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Informal caregiving and mental health: results from the Belgian health interview survey 2013 and 2018

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Abstract

Background Due to a globally ageing population, the demand for informal caregivers is increasing. This study investigates the socio-demographic profile of informal caregivers in Belgium and assesses the relationship between informal care (intensity and care recipients) and mental health, considering potential moderators like education, age, and gender.

Methods Using population-based data from the 2013 and 2018 waves of the Belgian Health Interview Survey (N = 14,661), we conducted multivariate (multinomial/ordinal) logistic and linear regression analyses to examine the socio-demographic profile of informal caregivers and their psychological distress, measured through the General Health Questionnaire (GHQ-12).

Results The prevalence of informal caregiving increased from 10.0% in 2013 to 13.0% in 2018. Informal caregivers were predominantly female, middle-aged, and often had no paid job. High-intensity caregivers (over 20 h/week) experienced significantly higher psychological distress compared to non-caregivers, whereas lower-intensity caregivers did not. Additionally, while gender, age, and education were significant predictors of who becomes a caregiver, they did not moderate the relationship between caregiving and mental health.

Conclusions Our findings suggest that the stress of caregiving is more directly related to the nature and intensity of the caregiving tasks themselves rather than the demographic characteristics of the caregivers. Interventions aimed at reducing the adverse effects of caregiving might need to be universally applicable to all caregivers, focusing on reducing the intrinsic burdens of caregiving tasks rather than targeting demographic subgroups.

Keywords Informal care, Psychological distress, GHQ-12, Public health, Population study

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Background

Countries worldwide are facing demographic shifts, including increased life expectancy [1] and declining fertility rates [2], leading to an ageing population. Already in 2020, the number of older adults (60+) surpassed the number of very young children (under 5 years) for the first time in history [3]. By 2030, 12% of the world population will be aged 60 years or older, rising to 22% by 2050. These shifts will result in a larger proportion of frail older people, many of whom will face physical disabilities and serious illnesses and will need palliative and end-of-life care. Currently, a significant portion of this type of care is provided by informal caregivers who play an important yet often unrecognized role in our healthcare system [4, 5]. Paradoxically, while the demand for informal caregivers is projected to increase, the number of potential caregivers is expected to decline due to lower fertility rates, higher divorce rates, greater geographic mobility, rising participation rates of women in the labour market, and increasing single-person households [6–9]. These global structural and demographic shifts highlight the importance of understanding who provides informal care and how it affects their well-being. Against this background, this study investigates the socio-demographic profile of informal caregivers and assesses the relationship between socio-demographic characteristics, informal care dynamics, and the informal caregiver's mental health.

We define an informal caregiver, as described by Eurocarers [10], as a person who provides – usually – unpaid care to someone with a chronic illness, disability or other long-lasting health or care need, outside a professional or formal framework. Informal care involves support with daily living activities like dressing, bathing, and feeding, as well as more complex tasks such as managing medications, providing emotional support, or other forms of help. Informal care extends beyond routine support typically expected within households, such as childcare, and signifies a dedicated potentially long-term commitment to help and assist someone in need. The definition provided by Eurocarers is more comprehensive than others found in the literature. For example, Brown & Brown [4] provide an overview of existing, more specific definitions (e.g., the type of care provided). As we argue below, a broad definition is needed if we wish to encompass *all* types of informal caregiving.

Given the growing importance of informal caregiving, research has focused on understanding the potential consequences of informal caregiving on the health and well-being of caregivers themselves. In this regard, the caregiver strain hypothesis has been the most dominant perspective, highlighting the numerous challenges informal caregivers face [4, 8, 11]. The relationship between informal caregiving and mental health is generally

reported to be negative. Caregiving has been associated with poorer mental health, including higher rates of anxiety [12], depression [13–15], psychological distress [13, 16], and lower subjective well-being [17]. The relationship between caregiving and aspects of mental health is, however, complex as different moderators have been identified, such as informal caregiver's gender (with women more adversely affected), socio-economic characteristics (non-working or less educated people reporting worse outcomes), their relationship to the care recipient (spousal caregivers often reporting worse outcomes), dependency and the mental state of the care recipient, and the intensity, type, and duration of the provided care [18]. Moreover, many of these variables are confounders, as they both differentiate caregivers from non-caregivers and are independently associated with mental health outcomes [4, 19]. For instance, age and having a seriously ill spouse are predictors of mental health problems regardless of caregiving status.

