufficient social support among PLM.^{25,26} However, these studies do not integrate the three behaviors within a 24-hour. Hence, understanding the barriers and facilitators that

influence Mexican OA and PLM in achieving sufficient physical activity, limiting sedentary behaviors, and obtaining adequate sleep is essential. This study therefore aimed to identify these barriers and facilitators to provide evidence that can inform the adaptation of the Mexican Guidelines on Physical Activity, Sedentary Behavior and Sleep.

Materials and methods

Study design

This cross-sectional study with a qualitative approach throughout 12 focus groups from July to November 2023 among OA (≥ 60 years old) and PLM (ages $\geq 18-59$) living in low-income conditions. Focus groups were conducted in rural and urban areas in Morelos, Mexico. The Ethics Committee at *Instituto Nacional de Salud Pública* (INSP) reviewed and approved this study (Approved July 05, 2023, CI: 1767, Folio Identification: R29).

Procedure and study population

Three rural areas (Yecapixtla, Tlaquiltenango, Tlaltizapan) and three urban areas (Cuernavaca, Jiutepec, Cuautla) were included. These locations were purposively selected in coordination with the *Sistema para el Desarrollo Integral de las Familias* (DIF), based on the higher concentration of OA and PLM state program beneficiaries, as well as logistical feasibility. These programs generally target populations with low socioeconomic status. PLM were defined in this study as individuals with a physical disability that limits movement, or those that live with limited mobility such as missing limbs, restricted mobility, or difficulty moving from one place to another, along with their caregivers when available. All eligible individuals were invited to participate. Participants under 18 years of age, those unable to participate in the discussion session, or those with verbal limitations were excluded for this study.

Participants were recruited from a list of beneficiaries of state programs provided by DIF, prioritizing participants whose age group and profile aligned with the study's focus rather than representativeness. Initial contact occurred during regular program activities, such as food or mobility assistance (e.g., wheelchairs, canes, and crutches). Recruitment and scheduling were coordinated with DIF social workers, who also facilitated outreach to those unable to attend program activities. The research team, with the support of social workers, presented the study and invited participants to the focus groups. In accordance with the Declaration of Helsinki, written informed consent was obtained. Those unable to

read received assistance and caregivers provided consent when necessary.

The sample included 81 participants (38 OA and 43 PLM), evenly distributed across urban (23 OA and 20 PLM) and rural areas (15 OA and 23 PLM) (table I). A total of 12 focus groups were conducted (6 with OA and 6 with PLM), each with 6-8 participants. Focus groups were not mixed, OA and PLM participated in separate sessions, and each group was stratified by urban and rural areas. We conducted three urban and three rural focus groups for OA, and three urban and three rural focus groups for PLM. The total number of focus groups was determined by theoretical saturation. Sessions were conducted at locations where social programs were implemented, including community centers, local DIF facilities, health clinics, and school sports courts. Each session, lasting 60 to 90 minutes, was led by a trained moderator, supported by an observer and a research assistant. The moderator took field notes and shared insights with the group and the study team throughout the process. Sessions were audio recorded, and participants received a small token of appreciation, such as a recyclable water bottle.

Instruments

Instruments were developed to explore the barriers and facilitators faced for engaging in healthy behaviors in 24-hours in urban and rural areas. Two sets of guidelines: the 2020 WHO physical activity and sedentary behavior guidelines,²¹ complemented the screen-time, sitting-time, and sleep recommendations with guidelines outlined in the 2017 Canadian 24Hour Movement Guidelines.¹⁷ The guiding questions (table II) were designed and reviewed by consensus among the research team and INSP researchers with experience in similar

studies, in accordance with the study's objectives based on the socioecological model,²⁷ and social marketing²⁸ frameworks. They were also pilot-tested and refined with a small subset of the population of interest.

Focus groups were conducted using a semi-structured format, including 28 open-ended questions presented after the international guidelines. Probing questions were used when necessary, considering economic, cultural, and traditional factors, the environment, and other emerging elements during the discussion.

