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# Housing Material Conditions, Psychological Wellbeing, and Risk of Cardiovascular and All-Cause Mortality: Evidence from a Lithuanian Cohort

**Rachel A. Cooper[1], Daniel P. Hayes[2]*, Melissa J. Stone[1]**

[1]Department of Social Work, College of Health Sciences, University of Michigan, Ann Arbor, United States.
[2]Department of Health Behavior and Health Education, School of Public Health, University of Michigan, Ann Arbor, United States.

***E-mail** ✉ daniel.hayes@outlook.com

## Abstract

To investigate the links between household possessions and facilities and psychological wellbeing (PWB), as well as their connections to overall mortality and deaths from cardiovascular disease (CVD). This research drew on data from the HAPIEE study. Mortality information for CVD and all causes was obtained from the Lithuanian Mortality Register, tracking outcomes from the initial survey (2006–2008) through 2023. Analyses employed logistic regression and multivariable Cox proportional hazards models.

Adjusted regression analyses revealed that material living conditions affected PWB: each additional household item was associated with higher odds of better PWB in men [OR = 1.14 (95% CI 1.11–1.18)] and women [OR = 1.13 (95% CI 1.11–1.17)]. It also reduced the hazard of all-cause mortality and CVD mortality in women [HR = 0.93 (95% CI 0.91–0.96) and HR = 0.91 (95% CI 0.87–0.95), respectively] and in men [HR = 0.92 (95% CI 0.90–0.94) and HR = 0.90 (95% CI 0.87–0.93), respectively]. The findings indicate that ownership of household items and amenities is linked to improved PWB and could serve as indicators for evaluating the risk of overall and CVD-related mortality.

**Keywords:** Longitudinal study, Housing items, CVD mortality risk, All-cause mortality, Psychological wellbeing

## Introduction

Living conditions within the home, including the availability of household items and amenities, constitute an important determinant of health and wellbeing. Adequate housing infrastructure and utilities contribute to physical safety, daily comfort, and environments that support positive health outcomes [1, 2]. Ownership of household items may influence psychological wellbeing (PWB) through a combination of material, psychosocial, and economic pathways. These include enhanced material security, greater perceived control over one's living environment, improved daily functioning, and symbolic meanings related to social position, personal identity, and emotional connection to the home [3, 4].

Household possessions such as domestic appliances and electronic equipment often serve as indicators of economic resources and stability, which may reduce uncertainty and psychological strain associated with unmet needs. Moreover, possession of specific assets or amenities—such as advanced household technologies, high-value electronics, private vehicles, agricultural land, or access to a garden—may reflect social achievement or prestige. Such characteristics can strengthen self-worth and social validation, both of which are closely linked to PWB. Taken together, these material and psychosocial benefits may contribute to higher life satisfaction, lower stress levels, and improved psychological and overall health [1, 5, 6]. Previous research has further demonstrated that elevated PWB is

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associated with improved survival outcomes [7, 8], including a reduced risk of death from cardiovascular diseases (CVD) [9, 10].

In Lithuania, demographic trends mirror those observed across Europe, with a growing proportion of older adults. Despite progress in CVD diagnosis and management, the burden of cardiovascular mortality remains exceptionally high. National data indicate that in 2022, diseases of the circulatory system were responsible for 52.5% of all deaths, according to the Center for Health Information of the Institute of Hygiene (Lithuania) [11]. While conventional risk factors for chronic disease morbidity and mortality, including CVD, are well established [12], there is increasing recognition of the role played by broader social and material conditions in shaping health and psychological wellbeing. Against this background, the present study aimed to investigate the relationship between housing items and amenities and PWB, and to evaluate their potential association with all-cause and CVD mortality risk, with attention to sex-specific differences.

## Materials and Methods

*Study population*

The present analysis is based on data from Lithuania collected within the Health, Alcohol and Psychosocial Factors in Eastern Europe (HAPIEE) project, a large-scale longitudinal study implemented across four countries [13]. The Lithuanian cohort was established in Kaunas city between 2006 and 2008 and included adults aged 45–72 years. Participants were randomly drawn from the Lithuanian National Population Register using predefined age- and sex-stratified sampling procedures. Of the 10,980 individuals invited to participate, 7,115 completed the baseline assessment, yielding a participation rate of 64.8%.

