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Causal Effects of Social Support and Family Proximity on Healthand Wellbeing of Older Adults in France

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Abstract

One of the central policy challenges posed by an ageing population is the identification of factors that influence health outcomes. In recent years, growing attention has been devoted to the roles of social support and family proximity; however, evidence for the French population remains limited. Moreover, much of the existing literature treats social support and family proximity as exogenous and relies on estimation strategies that do not adequately address endogeneity, thereby raising concerns about potential bias and inconsistency. This study examines the impact of structural social support and family proximity on health—measured by self-perceived health—among individuals aged 50 and above residing in France. The analysis draws on data from the ninth wave of the Survey of Health, Ageing and Retirement in Europe (SHARE). To address potential reverse causality between the key explanatory variables and health outcomes, we employ an instrumental variables approach. The results indicate that structural social support has a positive and statistically significant effect, reducing the likelihood of poor self-perceived health. Similarly, family proximity is found to exert a positive and significant influence on health. These findings are robust across a range of estimation methods and model specifications.

1 Introduction

1.1 Research Questions

Research questions are clear, focused, and specific inquiries that guide a research study and are essential for several reasons. They articulate the main goal of the study, clarifying its purpose, and inform the research design by directing the methodology, data collection, and analysis (29). Narrowing down broad topics to manageable areas of study, a well-formulated research question ensures that the research remains relevant

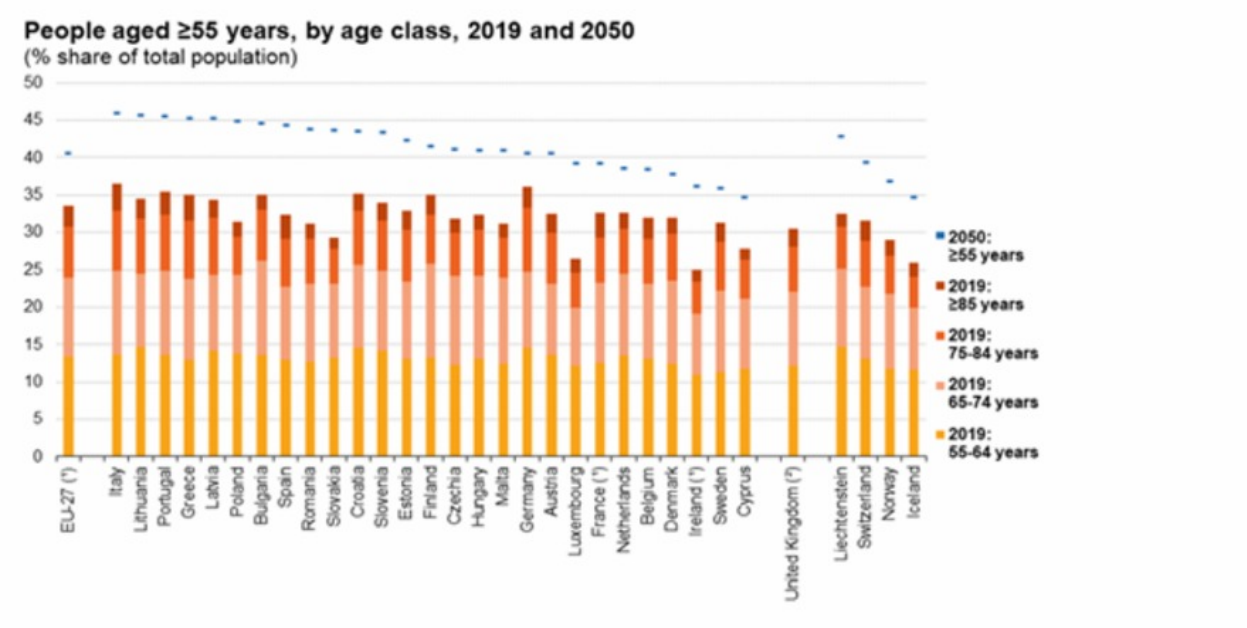


Figure 1: Population demography of aged people in Europe

and contributes meaningful insights to the field. Therefore, in an attempt to examine the causal effects of social support and family proximity on the health and well-being of people aged over 50 in France, the main research question is formulated as:

(i) What is the causal effect of social support and family proximity on the self-perceived health of individuals aged 50 and above in France?

1.2 Background and Motivation for the Study

According to the latest United Nations World Population Prospects, in 2023, individuals aged 60 and older represent approximately 20% of the global population, with this age group growing more rapidly than any other (36). Currently, Europe has the highest proportion of its population in this age bracket, at around 24% (16). This trend of rapid demographic aging is expected to continue, with projections indicating that by 2050, nearly a quarter or more of Europe's population will be aged 50 and above.

This increase in longevity is one of the significant achievements of modern societies and has profound implications for various policy areas, including welfare, the labor market, and public finances (30; 26; 28). As a result, European governments must anticipate and plan for the challenges associated with an aging population. Ensuring the well-being of older adults will require enhancing economic security, improving access to health services, and developing both formal and informal support networks.

Figure 1 illustrates the significant demographic shift in European countries, showing an increasing pro-

portion of people aged 55 and above from 2019 to 2050. Countries such as Italy, Lithuania, Portugal, and Greece are projected to have some of the highest shares of older adults in their total populations, with many nations exceeding 40% by 2050. This aging trend highlights critical socio-economic challenges, including rising healthcare costs, pension sustainability, and labor market shifts due to a shrinking working-age population. France is no exception to the global trend of aging demographics. Currently, individuals aged 50 and over account for 41.4% of the population, signaling a steady shift toward an older demographic profile (16). Driven by the aging "baby boomer" cohorts and sustained increases in life expectancy, this transformation is projected to intensify significantly by mid-century. By 2050, those aged 50 and above are expected to comprise nearly half of the French population, with the most pronounced growth occurring in the "very old" (75+) age categories..Given this rapid demographic transition, examining issues related to aging—such as social support, family proximity, healthcare access, and economic security—becomes imperative.