Analysis and trustworthiness

Focus groups recordings were transcribed verbatim and were analyzed using inductive thematic analysis.^{29,30} supported by NVIVO 1.7.1 software. The codes were organized based on age groups (i.e., PLM aged 18-59 years and OA aged 60 years or more). To seek scientific rigour the Critical Friends technique was used as its advantages in contrast with other techniques. To this end, three external researchers with experience in qualitative research and movement behaviors were provided of a sample of codes to review them and ask critical questions enhancing reflexivity and enriching coding process. Themes were developed by the researchers through reflection and interpretation of the data, considering the frequency and depth of discussion. The results are presented within four broad themes, each accompanied by illustrative data extracts.

Results

OA and PLM shared various barriers and facilitators for behaviors in 24-hours. No differences were found between rural and urban areas. Regarding physical activity, participants reported more barriers than fa-

Table I
INFORMANT DEMOGRAPHICS OF OLDER
ADULTS AND PEOPLE WITH LIMITED MOBILITY IN
MORELOS, MEXICO, 2023

	Older adults	People with limited mobility
Total sample number, n	38	43
Area, n (%)		
Rural	15 (39.5)	23 (53.5)
Urban	23 (60.5)	20 (46.5)
Average age and range in years, mean (range)	69 (60-80)	45 (18-70)
Sex, n (%)		
Women	28 (73.7)	31 (72.1)
Men	10 (26.3)	12 (27.9)

Table II
GUIDING QUESTIONS USED IN FOCUS GROUPS
WITH OLDER ADULTS AND PEOPLE WITH LIMITED
MOBILITY IN MORELOS, MEXICO, 2023

To explore barriers	To explore facilitators
"What factors or situations have made it difficult for you to follow this recommendation?"	"Do you think you could follow these recommendations?"
"Why do you think you are not following it?"	"What do you currently do to follow these recommendations?"
"What do you do when you face difficulties in following this recommendation?"	"Does anyone in your family follow these recommendations?"
"If you could modify or eliminate the factors that make it difficult to follow this recommendation, what would they be?"	"What would you need to follow these recommendations?"
	"What positive factors help you carry out these recommendations?"

Table III
SUMMARY OF PERCEIVED BARRIERS AND FACILITATORS TO PHYSICAL ACTIVITY, SEDENTARY BEHAVIOR, AND SLEEP AMONG OLDER ADULTS AND PEOPLE WITH LIMITED MOBILITY IN MORELOS, MEXICO, 2023

Groups	Barriers for each behavior	Facilitators for each behavior
Shared	Physical activity • Poor public space infrastructure • Medical indication • Physical fatigue • Perception of insecurity	Physical activity • Social support
	Sedentary behavior • Long sitting conversational meetings • Sedentary environments	Sedentary behavior • Active breaks
	Sleep • Screen use • Hot weather and insects • Noisy environment	Sleep • Relaxation techniques • Consistent bedtime routines
Older adults	Physical activity • Lack of infrastructure in public space • Family overprotection • Medical conditions • Physical fatigue • Time constraints • Low safety perception • Lack of social support • Work due to lack of financial resources • Sedentary activities • Lack of motivation	Physical activity • Motivational programs • Green spaces • Planning • Personal motivation • Adaptable equipment
	Sedentary behavior • Sedentary environments • Prolonged events • Perception of companionship in TV programs • Perception of rest and relaxation	Sedentary behavior • Active breaks • Engaging in hobbies
	Sleep • Screen use • Extreme heat • Noisy environment • Concerns and stress • Long work schedule • Medical conditions • Internal lighting (screens) and external lighting (cars or streetlamps)	Sleep • Relaxing music/sounds • Avoiding sugary drinks • Bedtime rituals (prayer, tea)
People living with disabilities	Physical activity • Physical obstacles on public pathways • Family overprotection • Perception of limited physical activity • Post-pandemic impacts (Covid-19) • Bad conditions of sidewalks • Depression • Lack of social support • Inaccessible public transportation • Confusion between physical activity and exercise/sports • Perception of insecurity	Physical activity • Use of prosthetics • Government programs • Professional guidance • Adaptive exercises
	Sedentary behavior • Sedentary routines related to disability • Preference for screen entertainment over physical activity • Perception of rest and relaxation	Sedentary behavior • Hobbies and crafts • Active breaks
	Sleep • Nighttime social events • Hot weather and mosquitoes • Consumption of ultra-processed foods • Depression • Health status • Refusal to use sleep medications • Concerns and stress • Screen use • Noisy environment	Sleep • Relaxation routines • Use of alternative relaxation techniques (music, prayer)