Following enrollment, participants were prospectively observed for mortality outcomes until 31 December 2022. Deaths due to all causes and cardiovascular disease (CVD) were identified during the follow-up period. Individuals with incomplete data on variables required for the analysis were excluded (n = 643). The main reasons for exclusion included technical difficulties in obtaining blood samples, refusal to undergo blood testing, or incomplete questionnaire responses. In most cases, excluded participants were comparable to those retained in the cohort with respect to other measured characteristics. The final analytical sample comprised 6,472 individuals (2,909 men and 3,563 women).

Ethical approval for the study was granted by the Kaunas Regional Biomedical Research Ethics Committee, Lithuania (11 January 2005; No. 05/09), and by the Ethics Committee of University College London, United Kingdom. All participants provided written informed consent prior to participation.

*Baseline sociodemographic characteristics, health behaviors, and psychological wellbeing*

Information on demographic characteristics, lifestyle factors, and psychological wellbeing (PWB) was collected at baseline using standardized instruments developed in accordance with the HAPIEE study protocol [13]. Data obtained included participants' sex, age, educational attainment, marital status, subjective health assessment, smoking behavior, and related variables.

Educational level was dichotomized into secondary education or less and post-secondary education (college level or higher). Marital status was recorded in five categories: married, cohabiting, single, divorced, or widowed. Self-rated health was assessed by asking participants to evaluate their health during the previous 12 months, with responses grouped as poor, good, or very good. Smoking status was classified into current smokers (individuals who smoked at least one cigarette daily), former smokers, and never smokers.

Psychological wellbeing was assessed at baseline using the Control, Autonomy, Self-realization and Pleasure (CASP-12) questionnaire [14]. The scale consists of 12 items, each rated according to frequency of experience (often, sometimes, not often, never). Total scores range from 12 to 48, with higher scores indicating better psychological wellbeing. The internal reliability of the CASP-12 scale in this study was acceptable (Cronbach's alpha = 0.74). For analytical purposes, participants were categorized as having higher PWB if their score was at or above the sex-specific median (≥40 for men and ≥38 for women).

*Measurement of housing resources and amenities*

Household material conditions were assessed using items drawn from the standardized questionnaire employed in the HAPIEE study [13]. For the current analysis, information on 20 specific housing-related possessions and amenities was included. A composite housing score

was constructed by calculating the total number of items reported as available within each household.

For analytical purposes, housing possessions were conceptually classified into three categories reflecting different levels of material function and social meaning. The first category, basic needs, consisted of essential infrastructure and household appliances, including central heating, access to hot water, centralized water and sewage systems, a microwave oven, washing machine, refrigerator, and access to a landline or mobile phone. The second category, referred to as socially oriented needs, included items associated with communication, mobility, and social participation, such as a colour television, video player, home internet connection, personal computer, and car ownership. The third category, defined as luxury items, encompassed possessions indicative of higher material comfort or wealth, including a freezer, dishwasher, satellite or cable television, DVD player or recorder, video camera or portable video camera with playback capability, ownership of a second dwelling, and possession of agricultural land or a garden [5]. Information on housing items and amenities was collected exclusively at baseline during the 2006–2008 survey period.

*Additional variables*

*Definition and assessment of metabolic syndrome*

Metabolic syndrome was identified based on the criteria outlined in the Third Report of the National Cholesterol Education Program Adult Treatment Panel III (NCEPATP III) [15]. Elevated triglyceride concentrations were defined as values ≥1.7 mmol/L. Reduced high-density lipoprotein (HDL) cholesterol was defined as <1.0 mmol/L for men and <1.3 mmol/L for women. Impaired glucose regulation was defined by a fasting glucose concentration of at least 6.1 mmol/L. Abdominal obesity was determined using waist circumference thresholds (>102 cm for men and >88 cm for women). Raised blood pressure was defined as systolic blood pressure exceeding 130 mmHg and/or diastolic blood pressure exceeding 85 mmHg. A diagnosis of metabolic syndrome was assigned when three or more of these five criteria were present.

