Housing conditions and mortality in Belgium (1991-2011)

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Background

In the Western countries, including Belgium, better socioeconomic and working conditions, as well as improvements in food and hygiene and a safer environment have led to an increase in life expectancy over the last decades. Nevertheless, inter-personal variation in life expectancy remains substantial (Trannoy, 2012). Health and mortality inequalities even have increased in recent decades (Jusot, 2010; Deboosere, Fiszman, 2009): socioeconomic status is a strong determinant of mortality at every age, more than ever before in European countries (Valkonen, 2002; Deboosere, Fiszman, 2009; Mackenbach, 2012). Existing research so far tended to approximate socioeconomic status with the level of educational attainment, occupational status or income. Housing is yet another socioeconomic factor that is up to now much less taken into account when studying inequalities in mortality. Housing is a complex and multidimensional element impacting several aspects of a person's health and well-being. First, the dwelling design as well its energy and ventilation characteristics can provoke infectious diseases, chronic illnesses or accidents (Boornsma et al., 2017; Shaw, 2004). Second, poorer housing quality affects mental health, expressed in, e.g. sleep disorders, depression and anxiety related to the frustration of living in unsatisfactory housing (Lawrence, 1998; Evans et al, 2003). Third, compared to renting, homeownership is associated with more freedom, valorization, control and attachment to the place, which optimizes a person's well-being (Lawrence, 1998; Bernard, 1998).

A bunch of studies have examined the socio-economic determinants of mortality (for Belgium: Deboosere, Gadeyne, Van Oyen, 2009; Gadeyne, 2006), but very few have included the housing dimension. Although some research has shown the variation in life expectancy according to housing quality, and housing tenure (owner/tenant), in Belgium (Eggerickx et al., 2018-A; Gadeyne, 2006), and elsewhere (e.g. in the UK: Dunn, 2002; or in Vancouver: Hiscock et al, 2003), these results were confronted with the fact that the living environment is also strongly linked to a person's socio-economic framework, namely their income level, socio-cultural context, among other things (Bugeja-Bloch, 2013). This research contributes to existing research by setting trends in housing conditions between 1991 and 2016 in relation to social inequalities in health and mortality over this period in Belgium. Housing is considered not only as a proxy of the socioeconomic situation, but also as a separate factor impacting mortality, aside from other socioeconomic and demographic characteristics.

Hypothesis

1. Poor quality housing decreases life expectancy and increases the risk of mortality;
2. Tenants face a higher risk of mortality and a shorter life expectancy than homeowners;
3. Housing-driven inequalities in mortality have increased over time, following the trend of other socio-demographic variables;
4. Housing conditions has an effect on its own on mortality that persists after controlling for socioeconomic background (education, socio-professional category, income)

Data and method

The data used in this research are the result of the coupling of the population censuses of 1991, 2001 and 2011 and the National Register. They cover the entire population of Belgium over three periods (1992-1996, 2002-2006, 2011-2015), i.e. 25 years. As the approach of the 1991

and 2011 census are more similarly constructed[1], we focus especially on a comparison between the 1992-1996 and 2011-2015 periods. Mortality will be measured through life expectancy and risk of death within 5 years after each census.

The population censuses provide two main indicators to measure housing conditions:

- An overall housing quality score (continuous scale from 0 to 4), a composite measure of different elements (housing tenure, the presence of a bathroom, central heating, garage, occupancy density, etc.). To clearly distinguish poor housing quality, we defined the following three categories: <2.2 (poor housing quality), 2.2-3.0 (moderate housing quality), >3.0 (high housing quality).[2]
- Housing tenure, which appears as a major element in this relation according to the literature.

First, we identified the socio-economic and demographic characteristics, in terms of education, professional occupation, position on the life cycle (age, family composition), of the most disadvantaged people in terms of housing: the population whose score is lower than 2.2/4 and the tenants. Then, on the basis of mortality trends by age group over the periods 1992-1996 and 2011-2015, life expectancies at birth of owners and tenants were calculated. We considered the evolution of these differentials over time, but also to the contribution of each age group to this evolution, using the Arriaga method (Meslé, Vallin, 2002). This life expectancy analysis still has to be made according to housing score degrees[3]. Finally, logistical regressions were carried out in order to determine the effect of housing characteristics on the risk of death after controlling demographic characteristics, such as age, sex, household type, marital status, nationality, region. In next steps, we then added information on the socio-economic status (educational level, occupation, and income level).

Results

Socio-demographic characteristics and housing conditions: In 2011, 1% of dwellings did not have a bathroom and 13% did not have central heating, compared to respectively 9% and 36% in 1991. Occupancy density is harder to compare, as the measure scale changed over time. As an example, in 1991, 1% of the population lived in less 10 m² per inhabitant while 5% of the population lived in less than 1 room per inhabitant in 2011. People with poorer quality housing are on average more disadvantaged, less educated, and more often unemployed or inactive than people living in high quality housing. They were also more likely to be unmarried (divorced, widowed, single) and younger. The housing tenure and comfort appeared to be important socio-demographic markers. However, in 2011, socioeconomic differences according to the housing global quality are decreasing. As an example, higher education graduates were more often living in poorer housing conditions than 20 years before. One reason may be that life course disruptions, such as a divorce or unemployment, tended to affect a larger population in 2011 than in 1991, through a loss of income and subsequent change and loss of housing quality.

In 2011, 62% of people living in Belgium were homeowners, and 26% were tenants. For remaining 12%, housing information was missing. These proportions seem stable over time,

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[1] The three censuses have different collection methods and the 2001 census is particular: it includes rich information about neighborhood and environmental satisfaction of the household, but it is also self-administered and presents a high missing values rate.