Finally, longitudinal analyses and population-based studies have shown that caregiving is not uniformly associated with adverse health outcomes, with caregivers experiencing reduced mortality and others reporting little or no caregiving-related strain [8, 18, 20, 21]. These studies are in line with the healthy caregiver hypothesis which holds that certain caregivers may experience informal caregiving as something positive and experience (mental) health benefits associated with prosocial behavior.

Several reviews [4, 8] have indicated that the above-discussed findings remain tentative due to certain limitations: (1) a focus on specific age groups and populations of care recipients, such as those with dementia [22, 23], (2) an emphasis on specific types of caregivers, like spousal caregivers [24], (3) a reliance on convenience samples, and (4) inadequate control measures [4]. These limitations impair the generalizability of their findings. Therefore, there is a need for more representative population-based samples [8], which can provide insights into the diverse experiences and risks associated with caregiving [25]. From a public health perspective, it is crucial to monitor changes over time in the proportion of informal caregivers, potential changes in their profiles, and the evolution of their burden compared to a control group.

The preceding arguments show that despite extensive research, the relationship between informal caregiving and mental health is complex and remains inconclusive. In addition, the roles of potential moderators such as educational level, age, and gender are not fully understood, particularly in diverse caregiving settings. Moreover, to the best of our knowledge no population-based studies on informal caregiving in Belgium exist. Therefore, this study aims at using data from the two most

recent waves from the Belgian National Health Interview Survey 2013–2018 ($N=24,356$) to (1) investigate the socio-demographic profile of informal caregivers, to whom they provide care, and the intensity of care; (2) assess the relationship between socio-demographic characteristics, informal caregiving intensity, care recipients, and mental health.

Belgian context

In Belgium, informal caregiving plays an important role in supporting an aging population. Belgium is often considered a hybrid model, situated between the Northern (social-democratic) and Conservative models in welfare state typologies [26]. It combines social-democratic-style redistributive benefits with financing mechanisms predominantly reliant on social insurance contributions, characteristic of the Conservative model. It is projected that by 2050, 25.2% of the Belgian population will be aged 65 or older, which is expected to increase the need for informal care further [27]. The ratio of available caregivers per care-recipients is currently of 4.71 and is expected to be halved by 2050 [7]. Belgium has a well-developed social protection system but gaps exist in long-term and home-based care services which increasingly leads to a reliance on family members, primarily women, to provide unpaid care for older adults and those with chronic illnesses [28]. Official recognition of the caregiving status has existed since 2019. Although financial support and care leave options exist, including regionally variable caregiver allowances and limited respite services, these supports are often insufficient and challenging to access.

Method

Data

The data from the two most recent available waves (2013 and 2018) of the Belgian Health Interview Survey (B-HIS) were used (data from the 2023 wave will be available in 2025). The B-HIS is a cross-sectional household survey held among a representative sample of the Belgian population, conducted every three to five years by Sciensano (<https://www.sciensano.be/en/projects/health-interview-survey>), i.e. the national research institute for public and animal health in Belgium. B-HIS aims to give a comprehensive overview of the health status of the Belgian population. Each wave must result in a net sample of at least 10,000 participants. A multistage stratified sampling design is used, which involves geographical stratification by regions and municipalities, followed by the selection of households within clusters and individuals within these households (for a detailed description, see Demarest et al. [29]). Face-to-face Computer Assisted Personal Interviews (CAPI) are used. In addition, self-administered questionnaires were given to the participants older

than 15 years, which dealt with more sensitive topics such as mental health problems. Instruments were constructed following strict procedures, including mainly standardised instruments from the WHO Consensus on Harmonising Methods and Instruments for Health Surveys, the Dutch Central Bureau of Statistics, the Belgian Centre for Social Policy, and the French National Institute for Health and Medical Research. The final weighted sample after removing missings included 6,990 respondents from the 2013 wave and 7,671 from the 2018 wave (see Table 1).

Measures

Dependent variables

Psychological distress was measured through the General Health Questionnaire (GHQ12). The GHQ12 is designed to detect psychological well-being and nonpsychotic psychiatric problems [30, 31]. It is a composed index of 12 items ($\alpha=0.873$), which are rated by respondents on a 4-point Likert scale ranging from 1 “Not at all” to 4 “Much more than usual”. The recommended traditional scoring method was used to recode the initial Likert scores (0-0-1-1) and then compute a summed score ranging between 0 and 12.

Three indicators of informal caregiving were included. *Providing informal care* was measured by the item “Do you provide at least once a week on a non-professional base care or assistance to one or more persons suffering from any age-related problems, longstanding illnesses, chronic conditions or handicaps?” (0 “No”, 1 “Yes”).

To whom informal care was provided was measured by the item “For whom do you provide most non-professional-based care or assistance?” (1 “One or more members of your household”, 2 “One or more members of your family not part of your household”, 3 “One or more persons not part of your household or family”).