Anthropometric measurements were obtained following standardized protocols. Waist circumference was measured at the level of the navel using a flexible measuring tape during relaxed respiration. Blood pressure was recorded three times at two-minute intervals using an Omron M5-I automated sphygmomanometer. Venous blood samples were collected in the fasting state by trained nursing personnel. Serum concentrations of triglycerides and HDL cholesterol were determined using standard enzymatic techniques. All lipid analyses were conducted at the WHO Regional Lipid Reference Centre, Institute of Clinical and Experimental Medicine, Prague (Czech Republic). Capillary blood glucose levels were measured using an individual “Glucotrend” glucometer [16].

*Cardiovascular diseases*

Cardiovascular disease (CVD) in this study included coronary heart disease (CHD) and/or stroke, ascertained at baseline. CHD diagnosis relied on three approaches: firstly, evidence of prior myocardial infarction (MI) or ischemic ECG alterations classified under Minnesota codes (MC) 1–1 or 1–2 [17]; secondly, exertion-related angina identified via the G. Rose questionnaire (excluding cases with MI or MC 1–1/1–2) [18]; thirdly, other ECG anomalies coded as MC 1–3, 4–1, 4–2, 4–3, 5–1, 5–2, 5–3, 6–1, 6–2, 7–1, or 8–3 (in the absence of MI, MC 1–1/1–2, or angina). Prior stroke was evaluated by asking respondents: “Has a doctor ever told you that you have had a stroke?” Reported cases were cross-checked against hospital documentation.

*Mortality follow-up*

Death records were sourced from the Official Lithuanian Mortality Register, derived from death certificates, covering the period from baseline (2006) through 31 December 2022. Causes were coded according to the International Classification of Diseases, 10th Revision (ICD-10). Overall mortality encompassed codes A00–Z99, whereas CVD deaths were identified using codes I00–I99. Median follow-up time was 14.5 years among men and 15.3 years among women.

*Statistical methods*

All computations were carried out with IBM SPSS Statistics (Version 29.0) (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 29.0. Armonk, NY, United States). Continuous variables were checked for normal distribution using skewness and kurtosis statistics. Analyses were stratified by gender. Summary statistics (percentages, means, standard deviations, and medians) were generated separately for men and women. Normally distributed continuous data were compared between sexes via independent t-tests; non-normal data used the Mann-Whitney U test.

Categorical data differences were examined with chi-squared tests and z-tests. A p-value below 0.05 indicated significance.

To explore links between housing possessions/amenities (categorized as basic, socially oriented, or luxury) and elevated psychological wellbeing (PWB), logistic regression provided odds ratios (ORs) with 95% confidence intervals (CIs). Each category was grouped into tertiles (lowest tertile as reference), with all categories entered simultaneously. Adjustments included sex, age, education level, self-rated health, and marital status. A separate logistic model tested the effect of a one-unit rise in total household items on PWB odds.

Cox proportional hazards models, adjusted for multiple covariates, yielded hazard ratios (HRs) and 95% CIs for overall and CVD-specific mortality risks by gender. Category-specific risks were estimated in a combined model, controlling for age, education, smoking, metabolic syndrome, and prevalent CVD at baseline (the latter only for CVD outcomes). Additional Cox analyses examined mortality hazards linked to a one-unit increment in total household items.

**Results and Discussion**

The analytical cohort consisted of 6,472 individuals aged 45–72 years, of whom 2,909 were men (44.9%) and 3,563 were women (55.1%).

Sex-specific baseline characteristics are presented in **Table 1**. At study entry, mean age was comparable between men and women. However, notable differences were observed in the distribution of biological and lifestyle-related risk factors. Men exhibited a higher prevalence of elevated blood pressure and were more likely to be regular smokers compared with women. In contrast, women showed a greater prevalence of metabolic syndrome and several of its components, including abdominal obesity and reduced high-density lipoprotein (HDL) cholesterol levels. Women also reported poorer self-rated health and had lower average psychological wellbeing (PWB) scores than men.

The proportion of participants with cardiovascular disease (CVD) at baseline did not differ significantly between sexes. During the follow-up period, however, mortality outcomes varied markedly by sex. Both all-cause mortality and CVD-specific mortality were substantially higher among men than women, with approximately 1.8-fold higher death rates observed in men ($p < 0.001$). Specifically, all-cause mortality reached 17.4% (95% CI: 16.0–18.8) in men compared with 9.5% (95% CI: 8.5–10.5) in women.