cilitators to engage in this behavior, particularly due to poor infrastructure and physical limitations (table III).

Theme I: Environment as key determinants

Most participants perceived that environmental factors can either promote physical activity or encourage sedentary behaviors, as people do not find conditions conducive to movement. Additionally, the environment also influences negatively the sleep of populations, as factors such as noise, temperature as hot weather, insects as mosquitoes in rural areas, and lighting can significantly impact rest quality and overall well-being.

Poor public space infrastructure. A main perceived barrier and facilitator to physical activity in both groups was pedestrian infrastructure, either its absence or its quality and accessibility. OA highlighted the lack of adequate public spaces, which prevents them from being active outdoors.

"At my age, it's not easy to go out for a walk [...] the streets aren't designed for us older folks [...]"(OA in urban settings)

Crime and insecurity. A significant barrier for both OA and PLM was a sense of living in unsafe neighborhoods. Many participants mentioned that crime, including muggings, made them reluctant and fearful to engage in outdoor physical activity.

"For example, near the ISSSTE, there are muggings [...]. I used to go there sometimes, but once people started getting mugged, I stopped walking there [...]"*(OA in urban settings)

Public and green spaces. Some participants emphasized the importance of an accessible and well-maintained in public and green spaces as a significant facilitator for engaging in physical activity and reducing sedentary behavior. For example, well-kept public spaces and sports fields motivated individuals to exercise in a safe and regulated environment.

"see the well-maintained spaces, it makes me want to exercise [...]"(OA in rural settings)

Access to nature and green spaces was also a motivating factor, with some noting the positive impact of natural surroundings on physical and mental well-

being, which encouraged regular outdoor activity. This was particularly relevant in rural areas, where physical activity is often linked to agricultural work.

Other factors: limited access to public transport, noise, and extreme weather. For some PLM, additional barriers include physical obstacles on public pathways and inaccessible public transport.

"the sidewalks especially, if you notice, some are very narrow [...] some are really high [...] or there's a pole in the middle [...]"(PLM in rural settings)

Regarding sleep, most participants perceived the noisy environment and adverse weather conditions as the primary barriers to achieving adequate rest, with a consequent negative impact on sleep quality and the ability to sleep restfully.

"many times, when the neighbors have their parties, they play their music until three, four, or five in the morning, so it's hard to sleep well [...]"(OA in rural settings)

Theme II: Social networks and community support

Social support and companionship. Social support emerged as a crucial motivator for physical activity and a way to reduce sedentary behavior among both OA and PLM. For OA, their social networks were perceived as essential for companionship, which helped to mitigate feelings of loneliness and isolation. However, some participants mentioned that family overprotection limited their independence.

"my family is overly protective; they don't let me go out just because they think I'm going to fall [...]" (OA in urban settings)

This protective behavior by the family unintentionally led to increased sedentary behavior, such as long periods spent sitting and watching television, which participants perceived as a form of companionship. In contrast, PLM often expressed a reliance on family members for mobility, though physical and social barriers sometimes hindered this support.

"Without my family's support, I can't go anywhere [...] but sometimes even they don't know how to help me [...]"(PLM in rural settings)

Covid-19 and physical activity programs. The Covid-19 pandemic was also reported as a factor that limited

* ISSSTE (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado): A Mexican public institution that provides healthcare and social security services for government employees.

access to structured physical activity programs, which had previously provided both exercise and social interaction.