Caregiving intensity was measured by the item “In total, how many hours per week do you normally provide care or assistance?” (1 “Less than 10 hours per week”, 2 “At least 10 but less than 20 hours per week”, 3 “20 hours per week or more”).

The three indicators on informal care serve as the dependent variables in the first part of the analyses (Who are the informal caregivers) and independent variables in the second part (The relationship between informal care and psychological distress).

Independent variables

Demographic variables such as *age* (1 “15–24 years of age”, 2 “25–44 years of age”, 3 “45–65 years of age”, 4 “65+”) and *Gender* (0 “Female” 1 “Male”) were included. *Level of urbanization* was based on a regrouping of the municipality of residence of the respondents (1 “Big

Table 1 Descriptives of (in)dependent variables (weighted)

	Year of the survey		
	2013 n(%) / M(SD)	2018 n(%) / M(SD)	Full sample n(%) / M(SD)
Providing informal care or help			
No	6,291 (90.0%)	6,674 (87.0%)	12,965 (88.4%)
Yes	699 (10.0%)	997 (13.0%)	1,696 (11.6%)
Number of hours spent weekly on informal care or help			
No caregiver	6,291 (90.0%)	6,674 (87.0%)	12,965 (88.4%)
Care <10h/week	433 (6.2%)	683 (8.9%)	1,116 (7.6%)
Care 10h > x < 20h/week	126 (1.8%)	176 (2.3%)	302 (2.0%)
Care >20h	140 (2.0%)	138 (1.8%)	278 (2.0%)
People to whom informal care is provided			
No caregiver	/	6,674 (87.0%)	6,674 (87.0%)
Household	/	276 (3.6%)	276 (3.6%)
Family outside household	/	568 (7.4%)	568 (7.4%)
Non-family outside household	/	153 (2.0%)	153 (2.0%)
Gender			
Man	3,348 (47.9%)	3,766 (49.1%)	7,114 (48.6%)
Woman	3,642 (52.1%)	3,905 (50.9%)	7,547 (51.4%)
Age group (5 categories)			
15–24 yrs	322 (4.6%)	284 (3.7%)	606 (4.1%)
25–44 yrs	2,495 (35.7%)	2,662 (34.7%)	5,157 (35.2%)
45–64 yrs	2,551 (36.5%)	2,846 (37.1%)	5,397 (36.8%)
65+ yrs	1,622 (23.2%)	1,879 (24.5%)	3,501 (23.9%)
Highest obtained diploma			
No or lower secondary education	2,397 (34.3%)	3,053 (39.8%)	5,450 (37.1%)
Higher secondary education	2,132 (30.5%)	1,979 (25.8%)	4,111 (28.1%)
Higher education	2,405 (34.4%)	2,639 (34.4%)	5,044 (34.4%)
Other	56 (0.8%)	0 (0.0%)	56 (0.4%)
Reported equivalent household income (weighted quintiles)			
Quintile1	1,188 (17.0%)	1,481 (19.3%)	2,669 (18.2%)
Quintile2	1,195 (17.1%)	1,335 (17.4%)	2,530 (17.3%)
Quintile3	1,454 (20.8%)	1,542 (20.1%)	2,996 (20.4%)
Quintile4	1,482 (21.2%)	1,665 (21.7%)	3,147 (21.4%)
Quintile5	1,671 (23.9%)	1,649 (21.5%)	3,320 (22.6%)
A paid job at this moment			
Yes	3,970 (56.8%)	4,434 (57.8%)	8,404 (57.3%)
No	3,020 (43.2%)	3,237 (42.2%)	6,257 (42.7%)
Level of urbanization			
Big cities and dense agglomerations	2,671 (38.2%)	2,954 (38.5%)	5,625 (38.4%)
Suburban / banlieus	1,370 (19.6%)	1,273 (16.6%)	2,643 (18.0%)
Urbanized municipalities	1,894 (27.1%)	2,616 (34.1%)	4,510 (30.8%)
Rural	1,055 (15.1%)	828 (10.8%)	1,883 (12.8%)
Mean GHQ-12 score of psychological distress	1.69 (2.78)	1.74 (2.78)	1.77 (2.78)

Abbreviations: n weighted number of participants in the present study, % weighted percentage for the Belgian population, M Mean, SD Standard Deviation

cities and dense agglomerations”, 2 “Suburban / banlieus”, 3 “Urbanized municipalities”, 4 “Rural”). *Year of the survey* (0 “2008”, 1 “2013”) was included to assess trends between survey years.