As a matter of urgency, researchers and policymakers have modeled the determinants of health and well-being of individuals across different regions and countries (19; 18). In health economics literature, factors affecting human health and well-being are classified into distinct categories, beginning with biological factors. These encompass genetics, including inherited traits and predispositions to certain diseases, as well as age and sex, which introduce varying health needs and risks associated with different life stages (9). Complementing these biological influences are behavioral factors, where lifestyle choices such as diet, exercise, smoking, and alcohol consumption directly impact health outcomes (23). Additionally, health literacy—defined as the understanding of health information—along with risk-taking behaviors, further complicates individual health trajectories (17). Environmental factors also play a critical role, encompassing the physical environment, which includes air and water quality, housing conditions, and access to recreational spaces, as well as the social environment, which involves community support and cultural contexts (24). Access to quality healthcare is paramount, as the availability of services, quality of care, and health insurance coverage directly affect individuals' ability to receive necessary medical attention (31). Furthermore, policy and governance factors are essential, as health and social policies shape healthcare delivery and public health initiatives, while public health programs actively prevent disease and promote health (10). Finally, psychosocial factors, including mental health and stress management, are integral to understanding overall health, as they significantly influence behavior and coping mechanisms (14).

Among the economic and non-economic factors affecting individual health and wellbeing, the influence of social support and family proximity, particularly on vulnerable groups, warrants significant attention. Literature affirms that social support provides individuals with a sense of belonging and emotional security. Friends and family offer comfort, empathy, and understanding during difficult times, effectively reducing feelings of loneliness and depression (11). **(author?)** (5) demonstrated that a strong support system mitigates

the effects of stress, acting as a buffer against the negative impacts of stressors and reducing physiological responses that can lead to health issues such as high blood pressure or weakened immune function. Supportive social networks motivate individuals to engage in healthier lifestyle choices, including regular exercise, proper nutrition, and adherence to medical treatments. Social influences foster accountability and create environments conducive to positive health behaviors (22). However, certain studies indicate that supportive relationships can inadvertently enable unhealthy behaviors; for instance, friends or family can encourage excessive drinking, poor eating habits, or other detrimental lifestyles rather than promoting healthier choices (1). Additionally, in specific contexts, social support can carry stigma. Individuals receiving support for mental health issues often face judgment or misunderstanding from their social circles, negatively impacting their self-esteem and willingness to seek help (5). Thus, while social support plays a critical role in enhancing health and well-being, it also presents challenges that must be acknowledged and addressed.

Family support is a significant factor influencing individual health outcomes, as living near family members enhances emotional support and provides a sense of security and belonging. This close-knit connection fosters feelings of love and acceptance, which reduce stress and improve mental health (6). Family members play a crucial role in monitoring each other's health, as proximity allows for regular check-ins that facilitate early detection of health issues and encourage timely medical intervention (9). Additionally, families living in close proximity share resources, such as information about healthcare providers, community services, and healthy lifestyle practices, thereby enhancing overall well-being through improved access to necessary support (11). Proximity also creates environments that promote healthy habits, as family members encourage one another to engage in physical activities, maintain healthy diets, and adhere to medical advice, contributing to better health outcomes (18). However, close physical proximity leads to increased interpersonal conflicts; frequent interactions amplify tensions or disagreements, resulting in stress and emotional distress, which adversely affect mental health (4). Moreover, proximity creates a lack of personal space and autonomy, with family members feeling overwhelmed by expectations or pressure to conform to familial norms, leading to stress and resentment (25).

The COVID-19 pandemic has acted as a shock and has profoundly disrupted the health of countless individuals, with its effects persisting long after the initial wave of infections (12). Many survivors are experiencing long-term health complications, commonly referred to as long COVID, which can include fatigue, respiratory issues, and cognitive impairments (13). **(author?)** (20) found that nearly 50% of COVID-19 survivors report ongoing health problems months after recovery. This deterioration not only alters individual health outcomes but also reshapes economic forecasts, as a less healthy workforce is less productive and incurs higher healthcare costs. Consequently, new studies in health economics are critical; these studies must accommodate the lasting impacts of COVID-19 to ensure that health policies are reflective of this new reality.

Integrating these effects into health policy frameworks is essential for developing effective interventions and resource allocations that address emerging health trends. Policymakers must recognize that the pandemic has created new pathways in public health, necessitating adaptive strategies that prioritize both health and economic resilience to effectively navigate future challenges.

Despite various studies attempting to address the health and well-being of individuals, three significant gaps remain in literature. First, a predominant focus on mental health determinants, rather than those specific to the aging population, limits the applicability of findings. Research such as that by **(author?)** (22), **(author?)** (31), **(author?)** (25), and **(author?)** (1) highlights mental health, which does not adequately capture the unique health challenges faced by older adults. Consequently, the generalizability of these studies is questionable. Second, only a limited number of studies have explored the effects of social support and family proximity on the health and well-being of older adults, with notable contributions from **(author?)** (11), **(author?)** (4), and **(author?)** (3). However, these studies do not focus on the European context, which further narrows the applicability of their findings. Lastly, the issue of endogeneity has largely been overlooked in existing literature. This oversight suggests that many findings are primarily correlational rather than indicative of causal relationships. To address these gaps, this study is motivated to employ an instrumental variable approach to rigorously examine the causal effects of social support and family proximity on the health and well-being of older adults in Europe.

The remainder of this report is organized as follows: Section II provides a brief review of the literature and establishes a theoretical framework concerning the determinants of health and well-being. Section III presents the dataset, variable measurement, and delineates the criteria for sample selection. In Section IV, we conduct a descriptive analysis of the data to identify key trends and patterns. Section V details the econometric models employed for the analysis, while Section VI presents the results derived from these models. Section VII includes a robustness analysis to assess the reliability of the main findings. Finally, Section VIII concludes with a discussion of the implications of the results for policy and future research directions.

