Living arrangements and socioeconomic-based health disparities in Mexico

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Abstract

Objective. To investigate the role living arrangements play in the co-dynamics of socioeconomic position and health in the latter part of life. **Materials and methods.** Based on longitudinal data from the Mexican Health and Aging Study (MHAS), latent class analysis (LCA) and locally weighted regressions, in this article we estimate age trajectories to examine the degree to which wealth and health-related outcomes correlate with typical living arrangement dynamics. **Results.** Main results suggest a complex dynamic relationship between living arrangements and social inequalities in health, with important differences by sex, unlike mortality trends as they appear to diverge with differences in wealth regardless of household structure. **Conclusions.** Our methodological approach provides new insights regarding the likely effect household structure play when analyzing the dynamics of social inequality. To date, this is the first longitudinal analysis to offer this kind of empirical evidence for the region.

Keywords: residence characteristics; life cycle stages; socioeconomic factors; longitudinal studies; latent class analysis; Mexico

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Resumen

Objetivo. Investigar el papel que juegan los arreglos de vivienda en la dinámica entre la posición socioeconómica y el estado de salud en el último tramo de la vida. **Material y métodos.** Con base en datos longitudinales del Estudio Nacional de Envejecimiento en México (Enasem), análisis de clases latentes (ACL) y regresiones localmente ponderadas, se estimaron trayectorias etarias para examinar el grado en el que se asocian resultados de riqueza y salud con las dinámicas típicas de los arreglos de vivienda. **Resultados.** Los principales resultados sugieren relaciones dinámicas complejas entre los arreglos de vivienda y la desigualdad social en salud, con un marcado componente de género, en contraste con las tendencias de la mortalidad que parecen divergir con diferencias en riqueza independientemente de la estructura de los hogares. **Conclusiones.** El presente abordaje metodológico ofrece nuevas pistas en lo que se refiere al probable efecto de la estructura de los hogares al analizar la dinámica de la desigualdad social. A la fecha, este es el primer análisis longitudinal en ofrecer este tipo de evidencia empírica para la región.

Palabras clave: características de la residencia; estadios del ciclo de vida; factores socioeconómicos; estudios longitudinales; análisis de clases latentes; México

Little doubt remains regarding the relationship between social position and health. Individuals in lower socioeconomic groups systematically experience higher mortality and worse health outcomes. It is also well known that these health disparities vary across the life course. However, whether these social inequalities in health widen or converge among middle aged and older adults is still a matter of debate.[1] This is hardly a surprise given the complexity surrounding various interactions among health determinants and the different

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settings in which these relationships are investigated. While different conclusions are expected according to the nature of the data being used (cross-sectional or longitudinal studies), the different measures of socioeconomic position (SEP; income, wealth, education, occupation) and health (self-reported or bio-markers), and the treatment of survival effects, research on whether living arrangements work as protective resources or contribute to widening gaps in health is scarce.

There are good reasons to expect living arrangements play a role in explaining differences in the empirical analysis of SEP-based health disparities as people grow older. For over twenty years, household structure has been widely considered as a crucial determinant for the well-being of older persons.[2] There is increasing evidence, mostly in high-income countries, that living arrangements can affect health in old age, such as the occurrence of poor self-rated health, disability in activities of daily living (ADL), cognitive impairment, mortality, and short-term morbidity.[3]

Little doubt remains that living arrangements, socioeconomic position and health are closely related, and that potentially new insights might be gained about socioeconomic inequalities in health by studying their evolution jointly over the life course. However, the age trajectories and extent of reciprocal linkages between them remain only partly understood, particularly in low- and middle-income countries where the longitudinal data covering the time window required to analyze such long-term social and demographic phenomena is hardly available. Also, there is hardly a natural and easy way to operationalize age trajectories of living arrangements from a life course perspective. Arguably one of the main reasons why living arrangement research is usually analyzed as transitions or turning points,[4-6] and not as age related sequences in a person's life.

On the other hand, even when synthetic cohort designs make possible to study the long-term (life course) relationship between socioeconomic position and age trajectories of health using relatively short-term panel data,[7] it is far from clear how to introduce living arrangement trajectories themselves in this framework.[8]

With this paper we aim at contributing to fill this void by exhibiting the co-dynamics between typical household-structure age trajectories, and their related age trends of wealth and health in the latter part of life among older Mexicans.

