

BMJ Open Association between multimorbidity and capacity impairment in the adult population of Chile: findings of the National Health Survey 2016–2017

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ABSTRACT

Objective This study aims to assess the association of multimorbidity with capacity impairment in the Chilean population.

Design Cross-sectional study.

Setting We analysed data from the National Health Survey performed in Chile in 2016 and 2017.

Participants Persons aged 15 years and over were selected using a random, stratified and multistage sampling by clusters in all 15 geographical regions of the country.

Primary and secondary outcomes We consider the WHO's definition of multimorbidity as the coexistence of two or more chronic conditions in the same person. For capacity impairment, the survey included 24 items in eight dimensions that represent functioning as a reflection of the overall health experience perceived by an individual with a health condition and interacting with the environment.

Results The 2016–2017 ENS (*Encuesta Nacional de Salud*) included 6233 participants (mean age 48.9±19.3, and 62% women). There is an association between impairment of capacity and being a woman (OR=1.62; 95% CI 1.37 to 1.92) and between being under 45 years old and conserved capacity (OR=0.8, 95% CI 0.64 to 0.99).

The predictive model determined that women classified with five or more chronic conditions of 80 years and over and with less than 8 years of formal education reach the highest probability of having any impairment of capacity.

Conclusion Multimorbidity is associated with impaired capacity in the adult population in Chile, and these public health problems are present at early ages and have a greater impact on women.

INTRODUCTION

Multimorbidity, the coexistence of two or more chronic health conditions in the same individual, is not just a medical term.^{1–3} Those with multimorbidity face a higher probability of premature death, greater disability and poorer functioning and health-related quality of life. This condition increases health service utilisation, poly-consultation, polypharmacy, hospital admissions and prolonged hospital

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The cross-sectional design of this study does not allow for establishing a directionality of the events.
- ⇒ Self-report questionnaires measured the exposure and the outcome.
- ⇒ The data was collected 8 years ago. However, it is the latest survey available nationwide in Chile.

stays, placing a greater economic burden on individuals and health systems.⁴

Globally, one in three individuals live with multimorbidity,⁵ with an estimated adult prevalence of 42.4% (95% CI 38.9% to 46.0%) but with very high heterogeneity mainly explained by age and by several definitions.⁶ Although age is highly related to multimorbidity, more people younger than 65 years are affected by multimorbidity, revealing that multimorbidity is not just a feature of ageing.⁴

In Chile, the last decade has seen a significant increase in morbidity and mortality associated with non-communicable diseases, representing the leading disease burden.⁷ It is estimated that approximately 11 million adults aged 15 years or older live with two or more chronic diseases simultaneously, and 2 400 000 live with five or more of these diseases simultaneously.⁸ Also, it has been reported that mortality risk increases by 10% for each additional morbidity.⁹

For the WHO, functioning is the third key health indicator, after mortality and morbidity. Its importance lies in the fact that it is the pathway to well-being.¹⁰ The construct emerges from the interaction between an individual's health status, body functions, structures, activities and participation level in life and social situations.^{11 12} At this point, it is crucial to differentiate between biological health and lived health, operationalised in the International Classification of Functioning,

Disability and Health¹³ through two qualifiers: capacity and performance. Biological health represents an individual's intrinsic capacity for health, meaning what they can do given their health conditions. This should not be confused with the actions a person takes or the limitations they experience in their environment, defined as lived health and assessed through performance in activities and participation.¹⁴ To measure this indicator, the construct 'capacity' indicates the highest possible level of functioning that a person can achieve at a given time, strictly considering their health status, and is used as a proxy for functioning.¹⁵ Ultimately, functioning is a valuable indicator not only of the health status of a population and the clinical and service outcomes provided but also of the health system's impact on individuals' perceived experience based on their health status.¹⁴

While reports from various countries and regions exist on the relationship between multimorbidity and functioning, this relationship may be confounded by other differential factors across countries, such as educational or economic factors, as well as how different people and cultures perceive health impairment and its impact on life. In this context, this work aims to assess the association of multimorbidity with capacity impairment as a proxy of functioning in the Chilean population.