2 Literature and Theoretical Framework

2.1 Theoretical Review

One of the theories that form the root of the argument of this study is the Social Production Function. It was propounded by **(author?)** (27), and the argument draws upon the Social Production Function (SPF) theory as it relates to aging, which posits that individuals pursue two fundamental goals: physical well-being

and social well-being. Social well-being is achieved through three instrumental goals: affection, behavioral confirmation, and status. The theory suggests that satisfaction with these needs enhances the overall well-being of an individual, including health (33). Affection is fulfilled through meaningful relationships that provide feelings of love, trust, and acceptance. Behavioral confirmation arises from the sense of acting rightly in the eyes of oneself and others, while the need for status is met through relationships that confer respect and validation (33). Individuals are seen as agents who rationally choose effective means to produce well-being, utilizing resources such as education, social class, and social skills as tools for this purpose. The main tenet of this argument is that health is not solely determined by medical interventions; it is significantly influenced by social factors such as relationships and community engagement (21). The Social Production Function (SPF) highlights the role of social determinants of health, including socioeconomic status, education, and social support networks, advocating for targeted interventions that address the root causes of health disparities (12). Additionally, the SPF emphasizes empowerment and agency, positioning individuals as active agents in their health production, suggesting that they can make rational choices to enhance their well-being (1). This focus on agency empowers individuals to seek resources and support that lead to better health outcomes. However, critics argue that the SPF undermphasizes the significance of biological and genetic factors in determining health (9). While social influences are important, physiological aspects also play a crucial role that the theory overlooks. Furthermore, the interactions between social determinants and health outcomes can be complex and multifaceted; critics suggest that the SPF oversimplifies these interactions, making it difficult to develop clear, actionable strategies for improving health (7). The theory assumes a uniformity in how social factors influence health across different populations; yet individual experiences can vary widely based on cultural, contextual, and personal factors, limiting the SPF's applicability in diverse settings (33).

2.2 Empirical Review

The causal relationship between social support, family proximity, and health outcomes has been a longstanding topic of inquiry in empirical research. However, the existing evidence remains ambiguous, attributed to discrepancies in methodologies, study scope, and data characteristics. For instance, **(author?)** (40) sampled 202 college students in Turkey to examine the effect of social support on the health and well-being of the participants using the Basic Perceived Social Support Questionnaire (BPSSQ). The study relied on primary data and employed multiple regression analysis to test the hypothesis. The findings revealed that social support significantly predicted resilience and life satisfaction in the college student sample. The authors argued that social support influences life satisfaction through the mediating effect of resilience, asserting that when college students possess strong social support networks, it helps them develop resilience, which in turn leads

to greater life satisfaction and improved health status. However, the use of a sample of 202 participants limited the study's findings. According to **(author?)** (34), small samples often lack the statistical power necessary to detect true effects, increasing the likelihood of Type II errors, where researchers fail to reject a false null hypothesis, resulting in inconclusive results. Furthermore, the study acknowledged the potential for reverse causality between social support and the mediating variables but did not account for this in the analysis. Therefore, as student resilience is not exogenous, the findings from the study may be spurious (39).

(author?) (3) utilized cross-sectional data from the fourth wave of the Survey of Health, Ageing and Retirement in Europe (SHARE) and employed an instrumental variable approach to account for reverse causality between social capital and health. Their study unequivocally revealed that structural social capital has a positive and significant effect on the self-perceived health of older European adults, asserting that the bias induced by reverse causality underestimates the magnitude of social capital's impact on health. Although the researchers used estimators that account for endogeneity, their analysis was restricted to a single wave of data. The literature clearly indicates that cross-sectional analysis cannot establish definitive causal relationships, as it captures only a single point in time (39). This limitation complicates the determination of whether one variable influences another or vice versa. Furthermore, according to **(author?)** (38), cross-sectional studies do not account for changes over time, which results in the omission of important trends or cyclical patterns in the data.

(author?) (6) explored the effect of physical proximity on the health and wellbeing of individuals, employing a systematic sampling technique and a questionnaire as instruments for data collection. The results from ordinary least squares analysis identified that physical proximity has a positive but insignificant effect on individuals' self-perceived health. Similarly, **(author?)** (4) found comparable results and argued that while being physically close to others can facilitate social interactions, the quality of these interactions is crucial. If individuals do not engage in meaningful relationships, mere proximity cannot translate into improved self-perceived health. Additionally, self-perceived health is subjective and can vary widely among individuals. Factors such as personal attitudes, experiences, and mental health can overshadow the effects of physical proximity, leading to a weak correlation (11).

(author?) (8) examined the impact of geographical proximity of family members on surgical patients and found that those with six or more first-degree relatives (FDRs) living nearby had significantly lower rates of all-cause readmission compared to patients with zero to one FDR. Similarly, unplanned readmission rates were lower for individuals with a greater number of FDRs, as were rates of non-index readmissions. Furthermore, patients with more nearby FDRs experienced higher rates of home discharge and a shorter average length of stay. The findings were justified on the theoretical ground that the positive effect is due to the increased availability of family support, which contributed to a smoother recovery process and a

greater likelihood of a safe transition to home care. Contrarily, **(author?)** (23) argued that caring for family members who are ill or in need can create an emotional burden. This caregiver stress can detract from an individual's own health and well-being, leading to negative self-perceptions regarding their health status.

2.3 Theoretical Framework

The theoretical framework of this study is drawn from utility theory on health status by **(author?)** (37). The individual's implicit utility function can be represented as follows:

$$U = U(C, H, S, F) \tag{1}$$

where:

- C is the consumption of goods and services,
- H represents health status,
- S denotes social support,
- F represents family proximity.

The study assumes that U is increasing in all arguments, i.e.,

$$\frac{\partial U}{\partial C} > 0, \quad \frac{\partial U}{\partial H} > 0, \quad \frac{\partial U}{\partial S} > 0, \quad \frac{\partial U}{\partial F} > 0. \tag{2}$$

The health production function is assumed to evolve over time as follows:

$$\dot{H} = f(E, S, F) \tag{3}$$

where: $\frac{\partial H}{\partial E} > 0$ (effort improves health), $\frac{\partial H}{\partial S} > 0$ (social support enhances health), $\frac{\partial H}{\partial F} > 0$ (family proximity positively affects health).

The individual maximizes utility subject to the budget constraint:

$$Y = C + E, \tag{4}$$

where Y is total income, and effort E incurs costs in terms of time and resources.

Using the method of Lagrange multipliers, we set up the following:

$$\mathcal{L} = U(C, H, S, F) + \lambda(Y - C - E). \tag{5}$$

The first-order conditions (FOCs) are:

$$\frac{\partial U}{\partial C} - \lambda = 0, \tag{6}$$

$$\frac{\partial U}{\partial H}\frac{\partial H}{\partial E} - \lambda = 0, \tag{7}$$

$$Y - C - E = 0. \tag{8}$$

Solving for the demand for health:

$$\frac{\partial U}{\partial H}\frac{\partial H}{\partial E} = \frac{\partial U}{\partial C}. \tag{9}$$

Taking the total derivative of the health production function:

$$dH = \frac{\partial H}{\partial S}dS + \frac{\partial H}{\partial F}dF. \tag{10}$$

Assuming $\frac{\partial H}{\partial S} > 0$ and $\frac{\partial H}{\partial F} > 0$, the study confirms the positive causal effect of social support and family proximity on health.