To make the most of the data at hand, here we use a data-driven (based on typical variables included in household structure research)[9] approach to estimate typical household-structure histories based on commonly used demographic markers. Particularly, we follow Huffman and colleagues [10] who, by way of accelerating the Mexican Health and Aging Study (MHAS),[11] used latent class analysis (LCA) to estimate typical age trajectories in the household composition of middle-aged adults as they grow older. We apply this same methodology to the latest data available (five waves) to examine the related wealth and health age trajectories.

Materials and methods

In all of our estimates we used data gathered by the MHAS. The MHAS is a national longitudinal study of adults 50 years and older in Mexico. With baseline conducted in 2001, representative of adults born in 1951 or earlier, in 2012 a new sample of adults born between 1952-1962 was added to refresh the sample, and once more in 2018 with adults born between 1963 and 1968. Comprehensive information about the MHAS as well as the data can be found on their website.[12]

Starting from the MHAS' detailed longitudinal information about every respondent aged 50 and over (with the exception of a few observations for which the age could not be determined), we follow[10] in approximating a long-term longitudinal study by conducting numerous concurrent short-term longitudinal studies of different age cohorts; that is we rearranged the five waves of the MHAS panel (2001, 2003, 2012, 2015 and 2018) into an ALD, also known as mixed longitudinal, cross-sequential or cohort-sequential design.[13] In a nutshell, the panel data is shaped into wide form with age-related columns instead of measurement occasions (waves) temporarily overlapping the cohort data. This strategy allows us not only to make inferences in time windows larger than what would be possible by looking at a single cohort in the panel, but also allow to somewhat account for age-period-cohort confounding (see reference 10 for further details).

Based on the sex of the respondent and other 9 household level sociodemographic markers (dichotomous indicators of children living in the household, adult children, adult children still in school, working adult children, adult children's partners, index older adult's partner or spouse, presence of nonrelatives, other relatives, and presence of grand-children or great-grandchildren), we used the MHAS-ALD to estimate four typical living arrangement dynamics of the older adult population by means of LCA. We make use of LCA as a classification technique looking for the best partition of the sociodemographic histories as per the MHAS-ALD. Loosely speaking, LCA creates respondent classes with similar answer patterns to each other but as different as possible from those in other classes. Even though the sex of the respondent is not a proper household-structure marker, we have included it

amongst the variables to account for traditional sex roles that might play a part in the redistribution of resources within households and, by this token, influence their structure.

Regarding our measures of socioeconomic position and health, in order to stay as close as possible to other inquiries into the heterogeneity behind aging and individual vulnerability, we look at commonly used inputs in frailty assessment:[14,15] depressive symptoms, falls, instrumental activities of daily living (IADL), basic activities of daily living (ADL), chronic diseases, and total net worth (TNW).

Finally, we also look at respondents' wealth through couple's net worth (assets-debts) of assets in the form of homes, businesses, rental properties, capital, vehicles, debts, and other assets.[16,*]

We present our health and wealth trends by means of a locally weighted regression, or loess, a method for smoothing a scatterplot analogous to how a moving average is computed for a time series,[17] of the respective variable on the respondents' age, broken down by the typical living arrangement dynamics estimated through LCA.

It is important to note that while the ALD allow us to make inferences in larger time windows, it is comprised by records of living people at the observation period (a feature inherited from the cross sectional dimension of our data). Given our analysis focuses on the latter part of life, there is an obvious risk of including survival effects (a selective process caused by socially patterned mortality) biasing our appreciation of SEP-based health disparities and their relation with living arrangements (population truncation may give the appearance of decreasing inequality).

To gauge the size of this likely bias in our age trajectories, we estimate Kaplan-Meier survival curves for each living arrangement class, properly accounting for left truncation in the ALD.[18]

Results

Table I shows the data structure of the MHAS-ALD. This is the base of all our estimates.

Regarding our LCA results, we have chosen a 4-Class partition of the MHAS-ALD based on goodness of fit statistics (not shown, available from the authors upon request) as well as the contrasts it allows across sex of respondents.

The results of our 4-Class model estimates are shown in figure 1. There we can see the average composition of the respondent's household as they grow older, but not the respondents themselves.

It is important to note that the different panels in figure 1 exhibit, not the transit through different a priori defined households structures, but the "best" statistical partition (grouping) of the data according to the 10 sociodemographic markers as per the MHAS-ALD. In particular, our estimates should not be interpreted as if the living arrangements of older Mexicans are not sometimes subject of drastic change, but that these changes do not come about, in general, as a function of age. This allows us to make the most of the variations along time and across households to examine how different developmental trends of living arrangements correlate with health and wealth outcomes among older adults in Mexico.[10,‡]

To account for the potential differences between men and women in the relation between SEP and health, we estimate health and wealth trajectories separately for men and women. Figures 2 and 3 show the age trajectories of our health and wealth outcomes by classes of living arrangement trends and sex.