METHOD

This study is a secondary analysis using data from the National Health Survey (ENS from '*Encuesta Nacional de Salud*' in Spanish) in Chile, in its third version carried out in 2016 and 2017. The Ministry of Health of Chile commissioned this survey to the Department of Public Health in conjunction with the Centre for Surveys and Longitudinal Studies, both institutions of the Pontificia Universidad Católica de Chile. The ENS has been positioned as a national epidemiological surveillance instrument, enabling the assessment of the prevalence of various health conditions and their associated risk or protective factors, as well as social determinants, at different times. The methodological design has been described elsewhere.¹⁶ In brief, ENS considers a cross-sectional design with a target population of persons aged 15 years and over, using a random, stratified and multistage sampling by clusters in all 15 geographical regions of the country.

For this report, we consider as exposure the multimorbidity defined by WHO as the coexistence of two or more chronic conditions in the same person, including long-term chronic conditions (eg, cancer), long-term mental conditions (eg, dementia) and/or long-term infectious diseases (eg, hepatitis C).²

Conditions identified in the 2016–2017 ENS were 30: chronic alcohol consumption (Alcohol Use Disorders Identification Tool),¹⁷ chronic smoking (WHO Framework Convention on Tobacco Control Compendium of Indicators),¹⁸ rheumatoid arthritis, dyslipidaemia, knee or hip arthrosis, asthma, cataracts or retinopathy, depression, diabetes mellitus, cerebrovascular disease, chronic

bronchitis, chronic kidney disease, cardiovascular disease, metabolic syndrome (American Diabetes Association criteria),¹⁹ migraine, varicose veins, osteoporosis, sexually transmitted infections, cirrhosis, glaucoma, high blood pressure, thyroid disorders, HIV/AIDS, cancer, obesity, insomnia or sleep apnoea, peptic ulcer and colorectal polyps. In a subsample, these conditions were identified using self-reported data plus altered test results or only altered test results. In the rest of the sample, the data were self-reported. Diagnoses could have been made throughout the lifespan using the question: 'Has a doctor or nurse ever told you that you have X illness?' Then, multimorbidity has been determined as the simple count of chronic conditions²⁰ over the 30 self-reported by the 2016–2017 ENS participants. Considering the number of chronic conditions present in a person, the multimorbidity level is stratified into four levels, from G0 to G3. At the G0 level are healthy people or people with no chronic conditions; at G1 are people with one chronic condition; at G2, there is already multimorbidity with two to four critical conditions; and at G3 are people with complex multimorbidity and a higher burden of frailty with five or more chronic conditions.²¹

Capacity impairment was hypothesised as the outcome and was measured using the WHO proposal for measuring disability in cross-sectional population-based studies. This method is based on the Model Disability Survey developed by the WHO and the World Bank.²² This instrument includes 24 items across eight dimensions and reflects the concept of functioning as the overall health experience perceived by an individual with a health condition in interaction with their environment.¹¹ Using the Rash Partial Credit Model¹⁵ and under the guidance of the WHO rehabilitation team, this methodology allows the population to be classified from mild to high capacity levels. For this analysis, the population was categorised into one of four categories: None, mild, moderate or severe capacity impairment. The instrument is available at <https://epi.minsal.cl/cuestionarios/>.

Other covariables were considered for the sample description and multivariable analysis for their potential role as confounders or effect modifiers: age (categorised as 15–24, 25–44, 45–64, 65–79 or 80 years old or more), sex (male or female), educational level (counting the maximum number of years of education completed), place of residence (urban or rural), body mass index (kg/m²) and physical activity (measured by Global Physical Activity Questionnaire and categorised as low, or moderate/high level).²³

Patient and public involvement

This survey and this report not consider the involvement of patents or public.