From the envelope theorem:

$$\frac{\partial U}{\partial S} > 0, \quad \frac{\partial U}{\partial F} > 0. \tag{11}$$

This confirms that well-being improves with increased social support and family proximity.

3 Data and Variables

The study used the SHARE (Survey of Health, Ageing and Retirement in Europe) data from waves 1 to 9. It is a comprehensive, cross-national research project that collects detailed information on the health, socio-economic status, and social networks of older adults across Europe (3). SHARE includes 17 European countries and Israel, and it aims to provide an in-depth analysis of the aging population. As of now, SHARE has 9 waves of data collection, ranging from wave 1 conducted in 2004 to the most recent wave 9 conducted in 2021. Each wave builds on the last, facilitating longitudinal analysis of aging in Europe. The study used the cleaned dataset from SHARE that contains all the waves to examine the causal effect of social support and family proximity on the self-perceived health of the aged population in France. The summary statistics of the data used in this study is presented in Table **??**.

The dependent variable of this study will be self-perceived health, measured on a scale of 1 to 5, ranging from very poor to very good. The study recodes the variable into a binary indicator of health status, where a value of 1 denotes good health (defined as an original score greater than or equal to 3) and 0 otherwise. This measurement approach is consistent with established practices in the literature (12; 3).

The independent variables aim at controlling those individual characteristics that have an effect on health. They can be divided into four groups: demographic variables (age, gender), socio-economic variables (income, years of education, social support received, and family proximity), physical health variables (number of chronic diseases), and past and present behavioral habits (smoking and Alcohol).

The study intends to utilize three principal instrumental variables: Religious Participation, Parental Longevity, and Geographical Distance to Family Members. Religious Participation is significant as membership in religious groups helps predict social support but does not directly affect individual health outcomes (15). Parental Longevity is another crucial variable; if parents lived longer, respondents tend to have stronger family networks due to a tradition of close family ties (2). Lastly, Geographical Distance to Family Members influences social support but does not directly determine health (32). Together, these instrumental variables will effectively address potential endogeneity in the model.

4 Summary Statistics

Table 1: Summary Statistics of Key Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Sphus	31476	3.206	1.304	1	5
sphus1	31476	0.602	0.490	0	1
Social support	31476	0.209	0.406	0	1
Family proximity	31476	0.295	0.456	0	1
female	31476	0.534	0.499	0	1
age	31476	65.401	3.810	52.5	92.2
eduyears mod	31476	10.776	8.093	6	25
mar stat	31476	1.151	4.172	1	6
vaccinated	31476	0.296	0.457	0	1
childhood health	31476	3.527	0.923	1	6
chronic mod	31476	0.314	3.693	0	9
bmi	31476	24.042	11.499	109.814	77.158
smoking	31476	0.123	0.328	0	1
Alcohol	31476	4.413	1.476	1	7
Sporting	31476	2.485	1.235	1	4
thinc m	31476	34 735.842	72272.586	2836.528	4 218 627.5

Note: Sphus = self-perceived health (1=very poor to 5=very good); sphus1 = binary self-perceived health (1=fair/good/very good); thinc m = monthly income in euros ().

Table 1 presents the descriptive statistics of the variables used in the analysis. The dependent variable, self-perceived health, is measured both on an ordinal scale and in binary form, where individuals reporting good health (values greater than or equal to 3) are coded as 1, and 0 otherwise. Approximately 60% of individuals in the sample report good self-perceived health. With respect to the key explanatory variables, about 49% of respondents report receiving social support, while 40.6% have at least one relative living in close proximity. The sample is composed of 53.4% females, with an average age of approximately 65 years, reflecting an ageing population. Regarding socioeconomic characteristics, individuals have completed an average of 11 years of schooling, and 29.6% report having received childhood vaccination. On average, respondents report relatively good childhood health, and the mean number of chronic conditions is below one. In terms of health-related behaviors, there is evidence of a tendency toward overweight (BMI > 24). Smoking prevalence is relatively low, with only 12.3% of individuals identified as smokers. Alcohol consumption is more common, with the average individual reporting consumption at least once or twice per week over the past six months. With respect to physical activity, individuals engage in sporting activities at least once per week on average. Finally, average income, measured as an indicator of the ability to make ends meet, is approximately 34,736.

5 Econometric model

The modelling approach for the effect of social support and family proximity on self-perceived health draws inspiration from similar studies(3; 12; 8). Let SS_i denote a binary indicator for high social support for individual i, FP_i a binary indicator for high family proximity, and SPH_i a binary indicator for good self-perceived health (coded 1 if the respondent reports "good" or "very good" health on the standard five-point self-rated health scale, and 0 otherwise). The recursive bivariate probit system is specified as follows.

First stage (treatment equations):

$$SS_i^* = \alpha' \mathbf{W}_i + \delta_1 \text{Shock}_{2008,i} + \delta_2 \text{Shock}_{COVID,i} + \varepsilon_i \tag{12}$$

$$FP_i^* = \beta' \mathbf{Z}_i + \gamma_1 \text{Shock}_{2008,i} + \gamma_2 \text{Shock}_{COVID,i} + \nu_i \tag{13}$$

where $SS_i = \mathbf{1}(SS_i^* > 0)$, $FP_i = \mathbf{1}(FP_i^* > 0)$. $\mathbf{W}_i$ and $\mathbf{Z}_i$ are vectors of instruments and exogenous covariates (including individual demographic and socio-economic characteristics). $\text{Shock}_{2008,i}$ and $\text{Shock}_{COVID,i}$ are binary indicators capturing exposure to the 2008 financial crisis and the COVID-19 pandemic, respectively.