A simple cursory look at the data allows us to notice that, in fact, household composition is most likely associated with the health and wealth of older individuals. Recall that both figures 2 and 3 show adjusted (locally weighted scatterplot smoothing) descriptive statistics for the most typical living arrangement histories in Mexico as per the MHAS-ALD.

Figure 4 shows our Kaplan-Meier survival estimates by living arrangement class and sex. Perhaps unsurprisingly, we do find evidence of sample selection in the form of pre- mature mortality in the least wealthy group (Class 1), but somewhat comparable to that of Class 4, particularly for men (figure 4, panel a). Interestingly enough, the particular wealth trajectory of men in Class 4 does not seem to have a marked effect on the odds of survival at 78. This figure goes to show the likely bias incurred by analyses of socioeconomic inequalities in health that fail to examine men and women separately. It is worth noting that our global survival estimates stand in line with those based on official Mexican Census data.[19] Also, these results reveal a consistent growing association (divergence in the risk of mortality) between wealth and mortality up to age 80 both stratified by sex and, consequently, in the full sample.

* Here we do not use the imputed data as it is not yet available for all five MHAS waves. For details on the imputation procedure used in the MHAS to assign an exact amount to questions on economic value see reference 16.

‡ For a detailed description of the statistical methodology see reference 10.

Table I
NUMBER OF OBSERVATIONS BY AGE GROUPS AND COHORTS IN THE MHAS-ALD. MEXICO

	Average age (sd)										
Age groups/	*51 (0.82)*	*54 (0.81)*	*57 (0.82)*	*60 (0.82)*	*63 (0.81)*	*66 (0.82)*	*69 (0.82)*	*72 (0.82)*	*75 (0.82)*	*78 (0.82)*	*n*
Cohort	*[50-52]*	*[53-55]*	*[56-58]*	*[59-61]*	*[62-64]*	*[65-67]*	*[68-70]*	*[71-73]*	*[74-76]*	*[77-79]*	
16	1 944	-	-	-	-	-	-	-	-	-	1 944
15	484	1 861	-	-	-	-	-	-	-	-	2 345
14	1 345	1 348	1 485	-	-	-	-	-	-	-	4 178
13	-	1 445	1 385	1 331	-	-	-	-	-	-	4 161
12	-	-	1 465	1 430	1 335	-	-	-	-	-	4 230
11	706	-	-	1 353	1 294	1 200	-	-	-	-	4 553
10	2 137	1 980	-	-	1 856	1 809	1 578	-	-	-	9 360
9	-	1 987	1 844	-	-	1 619	1 566	1 339	-	-	8 355
8	-	-	1 713	1 604	-	-	1 352	1 297	1 112	-	7 078
7	-	-	-	1 531	1 400	-	-	1 101	1 000	850	5 882
6	-	-	-	-	1 292	1 210	-	-	911	817	4 230
5	-	-	-	-	-	1 200	1 094	-	-	768	3 062
4	-	-	-	-	-	-	996	911	-	-	1 907
3	-	-	-	-	-	-	-	728	660	-	1 388
2	-	-	-	-	-	-	-	-	674	592	1 266
1	-	-	-	-	-	-	-	-	-	444	444
Total	6 616	8 621	7 892	7 249	7 177	7 038	6 586	5 376	4 357	3 471	64 383