Finally, the *highest educational level* within the household (0 “No or lower secondary education”, 1 “Higher secondary education”, 2 “Higher Education”, 3 “Other”), *household income*, and *having a paid job* were considered

as a proxy for different levels of socio-economic status of the family. The household income variable was divided into quintiles which are based on the income distribution at the Belgian level. Higher scores reflect higher household incomes relative to the Belgian income distribution. For example, quintile 5 represents the 20% highest household incomes. Having a paid job was measured through the item “Do you have at this moment a paid job, even if it is temporarily interrupted?” (1 “Yes”, 2 “No”). Descriptive statistics are provided in Table 1.

Analysis

Our analysis is built in three steps. First, descriptive statistics are given for all (in)dependent variables. To get population-based estimates for our descriptive table we used the weights provided by the Sciensano institute for age, gender, household size, region, trimester of the interview and accounted for other design effects such as clustering (at the household level) and stratification (at the provincial level). Second, we used multivariate logistic regression analysis to investigate the socio-demographic profile of informal caregivers, multivariate ordinal logistic regression analysis for informal caregiving intensity, and multinomial logistic regression analysis for to whom care was provided. For each analysis, we follow a hierarchical approach where we enter the year of survey and gender in model 1, age and education level in model 2, and household income, having a paid job, and level of urbanization of the respondent’s area of residence in model 3. Third, we use multivariate linear regression analysis to assess the relationship between informal caregiving (status, intensity, and care recipients) and mental health. We follow a hierarchical approach where we enter informal caregiving (status, intensity, and care recipients), year of survey and gender in model 1, age and education level in model 2, and household income, having a paid job, and level of urbanization of the respondent’s area of residence in model 3. Moderation effects on psychological distress between informal care indicators and gender, age, and education were assessed through two-way interactions. All analyses were carried out in Stata-MP (version 18) [32].

Results

Descriptive statistics

Table 1 presents the descriptive statistics. Approximately 10.8% of the Belgian population provided informal care. In 2013, 10.0% of respondents reported providing informal care or help, which increased to 13.0% by 2018. This substantial increase (+30.0%) is mainly due to a higher share of individuals providing less than 10 h of care per week from 6.2% in 2013 to 8.9% in 2018. In contrast, the proportion of individuals providing between 10 h and

less than 20 h of care per week (1.8% in 2013 and 2.3% in 2018) and more than 20 h of care (2.0% in 2013 and 1.8% in 2018) remained relatively stable. To whom caregivers provided care was only measured in 2018. Caregivers provided support primarily to family members outside of the household (7.4%) and household members (3.6%), with a smaller percentage assisting non-family members (2.0%). The mean General Health Questionnaire-12 (GHQ-12) score, indicative of psychological distress, was relatively stable across both years ($M=1.77$, $SD=2.78$).

Multivariate analyses

Who are the informal caregivers?

To get a better understanding of informal caregiving, we zoomed in on the people who provide informal care (category “yes” in Table 1), investigated the intensity of informal caregiving measured by the number of hours spent weekly on caregiving activities (Table 3), and to whom they provide care (Table A1 in appendix). Table 2 shows the result of the socio-demographic profile of the informal caregivers. In all models, women were more likely to be informal caregivers ($OR=1.457$, $p<0.001$ in Model 3). Concerning age, individuals aged 45–64 were more likely to provide informal care when compared to individuals older than 65 ($OR=1.527$, $p<0.001$ in Model 3). In contrast, younger age groups (15–24 and 25–44 years old) were less likely to provide care compared to the eldest group. People with a higher education were more likely to provide care when compared to individuals who obtained no or lower secondary education ($OR=0.741$, $p<0.001$ in Model 3). There was no difference between people with a higher education and a higher secondary education or other degree. Having a paid job reduced the likelihood of providing informal care ($OR=0.771$, $p<0.001$ in Model 3). Urbanization levels were also related to caregiving, with those living in suburban areas ($OR=0.669$, $p<0.001$) and urbanized municipalities ($OR=0.805$, $p<0.001$) being less likely to provide care compared to individuals in big cities and dense agglomerations. Interestingly, no differences were observed between rural regions and big cities. Year of the survey was not significant in all models.

Who provides the most informal care?

The multivariate ordinal logistic regression analyses categorized caregiving intensity into three levels: less than 10 h per week, at least 10 but less than 20 h per week, and 20 h per week or more (Table 3).