Second stage (outcome equations):

$$
\begin{aligned}
SPH_i = \alpha &+ \theta_1 \widehat{SS}_i + \theta_2 \text{Female}_i + \theta_3 \ln(\text{age}_i) + \theta_4 \ln(\text{agesqr}_i) + \theta_5 \text{Educ}_i \\
&+ \theta_6 \text{Vaccinated}_i + \theta_7 \text{Chronic}_i + \theta_8 \text{Smoking}_i + \theta_9 \text{Alcohol}_i + \theta_{10} \text{Sporting}_i \\
&+ \theta_{11} \ln(\text{Income}_i) + \theta_{12} \text{Yr2008}_t + \theta_{13} \text{Yr2019}_i \\
&+ \theta_{14}(SS_i \times \text{Yr2008}_t) + \theta_{15}(SS_i \times \text{Yr2019}_t) + \epsilon_i \qquad (14)
\end{aligned}
$$

$$
\begin{aligned}
SPH_i = \delta &+ \beta_1 \widehat{FP}_i + \beta_2 \text{Female}_i + \beta_3 \ln(\text{age}_i) + \beta_4 \ln(\text{agesqr}_i) + \beta_5 \text{Educ}_i \\
&+ \beta_6 \text{Vaccinated}_i + \beta_7 \text{Chronic}_i + \beta_8 \text{Smoking}_i + \beta_9 \text{Alcohol}_i + \beta_{10} \text{Sporting}_i \\
&+ \beta_{11} \ln(\text{Income}_i) + \beta_{12} \text{Yr2008}_t + \beta_{13} \text{Yr2019}_i \\
&+ \beta_{14}(FP_i \times \text{Yr2008}_t) + \beta_{15}(FP_i \times \text{Yr2019}_t) + \upsilon_i \qquad (15)
\end{aligned}
$$

In equation (14), $SPH_i = \mathbf{1}(SPH_i^* > 0)$, $\mathbf{X}_i$ is a vector of exogenous covariates, and θ_1 captures the baseline causal effect of social support on self-perceived health. The parameters θ_{14} and θ_{15} are of central interest in this study, as they capture the differential effects of social support during the two economic shocks relative to normal periods. A positive and significant θ_{14} would indicate that the protective health effect of social support was amplified during the 2008 financial crisis, consistent with a buffering or coping mechanism during economic distress. Similarly, θ_{15} identifies whether social support played a particularly important role in shielding older adults' health during the social isolation and economic uncertainty of the COVID-19 pandemic. Equation (15) provides the analogous specification for family proximity, where β_{14} and β_{15} are the corresponding interaction parameters.

SS denotes social support and FP denotes family proximity. *Female*, *Smoking*, *yr2008*, and *yr2019* are binary variables, taking the value 1 for the indicated characteristic or survey wave and 0 otherwise.

5.1 The Identification Strategy

In order to properly capture the effect of social capital on health we have to circumvent the endogeneity problem. To do that we have to find proper instruments able to purge the endogeneity and retrieve correct estimates. For an instrument to be valid, there are two conditions to be met: first, the instruments must be theoretically justified and correlated with the endogenous covariate (relevance condition); second, they should be uncorrelated with the error term (exclusion restriction).

To address the endogeneity of social support in the relationship with self-perceived health among older adults, the study propose two instrumental variables, each satisfying the relevance and exclusion restrictions.

Religious affiliation or attendance. Following a well-established literature (3; 11), the study argue that shared religious beliefs generate durable social networks that facilitate support and participation, while religious choices are largely determined early in life and are not directly driven by contemporaneous health. *Relevance:* membership in or regular attendance at a religious community is strongly correlated with higher levels of social support and social participation. *Exclusion restriction:* religious affiliation affects health exclusively through the social support it provides, with no direct, independent physiological or behavioural pathway. The validity of this exclusion is supported by controlling for age, country, and other potential confounders, as commonly practised in the literature.

Geographic proximity to adult children. When social support is operationalised as the exchange of practical or care-related help within families, proximity to adult children serves as a plausibly exogenous instrument. *Relevance:* living close to an adult child significantly increases the probability of both providing and receiving instrumental support and personal care. *Exclusion restriction:* the geographic distance to a child does not directly influence the older adult's health except by enabling family support. This assumption is strengthened by conditioning on observable confounders such as household wealth, neighbourhood quality, and local infrastructure, which might otherwise create a direct link between proximity and health

The effect of family proximity on the health of older adults is endogenous because family location decisions are not random. In particular, reverse causality may arise when adult children choose to live closer to parents whose health has deteriorated or who require care and assistance, implying that poor health may itself increase family proximity. To address this issue, we exploit exogenous variation in the number of siblings as an instrument for family proximity. The relevance condition holds because, in the French context where inheritance norms encourage geographic mobility, a larger sibship reduces the likelihood that any single child remains the uniquely designated nearby caregiver, whereas only children face a higher probability of residing close to aging parents. The exclusion restriction is also plausible because the number of siblings is determined at birth, long before late-life health decline, and is therefore orthogonal to contemporaneous parental health shocks. Moreover, conditional on parental socioeconomic status, France's universal healthcare system and long-term care support programs substantially mitigate potential direct resource-dilution effects of larger families on parental health.

Another instrument to correct reversal causality between family proximity and health is number of grandchildren. The need for grandparental childcare is a key driver. (25) notes that, "as Chinese adults are legally obligated to support and take care of their elderly parents and likely to take on the parental role of their grandchildren... 70% of grandparents raise their grandchildren. Also, (6) employed the geographic proximity between parents and their adult children as an instrument, concluding it is significantly correlated

with the provision of care. Finally, the number of grandchildren is plausibly exogenous because their existence is determined by the fertility decisions of the middle generation, not the health status of the grandparent.

6 Results and Discussion

This section presents and discusses the empirical results examining the causal effects of social support and family proximity on self-perceived health among older adults in France. To address potential endogeneity concerns, we estimate both standard Probit and Instrumental Variable Probit (IV-Probit) models and compare the findings.

6.1 Effect of social support on self-perceived health

Table 2 presents the results of Models 1 through 4. For ease of interpretation and comparison, the table reports the marginal effects of both the standard Probit and the Instrumental Variable Probit (IV-Probit) regressions. Before commenting on the results for social support, it is worth noting that all other variables, with the exception of the vaccination indicator, exhibit a statistically significant association with self-perceived health. Moreover, the signs of the coefficients are consistent with the existing literature. Specifically, self-perceived health deteriorates with age and is influenced by multiple factors, of which diseases and illnesses are only one component (3; 1).