Statistical analysis

Except for the descriptive prevalence estimates, all analyses were conducted on the original ENS 2016–2017 sample without incorporating survey weights or design

variables, because our primary aim was to explore internal associations rather than to generate population-level effect estimates. Population-weighted prevalences of multimorbidity (G0–G3) and of the four functional-capacity categories (none, mild, moderate, severe) were estimated with the ENS sampling weights and design variables. Continuous variables are presented unweighted as median (IQR). Bivariate associations were explored with Pearson's χ^2 test. Functional capacity, derived from the Rasch-transformed score, remained in its four ordered categories for descriptive purposes. We dichotomised capacity (any impairment vs none) to enhance interpretability for policy stakeholders and to increase events-per-variable in multivariable analyses. A complementary model, multivariable logistic regression, was fitted to analyse the association between capacity impairment and multimorbidity, including sex, age group, years of education and physical activity level as covariates. The results from the logistic model are presented as adjusted ORs with 95% CIs and marginal predicted probabilities.

Model assumptions were assessed by examining residual plots, variance-inflation factors (<5), the Hosmer-Lemeshow goodness-of-fit statistic and the area under the receiver operating curve. Finally, to examine whether ability score distributions differed simultaneously by sex and age group, quantile regression was applied for the median ($q=0.50$) with indicator terms for sex (reference: men) and the five age ranges, plus their interaction. Inference was based on robust SEs and a global Wald contrast for the sex and age coefficients. Analyses were performed in Stata V.17 (StataCorp, College Station, Texas, USA) and statistical significance was set at $p<0.05$.

RESULTS

Descriptive findings

The analytic sample comprised 6233 adults aged ≥ 15 years (table 1). Women made up 62% of participants and, on average, reported more chronic conditions than men (median=3 vs 2). Among the 6233 participants, 12.4% ($n=771$) reported no chronic condition (G0), 18.5% ($n=1155$) had one condition (G1), 44.9% ($n=2800$) lived with two to four chronic conditions (G2) and 24.2% ($n=1507$) presented five or more conditions (G3) (online supplemental figure 1). Women were over-represented in the most complex multimorbidity stratum (G3: 68.3% women vs 31.7% men; $p<0.001$), whereas men predominated in G0 (58.8%) (table 2). According to age range, more chronic conditions are observed with increasing age, with a median of 1 chronic condition between 15 and 24 years of age to a median of 4 chronic conditions from 65 years of age, with differences in the median number of chronic conditions between all age ranges ($p<0.001$). Figure 1 shows the levels of chronicity by age range, highlighting that the level of complex chronicity or G3 is decreasing in the younger age groups ($p<0.001$) while the G1 level is increasing ($p<0.001$).

Regarding functional capacity, only 11.2% of Chileans had no impairment. Mild, moderate and severe limitations were present in 43.9%, 27.9% and 17%, respectively. Median regression confirmed a graded increase in capacity impairment with age and higher scores in women. Compared with men aged 15–24 years (median=16.7), women showed a 5.0-point higher median (95% CI 2.9 to 7.2; $p<0.001$). Median impairment rose by 5.0 points in the 45–64 group, 9.5 points in the 65–79 group and 19.3 points in the ≥ 80 years group (all $p<0.001$). A joint Wald test for sex and age groups was significant ($F(5, 6222) = 99.9$; $p<0.001$), whereas sex-by-age interaction terms were not ($p>0.20$), indicating a parallel age gradient in both sexes (online supplemental table 1 and figure 2).

Bivariate associations between multimorbidity and capacity impairment

Higher multimorbidity coincided with more capacity impairment. Median counts of chronic conditions rose from 1 (IQR 2) among participants with no limitation to 5 (IQR 4) among those with severe impairment ($p<0.001$) (online supplemental table 2 and figure 3). Similarly, the prevalence of capacity impairment increased with the level of multimorbidity, ranging from 4.4% at level G1 to 45.6% at level G3 (online supplemental figure 4). Figure 2 shows the distribution of the number of chronic conditions by capacity impairment, by sex (a) and age strata (b), with more chronic conditions and more significant capacity impairment observed in women and among older individuals.

Multivariable models

Using a fully adjusted logistic model, multimorbidity emerged as the paramount predictor of any capacity impairment. Figure 3 shows that, compared with participants without chronic conditions (G0), the odds of impairment increased stepwise: OR=1.41 (95% CI, 1.12 to 1.78) for G1, OR=2.48 (1.99 to 3.10) for G2 and OR=13.24 (8.05 to 19.77) for G3.