The year of the survey was significantly related to the intensity of caregiving across all models. In 2018, respondents were less likely to engage in higher-intensity caregiving compared to those in 2013 ($OR=0.698$, $p<0.001$ in Model 3). There were no differences in

Table 2 Multivariate logistic regression analysis on providing informal care or help (yes vs. no)

	Providing informal care or help					
	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Year of Survey 2018 (Ref. 2013)	1.077	[0.977;1.188]	1.053	[0.953;1.162]	1.068	[0.967;1.180]
Woman	1.460***	[1.322;1.611]	1.485***	[1.344;1.640]	1.457***	[1.318;1.611]
Age (Ref. 65+ yrs)						
15–24 yrs			0.792	[0.593;1.058]	0.922	[0.682;1.245]
25–44 yrs			0.617***	[0.535;0.712]	0.727***	[0.614;0.861]
45–64 yrs			1.328***	[1.175;1.502]	1.527***	[1.328;1.757]
Education (Ref. Higher Education)						
No or lower secondary education			0.794***	[0.700;0.902]	0.741***	[0.644;0.853]
Higher secondary education			1.036	[0.922;1.164]	1.003	[0.888;1.134]
Other			1.469	[0.831;2.599]	1.334	[0.751;2.369]
Household Income (Ref. Quintile 1)						
Quintile2					0.971	[0.826;1.142]
Quintile3					1.125	[0.961;1.317]
Quintile4					1.087	[0.923;1.280]
Quintile5					0.967	[0.817;1.146]
Yes, a paid job					0.771***	[0.677;0.878]
Urbanization (Ref. Big cities and dense agglomerations)						
Suburban / banlieus					0.669***	[0.568;0.789]
Urbanized municipalities					0.805***	[0.709;0.914]
Rural					1.066	[0.928;1.225]
Constant	0.114***	[0.104;0.125]	0.124***	[0.107;0.144]	0.139***	[0.114;0.170]
Observations	14,661		14,661		14,661	
Pseudo R-Squared	0.005		0.021		0.026	

OR Odds Ratios, Exponentiated coefficients; 95% CI (Confidence Interval)

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 3 Multivariate ordinal logistic regression analysis on the intensity of informal caregiving (1 "Less than 10 hours per week" 2 "At least 10 but less than 20 hours per week" 3 "20 hours per week or more")

	Number of hours spent weekly on informal care or help					
	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Year of Survey 2018 (ref. 2013)	0.634***	[0.525;0.766]	0.675***	[0.556;0.821]	0.698***	[0.570;0.855]
Woman	1.103	[0.909;1.339]	1.146	[0.942;1.394]	1.118	[0.917;1.362]
Age (Ref. 65 + yrs)						
15–24 yrs			0.461*	[0.245;0.867]	0.556	[0.290;1.069]
25–44 yrs			0.843	[0.639;1.112]	1.136	[0.825;1.563]
45–64 yrs			0.767*	[0.608;0.968]	0.999	[0.772;1.293]
Education (Ref. Higher Education)						
No or lower secondary education			2.250***	[1.767;2.864]	1.799***	[1.383;2.339]
Higher secondary education			1.281*	[1.014;1.618]	1.154	[0.904;1.473]
Other			1.604	[0.576;4.469]	1.471	[0.519;4.168]
Household Income (Ref. Quintile 1)						
Quintile2					0.802	[0.591;1.088]
Quintile3					0.912	[0.680;1.223]
Quintile4					0.770	[0.565;1.050]
Quintile5					0.626**	[0.448;0.875]
Yes, a paid job					0.586***	[0.462;0.743]
Urbanization (Ref. Big cities and dense agglomerations)						
Suburban / banlieus					0.912	[0.655;1.270]
Urbanized municipalities					0.952	[0.735;1.233]
Rural					0.816	[0.616;1.081]
/						
Threshold 1	1.662***	[1.391;1.985]	2.001***	[1.496;2.676]	1.342	[0.928;1.941]
Threshold 2	4.393***	[3.625;5.324]	5.428***	[4.016;7.338]	3.701***	[2.543;5.387]
Observations	1,872		1,872		1,872	
Pseudo R-Squared	0.007		0.025		0.037	

OR Odds Ratios, Exponentiated coefficients; 95% CI (Confidence Interval)
 Significance levels: *p < 0.05; **p < 0.01; ***p < 0.001

caregiving intensity for gender, age (after controlling for income and having a job), and urbanization level.

People having no or a lower secondary education degree were more likely to engage in higher-intensity caregiving compared to those with higher education (OR=1.799, $p < 0.001$ in Model 3). There was no significant difference in caregiving intensity between individuals with higher secondary education and those with higher education. Having a paid job significantly reduced the likelihood of engaging in higher-intensity caregiving (OR=0.586, $p < 0.001$ in Model 3). Similarly, people in the highest quintile of household income were less likely to provide higher-intensity caregiving (OR=0.626, $p < 0.01$) when compared to the lowest quintile. There were no differences between the other quintiles. Urbanization level had no significant relationship with caregiving intensity.

