

# Prevalence of social isolation and loneliness by living arrangement among Mexican elderly during the Covid-19 pandemic

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## Abstract

**Objective.** To estimate the prevalence of social isolation (SI) and loneliness by sociodemographic, information and communication technologies use, health behavior, and health status among Mexican older adults (OA) living alone (LA) and those living with others (LWO) during the Covid-19 pandemic. **Materials and methods.** Data from the *Encuesta Nacional de Salud y Nutrición Continua 2021* conducted in Mexico were analyzed. SI and loneliness were measured using internationally validated scales (LSNS-6 and TILS respectively). Analyses were conducted on adults aged 65 years and older, LA and LWO, considering the survey design. **Results.** Approximately 30% of OA in Mexico were LA in 2021. Among those LA, the percentage of widowhood, low well-being index and suicidal ideation were higher than in those LWO. SI prevalence was similarly high among individuals LA and those LWO (81.1 and 81.9% respectively), while loneliness prevalence was higher among individuals LA (51.5%) compared to those LWO (35.4%). Some differences in the characteristics of OA with higher prevalences of SI and loneliness were observed between those LA and those LWO. **Conclusion.** Targeted interventions are needed to address SI and loneliness in OA, based on whether they are

## Resumen

**Objetivo.** Estimar la prevalencia del aislamiento social (AS) y soledad por características sociodemográficas, uso de tecnologías de la información y la comunicación, comportamiento saludable y estado de salud en personas adultas mayores (PAM) mexicanas que viven solas (VS) y en aquellas que viven acompañadas (VA) durante la pandemia de Covid-19. **Material y métodos.** Se analizaron datos de la Encuesta Nacional de Salud y Nutrición Continua 2021 realizada en México. El AS y la soledad se midieron utilizando escalas validadas internacionalmente (LSNS-6 y TILS, respectivamente). Los análisis se realizaron en personas de 65 años o más, VS y VA, considerando el diseño de la encuesta. **Resultados.** Aproximadamente 30% de las PAM en México estaba VS en 2021. Entre las PAM VS, el porcentaje de viudez, bajo índice de bienestar e ideación suicida fueron mayores que en aquellas VA. La prevalencia de AS fue igualmente alta entre las PAM VS y VA (81.1 y 81.9%, respectivamente), mientras que la prevalencia de soledad fue más alta entre las PAM VS (51.5%) comparada con las PAM VA (35.4%). Se observaron algunas diferencias en las características de las PAM con mayor prevalencia de AS y soledad entre aquellas VS y aquellas VA. **Conclusión.** Se requieren intervenciones dirigidas para abordar el AS y la soledad en

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LA or LWO, while considering the vulnerabilities of each living arrangement.

**Keywords:** social isolation; loneliness; older adults; living alone; living arrangement; information and communication technologies; Mexico

las PAM que tomen en cuenta si viven solas o acompañadas, y consideren las vulnerabilidades de cada arreglo residencial.

**Palabras clave:** aislamiento social; soledad; adultos mayores; vivir solo; arreglo residencial; tecnologías de la información y la comunicación; México

The changes in demographic dynamics—such as the aging population, declining marriage and fertility rates, higher divorce rates, increased childlessness, the migration of children, and a growing preference for independent living and privacy—have contributed to the weakening of the structure of social and family networks. As a result, living arrangements have been modified, with a significant proportion of older adults (OA) living alone (LA) worldwide, which has been increasing.<sup>1</sup> Moreover, the excess mortality during the Covid-19 pandemic may have further exacerbated this pattern.

Evidence indicates that OA LA may be more vulnerable to social isolation (SI) and loneliness compared to those living with others (LWO), in part due to the lack of a family support network in their daily lives and a reduced perception of having their emotional and affection needs met;<sup>2-6</sup> however, LA does not imply that individuals experience SI or loneliness.<sup>7</sup> During Covid-19 pandemic lockdowns, SI and loneliness may have been worsened among OA, particularly those LA,<sup>8</sup> who typically receive companionship and support from family and friends outside the home.

SI is commonly defined as the objective lack of (or limited) social contact with others, while loneliness has been defined by some authors as the perception of social isolation or the subjective feeling of being alone.<sup>4</sup> The presence of these conditions in the lives of OA represents a public health concern, as they have been related to worse mental and physical health outcomes, increased utilization of health services, and higher mortality rates.<sup>9</sup> Some studies have found that the frequency of SI and loneliness among OALA is higher than in those LWO.<sup>10-12</sup> The literature shows that factors such as sociodemographic characteristics, information and communication technologies (ICT) use, health behavior, and health status among others can contribute to SI and loneliness in older adults.<sup>4,9</sup> However, there is limited information regarding OALA and those LWO, despite its importance for identifying the most vulnerable individuals within each subgroup and for designing targeted strategies to reduce SI and loneliness. In Mexico, no studies have been conducted to assess the prevalence of SI and loneliness

among OA of both living arrangements. Thus, this study aimed to estimate the prevalence of SI and loneliness by sociodemographic, ICT use, health behavior, and health status characteristics among Mexican older adults LA and those LWO during the late-stage of the Covid-19 pandemic.

## Materials and methods

Data from the *Encuesta Nacional de Salud y Nutrición Continua 2021* (Ensanut Continua 2021) were used, which is a probabilistic survey with national and regional representativeness. The Ensanut Continua 2021, conducted from August to November in Mexico, collected information from 12 619 households.<sup>13</sup> The 2021 edition of Ensanut Continua is the only one from the 2020-2024 series that includes data on SI and loneliness among older adults, both those LA and those LWO. Of the 2 025 adults aged 65 and over who participated in the survey, 2 001 answered all questions measuring social isolation and loneliness. Living arrangement (LA or LWO) was established when the participants' response to the question "How many people normally live in this household?" and the number of household members (obtained from the list of residents) coincided. The analytical sample included 1 982 OA, of whom 517 were LA and 1 465 were LWO.

### Measurement of social isolation and loneliness

Social isolation was measured with the 6-item Lubben Social Network Scale (LSNS-6),<sup>14</sup> which includes three questions to assess social connections with relatives and three corresponding questions to assess social connections with friends: How many relatives/friends do you see or hear from at least once a month? How many relatives/friends do you feel at ease with that you can talk about private matters? How many relatives/friends do you feel close to such that you could call on them for help? In the case of the first question, it was slightly modified as follows: How many relatives/friends do you see (in person or by video call) or hear from (by phone, WhatsApp, Skype, Facebook, etc.) at least once

a month? The response categories were: 1= none, 2= one, 3= two, 4= three or four, 5= five to eight, and 6= nine or more. The responses were recoded and summed to obtain the overall score, which ranged from 0 to 30. Participants were categorized into two groups: those with social isolation (score <12) and those without social isolation (score ≥12).<sup>14</sup> This cutoff point has been used in diverse cultural settings,<sup>6,15</sup> allowing for comparability across populations.

Loneliness was assessed using the Three-Item Loneliness Scale (TILS),<sup>16</sup> which consists of the following questions: How often do you feel that you lack companionship? How often do you feel left out? How often do you feel isolated from others? Responses were recorded on a Likert scale (1= Hardly ever or never, 2= Some of the time, 3= Often) and summed to calculate the overall score (ranging from 3 to 9). Based on a cutoff point used in previous studies to identify all older adults with any level of loneliness, participants were classified as either without loneliness (score <4) or with loneliness (score ≥4).

## Variables

*Sociodemographic characteristics:* These included age (mean and quinquennial intervals), sex (woman, man), and education (none, elementary school, high school or higher), which was established according to the level of the last school year studied. The well-being index (low, medium, high) was constructed based on the characteristics of the households, as well as the available goods and services.<sup>13</sup> Marital status was categorized as: married/in a common-law union, divorced/separated from a marriage or common-law union, single, or widowed. Residence area was categorized as rural or urban/metropolitan, with 'rural' referring to areas with fewer than 2 500 inhabitants, 'urban' to areas with 2 500 to 99 999 inhabitants, and 'metropolitan' to areas with 100 000 or more inhabitants. The regions (Pacific-North, Border, Pacific-Central, Central-North, Central, Mexico City, State of Mexico, Pacific-South, Peninsula) were defined grouping contiguous states while ensuring that all regions had similar population sizes. For speaking an indigenous language, two categories were used (no, yes). The occupational status in the last week (not working, homemaker, working) was defined as follows: 'Working' if the participants worked at least one hour in the past week, helped in a family business, sold products, assisted with farm work, engaged in other paid activities, or had a job but were absent during the last week. 'Homemaker' if the participants were engaged in housework; and 'Not working' if they did not perform any of the activities described. Participants

were asked whether they received financial support through the government's 'Welfare Pension for Older Adults' program (no, yes) and whether they had the right to or access to medical services provided by public, governmental or private institutions (no, yes).