Additionally, women had higher odds than men (OR=1.61; 95% CI, 1.35 to 1.91), and the age-related risk rose sharply beyond 45 years, reaching an OR of 3.12 (95% CI, 1.51 to 6.44) in those aged 80 years or older. Low physical activity (OR=1.04; 0.87 to 1.25) and having ≥ 8 years of schooling (OR=0.84; 0.62 to 1.12) were not independently associated with impairment (online supplemental table 3).

Finally, predictive margins derived from the same model (online supplemental table 4) showed a near-certain probability ($>99\%$) of impairment in women aged ≥ 80 years with G3 multimorbidity and low education, whereas young men (15–24 years) without chronic conditions exhibited probabilities around 70%. Overall, discrimination was acceptable (AUC=0.75; online supplemental figure 5), and goodness-of-fit statistics supported model adequacy.

Table 1 Characteristics of the sample included in the Chilean 2016–2017 National Health Survey by multimorbidity level

Characteristic	Overall N=6233	G0 N=771	G1 N=1155	G2 N=2800	G3 N=1507
Age, mean±SD (95% CI)	48.9±19.3 (48.4 to 49.4)	35.6±16.9 (34 to 37)	40.0±17.9 (39 to 41)	49.5±18.3 (49 to 50)	61.4±15 (61 to 62)
Age range					
15–24 years old, n (%) (95% CI)	837 (13.4) (12.6 to 14.3)	254 (33) (29.7 to 36.3)	278 (24) (21.7 to 26.6)	284 (10) (9.1 to 11.3)	21 (1.4) (0.9 to 2.1)
25–44 years old, n (%) (95% CI)	1815 (29.1) (28.0 to 30.3)	311 (40) (36.9 to 43.8)	461 (40) (37.1 to 42.8)	862 (31) (29.1 to 32.5)	181 (12) (10.5 to 13.7)
45–64 years old, n (%) (95% CI)	2064 (33.1) (32.0 to 34.3)	148 (19) (16.6 to 22.1)	288 (25) (22.5 to 27.5)	1003 (36) (34.1 to 37.6)	625 (41) (39.0 to 44.0)
65–79 years old, n (%) (95% CI)	1176 (18.9) (17.9 to 19.9)	46 (6.0) (4.5 to 7.9)	100 (8.7) (7.2 to 10.4)	510 (18) (16.8 to 19.7)	520 (35) (32.1 to 36.9)
80+ years old, n (%) (95% CI)	341 (5.5) (4.9 to 6.1)	12 (1.6) (0.9 to 2.7)	28 (2.4) (1.7 to 3.5)	141 (5.0) (4.3 to 5.9)	160 (11) (9.2 to 12.3)
Sex					
