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MENTAL HEALTH, PAIN, AND HEALTH PERCEPTION IN OLDER ADULTS IN CHILE:
A PERSPECTIVE FROM THE LIFE COURSE STUDIES

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ABSTRACT

Background: The prevalence of chronic health conditions is increasing in the older population. Several risk factors have been identified in the goal of promoting good health. In epidemiological life course studies, it has been observed that trajectories in certain domains may be associated with poor health outcomes. To understand more about this phenomenon, we examined the relationship between employment-coresidence histories and self-perceived health, pain, and mental disorders in older adults in an urban area of Chile. **Methods:** Data was obtained by a Chilean longitudinal and urban population representative survey: ""*Life course and vulnerability among older people in Santiago, Chile"*. The sample comprised 802 older adults from Santiago, Chile. We used nine trajectories developed previously with the same data. We generated logistic regression models for each outcome adjusted by health habits (smoke, alcohol abuse, sedentarism) and inadequate weight. **Results:** Trajectories characterized by being out of the labor force were associated with an increased risk for poor self-perceived health. Informal part-time work, with a coresidence characterized by being solo parent & adult-children, is also associated with an increased risk, but it loses significance adding the control variables into analysis. Informal full time employment trajectory while living with a partner and children until later life has a significantly increased risk for troubled pain. For mental disorders stronger differences were seen in trajectories with poor labor attachment, and regards to the coresidence domain, not having children is particularly deleterious. **Conclusion:** Both employment and coresidence domains are strongly linked to health conditions in older ages.

INTRODUCTION

It is not unknown that the prevalence of the chronic non communicable diseases is increasing in the older population, as well as health problems like mental disorders and musculoskeletal pain (1, 2). At an individual level, these conditions can lead to poor functional status (3) and less quality of life (4). At a macro level, the social and economic burden of these consequences is substantial (5), being nowadays the leading causes of years of life lost due to disability in the world (6). Therefore,

recognizing those individuals at risk of suffering from illness, has become a priority in public health.

Countless risk factors have been identified in the goal of preventing and promoting good health: tobacco and alcohol use, sedentarism, high body-mass index (BMI), among others (5). However, from epidemiological life course studies it has been observed that some health conditions in older adults may be explained by the accumulation of various disadvantages through life experiences in different domains, for example, employment and family.

Effectively, research considering both employment and family life courses have been useful for deepening the understanding of wellbeing and disease in older ages. Increasing evidence has been shown that precarious or non-standard employment histories, including intense-caregiving unpaid pathways, are related to lower mental and self-reported health (7, 8, 9), less quality of life (10), lower functionality (11), and so forth.

However, these labor pathways, and their health-related effects, cannot be understood without considering the family circumstances, and the influence that gender roles have on employment attachment. In fact, for both sexes, early parenthood or weak work ties are associated with metabolic risk factors (12), and chronic inflammation (13). But when reviewed by gender, there are slight differences.

For women, it has been consistently found that the combination of motherhood and *part-time* work, as well as being with a partner, are related to good later-life health in terms of number of chronic conditions (14), depression (15, 16), life satisfaction (17) frailty (18) and even lower mortality rates (19, 20), among others. Less has been written about men. For this gender, it is described that life satisfaction is related to parenthood and marriage, but also to strong ties to paid work (17). On the other hand, there is no clear association between work-family trajectories and depressive symptoms (16).

Despite these advances, there are still some neglected aspects in this field of knowledge. First, most studies about work and family life-curses focus on women, to the detriment of the male gender (14, 15, 19, 20, 21). Second, most of the research addresses the family domain only by describing the marital status and/or parenthood (13, 15, 16), not taking into consideration the coresidence, which allows to explore the influence of caregiving responsibilities and support networks (22). And third, there is an absolute lack of research of this kind in developing countries, which denies the possibility to analyze common patterns seen in these nations, like persistent job informality (23) and intergenerational coresidence (24).

In this sense, this study aims to explore whether employment and coresidential trajectories are associated with somatic and psychological health outcomes in a developing setting for women and men. By using data from a longitudinal Chilean survey and life-course histories already constructed with the same data, we expect to elucidate how advantages in one domain can reduce disadvantages in another in terms of health.