*ICT use:* The use of a cell phone (no, yes), a computer (no, yes), the internet (no, yes), and social media (no, yes) was assessed. Those who reported using the respective ICT sometimes or always were grouped in the 'yes' category. For the use of social media, those who reported using platforms such as WhatsApp, Facebook, Twitter, YouTube, chat, or others were included in the 'yes' category. Additionally, whether the household had a landline telephone was considered (no, yes).

*Health behavior characteristics:* Participants were categorized into those who had walked for at least 10 continuous minutes on one or more days in the past 7 days, solely for recreation, sport, exercise, or pleasure (yes), and those who had not (no). They were also grouped into those who currently smoke tobacco every day or some days (yes), and those who do not (no). Participants were further categorized based on whether they had consumed at least one alcoholic drink daily, weekly, monthly, or annually in the past 12 months (yes), or had not consumed alcohol at all (no).

*Physical and mental health status:* Participants were asked whether a doctor had ever told them they had any of the following conditions: diabetes (no, yes), hypertension (no, yes), high cholesterol (no, yes), and high triglycerides (no, yes). For cardiovascular disease (no, yes), they were asked if a doctor had told them they have or had: a heart attack, angina, or heart failure. Depressive symptomatology (no, yes) was measured using the seven-item Center for Epidemiologic Studies Depression Scale (CESD-7) validated in Mexican older adults.<sup>17</sup> Disability (no, yes) was assessed using the Washington Group Short Set on Functioning (WG-SS), and individuals were categorized as having disability if they experienced a lot of difficulty with or could not do at all in at least one of the functional domains assessed.<sup>18</sup>

## Statistical analysis

To describe the population study, for both the OA LA and LWO, we used mean and standard deviation, or the percentage and 95%CI, of sociodemographic characteristics, ICT use, health behavior, and health status characteristics. Student's t-test or Chi-square test was used. The prevalence and 95%CI of SI and loneliness by living arrangement, and by all variables previously de-

scribed in OA LA and those LWO were analyzed. Finally, a map displaying the prevalence of SI and loneliness by living arrangement across the nine regions defined in the Ensanut was created using the R package version 2024.09.0+375. The Chi-square test was used. A  $p$ -value less than 0.05 was considered statistically significant. The analyses were performed considering the survey's sample design. The data were analyzed using the SVY command of the Stata statistical package, version 15.1.

## Results

### Characteristics of older adults living alone vs. those living with others

Out of the 1 982 OA studied who participated in the Ensanut Continua 2021, representing 4 957 716 OA, 27.1% (95%CI: 24.3,30.1) lived alone and 72.9% (95%CI: 69.9,75.7) lived with others (table I).

When comparing the characteristics of OA LA vs. those LWO, some significant differences were identified. The percentage of individuals aged 80 or older was higher in the LA subgroup than in the LWO subgroup (20.0 vs. 14.0%,  $p = 0.016$ ). This was also the case for the percentage of individuals who had a low well-being index (44.6% in LA vs. 32.3% in LWO,  $p < 0.000$ ), were widowed (60.5 vs. 27.9%,  $p < 0.000$ ), divorced (19.3 vs. 4.5%,  $p < 0.000$ ), single (15.5 vs. 7.3%,  $p < 0.000$ ), used a cell phone (60.1 vs. 52.6%,  $p = 0.052$ ), did not have a landline (58.1 vs. 50.3%,  $p = 0.028$ ), walked for exercise or pleasure in the past 7 days (31.0 vs. 23.3%,  $p = 0.005$ ), and reported suicidal ideation (8.3 vs. 3.8%,  $p = 0.002$ ). No significant differences were observed for the rest of the variables (tables I and II).

### Prevalences of social isolation among older adults living alone and those living with others

The prevalence of SI in OA LA was 81.1% (95%CI: 76.3,85.2), and in those LWO was 81.9% (95%CI: 79.1,84.4) (table III).

Among those LA, the prevalence of SI was 86.3% in men and 77.4% in women ( $p = 0.022$ ). The opposite was observed in those LWO (85.5% in women vs. 77.4% in men,  $p = 0.001$ ). Among individuals LA and those LWO, more than 80.0% of those with no education or elementary school education experienced SI, whereas less than 70.0% of those with a high school or higher education reported SI ( $p \leq 0.001$ ). Additionally, individuals in both living arrangements with a low well-being index had a higher prevalence of SI compared to those with a high well-being index, although the difference was margin-

ally significant in the LA subgroup (LA: 83.7 vs. 70.5%,  $p = 0.059$  and LWO: 87.0 vs. 74.7%,  $p = 0.000$ ). In the LA subgroup, the prevalence of SI was 91.4% for married OA, compared to 71.9% for those who were divorced ( $p = 0.057$ ). Among individuals LWO who were homemakers, the prevalence of SI was 85.8%, whereas among those who had worked or had not worked in the last week, it was less than 80.0% ( $p = 0.029$ ). Of individuals LA, 87.4% who did not have the right to or access to medical services experienced SI, compared to 75.3% of those who did ( $p = 0.006$ ) (table III).

For OA LA and those LWO, more than 83.0% of those who did not use a cell phone, computer, internet, or social media experienced SI, while less than 76.0% of ICT users experienced SI ( $p < 0.01$ ). Among OA LA without a landline telephone, the prevalence of SI was 86.3%, compared to 74.0% in those with one ( $p = 0.003$ ) (table III).

In OA LWO who did not walk for exercise or pleasure in the past 7 days, the prevalence of SI was 85.1%, compared to 71.2% in those who did ( $p = 0.000$ ). Among those LWO who did not consume alcohol in the past 12 months, the prevalence of SI was 83.6%, while it was 76.9% in those who did ( $p = 0.036$ ). Furthermore, the prevalence of SI was 83.5% among individuals LWO without high cholesterol, compared to 75.8% among those with high cholesterol ( $p = 0.012$ ). In the LA subgroup, the prevalence of SI was 87.5% among individuals experiencing loneliness and 74.4% among those not experiencing it ( $p = 0.002$ ) (table IV).

For OA LA, the highest prevalence of SI was observed in the Pacific-Central region (90.1%), while the lowest was found in the Border region (64.0%). Among those LWO, the highest prevalence of SI was observed in the State of Mexico region (88.3%), while the lowest was also found in the Border region (73.3%). However, no significant differences were observed by region (figure 1A).

### Prevalences of loneliness among older adults living alone and those living with others

The prevalence of loneliness in OA LA was 51.5% (95%CI: 45.8,57.1), and in those LWO was 35.4% (95%CI: 32.9,38.0) (table III).

Among individuals LWO aged 80 years or older, the prevalence of loneliness was 43.2%, while in those aged 65-69 years, it was 30.7% ( $p = 0.042$ ). In women LWO, a higher prevalence of loneliness was observed compared with men (39.4 vs. 30.6%,  $p = 0.003$ ). In the same subgroup, individuals with no education showed a loneliness prevalence of 42.7%, compared to 29.0% in those

**Table I**  
**SOCIODEMOGRAPHIC AND ICT USE CHARACTERISTICS OF OLDER ADULTS LIVING ALONE AND THOSE LIVING WITH OTHERS. MEXICO, ENSANUT CONTINUA 2021**