"Because of Covid, they took away the exercises at the DIF [...] they don't even care about us [...]"(OA in urban settings)

This reduction in organized activities not only affected their ability to stay physically active but also removed a vital source of social support and companionship, especially for OA and PLM who relied on these programs.

Theme III: Personal motivation and self-management

Personal motivation. Some OA and PLM participants underscored personal motivation as a fundamental factor in promoting physical activity. Many OA showed adaptability, using available resources creatively to stay active despite physical or environmental barriers. Personal motivation, adaptable equipment, and hobbies were reported as facilitators to physical activity and sleep, while lack of motivation and screen time acted as barriers. Additionally, some OA mentioned that certain actions, such as relaxing music or sounds, avoiding sugary drinks, and bedtime rituals (e.g. prayer, tea), improve their sleep habits. These strategies suggest that incorporating relaxing routines and mindful habits can play a key role in enhancing both sleep quality and overall well-being.

"I use what I have at home [...] sometimes I use little boards, with a brick [...] or I can use the broom [...] to dance and sweep [...]"(OA in urban settings)

For PLM, technological aids, including prosthetics, were described as vital tools that enabled them to engage in physical activity, fostering a sense of autonomy.

"with my prosthesis, I can walk better now [...] not perfectly yet, but I can walk [...]"(PLM in urban settings)

Sedentary behaviors, such as watching television, were seen by both groups as an acceptable form of rest and leisure. Most OA expressed that spending time with friends or family provided a restful alternative to physical activity. For PLM, screen use was often chosen over physical activity as a means of entertainment and relaxation. Nevertheless, for both OA and PLM, screen use was the main barrier to falling asleep and consequently achieving quality sleep.

"Well, more than anything, it's the TV that keeps you awake, because after a while, you're already starting to close your eyes, and then you just hear something[...] and you wake up, and your sleep is gone[...]"(OA in rural settings)

Theme IV: Health conditions and medical indications

Health conditions. Physical and mental health had a significant influence on the participants' ability to engage in physical activity and maintain good sleep quality. For some OA, chronic illnesses, such as diabetes, high blood pressure, joint pain and age-related physical limitations, were major barriers to being physically active.

"Well, what can I say? At this age, we can't do much [...] with all the aches and pains we have [...]"(OA in rural settings)

Similarly, PLM reported that depression and other health-related issues affected both their ability to be physically active and their sleep quality.

"I come for my husband [...] he had an accident and, [...] he can't even get out of bed because of the depression he has [...]"(Caregiver of PLM in rural settings)

Medical indications. Medical recommendations also influenced participants' physical activity, imposing specific restrictions on their movements and exertion.

"I'm going to the cardiologist [...] and she told me I can't walk too much [...]"(OA in urban settings)

Discussion

This study examined barriers and facilitators to achieving sufficient physical activity, limiting sedentary behaviors, and obtaining adequate sleep among OA and PLM in urban and rural areas of Morelos, Mexico. Four main themes summarize the study findings: I. *The environment as a key determinant*, II. *Social networks and community support*, III. *Personal motivation and self-management*, and IV. *Health conditions with medical indications*.

The environment as a key determinant

A major barrier to engaging in a healthy balance for behaviors in 24-hours identified in this study was inadequate infrastructure and environmental design. Although no previous studies have explored environmental barriers or facilitators for physical activity, sedentary behavior,

or sleep in combination among these populations, our findings align with prior research. Participants noted obstacles limiting their outdoor activities, such as narrow sidewalks, high curbs, and poorly maintained public spaces. Similar findings were reported in a qualitative study from Australia, where access to safe, well-designed, and well-maintained public spaces encouraged walking.³¹ Studies using direct measures of the built environment in Morelos,³² and Mexico City, also indicate limited park access and perceptions of unsafe crossings, poor sidewalks, and inadequate walking paths. Participants also noted environmental issues, particularly noise and pollution, that disrupted sleep. Similar findings were reported for older adults from a qualitative study in Africa.³³ In this context, green and inclusive spaces are crucial for promoting physical activity mitigating heat, and supporting mental health.³⁴⁻³⁶ Fear of violence further restricted participants' mobility, making recreational physical activity a privilege for those who can afford access to safe spaces. Similar concerns have been reported in other qualitative studies, where participants described feeling vulnerable to street robberies,³⁷ and aligns with the Mexican context, where crime, including muggings, discourages outdoor activities, and contributes to stress, anxiety, perceived frailty, and poor sleep.^{38,39}