METHODS

Data

We use data from a longitudinal and urban population representative survey: "*Life course and vulnerability among older people in Santiago, Chile"*. The sample was selected following the latest quality standards for data collection from the American Association for Public Opinion Research of AAPOR (25) and by a sampling frame obtained by the National Institute of Statistics (26). A number of 802 older adults aged from 65 to 75 years living in Santiago were randomly selected. Subsequently, they were asked about retrospective annual information on multiple dimensions of the life courses such as coresidential and educational histories, employment, health habits, presence of different health conditions, among others. In order to minimize recall error and bias, data collection was supported by the use of life history calendars (27).

For in-depth review of the survey, fieldwork and data collection process, weighting strategy, see Madero-Cabib & Cabello-Hut (28). For further information about the life history calendar method in this study, please refer to **Appendix A**.

Measures

For the employment and coresidential trajectories, we used the history patterns identified in the study *"Lifetime employment-coresidential trajectories and extended working life in Chile"* (29) which is framed in the same survey mentioned above. By using the longitudinal technique called Multichannel Sequence Analysis (MCSA) nine representative types of employment and coresidential pathways were identified, which are described in **Table 1**. For details about the methodology and the construction process, please refer to Madero-Cabib and Bhiel, 2021 (29).

Table 1. Sociodemographic characteristics of the trajectory types.

Trajectory Types and prevalence (%)	Gender composition (%)	Description
1. Formal full-time work, Parents & adult-children (27.2)	Men = 75.9 Women = 24.1	Individuals beginning in their early 20 in a formal full-time job and then permanently employed. After leaving their parental home, their coresidence trajectory is characterized by living with a partner and children until later life.
2. Short formal full-time work, Parents & adult-children (17.6)	Men = 37.0 Women = 63.3	Individuals employed over a shorter period in mostly formal full-time jobs, with long- term coresidence with a partner and children.
3. Mostly formal full-time work, three generation (11.7)	Men = 39.2 Women = 60.8	Individuals who spend most of their lives in formal full-time jobs, with some years spent in informal full-time work in mid- adulthood. These individuals have a coresidence characterized by living permanently in tri generational households, with or without a partner.

4. Mostly formal full-time work, Solo parent & adult-children (10.4)	Men = 22.0 Women = 78.0	Individuals who follow a similar employment pattern seen in Type 3, but with a coresidence characterized by living with their parents in early life; then a short period with a partner and children; and roughly by age 30 onwards, only with children.
5. Informal full-time work, Parents & adult-children (8.2)	Men = 51.1 Women = 48.9	Individuals beginning in their 15's in an informal full-time job and then continuously for most of their lives. Similar coresidence pattern as seen in Types 1 and 2 trajectories.
6. Out of the labor force, Parents & adult-children (7.8)	Men = 1.1 Women = 98.9	Individuals out of the labor force for most of their lives, living with a partner and children until later life.
7. Out of the labor force, Solo parent & adult-children (6.6)	Men = 3.3 Women = 96.7	Individuals with the same employment pattern seen in Type 6 trajectory, but who had lived mostly with children and without a partner.
8. Formal/Informal full-time work, Parents (6.3)	Men = 58.9 Women = 41.1	Individuals with either formal or informal full-time jobs across their adulthood with the same coresidencial trajectory: living mostly with their parents until later life, without a couple or children.
9. Informal part-time work, Solo parent & adult-children (4.0)	Men = 25.6 Women = 74.4	Individuals employed in part- time informal jobs for long periods of adulthood, with a coresidence characterized by living with a partner and children and then, from age 50 onwards, only with adult children.

Source: Obtained from *Madero-Cabib & Biehl, 2021* (29).

In order to strengthen the recognition of trajectories' effects on both somatic and psychological health, three health indicators were chosen as the main dependent variables: poor self-rated health, troubled pain, and mental disorders. We added inadequate weight and health habits for the control variables, measured in the same life-course survey. Neither gender nor educational level were considered, to avoid multicollinearity (30), because both can be predictors of certain trajectories. As an illustration, female gender and low education level are strongly associated with being out of the labor force, as detailed in Madero-Cabib & Cabello-Hut (28). For delving into the variables, refer to **Table 2**.

Table 2. Variable's description.