| Characteristics       | Living alone |                  |      |           | Living with others |                  |      |           | p value* |
|-----------------------|--------------|------------------|------|-----------|--------------------|------------------|------|-----------|----------|
|                       | n            | N<br>(thousands) | %    | 95%CI     | n                  | N<br>(thousands) | %    | 95%CI     |          |
|                       | 517          | 1 342            | 27.1 | 24.3,30.1 | 1 465              | 3 616            | 72.9 | 69.9,75.7 |          |
| Sociodemographic      |              |                  |      |           |                    |                  |      |           |          |
| Age (years)           |              |                  |      |           |                    |                  |      |           |          |
| Mean                  | 517          | 1 342            | 73.8 | 73.1,74.5 | 1 465              | 3 616            | 72.7 | 72.3,73.0 | 0.005    |
| 65-69                 | 158          | 414              | 30.8 | 26.7,35.3 | 585                | 1 422            | 39.3 | 36.6,42.2 | 0.016    |
| 70-74                 | 132          | 386              | 28.7 | 24.0,34.0 | 396                | 960              | 26.5 | 24.1,29.2 |          |
| 75-79                 | 112          | 274              | 20.4 | 16.0,25.7 | 268                | 728              | 20.1 | 17.7,22.8 |          |
| 80+                   | 115          | 268              | 20.0 | 15.6,25.2 | 216                | 507              | 14.0 | 12.1,16.2 |          |
| Sex                   |              |                  |      |           |                    |                  |      |           |          |
| Woman                 | 311          | 773              | 57.6 | 51.6,63.4 | 852                | 2 000            | 55.3 | 52.3,58.3 | 0.497    |
| Man                   | 206          | 569              | 42.4 | 36.6,48.4 | 613                | 1 616            | 44.7 | 41.7,47.7 |          |
| Education             |              |                  |      |           |                    |                  |      |           |          |
| None                  | 121          | 293              | 21.8 | 17.7,26.7 | 313                | 723              | 20.0 | 17.8,22.4 | 0.337    |
| Elementary school     | 270          | 626              | 46.6 | 40.9,52.4 | 779                | 1 856            | 51.3 | 48.0,54.7 |          |
| High school or higher | 126          | 423              | 31.5 | 25.7,38.0 | 373                | 1 037            | 28.7 | 25.2,32.4 |          |
| Well-being index      |              |                  |      |           |                    |                  |      |           |          |
| Low                   | 256          | 599              | 44.6 | 38.3,51.1 | 485                | 1 168            | 32.3 | 29.3,35.5 | <0.000   |
| Medium                | 181          | 461              | 34.4 | 29.1,40.0 | 499                | 1 152            | 31.9 | 29.0,34.9 |          |
| High                  | 80           | 282              | 21.0 | 15.7,27.4 | 481                | 1 296            | 35.8 | 32.2,39.6 |          |
| Marital status        |              |                  |      |           |                    |                  |      |           |          |
| Married <sup>‡</sup>  | 27           | 63               | 4.7  | 3.0,7.3   | 841                | 2 179            | 60.3 | 57.5,63.0 | <0.000   |
| Divorced <sup>§</sup> | 90           | 259              | 19.3 | 15.3,24.1 | 70                 | 164              | 4.5  | 3.5,5.9   |          |
| Single                | 81           | 208              | 15.5 | 12.2,19.5 | 100                | 264              | 7.3  | 5.9,9.0   |          |
| Widowed               | 319          | 811              | 60.5 | 55.0,65.7 | 454                | 1 009            | 27.9 | 25.3,30.6 |          |
| Residence area        |              |                  |      |           |                    |                  |      |           |          |
| Rural                 | 142          | 313              | 23.3 | 18.7,28.7 | 344                | 814              | 22.5 | 20.1,25.1 | 0.776    |
| Urban/Metropolitan    | 375          | 1 029            | 76.7 | 71.3,81.3 | 1 121              | 2 802            | 77.5 | 74.9,79.9 |          |
| Region                |              |                  |      |           |                    |                  |      |           |          |
| Pacific-North         | 71           | 129              | 9.6  | 7.0,13.1  | 139                | 276              | 7.6  | 6.2,9.4   | 0.078    |
| Border                | 38           | 160              | 11.9 | 7.5,18.4  | 96                 | 423              | 11.7 | 9.6,14.1  |          |
| Pacific-Central       | 53           | 206              | 15.3 | 9.9,23.0  | 113                | 321              | 8.9  | 7.3,10.8  |          |
| Central-North         | 132          | 203              | 15.1 | 12.2,18.6 | 341                | 468              | 13.0 | 11.3,14.8 |          |
| Central               | 31           | 120              | 8.9  | 5.3,14.7  | 107                | 390              | 10.8 | 9.1,12.8  |          |
| Mexico City           | 45           | 96               | 7.2  | 5.0,10.2  | 207                | 429              | 11.9 | 10.5,13.4 |          |
| State of Mexico       | 49           | 163              | 12.1 | 9.1,15.9  | 146                | 447              | 12.4 | 10.7,14.3 |          |
| Pacific-South         | 51           | 180              | 13.4 | 9.5,18.6  | 161                | 555              | 15.3 | 13.0,18.0 |          |
| Peninsula             | 47           | 86               | 6.4  | 4.4,9.2   | 155                | 307              | 8.5  | 7.0,10.2  |          |
| Indigenous language   |              |                  |      |           |                    |                  |      |           |          |
| No                    | 491          | 1 259            | 93.8 | 90.0,96.2 | 1 381              | 3 404            | 94.1 | 91.2,96.1 | 0.848    |
| Yes                   | 26           | 83               | 6.2  | 3.8,10.0  | 84                 | 212              | 5.9  | 3.9,8.8   |          |

(continues...)

(continuation)

|                                                         |     |       |      |           |       |       |      |           |       |
|---------------------------------------------------------|-----|-------|------|-----------|-------|-------|------|-----------|-------|
| Occupational status (last week)                         |     |       |      |           |       |       |      |           |       |
| Not working                                             | 190 | 526   | 39.2 | 33.2,45.6 | 458   | 1 207 | 33.4 | 30.5,36.4 | 0.073 |
| Homemaker                                               | 195 | 485   | 36.2 | 30.6,42.1 | 658   | 1 576 | 43.6 | 40.5,46.7 |       |
| Working                                                 | 132 | 330   | 24.6 | 19.8,30.1 | 349   | 833   | 23.0 | 20.6,25.7 |       |
| Welfare pension for older adults (a government program) |     |       |      |           |       |       |      |           |       |
| No                                                      | 178 | 467   | 34.9 | 30.3,39.7 | 587   | 1 425 | 39.5 | 36.5,42.6 | 0.089 |
| Yes                                                     | 338 | 872   | 65.1 | 60.3,69.7 | 874   | 2 180 | 60.5 | 57.4,63.5 |       |
| Right to or access to medical services                  |     |       |      |           |       |       |      |           |       |
| No                                                      | 257 | 649   | 48.4 | 42.8,54.1 | 648   | 1 569 | 43.4 | 40.1,46.9 | 0.116 |
| Yes                                                     | 259 | 692   | 51.6 | 45.9,57.2 | 816   | 2 043 | 56.6 | 53.1,59.9 |       |
| ICT use                                                 |     |       |      |           |       |       |      |           |       |
| Using a cell phone                                      |     |       |      |           |       |       |      |           |       |
| No                                                      | 212 | 535   | 39.9 | 33.3,46.9 | 721   | 1 713 | 47.4 | 44.4,50.3 | 0.052 |
| Yes                                                     | 305 | 806   | 60.1 | 53.1,66.7 | 744   | 1 903 | 52.6 | 49.7,55.6 |       |
| Using a computer                                        |     |       |      |           |       |       |      |           |       |
| No                                                      | 477 | 1 202 | 89.6 | 85.0,92.9 | 1 351 | 3 247 | 89.8 | 87.1,92.0 | 0.927 |
| Yes                                                     | 40  | 140   | 10.4 | 7.1,15.0  | 114   | 369   | 10.2 | 8.0,12.9  |       |
| Using the internet                                      |     |       |      |           |       |       |      |           |       |
| No                                                      | 428 | 1 059 | 78.9 | 73.2,83.7 | 1 174 | 2 812 | 77.8 | 74.8,80.5 | 0.688 |
| Yes                                                     | 89  | 283   | 21.1 | 16.3,26.8 | 291   | 804   | 22.2 | 19.5,25.2 |       |
| Using social media                                      |     |       |      |           |       |       |      |           |       |
| No                                                      | 197 | 469   | 58.2 | 51.1,65.0 | 469   | 1 138 | 59.4 | 54.7,63.9 | 0.780 |
| Yes                                                     | 108 | 337   | 41.8 | 35.0,48.9 | 282   | 779   | 40.6 | 36.1,45.3 |       |
| Having a landline telephone                             |     |       |      |           |       |       |      |           |       |
| No                                                      | 326 | 779   | 58.1 | 58.1,64.1 | 765   | 1 819 | 50.3 | 46.8,53.8 | 0.028 |
| Yes                                                     | 191 | 562   | 41.9 | 35.9,48.2 | 700   | 1 798 | 49.7 | 46.2,53.2 |       |

Ensanut: Encuesta Nacional de Salud y Nutrición.

N: Expanded population.

\* Chi-square test for categoric variables and Student's t-test for continuous.

‡ Including those in a common-law union.

§ Including those separated from a common-law union.

with a high school education or higher ( $p=0.007$ ). In both the LA and LWO subgroups, widowed individuals showed higher prevalences of loneliness than married individuals, but the difference was significant only in those LWO (LA: 54.7 vs. 24.4%,  $p=0.072$  and LWO: 45.0 vs. 30.9%,  $p=0.000$ ). In both subgroups, the prevalence of loneliness was also higher in individuals living in rural areas compared to those in urban/metropolitan areas (LA: 65.0 vs. 47.4%,  $p=0.006$  and LWO: 40.4 vs. 34.0%,  $p=0.038$ ). In individuals LWO with a welfare pension for OA (a government program), the prevalence of loneliness was 38.1%, while among those without a pension, it was 31.6% ( $p=0.035$ ) (table III).

OA LWO who did not use a computer showed a loneliness prevalence of 36.5%, compared to 26.4% in

those who used one ( $p=0.044$ ). A higher prevalence of loneliness was also observed among OA LWO who did not use social media, compared with those who did (38.3 vs. 30.3%,  $p=0.050$ ). Among individuals LA, 55.5% of those who did not use the internet experienced loneliness, while 36.4% of those who used it felt lonely ( $p=0.004$ ) (table III).