**Table 1.** Baseline characteristics of men and women participating in the Health, Psychosocial Factors and Alcohol in Eastern Europe study, Lithuania, Kaunas (2006–2008).

| Variable | Females (N = 3,563) | Males (N = 2,909) | p-value |
|---|---|---|---|
| Age, years (mean ± SD) | 60.4 ± 7.6 | 60.5 ± 7.6 | 0.164 |
| Education (%) | | | |
| Secondary or lower | 40.3 | 48.1 | <0.001 |
| College or higher | 59.7 | 51.9 | <0.001 |
| Self-rated health (%) | | | |
| Very good | 21.1 | 33.0 | <0.001 |
| Good | 61.6 | 56.2 | <0.001 |
| Poor | 17.3 | 10.8 | <0.001 |
| Psychological wellbeing (mean ± SD) | 37.6 ± 6.2 | 39.2 ± 5.5 | <0.001 |
| Marital status (%) | | | |
| Married | 56.0 | 84.0 | <0.001 |
| Divorced | 15.8 | 7.4 | <0.001 |
| Single | 5.7 | 1.9 | <0.001 |
| Cohabiting | 0.8 | 1.4 | <0.001 |
| Widowed | 21.7 | 5.3 | <0.001 |
| Components of metabolic syndrome (%) | | | |

| | | | |
|---|---|---|---|
| Elevated blood pressure (≥130/85 mmHg) | 74.2 | 85.3 | <0.001 |
| Increased waist circumference (men ≥102 cm, women ≥88 cm) | 53.0 | 28.9 | <0.001 |
| Low HDL cholesterol (men <1.0 mmol/L, women <1.3 mmol/L) | 25.3 | 12.0 | <0.001 |
| Elevated triglycerides (≥1.7 mmol/L) | 27.3 | 27.5 | 0.909 |
| Elevated fasting glucose (≥6.1 mmol/L) | 32.5 | 32.0 | 0.699 |
| Total housing items and amenities (mean ± SD)[a] | 12.2 ± 3.1 | 13.2 ± 3.1 | <0.001 |
| Psychological wellbeing categories (%) | | | |
| Higher | 44.7 | 47.1 | 0.06 |
| Lower | 55.3 | 52.9 | 0.06 |
| Current regular smoking (%) | 9.9 | 30.1 | <0.001 |
| Metabolic syndrome (%) | 38.0 | 28.1 | <0.001 |
| Housing items and amenities categories | | | |
| Socially oriented needs (number of items, %) | | | |
| 0–1 | 29.9 | 14.1 | <0.001 |
| 2–3 | 36.5 | 40.0 | <0.001 |
| 4–5 | 33.6 | 45.9 | <0.001 |
| Basic needs (number of items, %) | | | |
| 0–4 | 3.1 | 3.0 | 0.408 |
| 5–6 | 15.3 | 10.6 | <0.001 |
| 7–8 | 81.6 | 86.4 | <0.001 |
| Luxury items (number of items, %) | | | |
| 0–1 | 32.2 | 22.8 | <0.001 |
| 2–3 | 47.1 | 47.8 | 0.287 |
| 4–7 | 20.7 | 29.4 | <0.001 |
| Follow-up duration, median (years) | 15.3 | 14.5 | <0.001 |
| Cardiovascular disease mortality (%) | 9.5 | 17.4 | <0.001 |
| Baseline cardiovascular disease prevalence (%) | 22.3 | 20.4 | 0.069 |
| All-cause mortality (%) | 19.4 | 36.8 | <0.001 |

CVD, cardiovascular diseases; HDL, high-density lipoprotein; SD, standard deviation.

[a] Household material conditions were assessed using information on ownership of 20 domestic items and amenities. For analytical purposes, these assets were classified into three conceptual groups. The first group, basic needs, included eight items reflecting essential living infrastructure (central heating, hot water, sewage connection, water supply, microwave oven, washing machine, refrigerator, and telephone or mobile phone). The second group represented socially oriented needs and comprised five items facilitating social participation and connectivity (colour television, video player, home internet access, personal computer, and car ownership). The third group, defined as luxury items, consisted of seven assets indicating higher material affluence (freezer, dishwasher, satellite or cable television, DVD player or recorder, video camera or portable video camera with playback function, ownership of an additional dwelling, and agricultural land or garden).