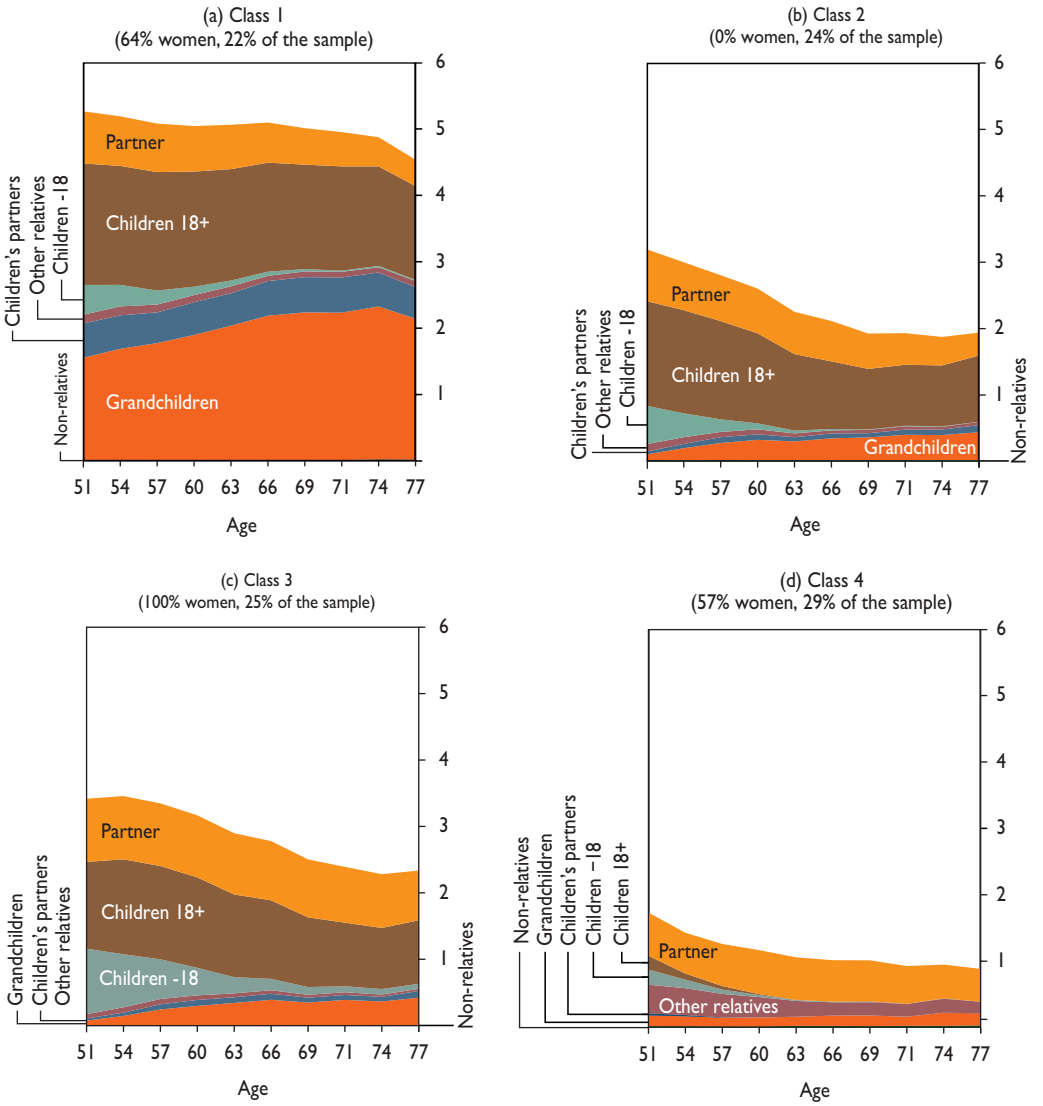
Note: Cohort 1 refers to all those born between 1922 and 1924, seen by the MHAS sometime between 2001 and 2018 with ages 77-79; Cohort 2 [1925-1927], ages 74-79; Cohort 3 [1928-1930], ages 71-76; Cohort 4 [1931-1933], ages 68-73; Cohort 5 [1934-1936], ages 65-79; Cohort 6 [1937-1939], ages 62-79; Cohort 7 [1940-1942], ages 59-79; Cohort 8 [1943-1945], ages 56-76; Cohort 9 [1946-1948], ages 53-73; Cohort 10 [1949-1951], ages 50-70; Cohort 11 [1952-1954], ages 50-67, Cohort 12 [1955-1957], ages 56-64, Cohort 13 [1958-1960], ages 53-61; Cohort 14 [1961-1963], ages 50-58; Cohort 15 [1964-1966], ages 50-55 and Cohort 16 [1967-1969], ages 50-52
MHAS-ALD: Mexican Health and Aging Study-Accelerated Longitudinal Design
Source: Prepared by the authors based on data from MHAS I-V

Discussion

First, our findings are consistent with previous studies that have shown that socioeconomic position is related to functional decline and mobility disability in later life,[20] particularly for women. However, figure 3 also shows how this relation expresses itself through the typical household composition trajectories of Mexican older women. Also, our results confirm the well established gender gap in health trajectories, with women overall reporting poorer health in the latter part of life. Particularly, our results attest the relevance of gender stratification for analyzing mental health,[21] above and beyond wealth and living arrangements, as shown by classes 1 and 4 age trajectories.