Men, n (%) (95% CI)	2315 (37.1) (35.9 to 38.3)	369 (48) (44.4 to 51.4)	489 (42) (39.5 to 45.2)	1107 (40) (37.7 to 41.4)	350 (23) (21.2 to 25.4)
Women, n (%) (95% CI)	3918 (62.9) (61.7 to 64.1)	402 (52) (48.6 to 55.6)	666 (58) (54.8 to 60.5)	1693 (60) (58.6 to 62.3)	1157 (77) (74.6 to 78.8)
Educational level, mean±SD (95% CI)	10.2±4.3 (10.0 to 10.3)	11.5±3.6 (11 to 12)	11.1±3.7 (11 to 11)	10.2±4.2 (10 to 10)	8.6±4.5 (8 to 9)
Residence					
Urban, n (%) (95% CI)	5242 (84.1) (83.2 to 85.0)	620 (80) (77.5 to 83.1)	966 (84) (81.4 to 85.7)	2382 (85) (83.7 to 86.3)	1274 (85) (82.6 to 86.3)
Rural, n (%) (95% CI)	991 (15.9) (15.0 to 16.8)	151 (20) (16.9 to 22.5)	189 (16) (14.3 to 18.6)	418 (15) (13.7 to 16.3)	233 (15) (13.7 to 17.4)
Body mass index, kg/m ² , mean±SD (95% CI)	28.9±5.6 (28.8 to 29.1)	25.5±4.3 (25 to 26)	27.5±5.3 (27 to 28)	29±5.3 (29 to 29)	31±5.7 (31 to 31)
Physical activity					
Low level, n (%) (95% CI)	2498 (40.1) (38.9 to 41.3)	282 (38) (33.3 to 40.0)	432 (38) (34.7 to 40.2)	1059 (39) (36.0 to 39.6)	725 (50) (45.6 to 50.6)
Moderate level, n (%) (95% CI)	1387 (22.3) (21.2 to 23.3)	176 (24) (20.0 to 25.9)	238 (21) (18.4 to 23.0)	640 (24) (21.3 to 24.4)	333 (23) (20.1 to 24.3)
High level, n (%) (95% CI)	2131 (34.2) (33.0 to 35.4)	286 (38) (33.8 to 40.6)	455 (40) (36.6 to 42.2)	1007 (37) (34.2 to 37.8)	383 (27) (23.3 to 27.7)
Capacity level					
None, n (%) (95% CI)	697 (11.2) (10.4 to 12.0)	195 (25) (22.4 to 28.5)	211 (18) (16.1 to 20.6)	270 (9.6) (8.6 to 10.8)	21 (1.4) (0.9 to 2.1)
Mild, n (%) (95% CI)	2733 (43.8) (42.6 to 45.1)	448 (58) (54.6 to 61.5)	650 (56) (53.4 to 59.1)	1282 (46) (43.9 to 47.6)	353 (23) (21.4 to 25.6)
Moderate, n (%) (95% CI)	1740 (27.9) (26.8 to 29.0)	127 (16) (14.0 to 19.3)	265 (23) (20.6 to 25.5)	876 (31) (29.6 to 33.0)	472 (31) (29.0 to 33.7)
Severe, n (%) (95% CI)	1062 (17.0) (16.1 to 18.0)	0 (0)	29 (2.5) (1.8 to 3.6)	372 (13) (12.1 to 14.6)	661 (44) (41.4 to 46.4)