Men reported ownership of a greater number of housing-related items than women overall. Moreover, higher ownership categories within each housing domain—basic needs (7–8 items), socially oriented needs (2–3 and 4–5 items), and luxury items (4–7 items)—were more commonly observed among male participants. These observed sex differences prompted further investigation into whether household material resources were differentially associated with psychological wellbeing (PWB) in men and women, and whether incremental increases in owned items translated into a higher likelihood of favourable PWB.

After accounting for age, educational level, self-rated health, and marital status, material living conditions remained independently associated with PWB in both sexes. Specifically, each additional housing item was associated with a statistically significant increase in the odds of reporting higher PWB, with an odds ratio of 1.14 (95% CI: 1.11–1.18; $p < 0.001$) among men and 1.13 (95% CI: 1.11–1.17; $p < 0.001$) among women.

Sex-stratified associations between PWB and the three housing domains—basic needs, socially oriented needs, and luxury items—are presented in **Table 2**. All estimates shown were derived from models adjusted for age, educational attainment, self-rated health, and marital status.

**Table 2.** Sex-specific odds ratios for higher psychological wellbeing across categories of amenities and housing items (Health, Psychosocial Factors and Alcohol in Eastern Europe study, Kaunas, Lithuania, 2006–2008).

| Housing domain | Women: Adjusted OR* | 95% CI | p-value | Total population: Adjusted OR** | 95% CI | p-value | Item ownership category | Men: Adjusted OR* | 95% CI | p-value |
|---|---|---|---|---|---|---|---|---|---|---|
| **Social participation–related items** | 1.00 | — | — | 1.00 | — | — | 0–1 (reference) | 1.00 | — | — |
| | 1.32 | 1.09–1.60 | 0.004 | 1.38 | 1.19–1.61 | <0.001 | 2–3 | 1.47 | 1.15–1.90 | 0.003 |
| | 1.43 | 1.14–1.79 | 0.002 | 1.49 | 1.25–1.78 | <0.001 | 4–5 | 1.62 | 1.22–2.15 | 0.001 |
| **Basic household needs** | 1.00 | — | — | 1.00 | — | — | 0–4 (reference) | 1.00 | — | — |
| | 1.85 | 1.18–2.90 | 0.008 | 1.44 | 1.02–2.02 | 0.036 | 5–6 | 1.05 | 0.63–1.76 | 0.850 |
| | 2.01 | 1.32–3.08 | 0.001 | 1.53 | 1.12–2.10 | 0.008 | 7–8 | 1.08 | 0.67–1.75 | 0.741 |
| **Luxury-related assets** | 1.00 | — | — | 1.00 | — | — | 0–1 (reference) | 1.00 | — | — |
| | 1.40 | 1.18–1.66 | <0.001 | 1.48 | 1.30–1.69 | <0.001 | 2–3 | 1.59 | 1.29–1.96 | <0.001 |
| | 1.94 | 1.53–2.45 | <0.001 | 2.09 | 1.77–2.48 | <0.001 | 4–7 | 2.30 | 1.79–2.94 | <0.001 |

OR* (odds ratios) adjusted for education, age, marital status and self-rated health.
OR** (odds ratios) adjusted for age, sex, self-rated health, education, and marital status.
CI, confidence interval.

Household material assets were classified into three domains: basic household necessities, comprising eight items (central heating, hot water, centralized sewage and water supply, microwave oven, washing machine, refrigerator, and landline or mobile phone); social participation–related assets, including five items (colour television, video player, home internet access, personal computer, and car); and luxury-related assets, consisting of seven items (freezer, dishwasher, satellite or cable television, DVD player or recorder, video or portable video camera with playback function, ownership of a second dwelling, and agricultural land or a garden).

Ownership of essential household facilities was associated with a statistically significant increase in the likelihood of higher psychological wellbeing only among women. In contrast, greater possession of assets linked to social engagement and luxury was consistently related to higher psychological wellbeing in both men and women. When analysing the entire study population, with additional adjustment for sex, the odds of exhibiting higher psychological wellbeing rose significantly as the number of owned items increased across all three housing domains. These findings indicate that improved material living conditions are positively related to psychological wellbeing, which may subsequently contribute to a lower risk of both all-cause and cardiovascular mortality.