Reverse causality between social support and self-perceived health precludes interpreting the standard Probit correlation as causal (Model 4, Column 4). Consistent with our hypothesis, we find a strong positive association between social support and self-perceived health in the IV-Probit specification (Model 3, Column 3). The marginal effect of 0.307 implies that, holding all other covariates at their mean values, receiving social support increases the predicted probability of good health by 30.7 percentage points relative to not receiving support. When compared to the standard Probit estimate of 0.097, which corresponds to a 9.7 percentage point increase, the IV-Probit estimate is substantially larger. This difference indicates that reverse causality induces a downward bias in the standard Probit estimator, leading it to underestimate the true protective effect of social support on self-perceived health. These findings underscore the importance of addressing endogeneity when estimating health production functions. The downward bias observed in the standard Probit estimate relative to the IV-Probit estimate is consistent with theoretical expectations. Older adults experiencing poor health are more likely to seek or receive social support, inducing a negative correlation between social support and health that counteracts the true positive causal effect. Consequently, the standard Probit estimator attenuates the true protective effect of social support toward zero. The positive and significant effect found is consistent with other studies (8; 3; 5). These studies argued that social

Table 2: Regression Results: Baseline, Control, and Full Models

	(1) Baseline	(2) Control	(3) Full (IV-Probit)	(4) Full (Probit)
Social Support	2.375***	0.301**	0.307**	0.097***
	(0.166)	(0.140)	(0.156)	(0.007)
Female		0.039**	0.038**	0.013**
		(0.017)	(0.017)	(0.005)
Log(age)		0.732***	0.731***	0.240***
		(0.152)	(0.152)	(0.050)
Log(agesqr)		-0.245***	-0.245***	-0.081***
		(0.038)	(0.038)	(0.010)
eduyears_mod		0.007***	0.007***	0.004***
		(0.001)	(0.001)	(0.001)
Vaccinated		0.007	0.006	0.002
		(0.035)	(0.039)	(0.007)
chronic_mod		-0.300***	-0.300***	-0.099***
		(0.008)	(0.008)	(0.002)
Smoking		-0.150***	-0.149***	-0.049***
		(0.025)	(0.025)	(0.008)
Alcohol		-0.064***	-0.064***	-0.021***
		(0.006)	(0.007)	(0.002)
Sporting		0.179***	0.179***	0.059***
		(0.007)	(0.007)	(0.002)
Log(income)		0.196***	0.196***	0.064***
		(0.011)	(0.011)	(0.004)
yr2008		-4.356***	-4.358***	-1.431***
		(0.105)	(0.104)	(0.030)
yr2019		-0.117***	-0.103***	-0.062**
		(0.025)	(0.020)	(0.009)
Support $\times yr2008$			0.047**	0.059**
			(0.025)	(0.026)
Support$\times yr2019$			0.053*	0.014*
			(0.030)	(0.008)
Observations	31476	31476	31476	31476
Wald test	202.720***	178.520***	10.691***	
	(0.000)	(0.000)	(0.006)	

Note: Robust standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. Wald test statistics with p-values in parentheses. Baseline model includes only Social Support. Control model adds demographic, socioeconomic, and behavioral controls. Full models include interaction terms (Support $\times yr2008 and Support \times yr2019$). $The reported coefficients are average marginal effects.$

support reduces psychological stress and buffers against physiological damage, promotes healthy behaviors such as exercise and treatment adherence, facilitates access to practical assistance and health information, and strengthens psychological resilience.However, some studies that found countrary results postulated that Social support can worsen self-perceived health through emotional burden, stigma and judgment, loss of autonomy, obligation and role strain, and conflict-induced stress (11; 19; 40).

On the control variables, being female higher predicted probability of reporting good self-perceived health compared to male by 3.8%, and its statistically significant at 5% level. The marginal effects of log(age) (0.731, $p < 0.01$) and log(age^2) (0.245, $p < 0.01$) provide evidence of a nonlinear relationship between age and the probability of good self-perceived health. The positive coefficient on the linear term and the negative coefficient on the quadratic term together imply an inverted U-shaped relationship. However, because our sample consists exclusively of individuals aged 50 years and older, we are located on the downward-sloping portion of this curve. Within this range, the negative quadratic term dominates, indicating that the probability of reporting good health declines monotonically with age, and the rate of decline accelerates as individuals grow older. This pattern is consistent with the law of diminishing returns: each additional year of age confers a progressively larger negative marginal effect on health, reflecting the accelerating physiological deterioration and increased disease burden associated with advanced age. These findings align with the theoretical framework of **(author?)** (37) and the empirical evidence documented by **(author?)** (3).For every a year increase in education, the predicted probability ogf having good health incrrases by 7% at 1% significant level. Vaccination during the childhood increases the probability of having good health but satistically insignificant at 10% level. Being a smoker reduces the probability of having a good health by 14.9% compared to non-smokers while drinking Alcohol reduces the probability of having good health by 6.4%. Engaging in sporting activities incrreases the predicted probability of having a good health by 17.9% Turning to socioeconomic determinants, the marginal effect of log(income) is 0.196 ($p < 0.01$). Since income is expressed in natural logarithms, this coefficient implies that a 1% increase in monthly income raises the predicted probability of reporting good self-perceived health by approximately 0.20 percentage points, holding all other covariates at their mean values. A 10% increase in income would therefore be associated with a 1.96 percentage point increase in the probability of good health. While statistically significant, the magnitude of this effect is modest, suggesting that income plays a meaningful but not dominant role in shaping health outcomes among older adults in France, after controlling for demographic, behavioral, and health-related factors. This finding is consistent with the established socioeconomic gradient in health, whereby higher economic resources facilitate access to better nutrition, healthcare, and living conditions (28).