95%CI, 95% confidence interval; G0, no chronicity; G1, 1 chronic condition; G2, 2–4 critical conditions; G3, 5 or more chronic conditions; SD, standard deviation.

DISCUSSION

To our knowledge, this is the first analysis in Chile that focuses directly on exploring the link between multimorbidity and the impairment of the ability of people

to perform different activities in their lives. Our results show that both the levels of chronicity and impairment of capacity are alarmingly high, affecting mostly older people and women, and that both phenomena are

Table 2 Prevalence of levels of multimorbidity (%) by sex (expanded population)

SEX	G0	G1	G2	G3	Total	P value
Men	58.8 (1 118 104.17)	56.4 (1 712 798.47)	50.5 (3 392 204.82)	31.7 (908 218.53)	49.1 (7 131 325.98)	<0.001*
Women	41.2 (782 692.37)	43.6 (1 323 494.35)	49.5 (3 328 611.23)	68.3 (1 952 845.07)	50.9 (7 387 643.01)	

*Statistical significance, χ^2 test.

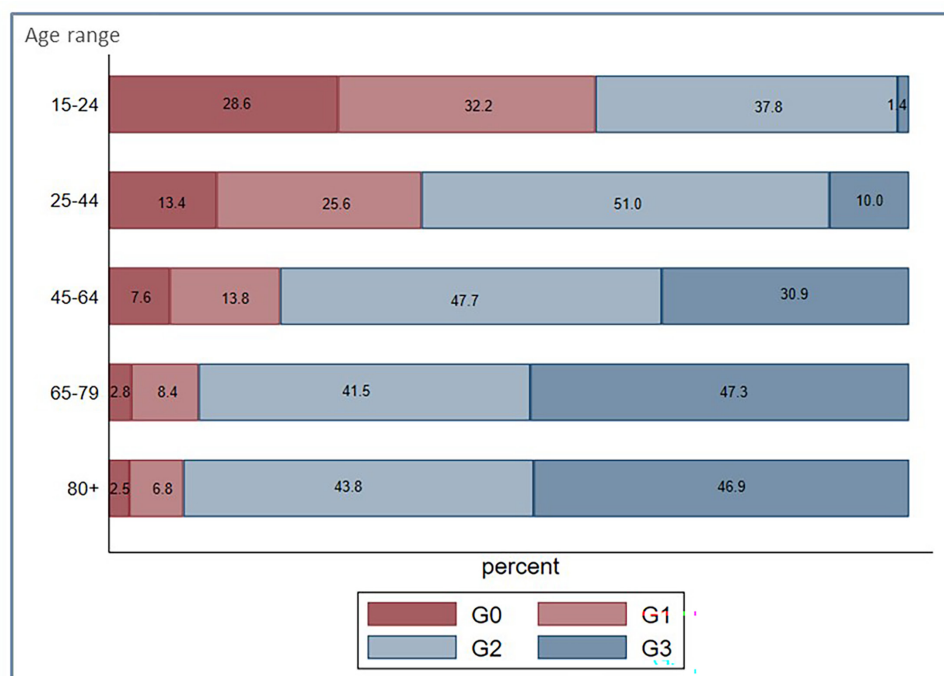
G0, without chronic conditions; G1, 1 chronic condition; G2, 2–4 chronic conditions; G3, 5 or more chronic conditions.

directly associated. It is important to highlight the finding that multimorbidity is notorious from the age of 25 years onwards, with half of the population between 25 and 44 years suffering from between two and four chronic conditions, while at the same time, at least a slight impairment of capacity is observed. Multivariate analyses also showed a consistent and increasing association between levels of chronicity and capacity impairment, with people with two to four conditions (G2) and those with five or more chronic conditions (G3) being 2.5 and 13 times more likely to have capacity impairment, respectively.

These findings are interesting and can be explained by several chronic diseases in an individual that affect different body systems, leading to a decrease in capacity through different physiological mechanisms associated with chronic inflammation.^{24 25} The combination of certain specific chronic conditions has a greater impact on the loss of capacity,^{26 27} resulting in a synergistic effect with mental health conditions that worsen functional outcomes.²⁸ Also, have related a greater difficulty in accessing health services for people with multimorbidity as an element that aggravates difficulties in capacity, as

well as the impact of psychosocial factors such as low socio-economic status, weak social networks and unfavourable life events²⁹ and educational level. In the specific case of education, this is a well-established social determinant of health and functioning. It influences health behaviours, access to care, health literacy and coping mechanisms, which in turn affect both the development of chronic conditions and the ability to maintain functioning despite disease.^{30 31}

Other reports have studied this relationship. From Asia, multiple studies have examined in some way the association between multimorbidity and ability, functioning or disability^{6 26 32–39} almost exclusively in people over 65 years of age. Only two studies included younger populations. On the one hand, the study by Arokiasamy and Himanshu³⁴ included people aged 50 or more from one region of India, and their results support the view that disability is sensitive to multimorbidity along with other risk factors. On the other hand, Pan *et al*,³⁸ in a longitudinal study in China, showed that physical multimorbidity was independently associated with an increased likelihood of disability and early retirement.