**Table 3** summarizes the results of multivariable Cox regression analyses examining the relationship between

household asset ownership and mortality outcomes from all causes and from cardiovascular disease among men and women over the follow-up period. These models were adjusted for age, educational attainment, smoking status, presence of metabolic syndrome, psychological wellbeing status, and baseline cardiovascular disease (included only in models assessing cardiovascular mortality).

**Table 3.** Associations between housing items and amenities, psychological wellbeing, and the risk of all-cause and cardiovascular mortality by sex (Health, Psychosocial Factors and Alcohol in Eastern Europe study, Kaunas, Lithuania, 2006–2008).

| Housing items and amenities (number owned) | Women | | | Men | | |
|---|---|---|---|---|---|---|
| | All-cause mortality | | CVD mortality | All-cause mortality | | CVD mortality |
| | HR* | 95% CI | HR** | HR* | 95% CI | HR** |
| **Socially oriented assets** | | | | | | |
| 0–1 | 1.00 | Reference | 1.00 | 1.00 | Reference | 1.00 |
| 2–3 | 0.77 | 0.64–0.92 | 0.78 | 0.86 | 0.72–1.02 | 0.78 |
| 4–5 | 0.84 | 0.65–1.08 | 0.73 | 0.67 | 0.55–0.83 | 0.56 |
| **Luxury-related assets** | | | | | | |
| 0–1 | 1.00 | Reference | 1.00 | 1.00 | Reference | 1.00 |
| 2–3 | 0.94 | 0.79–1.11 | 1.01 | 0.89 | 0.76–1.03 | 0.88 |
| 4–7 | 0.66 | 0.48–0.91 | 0.57 | 0.74 | 0.60–0.91 | 0.71 |
| **Psychological wellbeing (PWB)** | | | | | | |
| Lower | 1.00 | Reference | 1.00 | 1.00 | Reference | 1.00 |
| Higher | 0.84 | 0.71–0.98 | 0.78 | 0.79 | 0.70–0.90 | 0.86 |
| **Basic household needs** | | | | | | |
| 0–4 | 1.00 | Reference | 1.00 | 1.00 | Reference | 1.00 |
| 5–6 | 0.81 | 0.55–1.18 | 0.74 | 0.99 | 0.69–1.40 | 0.83 |
| 7–8 | 0.76 | 0.53–1.08 | 0.65 | 0.82 | 0.60–1.13 | 0.63 |

CI, confidence interval; CVD, cardiovascular diseases.
HR* were derived from models adjusted for age, educational attainment, smoking status, and the presence of metabolic syndrome; these models additionally incorporated psychological wellbeing categories and all housing item and amenity groups. Hazard ratios marked
HR** were calculated using the same set of covariates as
HR*, with the further inclusion of baseline cardiovascular disease for analyses of all-cause mortality.
PWB - wellbeing.

Household material conditions were classified into three domains. The basic needs category included eight essential household facilities (central heating, hot water, centralized sewage and water supply, microwave oven, washing machine, refrigerator, and landline or mobile telephone). The socially oriented needs category comprised five assets associated with social participation and communication (colour television, video player, home internet access, personal computer, and car ownership). The luxury category consisted of seven indicators of higher material affluence (freezer, dishwasher, satellite or cable television, DVD player or recorder, video or portable video camera with playback capability, ownership of a second dwelling, and agricultural land or a garden).

Among men, possession of a higher number of socially oriented assets (4–5 items) and luxury items (4–7 items), compared with minimal ownership (0–1 item in each category), was associated with a marked reduction in mortality risk. Specifically, all-cause mortality was reduced by approximately 33% and 26%, respectively, while cardiovascular mortality declined by about 44% and 29%. In addition, men with the highest level of basic household facilities (7–8 items) experienced a statistically significant reduction of approximately 37% in cardiovascular mortality risk relative to those with the lowest level of basic amenities (0–4 items).

In women, ownership of luxury items demonstrated the strongest association with survival outcomes. Women possessing 4–7 luxury assets had, on average, a 34% lower risk of death from all causes and a 43% lower risk of cardiovascular mortality compared with those owning 0–1 luxury item.