[2] This score was first divided into quartiles (25%) of population. However, the first quartile gathered very heterogenous situations, with scores from about 0.0 to 3.0.

[3] Results according to housing score quartiles were generated, but this type of division was discarded.

since already in 1991, Belgium had 60% of owners and 25% of tenants. Tenants have on average lower quality housing compared to owners, due to a lack of bathroom, central heating or higher occupancy density. Tenants were on average younger, more often foreigners, living in Brussels, and were less often married than owners. At the same time, homeowners were on average better endowed than tenants, in terms of education and employment levels. housing quality.

Figure 1 - Socio-demographic characteristics of the population living in poor housing conditions (score lower than 2,2/4) and of renters. Source : National Register and population census, author's calculation.
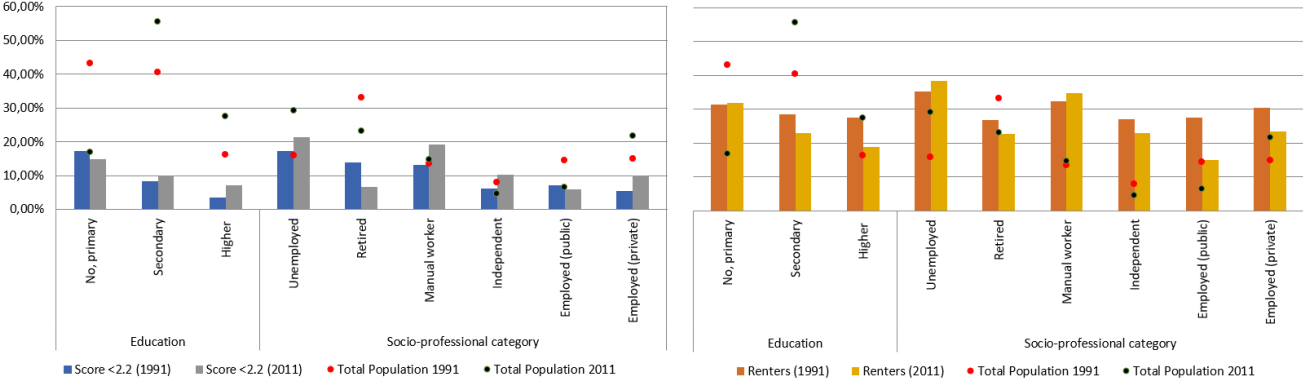
Housing quality and life expectancy: Comparing the 2010s to the 1990s, life expectancies had increased for the vast majority of the Belgian population, but not at the same rate for everyone, which extenuates social inequalities. Over the period 2011-2015, homeowners and tenants showed a life expectancy gap of 5.7 years for men and 3.8 years for women. Compared to the period 1992-1996, this gap has widened. The use of the Arriaga method shows the absolute and relative contribution of duodecimal age groups to the change in life expectancy between 1992-1996 and 2011-2015, depending on housing conditions. The age groups that have contributed to the increase in life expectancy of homeowners are generally older than those who rent. Owners are ahead of tenants in terms of health transition, expressed in the postponement of deaths to very old ages (Meslé, Vallin, 2002).

Figure 2 – Life expectancy and housing tenure. Source: National Register and population census, author's calculation.

Dimensions	Modalities	Male			Female		
		1992-1996	2011-2015	Rise in time	1992-1996	2011-2015	Rise in time
Housing Tenure	Tenant	70,6	74,2	3,6	78,8	81,0	2,2
	Owner	74,8	79,9	5,1	81,2	84,8	3,6
	Gaps between statuses	*4,2*	*5,7*		*2,4*	*3,8*	

Note: As a next step, the same process should be carried out for the degrees of housing score.

Regression results: After controlling for demographic characteristics in Model 1(-a for housing quality, -b for tenure), there remains an excess mortality rate among tenants compared to homeowners. Individuals living in poorer housing conditions (score<2.2) are associated with a higher mortality rate than individuals with an intermediate score of housing quality (from 2.2 to 3 out of 4). People living in high quality housing (score>3) have lower risk of mortality than people whose housing conditions are intermediate. These results remained robust, when including in Model 2 education level and occupational category and in Model 3 average income level (time-varying).

Figure 3 – Logistic regression results (on the risk of death on the 2011-2015 period). Source: National Register and population census, author's calculation.

		Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
Housing score (ref : score between 2,2 and	Score < 2,2	1.17	1.09	1.08			
	Score > 3	0.74	0.78	0.81			
Housing tenure (ref : owner)	Tenant				1.38	1.31	1.25

Note 1: Model 1: control for age, household configuration, marital status, region, nationality; Model 2: control for previous + education, socio-professional category; Model 3: control for previous + income. Models b also control for presence of a bathroom, of a central heating and for occupancy density.

Note 2: Results are all significant (p<0.01), as population data were used.

Conclusion

This study contributes to a better understanding of the relation between housing and mortality, by showing that housing conditions have a specific effect on the risk of death, in addition to other socio-economic characteristics. Ensuring good housing conditions seems a necessary step to reduce inequalities that should be considered in social policies. However, we cannot claim any causal link between housing conditions and life expectancy. A previously fragile health status may have led or interfere in a certain social marginalization and poorer housing conditions. Future studies may dig deeper into the causal relations between housing and health outcomes.

One asset of this study clearly is the use large population data that covers nearly 100% of Belgian residents. The dataset did however not allow us to examine housing history or housing transitions, as we only had housing information at the time of censuses.

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