Additionally, for individuals LWO with hypertension, the prevalence of loneliness was 40.8%, while in those without hypertension, it was 31.0% ( $p=0.000$ ). In the LA and LWO subgroups, individuals with disability showed higher prevalences of loneliness than those without disability (LA: 64.5 vs. 46.9%,  $p=0.010$  and LWO: 47.5 vs. 31.2%,  $p=0.000$ ). For both subgroups, the prevalence of loneliness was higher

**Table II**  
**HEALTH BEHAVIOR AND PHYSICAL AND MENTAL HEALTH STATUS CHARACTERISTICS OF OLDER ADULTS LIVING ALONE AND THOSE LIVING WITH OTHERS. MEXICO, ENSANUT CONTINUA 2021**

| Characteristics                                      | Living alone |                  |      |           | Living with others |                  |      |           | p value* |
|------------------------------------------------------|--------------|------------------|------|-----------|--------------------|------------------|------|-----------|----------|
|                                                      | n            | N<br>(thousands) | %    | 95%CI     | n                  | N<br>(thousands) | %    | 95%CI     |          |
| Health behavior                                      |              |                  |      |           |                    |                  |      |           |          |
| Walked for exercise or pleasure (in the past 7 days) |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 376          | 918              | 69.0 | 63.8,73.7 | 1 133              | 2 773            | 76.7 | 73.9,79.2 | 0.005    |
| Yes                                                  | 140          | 413              | 31.0 | 26.3,36.2 | 332                | 843              | 23.3 | 20.8,26.1 |          |
| Currently smokes tobacco                             |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 464          | 1 186            | 89.4 | 85.6,92.3 | 1 325              | 3 280            | 91.0 | 89.0,92.7 | 0.398    |
| Yes                                                  | 50           | 140              | 10.6 | 7.7,14.4  | 135                | 324              | 9.0  | 7.3,11.0  |          |
| Consumed alcohol (in the past 12 months)             |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 380          | 959              | 72.2 | 67.3,76.6 | 1 076              | 2 657            | 73.5 | 70.6,76.2 | 0.608    |
| Yes                                                  | 135          | 370              | 27.8 | 23.4,32.7 | 388                | 957              | 26.5 | 23.8,29.4 |          |
| Physical and mental health status                    |              |                  |      |           |                    |                  |      |           |          |
| Diabetes <sup>‡</sup>                                |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 385          | 999              | 74.4 | 69.4,78.9 | 1 073              | 2 676            | 74.0 | 71.3,76.6 | 0.875    |
| Yes                                                  | 132          | 343              | 25.6 | 21.1,30.6 | 391                | 939              | 26.0 | 23.4,28.7 |          |
| Hypertension <sup>‡</sup>                            |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 292          | 746              | 55.6 | 50.6,60.5 | 780                | 1 974            | 54.6 | 51.5,57.7 | 0.722    |
| Yes                                                  | 224          | 595              | 44.4 | 39.5,49.4 | 683                | 1 640            | 45.4 | 42.3,48.5 |          |
| Cardiovascular disease <sup>‡</sup>                  |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 505          | 1 308            | 97.5 | 95.4,98.7 | 1 421              | 3 528            | 97.6 | 96.6,98.3 | 0.942    |
| Yes                                                  | 12           | 33               | 2.5  | 1.3,4.6   | 44                 | 88               | 2.4  | 1.7,3.4   |          |
| High cholesterol <sup>‡</sup>                        |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 427          | 1 094            | 81.5 | 76.9,85.4 | 1 156              | 2 864            | 79.2 | 76.7,81.5 | 0.363    |
| Yes                                                  | 90           | 248              | 18.5 | 14.6,23.1 | 308                | 751              | 20.8 | 18.5,23.3 |          |
| High triglycerides <sup>‡</sup>                      |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 436          | 1 122            | 83.7 | 79.8,86.9 | 1 192              | 2 947            | 81.5 | 79.2,83.6 | 0.330    |
| Yes                                                  | 81           | 219              | 16.3 | 13.1,20.2 | 272                | 668              | 18.5 | 16.4,20.8 |          |
| Disability (WG-SS)                                   |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 378          | 991              | 73.9 | 68.4,78.7 | 1 098              | 2 684            | 74.2 | 71.0,77.2 | 0.909    |
| Yes                                                  | 139          | 350              | 26.1 | 21.3,31.6 | 367                | 932              | 25.8 | 22.8,29.0 |          |
| Depressive symptomatology (CESD-7)                   |              |                  |      |           |                    |                  |      |           |          |
| No (score <5)                                        | 211          | 541              | 40.3 | 34.9,46.0 | 649                | 1 613            | 44.6 | 41.2,48.0 | 0.224    |
| Yes (score ≥5)                                       | 306          | 801              | 59.7 | 54.0,65.1 | 815                | 2 002            | 55.4 | 52.0,58.8 |          |
| Suicidal ideation                                    |              |                  |      |           |                    |                  |      |           |          |
| No                                                   | 481          | 1 217            | 91.7 | 87.7,94.5 | 1 404              | 3 469            | 96.2 | 94.9,97.2 | 0.002    |
| Yes                                                  | 33           | 110              | 8.3  | 5.5,12.3  | 57                 | 137              | 3.8  | 2.8,5.1   |          |

Ensanut: Encuesta Nacional de Salud y Nutrición.

N: Expanded population.

WG-SS: Washington Group Short Set on Functioning.

CESD-7: seven-item Center for Epidemiologic Studies Depression Scale.

\* Chi-square test.

<sup>‡</sup> For each of the conditions evaluated, the following question was asked: Has a doctor told you that you have.....? In the case of cardiovascular disease, the question was: Has a doctor told you that you have or had a heart attack, angina, or heart failure?

among individuals with depressive symptomatology than in those without this symptomatology (LA: 58.2 vs. 41.5%,  $p=0.002$  and LWO: 46.5 vs. 21.7%,  $p=0.000$ ). In both subgroups, individuals with suicidal ideation also showed a higher prevalence of loneliness than

those without such ideation (LA: 84.2 vs. 49.1%,  $p=0.003$  and LWO: 72.8 vs. 33.8%,  $p=0.000$ ). Finally, for individuals LA, the prevalence of loneliness was higher in those experiencing SI (55.5%), compared with those not experiencing it (34.2%,  $p=0.002$ ) (table IV).

Table III

**PREVALENCE OF SOCIAL ISOLATION AND LONELINESS AMONG OLDER ADULTS LIVING ALONE AND THOSE LIVING WITH OTHERS BY SOCIODEMOGRAPHIC AND ICT USE CHARACTERISTICS. MEXICO, ENSANUT CONTINUA 2021**