Social networks and community support

This study highlighted the critical role of social support for healthy behaviors in 24-hours. Participants noted that family and community networks could both enable and restrict these healthy behaviors, revealing cultural and relational dynamics. While such networks offered motivation and companionship, family overprotection often confined older adults indoors, increasing screen time and limiting autonomy. While intended to ensure safety, overprotection inadvertently reinforced sedentary behavior, as reported in previous research.^{40,41} A qualitative study with caregivers of OA reported that overprotection stemmed from fear of falls,⁴² and another qualitative study participants describing this experience as feeling "a prisoner in the house".⁴³ In México, where family dynamics are deeply rooted and watching television is a common form of leisure,⁴⁴ addressing overprotectiveness requires balancing support and autonomy amid unsafe environments and inadequate infrastructure, that limit outdoor activities.^{45,46} For PLM, social support was equally critical. Similar findings in other studies highlight the need for inclusive practices and training programs to help families and communities support PLM.⁴⁷ Physical activity programs foster social interaction, support, and resilience.^{48,49} However, during the Covid-19 pandemic many structured activities,

including exercise programs offered by different institutions or community centers, were suspended without alternatives,^{50,51} leaving OA and PLM without essential opportunities for physical activity and social interaction, exacerbating isolation. Maintaining even partial access during crises can mitigate the negative effects.⁵² In Mexico, the lack of preparedness and inclusive programs remains a major public health gap, highlighting the urgent need for action.^{44,53,54}

Personal motivation and self-management

Personal motivation emerged as a critical facilitator for engaging in physical activity, especially in environments with limited resources. OA in our study displayed remarkable resilience, creatively adapting to barriers by using household items for exercise, demonstrating their determination to stay active despite limited resources. For PLM, the use of assistive devices and professional guidance were essential in enabling personalized adaptations to meet their needs. This finding is consistent with a qualitative study in which adults with physical disabilities described adapting to their context using available resources when spaces were inaccessible.⁵⁵ However, most participants assume that physical activity refers to structured exercises only. These highlight the importance of educational programs aimed at promoting self-efficacy and motivation while broadening the understanding domains of physical activity to include everyday tasks.^{56,57} Encouraging daily movement, including activities at home such as walking, household chores, or gardening, can be particularly beneficial. These activities not only promote physical health but also enhance autonomy and improve overall quality of life.^{57,58}

Health conditions with medical indications

Participants reported that health conditions and medical advice affected their physical activity and sleep quality. Chronic illnesses such as diabetes, hypertension, and joint pain were described as major barriers to regular exercise. Although reducing sedentary behavior and following physical activity guidelines benefit these conditions,²¹ Participants noted that medical advice often restricted activity due to cardiovascular risks. While necessary for safety, such recommendations may unintentionally promote sedentary lifestyles and reduce quality of life. Limited training among general practitioners was also perceived as a barrier to providing appropriate guidance on 24-hour movement behaviors.⁵⁹ Study participants reported that perceived depressive symptoms reduce motivation to be active, increasing sedentary time, disrupting sleep, and creat-

ing a vicious cycle. These findings align with previous studies showing that depression exacerbates inactivity and sleep disruption reduce.^{60,61} A systematic review further confirmed an inverse relationship between depression and physical activity.⁶² Overall, these results underscore the need for a holistic approach addressing the interplay among chronic diseases, mental health, and 24-hour movement behaviors. Healthcare professionals play a crucial role in helping individuals achieve balance across these behaviors,⁶³ supporting mental and physical health, overall well-being, and healthy aging.