Together, figures 1 and 2 reveal Class 2 living arrangement dynamics, comprised of older male adults in lower household life-cycle stages, with the highest frequency of underage children, mostly young adolescents (in which it is still possible to find underage children in 1 out of 10 households by the time respondents turn 67), as the one clearly exhibiting the lowest number of depressive symptoms along the whole period, but not so much in terms of falls, functional limitations and chronic diseases. It is no coincidence that it is precisely this class of households that also exhibit the highest personal/couple wealth across practically the whole time window, a noteworthy pattern already documented for Mexico.[22]

Scholars have long demonstrated that persons of high economic status are likely to be healthier than persons of low socioeconomic standing. Furthermore, it has been shown that this positive association between wealth and health holds even after controlling for sociodemographic attributes and household income.[23] Now we can add that in Mexico, more often than not, this correlation is expressed more clearly through older male adults with the youngest children and partners. It is also important to note that our results also stand in line with studies that find that, among married older persons, chronic conditions reduce the odds of living



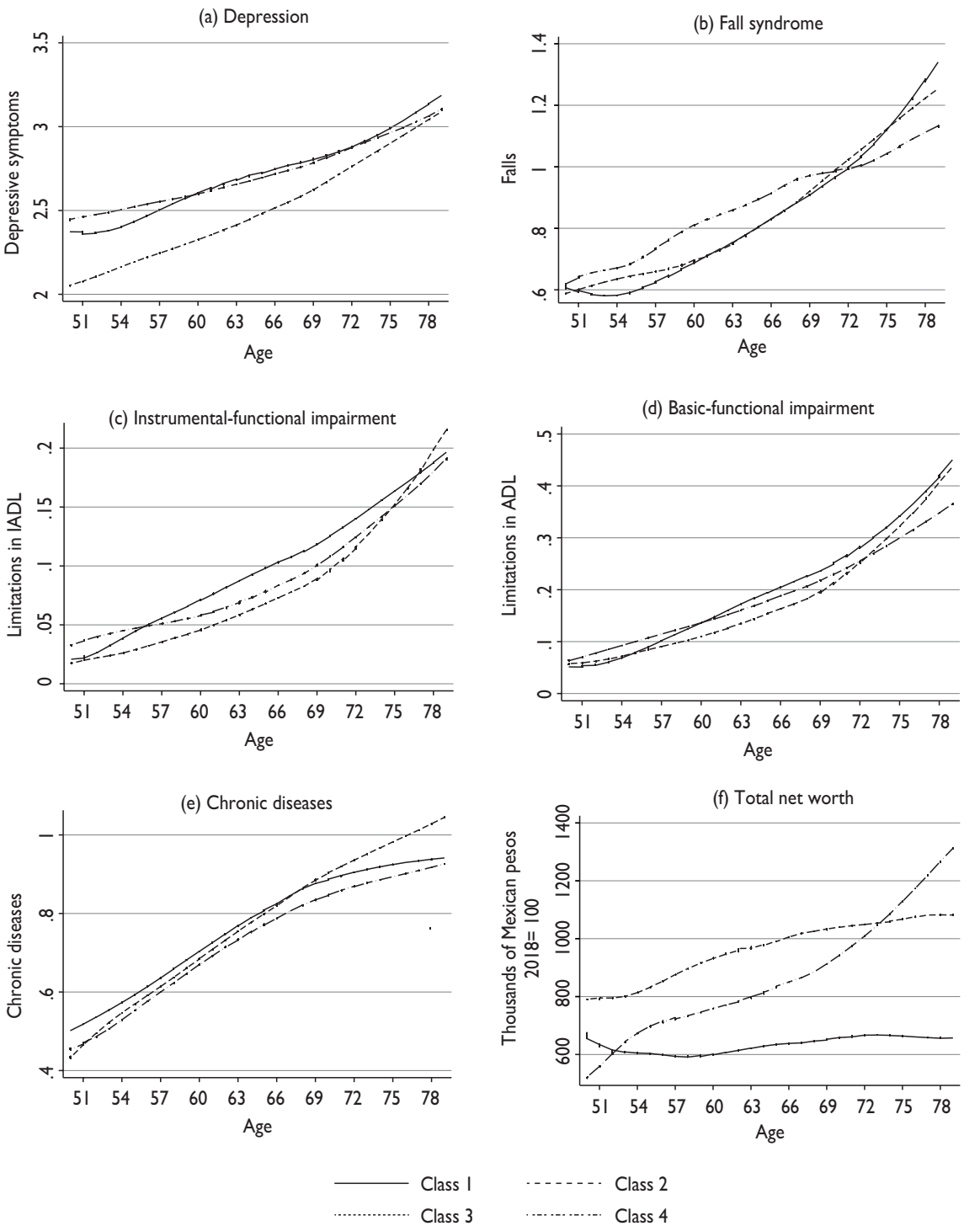
Note: Each panel shows the respondents age along the x-axis and the average number of other household members along the y-axis (excluding the older adult him/her self), according to their familial relation with the respondent: the number of children, older adult's partners in the household, children, children's partners or spouses, grandchildren, other relatives and non-relatives
Source: Prepared by the authors based on data from MHAS I-V
MHAS: Mexican Health and Aging Study