| Characteristics         | Prevalence of social isolation |      |           |                    |      |           | Prevalence of loneliness |      |           |                    |      |           |
|-------------------------|--------------------------------|------|-----------|--------------------|------|-----------|--------------------------|------|-----------|--------------------|------|-----------|
|                         | Living alone                   |      |           | Living with others |      |           | Living alone             |      |           | Living with others |      |           |
|                         | n                              | %    | 95%CI     | n                  | %    | 95%CI     | n                        | %    | 95%CI     | n                  | %    | 95%CI     |
|                         | 434                            | 81.1 | 76.3,85.2 | 1215               | 81.9 | 79.1,84.4 | 284                      | 51.5 | 45.8,57.1 | 527                | 35.4 | 32.9,38.0 |
| <b>Sociodemographic</b> |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| Age (years)             |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| 65-69                   | 130                            | 77.1 | 67.3,84.6 | 480                | 79.7 | 74.9,83.7 | 83                       | 50.7 | 40.6,60.7 | 188                | 30.7 | 26.7,35.0 |
| 70-74                   | 115                            | 83.8 | 73.1,90.9 | 318                | 80.4 | 75.1,84.8 | 73                       | 53.2 | 42.4,63.8 | 135                | 36.0 | 30.2,42.3 |
| 75-79                   | 91                             | 78.7 | 67.6,86.8 | 231                | 85.1 | 79.0,89.6 | 65                       | 50.7 | 38.3,63.1 | 107                | 38.4 | 31.8,45.4 |
| 80+                     | 98                             | 85.9 | 75.9,92.3 | 186                | 86.1 | 81.2,89.9 | 63                       | 51.0 | 40.8,61.1 | 97                 | 43.2 | 36.2,50.5 |
|                         |                                |      | 0.469*    |                    |      | 0.162*    |                          |      | 0.979*    |                    |      | 0.042*    |
| Sex                     |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| Woman                   | 259                            | 77.4 | 70.8,82.8 | 735                | 85.5 | 82.2,88.3 | 166                      | 49.1 | 42.5,55.7 | 340                | 39.4 | 36.3,42.6 |
| Man                     | 175                            | 86.3 | 80.2,90.7 | 480                | 77.4 | 73.2,81.1 | 118                      | 54.7 | 46.4,62.7 | 187                | 30.6 | 26.3,35.2 |
|                         |                                |      | 0.022*    |                    |      | 0.001*    |                          |      | 0.245*    |                    |      | 0.003*    |
| Education               |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| None                    | 109                            | 91.6 | 85.6,95.3 | 277                | 89.8 | 86.0,92.7 | 67                       | 53.5 | 43.2,63.4 | 134                | 42.7 | 36.3,49.5 |
| Elementary school       | 234                            | 83.8 | 77.1,88.9 | 673                | 86.3 | 83.4,88.7 | 160                      | 53.3 | 45.8,60.7 | 283                | 36.2 | 32.4,40.2 |
| High school or higher   | 91                             | 69.9 | 59.5,78.6 | 265                | 68.4 | 61.4,74.7 | 57                       | 47.4 | 36.4,58.6 | 110                | 29.0 | 24.1,34.3 |
|                         |                                |      | 0.001*    |                    |      | 0.000*    |                          |      | 0.588*    |                    |      | 0.007*    |
| Well-being index        |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| Low                     | 221                            | 83.7 | 77.1,88.6 | 426                | 87.0 | 83.5,89.9 | 145                      | 53.0 | 45.1,60.7 | 183                | 37.4 | 32.8,42.2 |
| Medium                  | 155                            | 84.4 | 76.6,89.9 | 416                | 84.7 | 80.7,88.0 | 102                      | 54.9 | 44.2,65.2 | 193                | 36.9 | 31.9,42.1 |
| High                    | 58                             | 70.5 | 56.5,81.4 | 373                | 74.7 | 69.0,79.7 | 37                       | 42.7 | 31.6,54.6 | 151                | 32.4 | 28.3,36.7 |
|                         |                                |      | 0.059*    |                    |      | 0.000*    |                          |      | 0.280*    |                    |      | 0.271*    |
| Marital status          |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| Married <sup>‡</sup>    | 24                             | 91.4 | 74.3,97.5 | 691                | 81.2 | 77.9,84.2 | 8                        | 24.4 | 9.6,49.5  | 249                | 30.9 | 27.6,34.4 |
| Divorced <sup>§</sup>   | 70                             | 71.9 | 60.0,81.4 | 54                 | 78.7 | 65.9,87.6 | 46                       | 52.5 | 41.5,63.4 | 29                 | 35.5 | 23.6,49.5 |
| Single                  | 65                             | 79.0 | 66.6,87.6 | 82                 | 75.9 | 62.7,85.5 | 42                       | 45.8 | 33.2,59.1 | 41                 | 36.0 | 26.5,46.8 |
| Widowed                 | 275                            | 83.8 | 78.4,88.1 | 388                | 85.3 | 81.1,88.7 | 188                      | 54.7 | 47.7,61.5 | 208                | 45.0 | 40.2,50.0 |
|                         |                                |      | 0.057*    |                    |      | 0.202*    |                          |      | 0.072*    |                    |      | 0.000*    |
| Residence area          |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| Rural                   | 122                            | 83.7 | 74.9,89.8 | 289                | 82.5 | 77.5,86.5 | 87                       | 65.0 | 54.3,74.3 | 134                | 40.4 | 35.1,45.9 |
| Urban/Metropolitan      | 312                            | 80.4 | 74.6,85.1 | 926                | 81.7 | 78.4,84.6 | 197                      | 47.4 | 40.8,54.1 | 393                | 34.0 | 31.2,36.9 |
|                         |                                |      | 0.490*    |                    |      | 0.781*    |                          |      | 0.006*    |                    |      | 0.038*    |

(continues...)

(continuation)

|                                                         |     |      |           |       |      |           |     |      |           |     |      |           |
|---------------------------------------------------------|-----|------|-----------|-------|------|-----------|-----|------|-----------|-----|------|-----------|
| Indigenous language                                     |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 414 | 81.5 | 76.5,85.6 | 1 139 | 81.5 | 78.7,84.1 | 271 | 52.0 | 46.2,57.8 | 492 | 35.0 | 32.4,37.7 |
| Yes                                                     | 20  | 75.8 | 52.7,89.8 | 76    | 87.1 | 73.0,94.4 | 13  | 43.1 | 24.1,64.4 | 35  | 42.4 | 32.1,53.4 |
|                                                         |     |      | 0.530*    |       |      | 0.368*    |     |      | 0.432*    |     |      | 0.184*    |
| Occupational status (last week)                         |     |      |           |       |      |           |     |      |           |     |      |           |
| Not working                                             | 158 | 80.4 | 71.4,87.1 | 362   | 78.5 | 73.0,83.2 | 112 | 49.1 | 41.2,57.0 | 160 | 34.9 | 29.7,40.4 |
| Homemaker                                               | 169 | 83.9 | 76.4,89.4 | 569   | 85.8 | 82.1,88.9 | 105 | 53.0 | 43.2,62.6 | 251 | 36.3 | 32.5,40.3 |
| Working                                                 | 107 | 78.2 | 68.7,85.5 | 284   | 79.2 | 73.0,84.3 | 67  | 53.0 | 42.0,63.8 | 116 | 34.5 | 29.2,40.3 |
|                                                         |     |      | 0.583*    |       |      | 0.029*    |     |      | 0.781*    |     |      | 0.862*    |
| Welfare pension for older adults (a government program) |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 143 | 75.5 | 66.5,82.7 | 481   | 80.0 | 75.5,83.8 | 97  | 51.6 | 41.8,61.3 | 197 | 31.6 | 27.4,36.0 |
| Yes                                                     | 291 | 84.4 | 78.2,89.1 | 730   | 83.0 | 79.8,85.8 | 187 | 51.6 | 44.8,58.3 | 330 | 38.1 | 34.6,41.8 |
|                                                         |     |      | 0.072*    |       |      | 0.191*    |     |      | 0.991*    |     |      | 0.035*    |
| Right to or access to medical services                  |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 226 | 87.4 | 81.3,91.6 | 558   | 84.6 | 80.6,87.9 | 151 | 56.2 | 48.7,63.4 | 239 | 35.9 | 32.1,40.0 |
| Yes                                                     | 207 | 75.3 | 68.0,81.4 | 657   | 79.9 | 76.1,83.3 | 132 | 47.0 | 39.3,54.8 | 288 | 35.1 | 31.6,38.8 |
|                                                         |     |      | 0.006*    |       |      | 0.069*    |     |      | 0.080*    |     |      | 0.768*    |
| ICT use                                                 |     |      |           |       |      |           |     |      |           |     |      |           |
| Using a cell phone                                      |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 193 | 89.5 | 82.1,94.0 | 647   | 89.0 | 85.9,91.5 | 124 | 55.4 | 47.2,63.2 | 255 | 35.7 | 32.3,39.4 |
| Yes                                                     | 241 | 75.6 | 69.1,81.1 | 568   | 75.4 | 71.3,79.2 | 160 | 48.9 | 41.7,56.1 | 272 | 35.1 | 31.5,39.0 |
|                                                         |     |      | 0.005*    |       |      | 0.000*    |     |      | 0.222*    |     |      | 0.821*    |
| Using a computer                                        |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 410 | 83.8 | 79.1,87.6 | 1 143 | 83.7 | 81.0,86.1 | 267 | 52.8 | 46.8,58.6 | 494 | 36.5 | 33.9,39.1 |
| Yes                                                     | 24  | 58.4 | 42.0,73.1 | 72    | 65.4 | 53.0,76.0 | 17  | 40.5 | 23.2,60.6 | 33  | 26.4 | 18.6,36.0 |
|                                                         |     |      | 0.000*    |       |      | 0.000*    |     |      | 0.252*    |     |      | 0.044*    |
| Using the internet                                      |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 373 | 85.3 | 80.1,89.2 | 1 017 | 85.3 | 82.5,87.8 | 246 | 55.5 | 49.1,61.7 | 431 | 36.1 | 33.0,39.3 |
| Yes                                                     | 61  | 65.7 | 54.5,75.4 | 198   | 69.8 | 62.6,76.2 | 38  | 36.4 | 26.5,47.5 | 96  | 33.1 | 27.3,39.4 |
|                                                         |     |      | 0.000*    |       |      | 0.000*    |     |      | 0.004*    |     |      | 0.434*    |
| Using social media                                      |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 170 | 83.8 | 76.5,89.1 | 398   | 84.8 | 80.9,88.1 | 112 | 52.0 | 43.2,60.6 | 183 | 38.3 | 33.3,43.6 |
| Yes                                                     | 71  | 64.2 | 54.0,73.3 | 175   | 61.7 | 54.4,68.5 | 48  | 44.6 | 33.5,56.3 | 90  | 30.3 | 25.0,36.1 |
|                                                         |     |      | 0.000*    |       |      | 0.000*    |     |      | 0.306*    |     |      | 0.050*    |
| Having a landline telephone                             |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                                      | 285 | 86.3 | 81.3,90.1 | 652   | 83.7 | 80.3,86.6 | 183 | 52.6 | 45.2,59.8 | 294 | 37.8 | 33.9,41.8 |
| Yes                                                     | 149 | 74.0 | 65.5,81.1 | 563   | 80.0 | 75.9,83.6 | 101 | 50.0 | 41.2,58.7 | 233 | 33.1 | 29.4,37.0 |
|                                                         |     |      | 0.003*    |       |      | 0.132*    |     |      | 0.656*    |     |      | 0.115*    |

Ensanut: Encuesta Nacional de Salud y Nutrición.