Dependent variables	**Control variables : Adult Mediators**
Poor self-perceived health "No" = meaning fair, good, very good, or excellent health. "Yes" = meaning poor health.	**Smoke** "No" = absence of smoking habit daily for a period of at least one year. "Yes" = presence of smoking habit daily for a period of at least one year.
Mental disorders "No" = not been diagnosed of any affective or emotional disorders, including anxiety, and nervous and psychiatric disorders*. "Yes" = been diagnosed of any of the above-mentioned mental conditions*. * It excludes Alzheimer disease, dementia, and organic mental disorders.	**Alcohol abuse** "No" = did not drink six or more drinks on one occasion in the last 3 months. "Yes" = did drink six or more drinks on one occasion in the last 3 months.
Troubled pain "No" = no presence of pain. "Yes" = presence of pain.	**Sedentarism** "No" = do physical activity more than one time a week (including heavy housework or work that requires physical effort). "Yes" = Rarely or never do physical activity, once or three times a month, one time a week.
	Inadequate body weight "No" = Body Mass Index (BMI) ≧ 23.1 and ≦ 27.9 "Yes" = BMI calculated ≦ 23 or ≧ 28

Source: Variables formulated from data of "*Life course and vulnerability among older people in Santiago, Chile"* research (Madero-Cabib & Cabello-Hut, 2021 (28)). Cases with "no response" or "not known" answers were omitted for the statistical analysis.

Statistical analysis

We performed a weighted descriptive analysis for each of the identified trajectories, as well as bivariate analysis using chi-square test (significance value < 0.05) for a first approximation. Then, we measured the interaction effects of the trajectory types on the three health outcomes of interest using logistic binomial regressions. All models were then adjusted by the above-mentioned control variables (Model 1 and Model 2, respectively). For the reference category, we used the most

prevalent trajectory (Trajectory 1). Ethic's approval was received by the Ethics Committee of the Pontificia Universidad Católica de Chile (**Appendix B**) according to the protocols of evaluation of the ethical and safety aspects of the same study center.

All the analyses in this study were accomplished using the statistical software R Studio (31): specifically, the packages *survey* (32) for application of the weighting factors and the logistic regressions (*svy.glm* (33)).

RESULTS

Table 3 shows the weighted descriptive statistics of all analysis variables by work-coresidence trajectory types, as well as the bivariate analysis.

Table 3. Descriptive analysis of the trajectory types

Trajectory types	1.F ft, P-AC	2. SF ft, P - AC	3. MF ft, 3G	4. MF ft, SP - AC	5. I ft, P - AC	6. OLF, P - AC	7. OLF, SP - AC	8. F/I ft, Par	9. I pt, SP - AC	Total population
Adult Mediators										
Smoke	63.42	62.72	56.31	58.68	51.82	40.47	45.84	59.22	62.36	57.61
Alcohol abuse	11.51	2.42	10.33	5.62	22.12	5.48	4.07	12.54	21.15	9.48
Sedentarism✳	47.03	70.25	72.19	53.31	61.35	67.59	89.55	67.42	79.50	60.53
Inadequate body weight	48.46	70.71	54.52	72.41	32.63	70.86	65.18	53.49	69.97	55.66
Trajectory types	**1.F ft, P-AC**	**2. SF ft, P - AC**	**3. MF ft, 3G**	**4. MF ft, SP - AC**	**5. I ft, P - AC**	**6. OLF, P - AC**	**7. OLF, SP - AC**	**8. F/I ft, Par**	**9. I pt, SP - AC**	**Total population**
Outcomes										
Poor self-perceived health✳	8.49	38.14	16.03	8.74	13.72	47.13	25.33	14.01	27.68	20.30
Presence of pain	69.84	87.79	73.35	66.17	91.69	64.36	73.87	72.92	80.15	75.28
Mental disorders✳	1.98	1.45	5.24	8.36	2.75	13.94	8.02	25.71	12.02	8.54

✳Strong associations were identified between trajectories and sedentarism (p-value: <0.001), poor self-perceived health (p-value < 0.001) and mental disorders (p-value: 0.01)

In general, a high proportion of older adults in Santiago mention having unhealthy habits. Approximately 60% of the sample are sedentary, 57.6% were smokers, and 55.6% report an inadequate weight. Alcohol abuse is less frequent, with a prevalence of 9.4%. Only significant differences between trajectories were found for sedentarism, in which the higher prevalence is seen particularly in the trajectory characterized by being out of the labor force and without a partner (Trajectory 7 = 89.55%).