Figure 1. Typical living arrangement dynamics. Mexico

with unmarried children, whereas better self-rated health leads to a greater probability of living with unmarried children.[24]

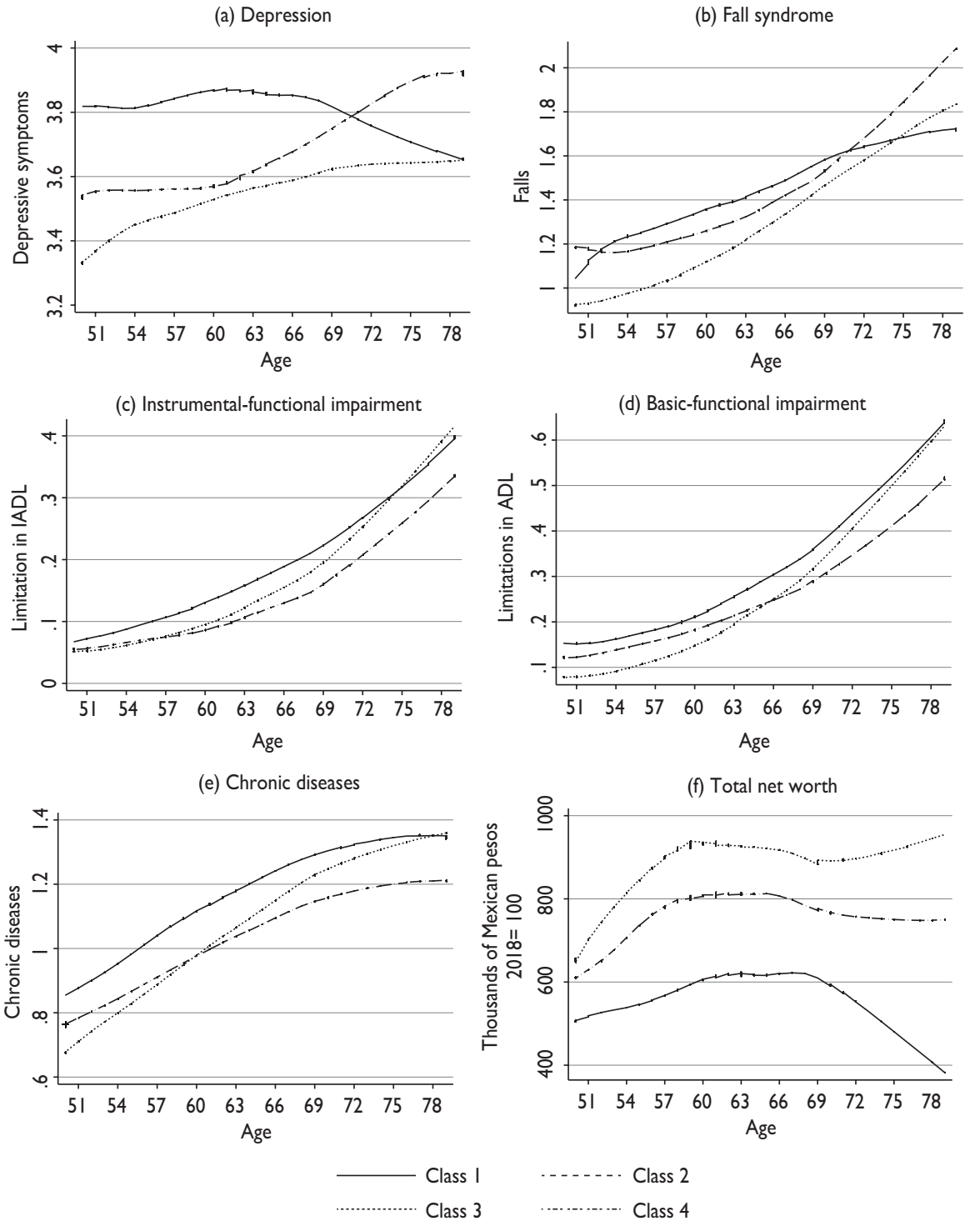
Even though panel a of figure 2 seem to imply some convergence in social in-equalities of mental health among men, it is important to note the higher mortality risk associated with classes 1 and 4, relative to 2, which would suggest some survival effect that warrants caution in this interpretation, particularly with classes 1 and 4 following closely each other while exhibiting such different wealth trajectories.