Consistent findings were observed when the total number of housing items was analysed as a continuous variable. After adjustment for age, education, smoking status, metabolic syndrome, psychological wellbeing, and baseline cardiovascular disease, each additional housing item was associated with a significant reduction in mortality risk. In men, every one-unit increase in housing item count corresponded to an average decrease of 8% in all-cause mortality risk [HR = 0.92 (95% CI 0.90–0.94; $p < 0.001$)] and a 10% reduction in cardiovascular mortality risk [HR = 0.90 (95% CI 0.87–0.93; $p < 0.001$)]. Comparable protective effects were observed in women, with each additional item associated with a 7% reduction in all-cause mortality [HR = 0.93 (95% CI 0.91–0.96; $p < 0.001$)] and a 9% decrease in cardiovascular mortality risk [HR = 0.91 (95% CI 0.87–0.95; $p < 0.001$)].

Psychological wellbeing (PWB) is shaped by a wide range of interacting influences, including personal characteristics, social relationships, and broader community and environmental contexts. Consequently, interventions aimed at improving housing-related material conditions that support PWB may represent one component of an integrated strategy to enhance population health and potentially mitigate mortality risks linked to cardiovascular and other chronic diseases.

In the present study, we examined the associations between ownership of housing items and amenities and PWB, as well as the combined impact of these factors on all-cause and cardiovascular disease (CVD) mortality. Although the relevance of material living conditions for health outcomes has been widely acknowledged, housing items and amenities have rarely been examined as standalone predictors. Instead, they are commonly embedded within composite indicators such as socioeconomic status indices or the HOUSES Index [19, 20], or treated as one dimension of broader social determinants of health [21]. The key contribution of this study lies in its analytical approach: housing items and amenities were modelled as independent exposure variables, allowing us to directly evaluate their associations with PWB and their potential implications for overall and CVD-specific mortality.

Our findings demonstrate that each incremental increase in the number of housing items and amenities was associated with a higher likelihood of favourable PWB in both sexes, even after controlling for age, education, self-rated health, and marital status. Specifically, the odds of higher PWB increased by approximately 14% in men and 13% in women per additional item. When housing items were further classified into basic needs, socially oriented needs, and luxury categories, distinct sex-specific patterns emerged. Among men, ownership of socially oriented and luxury items was associated with higher PWB, whereas basic household necessities showed no significant association. In contrast, women demonstrated increased odds of higher PWB with greater ownership across all three categories, particularly for basic needs. These findings suggest that, on average, men's psychological wellbeing may be more strongly influenced by items that enhance lifestyle quality and social participation rather than by essential household infrastructure. Nevertheless, such interpretations should be approached cautiously, as individual preferences are shaped by multiple factors including age, cultural context, and life experiences.

Evidence from a cross-sectional study conducted in Pakistan reported that housing amenities and marital status were associated with reduced psychological distress among women only, while financial strain emerged as a stronger predictor of distress among men [22]. These sex-specific patterns were interpreted within the context of traditional gender roles in Pakistan, where men are typically viewed as primary economic providers and women are more closely involved in family and relational dynamics [22]. Due to substantial cultural and social differences, particularly regarding gender equality, these findings cannot be directly extrapolated to the Lithuanian context. Moreover, we identified a notable gap in the literature, as few contemporary studies from countries geographically or culturally closer to Lithuania have examined sex-specific associations between housing amenities, PWB, and mortality. Nonetheless, our results suggest that differing priorities and expectations between men and women may partly explain why basic household amenities were associated with PWB in women but not in men, whereas socially oriented and luxury items were relevant for both sexes.

The relationship between housing conditions and all-cause mortality is inherently complex and influenced by numerous interrelated factors, including health behaviours, socioeconomic position, and environmental

exposures. Previous studies have largely focused on broader socioeconomic indicators and lifestyle factors when examining mortality outcomes [23, 24]. However, evidence from pooled HAPIEE study samples across Central and Eastern Europe and former Soviet Union countries has shown a clear inverse gradient between household amenities and mortality, with the highest mortality observed among individuals in the lowest tertile of amenities [23]. Similarly, findings from the EPIPorto Cohort Study indicated that residence in substandard or social housing was associated with higher mortality, independent of education and occupation, suggesting that housing quality exerts an influence beyond traditional socioeconomic measures [25]. Notably, the strength of the association between poor housing and mortality in that study exceeded that of several established risk factors, including hypertension, obesity, physical inactivity, and heavy alcohol consumption [25]. Longitudinal evidence from Belgium further supports these conclusions, showing lower mortality rates among individuals living in adequate housing compared with those experiencing housing deprivation [26].