Regarding health outcomes, it is notorious that almost three quarters of older adults experience troubled pain (75.3%), that reaches up to roughly 90% in the trajectory with full-time informal work, (Trajectory 5). There is a lower prevalence for poor self-perceived health (20.3%), although this number increases more than double for trajectories with poor labor attachment (Trajectory 2 and 6). Finally, a small proportion of older adults are diagnosed with mental disorders (8.5%). However, for Trajectory 8 (mixed formal/informal labor pattern, with no partner or children) almost one in four individuals present this health condition. Strong associations were observed between employment-coresidential trajectories and poor self-perceived health and mental disorders, subject of which will be discussed next.

Table 4 depicts the results of the association between the trajectories and the health outcomes. When performing the regression models, it can be easily seen that being out of the labor force or having informal labor trajectories, are associated with an increased risk for poor health conditions.

Table 4. Regression Models for health outcomes.

Trajectories	Poor self perceived health		Troubled pain		Mental disorders	
	Model 1 coefficient OR (CI)	Model 2 coefficient OR (CI)	Model 1 coefficient OR (CI)	Model 2 coefficient OR (CI)	Model 1 coefficient OR (CI)	Model 2 coefficient OR (CI)
Intercept	-2.37***	-2.61***	0.84**	0.26	-3.9***	-4.61***
	0.09 (0.04-0.19)	0.07 (0.02-0.18)	2.31 (1.25-4.25)	1.30 (0.50-3.34)	0.02 (0.01-0.05)	0.009 (0.002-0.03)
2. SF ft, P - AC	1.89**	1.78**	1.13*	1.05[x]	2.13*	2.28*
	6.64 (2.13- 20.68)	5.93 (1.70-20.65)	3.10 (1.16-8.23)	2.88 (0.95-8.70)	8.42 (1.38-51.07)	9.83 (1.71-56.45)
3. MF ft, 3G	0.72	0.48	0.17	0.25	1.00	0.93
	2.05 (0.8-5.23)	1.63 (0.57-4.54)	1.18 (0.47 - 2.98)	1.28 (0.47-3.51)	2.73 (0.61-12.09)	2.54 (0.56-11.51)
4. MF ft, SP - AC	0.03	-0.16	-0.16	-0.28	1.5*	1.54[x]
	1.03 (0.32-3.23)	0.84 (0.25-2.86)	0.84 (0.27 - 2.62)	0.75 (0.28-2.01)	4.50 (1.05-19.23)	4.70 (0.96-22.88)
5. I ft, P - AC	0.53	0.44	1.56**	1.85***	0.33	0.01
	1.71 (0.56 - 5.17)	1.56 (0.50-4.82)	4.76 (1.69-13.37)	6.40 (2.21-18.51)	1.39 (0.27-7.02)	1.01 (1.14-6.92)
6. OLF, P - AC	2.26***	2.17**	-0.24	-0.3	2.08***	2.33***
	9.60 (2.97 - 30.98)	8.81 (2.28-34.04)	0.77 (0.24-2.51)	0.73 (0.21-2.49)	8.00 (2.92 -21.87)	10.33 (3.48 - 30.63)
7. OLF, SP - AC	1.29*	0.67	0.19	0.62	1.46[x]	1.31
	3.65 (1.30 - 10.21)	1.9 (0.62-6.20)	1.22 (0.50-2.93)	1.87 (0.66 - 5.28)	4.31 (0.83-22.13)	3.71 (0.69-19.96)
8. F/I ft, Par	0.56	0.43	0.15	0.39	2.83***	2.85***
	1.75 (0.65-4.70)	1.54 (0.62-3.85)	1.16 (0.34 - 3.97)	1.48 (0.38 - 5.69)	17.10 (3.90-73.52)	17.41 (3.59-84.21)
9. I pt, SP - AC	1.41*	1.25[x]	0.55	0.5	1.9*	1.81[x]

4.12 (1.24- 13.71)	3.50 (0.93- 13.12)	1.73 (0.65- 4.60)	1.64 (0.62- 4.32)	6.74 (1.10- 41.22)	6.14 (0.95- 39.32)

p-values : '***' 0.001 '**' 0.01 '*' 0.05 'x' 0.1

The results of poor self-perceived health highlight the elevated odds of the trajectories characterized by having low work attachment, whether it is being employed over a short time period in formal jobs (Trajectory 2), out of the labor force (Trajectory 6 and 7), or having a predominantly informal part time work pattern (Trajectory 9). It is worth to notice that, even when the majority of these trajectories follow a common coresidence arrangement: living with a couple and children, being a solo parent may be deleterious (trajectory 7 and 9), although this association loses strength when adding the control variables. In addition, it should be recorded that these trajectories are predominantly followed by women.