Somewhat at the other extreme we find Class 3 trends, to which only female respondents belong. These older women that register the largest drops in cohabitation with partner or spouse, also exhibit the smallest number of depressive symptoms (among women) across the whole age window analyzed, and the wealthiest age trajectories among women. However, unlike men's



IADL: Instrumental activities of daily living
ADL: Activities of daily living

FIGURE 2. HEALTH AND WEALTH OUTCOMES BY CLASSES OF LIVING ARRANGEMENT TRENDS (MEN). MEXICO



IADL: Instrumental activities of daily living
ADL: Activities of daily living

Figure 3. Health and wealth outcomes by classes of living arrangement trends (women). Mexico

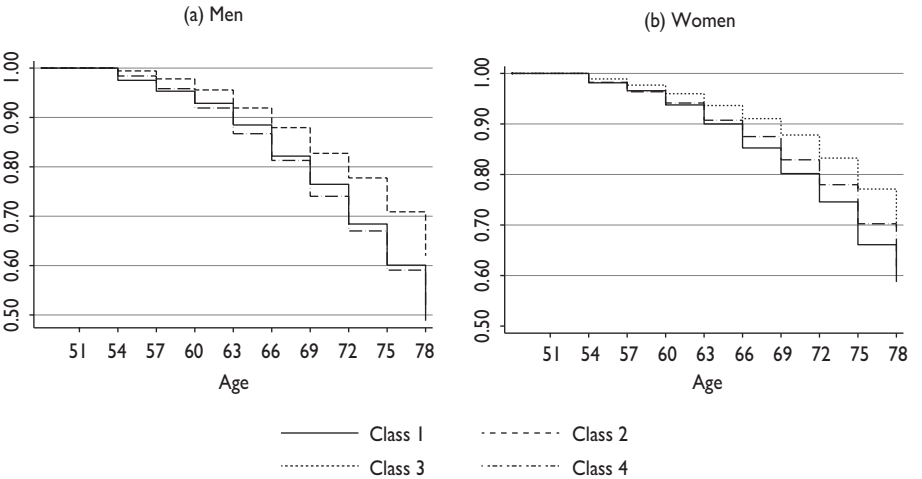


FIGURE 4. KAPLAN-MEIER SURVIVAL ESTIMATES BY CLASSES OF LIVING ARRANGEMENT TRENDS. MEXICO

health trajectories, and even though they remain with the lowest number of falls, and start at comparable levels of functional limitations and chronic diseases as emptying-nest households (Class 4), they quickly pick up the pace around 60 (about the same time these households start to shrink faster) to catch up with the worst health outcomes by their late 70s. It is worth noting that, while somewhat similar to Class 2 households in a lower household life-cycle stage, the drop in the presence of a partner in Class 3 households could mean a combination of either the death of the partner/spouse or, in some cases, divorce or separation in combination with a higher reluctance to repartner.

Curiously enough, the net worth of Class 3 households follow closely that of Class 2 (roughly) between 55 and 60 years old, when the likelihood of living with a spouse starts its decline and the number of functional limitations, falls and chronic diseases take-off. This suggest that, however important economic position is for health-related indicators, there is more to this relationship than a direct association between wealth and mental health or functional status.[22]

It is important to bear in mind that our results are of a correlational nature and, as pointed out before, effects might be confounded here. That is, gendered health-trends could be behind the living arrangements histories exhibited by Class 3 households. Even though the apparent simultaneity (with regards to age) of these phenomena does not allow us to disentangle these matters, our findings do point out the interplay of gendered living arrangement dynamics -common in older Mexican adulthood- with experiencing both functional impairment and depressive symptoms.