Who provides informal care to whom?

We conducted a multinomial regression analysis to assess who is more likely to provide informal care to household members, family members outside the household, and non-family members (Only the 2018 sample - Table A1 in the appendix).

Women were more likely to provide informal care than men for both family members outside the household (OR=1.771, $p < 0.001$) and non-family members outside the household (OR=2.081, $p < 0.001$) when compared to providing care to household members. This implies that compared to men, women had higher odds of providing care outside the immediate household context. However, when comparing when caregiving was provided to family members and non-family members outside the household, gender was not significant. This suggests that once women and men are already involved in informal caregiving outside the household, they are equally likely to care for either family or non-family members.

Compared to those aged 65 and older, middle-aged adults between 45 and 64 years old were significantly more likely to provide care to family members outside the household (OR=2.231, $p < 0.001$) compared to providing care within the household. This indicates a strong involvement of middle-aged adults in extended family caregiving roles.

Individuals with no or lower secondary level of education were significantly less likely to provide care to both family members outside the household (OR=0.274, $p < 0.001$) and non-family members (OR=0.429, $p < 0.01$) compared to those with higher education. Similarly, individuals with higher secondary education were less likely to provide care to family members outside the household (OR=0.668, $p < 0.050$) and less likely, although not significantly, to provide care to non-family members (OR=0.636). This indicates that higher educational

attainment was associated with a broader caregiving role. Income and having a paid job were unrelated to the different categories of care recipients.

What is the relationship between informal caregiving and mental health?

As can be seen in Table A2 in the appendix informal caregiving was positively related to psychological distress. Table 4 below, however, shows that this relationship was nuanced and depended on the intensity of the care provided. The findings indicate that only the high-intensity informal caregivers who provide more than 20 h of care per week exhibited significantly higher levels of psychological distress ($b = 0.472$, $p < 0.001$ in Model 3). In contrast, informal caregivers who provide less than 10 h of care per week, or between 10 h and 20 h of care per week, do not show a significant increase in psychological distress when compared to people who don't provide care. Furthermore, we see some expected patterns that have been observed earlier in the literature. Women, younger people, people with a lower income, and those without a paid job showed higher psychological distress when compared to men, older people, with a higher income, and those with a job.

We tested the moderation effects of gender, age, and education on the relationship between the intensity of care and psychological distress. None of the interactions between gender, education, and intensity of informal care were statistically significant (see appendix Table A3). For age, two out of nine tested interactions were statistically significant, but no clear pattern emerged. The absence of moderation effects was similar to the relationship between informal caregiving and psychological distress (see Table A2 in the appendix). We also tested the relationship between care recipients and psychological distress (see Table A4 in the appendix - only the 2018 sample). There were no differences observed in psychological distress for providing care to member(s) of the household, family, or non-family when compared to non-caregivers. Again, the moderation effects for gender, education were not significant.

Discussion

As countries worldwide face demographic shifts marked by increased life expectancy [1], decreased fertility [2], and an increasing need for (palliative) care [3], the role of informal caregivers becomes increasingly important. Traditionally, informal caregiving has been associated with negative mental health outcomes [12, 13, 16]. Yet, review studies [4, 8] call for more population-based research that goes beyond specific types of caregiving groups (e.g., elderly spouses) or care recipients (e.g., older people with advanced dementia) to better understand who the

Table 4 Multivariate linear regression analysis of informal caregiving intensity on psychological distress (GHQ-12)