The two shocks representing 2008 economic depression and COVID-19 indicated statistically significant

association. The marginal effects of the period indicators are negative and statistically significant for both the 2008 financial crisis (-4.358, $p < 0.01$) and the COVID-19 pandemic (-0.103, $p < 0.01$). The probability of reporting good health in 2008 reduced by 4.358 percentage points relative to the reference period, while the probability of reporting good health in 2019 was lower by 10.3% holding all other covariates at mean value . The substantially larger magnitude of the 2008 effect — approximately 42 times greater — suggests that the prolonged economic contraction of the late 2000s had more severe consequences for self-perceived health than the acute but shorter-lived pandemic shock. An interesting pattern emerges from the interaction terms. Individuals who received social support during the 2008 financial crisis (`sp002_modyr2008`) and the 2019 COVID-19 pandemic (`sp002_modyr2019`) have a higher predicted probability of reporting good health compared to those who did not receive support during these periods. This suggests that social support play a protective role during times of macroeconomic and health crises, buffering individuals against the adverse psychological and physiological consequences of such shocks.

6.2 Effect of familiy proximity on self-perceived health

Table 3 presents the results of effecdt of family proximity on self-perceived health in Models 5 through 8. The results from instrumental probit regression in Model 7 indicated that living very close to a family member higher the probability of reporting good health by 5.1% at 10% significance level. When compared the results with standard probit regression, it was found that standard probit regression overestiamted the effect of family proximity on self-perceived health. Prior to estimation, we anticipated that the standard Probit estimator would yield an upward-biased estimate of the effect of family proximity on self-perceived health. This expectation was based on three theoretical mechanisms: positive selection of healthier individuals into family-proximate living arrangements, unobserved family orientation confounding the relationship, and reverse causality whereby declining health prompts moves closer to family for care. Each of these mechanisms generates a positive correlation between family proximity and health that is not causal, thereby inflating the standard Probit estimate relative to the true effect identified through instrumental variables. The positive and significant association found in this study is consistent with prior research (6; 8; 25). Nevertheless, our findings depart from the conclusions of certain existing studies (23; 3). This discrepancy may be attributed to differences in sample characteristics (age composition, country-specific factors), measurement of family proximity, and estimation methods, as the study employed an instrumental variable approach to address endogeneity, whereas previous studies largely relied on standard Probit estimators and OLS.

Wald tests confirm that family proximity across all the IV-Probit models is endogenous, thereby justifying the use of instrumental variable Probit estimators. As reported in Table 2, the control variables retain their

Table 3: Regression Results: Family Proximity and Self-Perceived Health

	(5) Baseline	(6) Control	(7) Full (IV-Probit)	(8) Full (Probit)
Family proximity	0.757***	0.046*	0.051*	0.141***
	(0.045)	(0.025)	(0.023)	(0.016)
Female		0.030*	0.034**	0.011**
		(0.016)	(0.016)	(0.005)
Log(age)		0.723***	0.746***	0.247***
		(0.152)	(0.152)	(0.050)
Log(agesqr)		-0.271***	-0.257***	-0.088***
		(0.031)	(0.032)	(0.010)
eduyears_mod		0.007***	0.007***	0.002***
		(0.001)	(0.001)	(0.000)
Vaccinated		0.048**	0.043**	0.012*
		(0.021)	(0.020)	(0.007)
chronic_mod		-0.305***	-0.303***	-0.100***
		(0.007)	(0.007)	(0.002)
Smoking		-0.157***	-0.156***	-0.051***
		(0.024)	(0.024)	(0.008)
Alcohol		0.069***	0.068***	0.022***
		(0.006)	(0.006)	(0.002)
Sporting		0.182***	0.180***	0.060***
		(0.007)	(0.007)	(0.002)
Log(income)		0.199***	0.196***	0.066***
		(0.011)	(0.011)	(0.004)
yr2008		-4.383***	-4.359***	-1.440***
		(0.099)	(0.099)	(0.030)
yr2019		-0.013**	0.059**	0.039**
		(0.007)	(0.028)	(0.018)
Proximity $\times yr2008$			0.069*	0.071**
			(0.041)	(0.033)
Proximity $\times yr2019$			-0.162***	0.029*
			(0.052)	(0.017)
Proximity$\times Support$			0.261***	0.080***
			(0.052)	(0.011)
Observations	31476	31476	31476	31476
Wald test	356.150***	167.480***	56.173***	
	(0.000)	(0.001)	(0.004)	

Note: Robust standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. Wald test statistics with p-values in parentheses. Family proximity is measured as having at least one relative living in close proximity. Baseline model includes only Family proximity. Control model adds demographic, socioeconomic, and behavioral controls. Full models include interaction terms (Proximity $\times yr2008, Proximity \times yr2019, Proximity \times Support$). $The reported coefficients are average marginal effects.$

theoretically expected signs and magnitudes. Notably, individuals who both live in close proximity to family and receive social support have a 26.1% higher predicted probability of reporting good health. Similarly, living close to family during the 2008 financial crisis is associated with a 6.9% increase in the probability of good health, while the corresponding effect for the 2019 COVID-19 pandemic is 16.2%. All control variables are correctly signed and consistent with prior literature and theoretical predictions.

7 Robustness Checks

In this study, two robustness checks were conducted to assess the stability of the empirical results. First, the baseline estimates were replicated using an alternative modeling approach based on probit regression. Second, to evaluate potential heterogeneity in the effects of social support and family proximity on self-perceived health, the analyses were stratified by gender. The corresponding results are reported in Table 4.

Table 2 and Table 3 present the standard Probit and IV-Probit estimates side by side. Using alternative estimation techniques, we find that the standard Probit regression underestimates the marginal effect of social support on self-perceived health, while it overestimates the effect of family proximity. These downward and upward biases, respectively, were theoretically anticipated in our methodology. Individuals in poor health tend to receive more social support (inducing downward bias) and live closer to family (inducing upward bias). The IV-Probit estimates correct for these biases and provide more credible causal effects.

Table 4 presents gender-disaggregated marginal effects for social support, family proximity, and the two economic shocks (yr2008 and yr2019). This heterogeneity analysis aims to determine whether the effects of these variables are uniform in both nature and magnitude across genders. The results reinforce the main findings in terms of the direction (nature) of effects, though notable differences in magnitude emerge between females and males. The effect of social support is positive and statistically significant for both genders, indicating a uniform protective nature. However, the magnitude differs substantially. For females, the marginal effect is 0.424 ($p < 0.1$), implying that receiving social support increases the probability of reporting good self-perceived health by 42.4 percentage points. For males, the marginal effect is 0.151 ($p < 0.05$), implying a 15.1 percentage point increase (1; 6). Thus, while social support protects the health of both men and women, the protective effect is nearly three times larger for females.