For troubled pain, only a significantly higher odds was observed for Trajectory 5 (Odds = 6.4), which was composed by men and women in equal proportions, and characterized by having an informal full time work throughout the life, with a common coresidence pattern.

Finally, several findings were observed for mental disorders. It is evident that trajectories characterized for being out of the labor force, partial or totally (Trajectory 2 and 6, respectively), and mixed labor trajectories without children (Trajectory 8), represent a significantly increased risk for this health condition. Nevertheless, the effect of coresidence pattern characterized by being a solo parent is less clear. When reviewing by trajectory, it calls the attention that trajectory 7, being out of the labor force and without a couple, seems to have no association to mental disorders, while Trajectories 4 and 9 that share similar family trajectory and different employment history (mostly formal full time versus informal part time, respectively) evidence a higher risk, even though this effect is less significant when adding the control variables.

DISCUSSION

This article reinforces the idea that cumulative disadvantages through work and family life courses are associated with long-term effects on health. It is consistent with existing literature from Western countries by demonstrating that individuals who follow trajectories mostly informal or outside the labor market, are more exposed to suffering from poor health conditions (12, 13, 33, 35, 36).

No such strong effects were observed for the coresidence domain, excepting for the association between not having children and the presence of mental disorders. Possible explanations for this phenomenon could be not taking into consideration other confounding factors, such as current socioeconomic status or previous health conditions.

Finally, this investigation evidences some common arrangements seen in Chile: the tendency towards full-time employment, the intergenerational coresidence, and the strong traditional gender roles, with a male-breadwinner and female-homemaker model. Therefore, few lessons may be taken from this investigation.

First, it remarks the importance of regulating the labor market in a country like Chile, with high levels of informality and low female participation rates nowadays, especially after the COVID pandemic (37, 38). In this sense, public policies and labor rights should consider other forms of work, such as part-time/flexible jobs or independent employment, in order to increase the possibilities for both men and women to develop careers compatible with domestic duties. In addition, it is necessary to advance simultaneously on improving access to kindergartens, and strengthen support programs for people with dependence, as recommended by various organizations (39, 40). This is particularly relevant in the Chilean context, where women are found to bear the responsibilities of caring for young children in early adulthood, and then caring for parents, grandchildren or other family members in mid-life and early old age (41).

Second, this study underlines the importance of social support and its association with mental health in older ages. For this reason, generating public policies focused on bonding and bridging social capital to isolated or lonely individuals, may be appropriate in a country whose elderly population is increasing rapidly (42). Successful experiences obtained by COVID pandemic learnings may be a good contribution for innovative and strong evidence-based strategies (43).

This is the first investigation until the date that deepens the interaction of lifetime trajectories and health outcomes in Chile. Even though it is a valuable contribution, it has a few limitations that are worth mentioning.

On one hand, although we use sampling weights to ensure representability, the findings cannot be extrapolated to rural areas, because there are limitations to the sample that do not allow us to generalize the findings to the whole Chilean population. On the other hand, even when we find important associations among life trajectories and health outcomes, we cannot make causal claims by using retrospective data, especially when studying patterns that start so early in life. And finally, only one cohort was considered for this study, which means that the results obtained must be observed carefully when extrapolating to other generations.

Consequently, we propose for future research to address these issues, by considering cohort or panel studies with entire population representativeness, as has been done in other countries (44, 45). Moreover, it would be interesting to reach other outcomes, such as chronic non communicable diseases, or health problems like dementia or cognitive impairment, understanding the impact of these conditions in older adults' functionality and autonomy (46), and including other possible confounding variables.