	Psychological distress (GHQ12)					
	Model 1		Model 2		Model 3	
	b	95% CI	b	95% CI	b	95% CI
Hours caregiving (ref. No caregiver)						
Care < 10 h/week	0.040	[-0.139;0.220]	0.065	[-0.115;0.244]	0.041	[-0.136;0.218]
Care 10 h > x < 20 h/week	0.287	[-0.061;0.636]	0.296	[-0.051;0.644]	0.172	[-0.170;0.514]
Care > 20 h	0.693***	[0.332;1.053]	0.661***	[0.302;1.020]	0.472**	[0.118;0.826]
Year of Survey 2018 (ref. 2013)	-0.024	[-0.128;0.080]	0.007	[-0.097;0.111]	-0.021	[-0.124;0.082]
Woman	0.514***	[0.411;0.618]	0.516***	[0.412;0.619]	0.410***	[0.308;0.512]
Age (Ref. 65+ yrs)						
15–24 yrs			0.099	[-0.215;0.412]	0.755***	[0.432;1.078]
25–44 yrs			0.629***	[0.488;0.771]	1.337***	[1.163;1.511]
45–64 yrs			0.561***	[0.427;0.694]	1.156***	[1.003;1.310]
Education (Ref. Higher Education)						
No or lower secondary education			0.542***	[0.408;0.675]	0.047	[-0.099;0.192]
Higher secondary education			0.178**	[0.056;0.301]	-0.084	[-0.211;0.043]
Other			-0.176	[-0.842;0.489]	-0.571	[-1.229;0.087]
Household Income (Ref. Quintile 1)						
Quintile2					-0.147	[-0.321;0.027]
Quintile3					-0.442***	[-0.612;-0.272]
Quintile4					-0.511***	[-0.684;-0.339]
Quintile5					-0.754***	[-0.931;-0.578]
Yes, a paid job					-0.979***	[-1.122;-0.836]
Urbanization (Ref. Big cities and dense agglomerations)						
Suburban / banlieus					-0.162*	[-0.315;-0.008]
Urbanized municipalities					-0.223***	[-0.351;-0.095]
Rural					-0.175*	[-0.324;-0.027]
Constant	1.510***	[1.414;1.605]	0.863***	[0.707;1.019]	1.740***	[1.528;1.951]
Observations	11,635		11,635		11,635	
R-squared	0.010		0.021		0.052	

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

informal caregivers are and to be able to investigate the mental health of all informal caregivers in comparison to a reference group of the general population. Against that background, we investigated (1) the socio-demographic profile of who provides informal care, to whom, and how often, and (2) the relationship between socio-demographic characteristics, and informal care (to whom and the intensity) and mental health, using data from the Belgian National Health Interview Survey 2013–2018.

Our results show that within the Belgian population, the number of informal caregivers is rising, potentially linked to increased longevity and economic factors, such as the increasing costs of nursing homes [33] and the increasing tendency in Belgium (and other European countries) to use nursing homes only when a home care approach with informal and formal support is no longer possible [34]. In Belgium, most older adults are reluctant to go to a nursing home and wish to remain in their own

home as long as possible [35]. Additionally, this rise may partly reflect increased awareness and recognition of informal caregiving, as public and policy attention to caregiving roles has grown over recent years. As caregiving becomes more widely discussed and socially recognized, individuals may be more likely to identify themselves as informal caregivers compared to previous periods.

Our findings show that the informal caregivers are more likely to be female, unemployed, and in the older age categories (45+) which is consistent with previous studies [17, 36, 37]. In addition, middle-aged adults between 45 and 64 years old are most involved in providing care to family members outside the household. Middle-aged adults, also called the “sandwich generation”, typically face dual caregiving pressures [38, 39]. They are often responsible for caring for their ageing parents while also supporting their children, leading to a higher overall involvement in caregiving activities.

In addition, people living in big cities and rural environments are more likely to provide care when compared to those living in suburban regions or municipalities, without a significant difference in terms of caregiving intensity. In rural regions, strong community ties and extended family networks are more common while access to professional healthcare services can be limited [40]. Less availability of healthcare facilities and professionals means that families often need to provide care themselves. In both urban and rural settings, economic constraints can also play a significant role. Individuals who cannot afford professional care might rely more on informal networks. Especially big cities with high population densities provide opportunities for community-based care initiatives, which might be supported by local non-profits or religious organizations.

Interestingly, while women and older individuals are more likely to take on caregiving roles, the intensity of their involvement—measured in hours of caregiving—equals that of their less frequently participating counterparts (men and younger individuals). This suggests that once an individual becomes a caregiver, the level of commitment, in terms of time, tends to equalize across different groups as we did not observe any significant differences. This suggests that once the caregiving commitment is undertaken, the main predictor of the caregiving intensity lies in the caregiving trajectory, which is mainly driven by the disability of the care recipient and its evolution, regardless of the caregiver's sociodemographic profile [41].