Family proximity also exerts a uniformly positive effect across genders, though with smaller magnitudes than social support. For females, the marginal effect is 0.137 ($p < 0.1$), indicating a 13.7 percentage point increase in the probability of good health. For males, the marginal effect is 0.058 ($p < 0.1$), indicating a 5.8 percentage point increase. While both genders benefit from living near family, the benefit for females is approximately 2.4 times larger than for males.

Table 4: Regression Results by Gender: Social Support and Family Proximity

	(9) Female Model	(10) Male Model	(11) Female Model	(12) Male Model
Social support	0.424*	0.151**		
	(0.256)	(0.069)		
Family proximity			0.137*	0.058*
			(0.075)	(0.033)
Log(age)	0.428**	1.216***	0.452**	1.216***
	(0.195)	(0.245)	(0.195)	(0.244)
log(agesqr)	-0.326***	-0.139***	-0.346***	-0.140***
	(0.047)	(0.049)	(0.043)	(0.049)
eduyears_mod	0.006***	0.008***	0.006***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
vaccinated	0.046	0.099**	0.013	0.080***
	(0.038)	(0.041)	(0.029)	(0.030)
chronic_mod	-0.305***	-0.298***	-0.310***	-0.296***
	(0.010)	(0.010)	(0.009)	(0.009)
smoking	-0.138***	-0.151***	-0.153***	-0.149***
	(0.035)	(0.034)	(0.034)	(0.033)
Alcohol	-0.065***	-0.065***	-0.074***	-0.064***
	(0.008)	(0.008)	(0.008)	(0.008)
Sporting	0.163***	0.203***	0.164***	0.201***
	(0.009)	(0.010)	(0.009)	(0.010)
ln_income	0.175***	0.220***	0.177***	0.222***
	(0.015)	(0.016)	(0.015)	(0.017)
yr2008	-4.463***	-4.259***	-4.483***	-4.241***
	(0.143)	(0.142)	(0.141)	(0.140)
yr2019	-0.018	-0.085	-0.028	-0.037
	(0.062)	(0.069)	(0.046)	(0.047)
Support $\times yr2008$	0.058*	0.046*		
	(0.031)	(0.024)		
Support $\times yr2019$	0.135***	-0.146***		
	(0.048)	(0.039)		
Proximity $\times Support$	0.165*	0.113***	0.380***	0.169**
	(0.090)	(0.037)	(0.068)	(0.070)
Proximity $\times yr2008$			0.071	0.083
			(0.035)	(0.037)
Proximity $\times yr2019$			0.042	0.041
			(0.094)	(0.097)
Observations	16823	14653	16823	14653
Wald test	20.631***	6.294**	50.741**	70.825***
	(0.004)	(0.048)	(0.002)	(0.001)

Note: Robust standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. Wald test statistics with p-values in parentheses. Columns (9)-(10) present results for social support (sp002_mod) by gender. Columns (11)-(12) present results for family proximity (ch007_km) by gender. br010_mod and br015_ are behavioral risk factors.

The 2008 financial crisis (yr2008) exerted a substantial negative effect on both genders. For females, the marginal effect is 4.463 ($p < 0.01$); for males, it is 4.259 ($p < 0.01$). These translate to a 4.46 and 4.26 percentage point reduction in the probability of good health, respectively. The effects are nearly identical in magnitude, indicating that the financial crisis harmed the health of older adults irrespective of gender. The COVID-19 pandemic (yr2019), by contrast, shows no statistically detectable effect for either gender. The magnitude of the 2008 effect is approximately two orders of magnitude larger than the 2019 effect, potentially reflecting the prolonged, structural nature of the financial crisis versus the acute but shorter-lived pandemic shock (12).

During the 2008 crisis (sp002_modyr2008), social support was modestly protective for both genders: 0.058 ($p < 0.1$) for females and 0.046 ($p < 0.1$) for males. During the COVID-19 pandemic (sp002_modyr2019), social support remained protective for both genders, with effects of 0.135 ($p < 0.01$) for females and 0.146 ($p < 0.01$) for males. Notably, the protective effect of social support during the pandemic was slightly larger for males, reversing the pattern observed in the main social support effect. The combination of family proximity and social support (ch007_kmsp002_mod) is beneficial for both genders across all specifications. This suggests that social support and family proximity are complements rather than substitutes: individuals who receive both forms of social connectedness experience greater health benefits than those who receive only one.

8 Conclusion

This study provides a rigorous causal analysis of the impact of structural social support and family proximity on the self-perceived health of individuals aged 50 and above in France. Longitudinal data from the Survey of Health, Ageing and Retirement in Europe (SHARE) was utilised and instrumental variable (IV-Probit) approach was adopted to effectively address the inherent endogeneity and reverse causality that often bias standard estimations in health economics literature. The findings confirm that structural social support exerts a strong, positive, and statistically significant causal effect on health. Specifically, receiving social support increases the probability of reporting good health by 30.7 percentage points. The study demonstrates that standard Probit models underestimate this effect due to downward bias, as individuals in poorer health are more likely to seek support. Living in close proximity to family members also has a positive and significant influence on health outcomes, increasing the likelihood of good self-perceived health by 5.1%. This underscores the importance of informal family networks in maintaining the well-being of the aging population. A critical insight of this research is the protective role of social support during periods of crisis. Interaction terms reveal that individuals with strong social networks maintained higher health probabilities

during the 2008 financial crisis and the COVID-19 pandemic, suggesting that social support acts as a vital buffer against macroeconomic and public health shocks.

The results remain consistent and statistically significant across various estimation methods and model specifications. The use of robust instrumental variables—such as religious participation, parental longevity, and geographical distance to family—ensures that the identified relationships are causal rather than merely correlational. Furthermore, the inclusion of a wide array of controls, including socioeconomic status, lifestyle habits (smoking, alcohol, and exercise), and chronic conditions, reinforces the reliability of the core findings. As France's population continues to age—with those over 50 projected to comprise nearly half the population by 2050—these findings have profound policy implications. Enhancing the well-being of older adults requires more than medical intervention; it necessitates the development of formal and informal support systems. Policymakers should prioritize initiatives that foster social engagement and facilitate family-based care, particularly as a strategy to mitigate the long-term health consequences of economic and health-related stressors.

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