\* Chi-square test.

‡ Including those in a common-law union.

§ Including those separated from a common-law union.

Among OA LA, the highest prevalence of loneliness was observed in the Pacific-Central region (73.0%), while the lowest was observed in the Peninsula region (43.4%). For those LWO, the Pacific-South region had the highest prevalence of loneliness (38.7%), while the State of Mexico region had the lowest (32.2%). However, differences by region were not statistically significant (figure 1B).

## Discussion

While the Ensanut<sup>13,19-21</sup> monitors various aspects of population health, it has also been useful in understanding the landscape of certain mental health issues,<sup>22-24</sup> providing data on prevalence,<sup>23</sup> needs,<sup>24</sup> and outcomes, which in turn can contribute to the design of public policies and interventions. The mental health landscape is

**Table IV**  
**PREVALENCE OF SOCIAL ISOLATION AND LONELINESS IN OLDER ADULTS LIVING ALONE AND THOSE LIVING WITH OTHERS BY HEALTH BEHAVIOR AND PHYSICAL AND MENTAL HEALTH STATUS CHARACTERISTICS. MEXICO, ENSANUT CONTINUA 2021**

| Characteristics                                      | Prevalence of social isolation |      |           |                    |      |           | Prevalence of loneliness |      |           |                    |      |           |
|------------------------------------------------------|--------------------------------|------|-----------|--------------------|------|-----------|--------------------------|------|-----------|--------------------|------|-----------|
|                                                      | Living alone                   |      |           | Living with others |      |           | Living alone             |      |           | Living with others |      |           |
|                                                      | n                              | %    | 95%CI     | n                  | %    | 95%CI     | n                        | %    | 95%CI     | n                  | %    | 95%CI     |
| <b>Health behavior</b>                               |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| Walked for exercise or pleasure (in the past 7 days) |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| No                                                   | 320                            | 83.0 | 77.7,87.2 | 965                | 85.1 | 82.3,87.5 | 219                      | 54.1 | 48.5,59.6 | 410                | 36.6 | 33.8,39.5 |
| Yes                                                  | 113                            | 76.5 | 66.1,84.5 | 250                | 71.2 | 64.0,77.4 | 65                       | 47.0 | 36.5,57.7 | 117                | 31.5 | 25.8,37.8 |
|                                                      |                                |      | 0.191*    |                    |      | 0.000*    |                          |      | 0.202*    |                    |      | 0.149*    |
| Currently smokes tobacco                             |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| No                                                   | 390                            | 81.1 | 76.0,85.3 | 1105               | 82.4 | 79.4,85.0 | 258                      | 52.5 | 46.6,58.4 | 479                | 35.2 | 32.6,37.9 |
| Yes                                                  | 41                             | 79.8 | 63.4,90.0 | 105                | 76.2 | 66.1,83.9 | 25                       | 47.0 | 32.8,61.7 | 47                 | 38.4 | 29.1,48.7 |
|                                                      |                                |      | 0.856*    |                    |      | 0.154*    |                          |      | 0.483*    |                    |      | 0.538*    |
| Consumed alcohol (in the past 12 months)             |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| No                                                   | 323                            | 82.1 | 76.5,86.6 | 910                | 83.6 | 80.6,86.3 | 202                      | 50.7 | 43.9,57.5 | 391                | 35.6 | 32.5,38.8 |
| Yes                                                  | 109                            | 77.9 | 68.2,85.3 | 304                | 76.9 | 70.3,82.4 | 81                       | 54.7 | 45.3,63.8 | 135                | 34.8 | 29.5,40.5 |
|                                                      |                                |      | 0.382*    |                    |      | 0.036*    |                          |      | 0.488*    |                    |      | 0.830*    |
| <b>Physical and mental health status</b>             |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| Diabetes <sup>‡</sup>                                |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| No                                                   | 323                            | 81.2 | 75.1,86.0 | 902                | 82.0 | 78.7,84.8 | 204                      | 50.2 | 43.4,57.0 | 386                | 36.0 | 32.9,39.3 |
| Yes                                                  | 111                            | 81.0 | 70.6,88.3 | 313                | 81.7 | 77.0,85.6 | 80                       | 55.2 | 44.0,66.0 | 141                | 33.7 | 28.9,38.9 |
|                                                      |                                |      | 0.977*    |                    |      | 0.897*    |                          |      | 0.462*    |                    |      | 0.478*    |
| Hypertension <sup>‡</sup>                            |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| No                                                   | 247                            | 82.8 | 76.6,87.6 | 649                | 81.8 | 78.1,84.9 | 151                      | 47.2 | 38.8,55.7 | 248                | 31.0 | 27.6,34.7 |
| Yes                                                  | 186                            | 79.0 | 70.8,85.4 | 565                | 82.1 | 78.5,85.2 | 132                      | 56.8 | 48.1,65.0 | 279                | 40.8 | 37.2,44.5 |
|                                                      |                                |      | 0.421*    |                    |      | 0.890*    |                          |      | 0.144*    |                    |      | 0.000*    |
| Cardiovascular disease <sup>‡</sup>                  |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| No                                                   | 425                            | 81.3 | 76.5,85.4 | 1184               | 82.1 | 79.3,84.7 | 276                      | 51.1 | 45.3,56.8 | 508                | 35.3 | 32.7,37.9 |
| Yes                                                  | 9                              | 73.5 | 40.1,92.0 | 31                 | 71.8 | 56.2,83.5 | 8                        | 66.3 | 34.1,88.2 | 19                 | 40.9 | 26.4,57.1 |
|                                                      |                                |      | 0.535*    |                    |      | 0.101*    |                          |      | 0.349*    |                    |      | 0.486*    |
| High cholesterol <sup>‡</sup>                        |                                |      |           |                    |      |           |                          |      |           |                    |      |           |
| No                                                   | 360                            | 82.7 | 77.6,86.7 | 977                | 83.5 | 80.6,86.1 | 233                      | 51.6 | 45.5,57.7 | 396                | 34.0 | 31.1,37.0 |
| Yes                                                  | 74                             | 74.4 | 58.2,85.9 | 238                | 75.8 | 69.2,81.4 | 51                       | 50.9 | 37.3,64.3 | 131                | 40.8 | 34.8,47.1 |
|                                                      |                                |      | 0.238*    |                    |      | 0.012*    |                          |      | 0.924*    |                    |      | 0.056*    |

(continues...)

(continuation)

|                                    |     |      |           |       |      |           |     |      |           |     |      |           |
|------------------------------------|-----|------|-----------|-------|------|-----------|-----|------|-----------|-----|------|-----------|
| High triglycerides <sup>‡</sup>    |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                 | 365 | 81.6 | 76.7,85.7 | 1 000 | 82.4 | 79.3,85.0 | 235 | 50.9 | 45.0,56.9 | 413 | 34.3 | 31.3,37.3 |
| Yes                                | 69  | 78.6 | 61.2,89.5 | 215   | 79.9 | 73.9,84.8 | 49  | 54.3 | 39.9,67.9 | 114 | 40.6 | 34.0,47.6 |
|                                    |     |      | 0.678*    |       |      | 0.383*    |     |      | 0.668*    |     |      | 0.107*    |
| Disability (WG-SS)                 |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                 | 314 | 79.6 | 74.0,84.2 | 913   | 80.9 | 77.4,84.0 | 189 | 46.9 | 41.3,52.6 | 341 | 31.2 | 28.3,34.3 |
| Yes                                | 120 | 85.5 | 76.3,91.5 | 302   | 84.6 | 80.6,87.9 | 95  | 64.5 | 51.9,75.4 | 186 | 47.5 | 41.6,53.5 |
|                                    |     |      | 0.230*    |       |      | 0.147*    |     |      | 0.010*    |     |      | 0.000*    |
| Depressive symptomatology (CESD-7) |     |      |           |       |      |           |     |      |           |     |      |           |
| No (score <5)                      | 172 | 78.8 | 72.3,84.1 | 527   | 79.5 | 75.0,83.3 | 95  | 41.5 | 33.6,50.0 | 139 | 21.7 | 18.1,25.8 |
| Yes (score ≥5)                     | 262 | 82.7 | 76.7,87.4 | 688   | 83.9 | 80.5,86.7 | 189 | 58.2 | 51.2,64.9 | 388 | 46.5 | 42.9,50.2 |
|                                    |     |      | 0.286*    |       |      | 0.080*    |     |      | 0.002*    |     |      | 0.000*    |
| Suicidal ideation                  |     |      |           |       |      |           |     |      |           |     |      |           |
| No                                 | 402 | 80.5 | 75.3,84.8 | 1 165 | 81.8 | 78.8,84.4 | 254 | 49.1 | 43.2,54.9 | 482 | 33.8 | 31.3,36.5 |
| Yes                                | 29  | 86.2 | 64.6,95.5 | 47    | 83.8 | 69.7,92.0 | 29  | 84.2 | 61.4,94.7 | 42  | 72.8 | 58.3,83.6 |
|                                    |     |      | 0.521*    |       |      | 0.746*    |     |      | 0.003*    |     |      | 0.000*    |
| Social isolation                   |     |      |           |       |      |           |     |      |           |     |      |           |
| No (score ≥12)                     | -   | -    | -         | -     | -    | -         | 35  | 34.2 | 24.0,46.1 | 88  | 31.2 | 25.0,38.1 |
| Yes (score <12)                    | -   | -    | -         | -     | -    | -         | 249 | 55.5 | 49.2,61.6 | 439 | 36.4 | 33.5,39.3 |
|                                    |     |      |           |       |      |           |     |      | 0.002*    |     |      | 0.184*    |
| Loneliness                         |     |      |           |       |      |           |     |      |           |     |      |           |
| No (score <4)                      | 185 | 74.4 | 66.7,80.9 | 776   | 80.7 | 77.0,83.9 | -   | -    | -         | -   | -    | -         |
| Yes (score ≥4)                     | 249 | 87.5 | 82.0,91.4 | 439   | 84.1 | 80.0,87.4 | -   | -    | -         | -   | -    | -         |
|                                    |     |      | 0.002*    |       |      | 0.184*    |     |      |           |     |      |           |