Concerning the relationship between informal caregiving and mental health, the caregiver strain hypothesis has received the most attention in the literature [13, 16]. Our findings confirm that informal caregiving is positively related to psychological distress. However, this relationship is nuanced as our findings indicate that only the high-intensity caregivers who provide more than 20 hours of care show higher levels of psychological distress when compared to non-caregivers. This higher level of distress can be linked to the fact that these caregivers are more likely to be caring for individuals with severe health needs and poorer prognoses, which intensifies the emotional and physical burdens placed on them. This also suggests that for the majority of caregivers (82.8% when extrapolated to population-based estimates) caregiving does not adversely affect caregiver's psychological well-being. While our findings are in line with the observations of Roth et al. [8] "that many family caregivers, in fact, report little or no strain associated with providing caregiving assistance", they also underscore the need for a nuanced approach to the caregiver challenges. The heterogeneity of caregiving experiences, trajectories, and contexts - even among those providing less than

20 h/week - implies that within this group, there could be both 'healthy' caregivers, who manage their responsibilities with little distress, and 'unhealthy' caregivers, who experience significant strain [42, 43]. Therefore, further research is warranted to identify and understand the distinct subgroups that may exist within caregivers providing fewer hours of care and how these subgroups contribute to the overall lack of association with psychological distress. From a public health policy perspective, it calls for targeted support and interventions for caregivers who are engaged in high-intensity caregiving, but also an understanding of the groups of informal caregivers beyond the intensity of care. Especially with the expected increase in caregiving recipients and informal caregivers, policymakers could reduce healthcare costs by creating affordable and accessible support services for specific caregiver groups who need such help to mitigate the negative impacts of caregiving on their mental health.

We found no significant moderation effects of gender, and education on the relationship between caregiving, care recipients, or the intensity of care and psychological distress. Despite the differences that we observed in the likelihood of becoming an informal caregiver (with women more often taking on caregiving roles), our results indicate that once individuals engage in caregiving, their experience of distress may not be significantly related to their gender and other demographic variables. This suggests that the stress of caregiving is more directly related to the nature and intensity of the caregiving tasks themselves rather than the demographic characteristics of the caregivers [8, 21]. In this sense, interventions aimed at reducing the adverse effects of caregiving might need to be universally applicable to all caregivers, focusing on reducing the intrinsic burdens of caregiving tasks rather than targeting demographic subgroups.

Limitations

This study has several limitations. First, the cross-sectional design does not allow for causal inferences to be made between the investigated variables. Developing effective support strategies and untangling the caregiver strain vs. the healthy caregiver hypothesis requires that we get a better grip on causal mechanisms. For this reason, longitudinal research that focuses on people transitioning into an informal caregiver role could shed light on self-selection mechanisms and how these are related to mental health problems regardless of caregiving status [4]. This could answer questions such as whether high-intensity caregivers generally started as low-intensity caregivers and whether this matters for their mental health. Second, our data came from a general health survey which guaranteed that the data are based on a

large and high quality sample avoiding self-selection bias. Because such a survey has to cover many different topics, the available measures were limited to caregiving status, the intensity of caregiving and to whom care was provided. Further research could include other variables such as the relationship with the care recipient (e.g., spousal caregivers), the level of need, mental and physical health problems of the care recipient, the available other formal and informal resources of the care recipient, or the duration of the provided care to further investigate the relationship between caregiving and mental health problems and possible moderation effects with socio-demographic variables.

Conclusion

This study adds to the population-based literature on informal caregiving and underscores the growing importance of informal caregiving as the population ages. Despite a higher likelihood for women and older individuals to undertake caregiving roles in Belgium, we find that the intensity of caregiving does not differ across different demographic groups once the caregiving role is assumed. Our findings reveal that only high-intensity caregivers, dedicating more than 20 hours per week regardless of age, gender, or level of education, experience significant psychological distress when compared to non-caregivers. This result highlights the resilience or adaptability of the large majority of caregivers. Our findings call for nuanced, targeted public health policies and interventions that specifically aim to reduce high-intensity caregivers' stress, rather than solely targeting specific demographic groups. Such tailored support could not only enhance caregiver well-being but also optimize broader healthcare cost efficiencies considering the growing reliance on informal care networks.

Supplementary Information

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Supplementary Material 1

Authors' contributions

FVD was responsible for the initial conception, design, analysis, draft and finalization of the manuscript. BS and PG contributed to conceptualisation, study design, interpretation of data, and critical revisions of the manuscript. PS, LVD, RDP, SD contributed to study design, interpretation of data, and critical revisions of the manuscript. All authors approve the final version manuscript.

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Data availability

The data from the two most recent available waves (2013 and 2018) of the Belgian Health Interview Survey (B-HIS) were used. The B-HIS is a cross-sectional household survey held among a representative sample of the Belgian population, conducted every three to five years by Sciensano, i.e. the national

research institute for public and animal health in Belgium. Access to the data can be requested through Sciensano (see <https://www.sciensano.be/en/node/55737/health-interview-survey-microdata-request-procedure>).

Declarations

Ethics approval and consent to participate

Secondary data was used from the Belgian Health Interview Survey (B-HIS) for which we signed a GDPR convention (ref. HIS2018/DATA/2023/05).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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