Despite the lack of consensus on specific housing items that directly affect mortality, our study sought to clarify whether ownership of housing items, treated as independent exposures, was associated with survival outcomes. The results of the Cox proportional hazards models indicated that each additional housing item was linked to a meaningful reduction in all-cause mortality risk, even after adjustment for multiple confounders including age, education, smoking status, metabolic syndrome, PWB, and follow-up duration. On average, mortality risk decreased by approximately 7%–8% per additional item in both men and women. Furthermore, ownership of luxury items was consistently associated with lower all-cause mortality in both sexes, while socially oriented items were protective primarily among men.

Research directly linking housing amenities to CVD mortality remains limited. A systematic review by Parekh *et al*. primarily focused on housing instability and food insecurity as determinants of cardiovascular outcomes, rather than specific household amenities [27]. More recent longitudinal analyses in the United States have demonstrated that housing and food insecurity contribute to chronic stress and related conditions—such as hypertension, diabetes, depression, and anxiety—which in turn elevate CVD risk and mortality [28]. Although the 2021 European Society of Cardiology guidelines highlight the multifactorial nature of cardiovascular health, encompassing genetic, behavioural, and environmental influences [12], few studies have evaluated housing amenities as independent predictors of CVD mortality.

In our analyses, increasing the number of housing items was associated with a significant reduction in CVD mortality risk in both sexes, even after controlling for baseline CVD and other major confounders. Each additional housing item corresponded to an approximate 9%–10% reduction in CVD mortality risk. As observed for all-cause mortality, ownership of luxury items emerged as a particularly strong protective factor against CVD-related death. Comparable findings have been reported in studies from Israel, where household amenities were shown to be a strong indicator of socioeconomic inequalities in both overall and cardiovascular mortality among men and women [29, 30].

While conventional socioeconomic indicators remain central to understanding health inequalities, our findings highlight the underexplored but significant role of housing items and amenities. By analysing these factors as independent variables, this study provides a more detailed perspective on how material living conditions relate to psychological wellbeing and mortality from non-communicable diseases. Our results suggest that housing amenities not only complement traditional risk factors but may also interact with psychological pathways to influence long-term health outcomes. Recognizing these complex interactions is essential for developing comprehensive public health strategies. Increasingly, both researchers and policymakers acknowledge that multidisciplinary approaches are required to address the diverse and interconnected determinants of health and wellbeing.

*Strengths and limitations*

A key advantage of the present investigation is its prospective cohort design combined with a large, population-based sample. Additional strengths include the use of standardized and validated data collection procedures, an extended follow-up period, and comprehensive statistical adjustment for a wide range of potential confounders. In the fully adjusted multivariable regression models, seven relevant covariates were taken into account, enhancing the robustness of the observed associations.

Several limitations should also be acknowledged. First, although numerous confounding factors were controlled for, information on family history of cardiovascular disease was not available for inclusion in the analyses, which may have influenced the estimated associations. Second, several variables—including psychological wellbeing, self-rated health, and smoking behaviour—were based on self-reported data and therefore subject to recall bias or reporting inaccuracies, potentially leading to either underestimation or overestimation of effects. Third, both housing item ownership and psychological wellbeing were assessed only at baseline (2006–2008), preventing evaluation of temporal changes in these factors over the life course of participants. Finally, detailed information regarding the onset of new diseases, comorbid conditions, emerging lifestyle risk factors, or their duration during the follow-up period was not available, limiting more granular interpretation of long-term health trajectories.

## Conclusion

The findings of this study indicate that greater ownership of housing items and amenities—reflecting material living conditions—is associated with higher psychological wellbeing and may serve as a meaningful indicator in assessing the risk of all-cause and cardiovascular mortality. These results suggest that housing-related material factors should be considered within broader health promotion frameworks. Interventions aimed at improving housing conditions that support psychological wellbeing may contribute to better overall health outcomes and potentially reduce mortality risks related to cardiovascular and other chronic diseases.

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