**Figure 1** Prevalence of multimorbidity by age range.

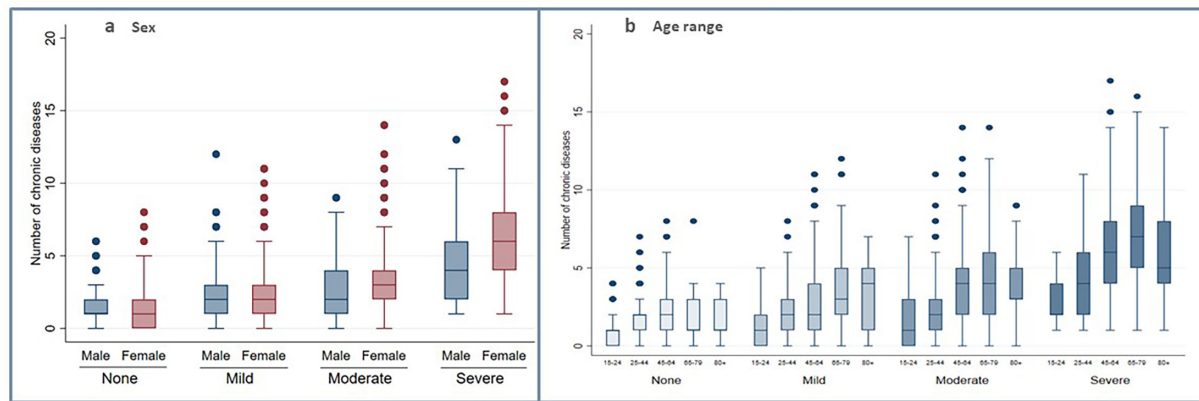


Figure 2 Distribution of chronic conditions by functioning impairment and by sex (a) and age range (b).

Several reports from European countries have been interested in studying this issue,^{340–46} with findings consistent with ours, although most also focused on studying older people. The study by Müller *et al*⁴⁵ specifically assessed the effects of single and multiple morbidities on various aspects of health in slightly younger people aged 50 or more following a cohort in the Netherlands. Their paper concludes that having single and especially multiple chronic morbidities was associated with impaired functioning in middle-aged and older adults, an association that was mitigated in those living with a partner.

There are also other studies from North America,^{28 47–52} where at least four included younger adult populations. McClean *et al*,⁴⁸ in a prospective cohort study of Mexican adults aged 51 years or older with diabetes alone or with some other chronic condition, concluded that when comorbidity included depression, the association with disability increased. Rivera-Almaraz *et al*,⁵⁰ also in Mexico, studied people over the age of 50 and found that multimorbidity was associated with disability, as well as lower quality of life and higher mortality. Two other studies from the USA conducted subanalyses of national studies. Wei *et al*⁵¹ worked specifically with three cohorts of health professionals, finding that the weighted multimorbidity index was strongly associated with higher mortality risk and lower long-term physical functioning. Williams and

Egede⁵² showed that three or more chronic conditions were significantly associated with worse outcomes in terms of quality of life, basic and instrumental activities of daily living and physical limitation compared with having one or two conditions.

At the Latin American level, in Peru, Ortiz *et al*⁵³ assessed the association between multimorbidity and gait speed as a proxy for functioning in a sample of 265 older people without functional dependence, observing a decrease in gait speed as the number of chronic conditions increased with a difference in mean gait speed between older adults without a chronic condition and those with three or more chronic conditions of 0.24 m/s. On the other hand, Schmidt *et al*⁵⁴ in Brazil showed that specific patterns of multimorbidity were associated with the presence of functional disability. In contrast, individuals with a pattern of mental–musculoskeletal multimorbidity had a higher chance of disability in basic activities of daily living, and those with a pattern of more cardiopulmonary origin showed a higher chance of disability in instrumental activities of daily living.

While it is true that definitions and measurements used to determine multimorbidity and capacity limitations differ across existing studies, the findings are consistent and strengthen our own. They demonstrate that, as proposed by the WHO, functioning should be considered an indicator

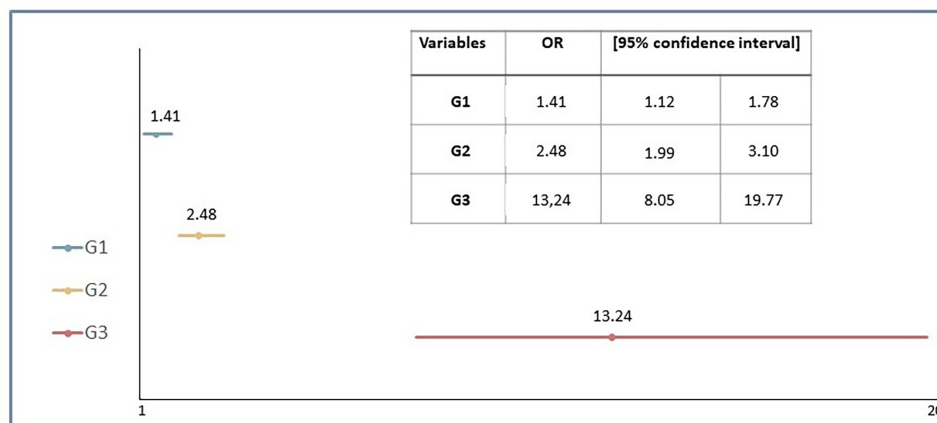


Figure 3 Risk of having capacity impairment according to multimorbidity.