Ensanut: Encuesta Nacional de Salud y Nutrición.

WG-SS: Washington Group Short Set on Functioning.

CESD-7: seven-item Center for Epidemiologic Studies Depression Scale.

\* Chi-square test.

<sup>‡</sup> For each of the conditions evaluated, the following question was asked: Has a doctor told you that you have.....? In the case of cardiovascular disease, the question was: Has a doctor told you that you have or had a heart attack, angina, or heart failure?

characterized by a high global burden, affecting millions of people—a situation exacerbated by events such as the Covid-19 pandemic<sup>25</sup> and by a significant gap in available support, especially for vulnerable populations—the reason for this contribution focusing on the population over 65 years of age LA and LWO. The study of SI and loneliness in OA is crucial, as both constitute public health problems with significant negative repercussions on mental and physical health, including an increased risk of dementia, cardiovascular disease, and premature death.<sup>9,26</sup> Understanding SI and loneliness is fundamental for developing interventions, informing policies, and improving quality of life, as research demonstrates that social connection is vital for overall well-being.

Based on data from the Ensanut Continua 2021, this study estimated that 27.1% of OA aged 65 and over in Mexico were LA in 2021 during the Covid-19 pandemic,

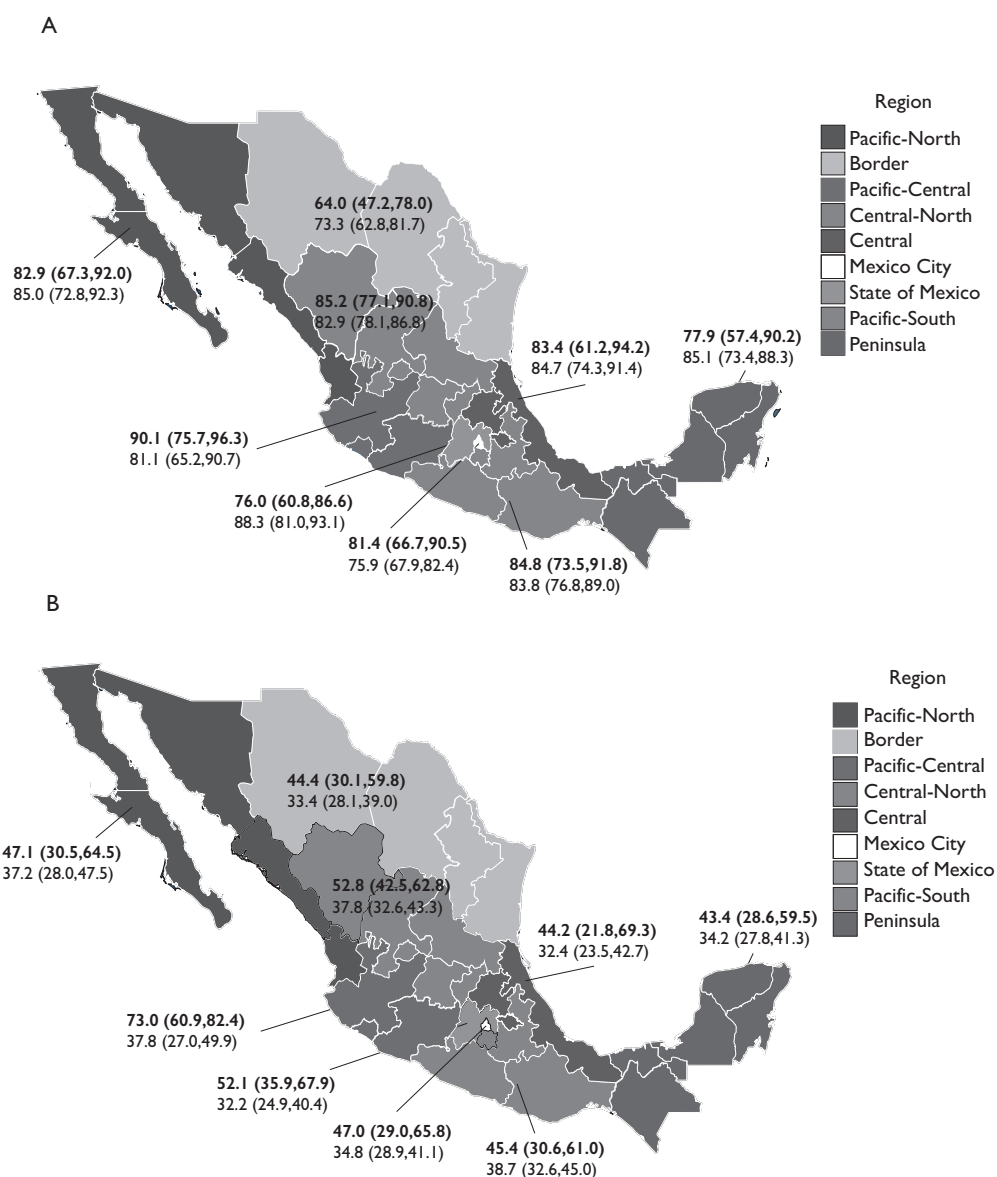
which doubles the estimate (12.4%) from the Ensanut Continua Covid-19 conducted in 2020.<sup>27</sup> This figure more closely resembles what is typically observed in countries with more individualistic social structures, rather than in countries with more family-oriented structures, such as those in Latin America.<sup>1</sup> The increase in the percentage of OA LA observed in Mexico could be explained in part by the loss of partners and other relatives with whom the OA cohabitated, or because a higher proportion of OA LWO may have died compared to those LA.

In other countries, research has shown that among OA LA the prevalence of SI and loneliness is higher than among those LWO.<sup>10-12,28,29</sup> LA in old age can make individuals more vulnerable to SI, as the absence of the emotional and instrumental support, that cohabitation may provide, can make it more difficult to cope with

daily life, have the motivation to maintain relationships, and stay connected. The results of this study showed a similarly high prevalence of SI (objective lack of social contacts) in both OALA and those LWO (81.1 and 81.9% respectively) during the pandemic. In Mexico, lockdown measures for OA, such as staying home and limiting in-person social contacts, were maintained continuously throughout the pandemic, which could have drastically

increased their SI regardless of their living arrangement. Furthermore, the low use of ICT among OA LA and those LWO may have contributed to SI by limiting their options for staying in touch with others virtually.

Despite the similar prevalence of SI observed between both subgroups in our study, the prevalence of loneliness (perceived SI or the subjective feeling of being alone) was higher among OA LA (slightly over



Percentages (95%CI) in older adults living alone are shown in bold text, while data for those living with others are shown in non-bold text. Ensanut: Encuesta Nacional de Salud y Nutrición.