At the present times, where resources are limited and the health systems are increasingly demanding, it becomes essential to recognize vulnerable populations in danger of suffering from disease. In this sense, the results obtained by this life course study give a holistic picture of how employment and coresidence are associated with

self-perceived health, the presence of pain and mental disorders. We hope that this contribution will help to develop effective and efficient policies and thus promote better well-being of society.

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Notes

For relevant ethical and legal aspects, as well as investigation costs, Gantt chart, and study communication and dissemination strategy, please refer to **Appendix C**.

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Appendix A.

History Calendars

Life history calendar or event history calendar (EHC) is a method of data collection which helps respondents to report life events across a certain time span using a chronological calendar grid (Morselli et al, 2019). Is effective for a number of reasons.

First, it replicates the autobiographical memory retrieval processes, which are a) the temporal order of occurrence of the events, b) the hierarchical order of life events (those more or less relevant to each person); and c) the interrelationships between the occurrence of events in one domain and the occurrence of events in other domains) (Conway 1996). Second, the graphical structure of the grid allows the linking of events in the different domains of life, stimulating the three mechanisms mentioned above. And third, EHC are useful for remembering and chronologically organizing the various episodes during life, due to the interviewer–respondent interaction. In effect, scholars have noticed that both precision and number of reported events increases, as the interviewer acts like a 'double-checking' of the provided information (Belli et al, 2004; Glasner & Van der Vaart, 2009).

In the survey used for this investigation, a life history calendar involving interviewer–respondent interaction was administered. Given the characteristics of this survey associated with the older adult population, interviewers who have previously worked in DESUC were recruited. Secondly, two trainings were carried out by DESUC professionals, and with the participation of the Technical Counterpart of the Study. One of the sessions was executed under a mixed methodology (expository and active-participatory), thus ensuring knowledge of the objectives of the survey and practical understanding of the application protocols.

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Appendix B.

(Separate document)

Appendix C.

I) Relevant ethical and legal aspects.

The study *"Health conditions in older adults in chile: a perspective from the life course studies"* is based on the analysis of data obtained through the survey of events and life trajectories carried out in 2019 in the study *"Vulnerability in the elderly in Chile: a life course study on accumulated advantages and disadvantages*" by Professor Ignacio Madero-Cabib (Fondecyt nº 11180360), therefore, during the development of the current project there was no recruitment or selection of participants.

The design of the previous study specifies the destination of personal and sensitive data and ensures confidentiality. Since this investigation was limited to data analysis, I did not obtain additional information that needed to be stored. Details about the previous study are presented below.

The data collection was carried out by staff of the Dirección the Estudios Sociales (DESUC), which is a unit of studies and professional services of the Institute of Sociology of the Pontificia Universidad Católica de Chile : *"As in all the studies carried out by DESUC, there was a Data Security Plan, which refers to security*

mechanisms that allow all the information provided by the respondents through the applied instruments to be stored safely, allowing its physical preservation, and, in addition, safeguarding the confidentiality of the data. In this way, a Plan was established where, upon receiving the information from the field, it was immediately collected and stored in DESUC warehouses for conservation. This Plan allows to minimize the loss of material and unauthorized access to confidential data of the respondents" (Estudios Sociales, 2019).

Access to the database is restricted to the main researcher and thesis students and technical / professional staff of the research project FONDECYT N ° 11180360. In order to access the database, and then make use of the information for the development of the work, a confidentiality agreement is previously signed which implies the obligation to maintain the information contained in the project cited as Confidential Information.

II) Investigation costs.

Since it is a Fondecyt project it is worth mentioning that as an assistant student, an amount will be attributed to me for the contributions to the investigation, payment that will take place after the presentation of the thesis. Personally, this project means little monetary resources, since the R Studio software is free.

III) Study communication and dissemination strategy.

In order to raise awareness about how life trajectories in the work and family domains can be associated with certain health conditions in a developing country, various initiatives will be taken.

The first, to generate an article to publish in an international journal, *Journal of Epidemiology and Community Health.*

The second, a brief seminar on the findings will be held in the Home Hospitalization team of the Public Assistance Emergency Hospital on August 6th, to raise awareness among those who closely interact with the population targeted in this study.

And third, according to the permissions of the publishing journal, we hope to participate in the contest for publications and posters of the annual Geriatrics congress of the Chilean Geriatrics Society, where not only eminent figures from the field of medicine participate, but also decision makers who might be interested in this topic.

IV) Gantt Chart.