This study has several strengths. The focus on vulnerable populations and data collection in both urban and rural settings provide a rich, context-specific understanding of participants' experiences. The richness of the data provides a nuanced understanding of the socio-environmental influences on healthy behaviors in 24-hours among OA and PLM, and sheds light on the barriers and facilitators faced by these populations. However, a limitation of this study is that detailed sociodemographic information, such as health status, living arrangements, marital status, presence of caregivers or companions, and use of mobility aids, was not collected, which could have provided additional context for interpreting participants' experiences. Furthermore, we did not collect information on older adults' functional capacity (basic, instrumental, and advanced

activities of daily living), sensory (visual and auditory), psychological, or cognitive limitations, which could have enriched the analysis of barriers and facilitators in this group. Moreover, although we grouped OA and PLM based on global recommendations, we recognize that variability within these broad categories may influence the perception of barriers and facilitators, and that analyzing both populations jointly may have limited our ability to detect subtle differences between OA and PLM regarding environmental determinants, social support, and health-related barriers. Therefore, we suggest that future studies further examine these relationships. Finally, the barriers and facilitators identified in this study may not reflect the experiences of Mexicans in other regions.

Practical implications

This study found that environmental and social factors, alone and combined, influence 24-hour health behaviors among OA and PLM. Multi-level, cross-sectoral, and tailored interventions may be more effective in addressing these factors.^{64,65} Overcoming these barriers requires practical solutions and a comprehensive approach engaging stakeholders across sectors, informing policy, healthcare, and community initiatives to improve 24-hour health behaviors in OA and PLM (table IV).

Table IV

PRACTICAL IMPLICATIONS AND POLICY RECOMMENDATIONS FOR PROMOTING HEALTHY BEHAVIORS IN 24-HOUR AMONG OLDER ADULTS AND PEOPLE WITH LIMITED MOBILITY IN MORELOS, MEXICO, 2023

Personal level:

- Updated guidelines on physical activity, sedentary behavior, and sleep should be culturally contextualized to meet the needs and capacities of older adults (OA) and people with limited mobility (PLM).
- Educational interventions should redefine physical activity to include everyday movements and emphasize their health benefits, encouraging greater engagement.

Healthcare services:

- Training for healthcare providers, particularly in primary care, should raise awareness of the unique challenges faced by these populations in maintaining physical activity and sleep quality and reduce sedentary behaviors.
- Providers can promote activity by offering personal recommendations and use guidelines adapted for those who need it.

Social and community networks:

- Promoting daily movement, including household activities, enhances autonomy and quality of life for vulnerable individuals.
- Community programs should promote safe group activities that empower people to support independence positively.
- Awareness campaigns focused on inclusive practices for PLM can also strengthen community support networks.

Policy level:

- Policymakers should prioritize infrastructure improvements, creating safe, accessible, and green spaces that facilitate active lifestyles for all.
- Inclusive urban planning should address the specific mobility needs of OA and PLM, reducing health disparities.
- Expanding social programs that offer structured group activities may help reduce social isolation and sedentary behavior.
- Moving forward, interventions should focus on promoting autonomy within supportive environments.

Academia and future research:

- Further research should examine these issues in diverse geographic and cultural contexts, enhancing the broader applicability of findings.
- Comparative studies across regions may refine intervention strategies and support the development of culturally relevant health programs.
- Continue exploring the influence and benefits of behaviors in 24-hours, emphasizing their role in promoting overall health and well-being.
- Adopting a comprehensive framework encompassing physical activity, sedentary behavior, and sleep could enhance the understanding and integration of these behaviors in public health strategies and interventions.

Conclusion

This study highlights the concerning situation of OA and PLM in Mexico. Findings suggest that older adults and people living with disability tailored interventions should focus on improving accessibility to public spaces, promoting autonomy, and addressing health and safety concerns in both urban and rural areas. This study highlights the need for inclusive public health initiatives that address structural and social barriers, fostering more active and healthier lifestyles among OA and PLM. Collaboration among policymakers, healthcare providers, and civil society is essential to overcoming these barriers and enabling healthier lifestyles for these populations.

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