**FIGURE 1. PREVALENCES OF A) SOCIAL ISOLATION AND B) LONELINESS ACROSS THE NINE REGIONS COVERED BY THE ENSANUT CONTINUA 2021. MEXICO**

half) compared to those LWO (just over a third), which is consistent with the findings of other authors.<sup>10,29</sup> Our results can be explained in part by the fact that, while SI can contribute to loneliness,<sup>30</sup> the two are often not highly correlated. Moreover, it has been suggested that the quality of relationships is more strongly associated with loneliness than quantity.<sup>31</sup> Thus, during the Covid-19 pandemic lockdown in Mexico, LWO may have provided OA with opportunities for meaningful connections and support within the household. In contrast, OA LA may have experienced more loneliness, as they likely had fewer opportunities for meaningful daily connections and received less emotional and practical support. This may have been further exacerbated by the higher proportion of OA LA who were older, had a low well-being index, and were widowed, all of which are known characteristics associated with loneliness.<sup>32</sup>

Regardless of living arrangement, the prevalence of SI was higher among OA who had no or low education, a low well-being index, and who did not use a cell phone, computer, internet or social media. The prevalence of loneliness was higher among OA who lived in rural areas, had disability, depressive symptomatology, or suicidal ideation, as well as among widowed individuals and those with no or low education. However, in the case of the latter two, the difference was not statistically significant in the LA subgroup. Findings from a previous study analyzing data from 2020 Ensanut Continua Covid-19 suggest that OA LA who are widowed or have no or low education, are more vulnerable to loneliness.<sup>27</sup> These findings are consistent with those of previous studies on SI<sup>33-36</sup> and loneliness<sup>4,29,32,37</sup> in the general population of OA.

In the LA subgroup, the prevalence of SI was higher among men, those who were married, did not have the right to or access to medical services, did not have a landline telephone, and experienced loneliness. Research in OA supports these results.<sup>4,33,34,36</sup> Individuals LA were already at higher risk of SI, and men may have been even more vulnerable, as they tend to be less willing to broaden their social circles and have close friends. Being male has been associated with SI in other studies.<sup>34</sup> Spouses can be a significant source of social support for OA, and some studies have found that those without a spouse are more likely to experience SI.<sup>34</sup> However, during the pandemic in Mexico, married individuals who LA were the most vulnerable to SI, although the difference was statistically marginal. In Mexico, couples can live apart together (LAT)—that is, maintain their relationships while living in separate household—due to migration or mutual agreement. During the pandemic, individuals LA and married may have primarily relied on their spouse for social interaction and did not maintain broader social ties. In contrast, individuals LA and

unmarried might have developed more diverse social ties prior to the pandemic and may have more likely to maintain them despite the confinement. These findings highlight the importance of not assuming cohabitation or social connectedness based solely on marital status. Lack of access to medical services and a landline phone may have limited ways of interacting with others or staying connected. Loneliness may have generated negative social biases, avoidance behaviors, and reduced motivation to seek social contact,<sup>4</sup> leading OA to become more isolated, especially those LA.

We also found that in the LWO subgroup, the prevalence of SI was higher among women, those who were homemakers, did not walk for exercise or pleasure, and did not have high cholesterol. Contrary to what has been observed by many authors, a few studies in OA have observed that women are more vulnerable to SI.<sup>34</sup> In Mexico, women and homemakers LWO may have faced more household responsibilities and fewer opportunities for outside interaction, especially during the pandemic. Other authors have reported that physically active OA are less likely to experience SI, arguing that, as OA tend to integrate regular physical exercise with social interactions, this may help reduce the risk of SI.<sup>35</sup> In our study, not walking for exercise or pleasure could indicate lower engagement in public or community spaces and less social contact. Likewise, not having a medical condition such as high cholesterol could indicate reduced interaction with healthcare providers and, consequently, less activation of support networks.

In the OA LA subgroup, the prevalence of loneliness was higher among individuals who did not use the internet and who experienced SI. OA LA who did not use the internet may have had more limited possibilities for meaningful connection during the pandemic, as internet use can provide social support and opportunities to participate in activities of interest.<sup>4,38</sup> As discussed previously, SI can contribute to loneliness in OA.<sup>4,30</sup> In a study conducted at the onset of the Covid-19 pandemic in the U.S., bivariate correlations revealed that, regardless of whether individuals were LA or LWO, higher levels of loneliness were associated with more SI.<sup>8</sup> In our study, the lack of social contacts outside the home may have further increased the sense of loneliness among people LA.

In the OA LWO subgroup, loneliness was more prevalent among older individuals, women, those receiving a welfare pension for OA (a government program), individuals who did not use a computer, did not use social media, and those with hypertension. Older age and being female have been associated with loneliness in OA in previous studies.<sup>24,39</sup> The oldest individuals may be more vulnerable to loneliness due to age-related con-

ditions such as functional difficulties, the loss of family members, diminished social roles, and shrinking social networks.<sup>39</sup> Female OA may be more likely to experience loneliness due to psychologically distressing life events (such as the loss of a spouse), personality traits, or social roles.<sup>39</sup> In a bivariate analysis conducted at the onset of the Covid-19 pandemic in the U.S., loneliness was associated with younger age and female gender only in the OA LWO subgroup.<sup>8</sup> Receiving a welfare pension for OA (a government program) could generate conflicts within the household (regarding resource management), which could influence the emotional well-being of OA. In a systematic review was found that social media use was associated with lower levels of loneliness.<sup>40</sup> Not using a computer or social media may have made OALWO more vulnerable to loneliness by reducing opportunities for meaningful social contact. Although some studies have shown that loneliness is a risk factor for hypertension, an inverse association has also been reported.<sup>41</sup> Hypertension may affect emotional well-being and social engagement, increasing the vulnerability of OA to loneliness. Further studies are needed to better understand the differences observed according to living arrangement.

The analysis by region showed that in OA LA the highest prevalence of SI and loneliness was observed in the Pacific-Central region, while the lowest prevalences (more than 25 percentage points lower than the highest) were found in the Border and Peninsula. Among OA LWO the highest prevalence of SI was found in the State of México and the lowest in the Border region, while for loneliness, prevalences were more homogeneous across regions. Although these differences were not significant, data suggest that the region could contribute to SI and loneliness in OA, particularly in the LA subgroup.

A variety of strategies have been proposed in the literature to address SI and loneliness in OA.<sup>4,9</sup> Our data suggest that in Mexico, the design of interventions should focus on individuals with no or low education, low well-being index, and no use of ICT, as well as those who are widowed, live in rural areas, have disability, depressive symptomatology, or suicidal ideation. Our results also suggest that targeted interventions for individuals LA and those LWO are needed, considering the vulnerabilities of each living arrangement evidenced in this study. Among OA LA some potential interventions could include: 1) promoting personalized support networks and group activity programs (in-person or virtual), with particular attention to men and married individuals who may have lost key ties, 2) facilitating access to the internet and landline telephones, 3) promote digital literacy, focusing on the social uses of the internet (video calls, messaging, community platforms), for maintaining emotional connection with

family, friends, or stakeholders, 4) design community programs that combine social activities with health promotion, and 5) ensuring access to health services not only as basic services but also as bridges for social contact. On the other hand, among OA LWO the following recommendations could be made: 1) identifying and strengthening emotional support for those at risk of loneliness (despite being surrounded by other people), particularly older individuals and women, 2) promoting spaces for meaningful connection both inside and outside the home for homemakers, through recreational group activities or volunteering, 3) promoting recreational physical activity, not only as a healthy habit but also as a means of connection and integration, 4) incorporating the emotional and relational components into physical health programs, especially for individuals with chronic conditions such as hypertension, and 5) supporting the use of technology (computers and social media), beyond mere access, by encouraging its use to create and maintain emotional bonds.

One of the strengths of the study is that this is, to our knowledge, the first population-based study to describe the prevalence of SI and loneliness in LA and LWO subgroups according to sociodemographic, ICT use, health behavior, and health status characteristics. For the analysis, a nationally representative sample from Ensanut Continua 2021 was used, which ensures the results are reliable and applicable to Mexican adults aged 65 years and older living alone and living with others. SI and loneliness indicators were measured with scales validated and used in population studies in various countries. Our results support that SI should be conceptually distinguished from living arrangements and marital status. This study also presents some limitations that should be considered. All variables are based on participants' self-reports. SI and loneliness estimates could be influenced by the used cutoff point; future analyses could explore different cutoff points.

In conclusion, our results showed that while OA LA and those LWO presented similar prevalences of SI during the Covid-19 pandemic, the prevalence of loneliness was higher among OA LA compared to those LWO, although it was also elevated in the latter subgroup. These findings underline the vulnerability of Mexican OA without support networks within the home to loneliness, while also indicating that cohabitation does not necessarily ensure meaningful emotional connections. This study revealed differences in the characteristics of OA with higher prevalences of SI and loneliness between those LA and those LWO. These results may be specific to the Covid-19 pandemic period in Mexico, so further research is needed. Our findings provide valuable insights into the magnitude of the SI

and loneliness problem among OALA and those LWO. Targeted interventions are needed to address SI and loneliness in OA, according to the living arrangement, and considering the vulnerabilities of individuals in the LA and LWO subgroups.

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## Authors' contributions

Conceptualization: RR-V, ALRV. Methodology: RR-V, LF-L, AA-L. Formal analysis: ALRV, LF-L. Writing original-draft: RR-V. Writing-review and editing: RR-V, AA-L, EL-P. All authors approved the final version of the manuscript.

*Declaration of conflict of interests.* The authors declare that they have no conflict of interests.

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