With the poorer health and wealth trends, are respondents belonging to Class 1, the class of respondents with the largest (multi-generational) households -even though the average household size in this class falls from 6.2 at age 51 to 5.5 at ages around 80. Unlike the other three classes, Class 1 respondents also exhibit the lowest wealth trends both among men and women, with the shape of an inverted U in the case of women, suggesting that financial support and transfers from co-residents may be particularly important for women with a low socioeconomic position.[25]

Unquestionably, personal and couples' wealth trends do not tell the whole health story. Even though Class 1 older adults fall far behind in terms of wealth starting in their 50s, in the case of men, health trajectories other than depressive symptoms are quite comparable across classes. While the case of women is markedly different, it is important to bear in mind that Class 3 women exhibit the largest survival estimates after 63 in our sample (see figure 4, which would explain in part the apparent worsening of health conditions relative to the other classes).

Class 4 households, the second less wealthy class (for most of the time window in the case of men) with the smallest average household size, but the highest number of other relatives living in the household, sets quite apart from the rest the wealth trajectories of men. While there is no way for us to explore how international migration correlates with the observed trends with our data, the combination of decreasing number of children, together with the growing presence of grandchildren (if only found in 10% of Class 4 households), reminds us of the previous findings on the effects of adult child

migration and the health of older parents left behind in Mexico;[26,27] a common situation in Mexican households (skip-generation or donut households) that clearly do not correspond to any ideal stage of the domestic cycle.[28] These respondents exhibit depressive symptoms comparable to those in the poorest class. This coincides with other studies' findings that smaller increases in depressive symptomatology are seen over time if respondents coreside with children, and that coresidence with others, however, is linked to larger increases in depressive symptoms.[29]

Also, the fact that women in Class 4 households exhibit better health trends than those in Class 1 suggests several possible selection issues. On the one hand, older adults whose health allows them to live apart from their children tend to do so. On the other hand, while mortality selection bias is expected with respect to Class 3, it is not expected with respect to Class 1 (figure 4).

Panel a of figure 3, however, exhibit a somewhat puzzling pattern for women in smaller (Class 4) living arrangements as their mental health trajectories seem to diverge from that of women in Class 3, a change in pace not easily explained by wealth trajectories nor survival effects, but closely related to the change of pace in falls. This would suggest some living arrangements work as protective resources modulating both the risk of falls and poor mental health, particularly for women over 60 years old. For sure, living in multi-generational households can be a resource for support that can be utilized in times of crisis.

We also find it interesting that, even though we see some important catching up (and passing) of Class 3 women in their health trajectories, we do not consider this compelling evidence regarding whether social inequalities in health widen or converge in the latter part of life. While Class 3 women health trajectories seem to converge with those of Class 1, we cannot ignore that this might be driven in part by mortality selection, in which those experiencing the poorest health, who are disproportionately of Classes 1 and 4, with lower SEP, are more likely to have died and not been included in our sample, thus making these classes look healthier than they really are in the latter part of life. The same can be said regarding Class 2 men catching up with those in classes 1 and 4.

This mortality selection, however, do not help us explain the apparent divergence between Class 1 and Class 4 women as one would expect according to their respective wealth trajectories. If anything, we would expect this gap to widen as we control for this bias. On the other hand, age do seems to work as a leveler in mental health disparities between sexes (compare panels *a* in both figures 2 and 3, Class 3 vis-á-vis Class 2). It would appear that, in Mexico, mental health inequalities across sexes decrease at older ages,[20,30] as health disparities seem to converge in later life according to our estimates.

Conclusions

To some extent, the living arrangement dynamics and their health and economic correlates in Mexico appear to be following trends noted in other countries. Indeed, we reproduce the finding that wealth and health are strongly and positively related to each other: wealthier persons are longer healthy. A result to which now we can add that this pattern relates more clearly to typical living arrangement dynamics belonging to partnered older male adults with the highest number of underage children and younger female partners. Albeit unsurprising, this is an important finding. Another closely related finding of our study is the new evidence provided in favor of the likely effect household structure play when analyzing the dynamics of social inequality (age-as-leveler hypothesis vis-á-vis cumulative disadvantage hypothesis) in older ages in Mexico. To date, this is the first longitudinal analysis to offer this kind of empirical evidence for the region.

Nevertheless, we believe our analysis of the correlates of living arrangement dynamics and health and wealth outcome trends among older adults in Mexico provides new insight regarding the most common dynamic relationships of these elements in the latter part of life, thus expanding the types of questions in need of answers, and the empirical approaches susceptible of providing them.

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

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