of health status that is indifferent to conditions. This underscores the need to prevent the development of multiple chronic conditions or to take an early approach as soon as multimorbidity becomes present.

It is also important to highlight that the most crucial difference between previous reports and our work is the fact that we included in the analysis a large representative population of people over 15 years of age in our country, demonstrating that the problem of multimorbidity, capacity and its relationship is not a problem exclusive to older people and that it is also affecting the young adult population, which undoubtedly highlights again the fact that addressing functioning is an urgent challenge of public policy. Rehabilitation as a health strategy to improve functioning and reduce disability is considered one of the pillars of universal health coverage by the WHO, which in 2017 made a broad call to states to strengthen rehabilitation services through the strategy Rehabilitation 2030.⁵⁵ Since then, many activities and products have been developed, such as rehabilitation packages, which try to influence different countries by inviting them to consider various interventions as part of the arsenal needed to address at least certain disabling health conditions. These include musculoskeletal, neurological or cardiopulmonary conditions, among other mental health, neurodevelopmental and cancer conditions.⁵⁶ With findings such as those of our study and evidence from other American countries and the world, the need to seriously consider this type of recommendation is further reinforced, starting at least from the conditions previously mentioned, but with an additional effort, both by clinicians and decision-makers, to look at people, throughout the life cycle, with their multimorbidity as a whole that is impacting both their intrinsic capacity and the possibility of adequately participating in their environment and daily life. This undoubtedly implies integrating rehabilitation interventions comprehensively into health systems and at all levels of care.⁵⁷

Our study has some limitations, including the use of secondary data collected 8 years ago. However, they are still valid for health decision making at the national level since it is the most recent survey and allowed us to identify a proportion of chronic conditions that could impact people's functioning, but with the advantage of having used data from a nationally representative sample of the population over 15 years of age, which allows extrapolations to be made with a high level of confidence. Additionally, exposure and outcome were measured using self-report questionnaires. In addition, it is essential to consider the study's cross-sectional design, which does not permit the establishment of a causal direction between the events. Therefore, the possibility of reverse causality exists. However, the magnitude of the associations and the consistency between our results and those of other authors contribute to strengthening our conclusions.

Finally, our results allow us to conclude that multimorbidity is strongly associated with impaired capacity in the adult population in Chile and that these public health problems are present at early ages and have a greater impact on women. These findings highlight the urgent

need to redirect efforts and resources to prevent and intervene in people with multimorbidity from early stages and from an integral perspective, which not only keeps them under control of their health from the perspective of body structure and function but also allows them to participate optimally in life and their social environment, to contribute to well-being.

Contributors PS: Guarantor, substantial contributions to the conception, design of the work and interpretation of data. Drafting the work. Final approval of the version to be published. RV-S: Substantial contributions to the conception and interpretation of data. Drafting the work. Final approval of the version to be published. MJJO: Substantial contributions to the conception, design of the work, analysis and interpretation of data. Drafting the work. Final approval of the version to be published. CM: Substantial contributions to the analysis and interpretation of data. Final approval of the version to be published. CU: Acquisition Reviewing it critically. Final approval of the version to be published. AS: Drafting the work and reviewing it critically. Final approval of the version to be published. XN: Substantial contributions to the conception and interpretation of data. Reviewing it critically for important intellectual content. Final approval of the version to be published Grammarly (Premium version, powered by advanced AI) to improve the English writing.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Scientific Ethics Committee of the Faculty of Medicine of Pontificia Universidad Católica de Chile. Number 16–019). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. A third party collected the data used in this report. Since they are from a national health survey, they are available upon request from the Chilean Ministry of Health.

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