Housing conditions and limitations in physical function among older adults.

Esther García-Esquinás, Bibiana Pérez-Hernández, Pilar Guallar-Castillón, José R. Banegas, José Luis Ayuso-Mateos, Fernando Rodríguez-Artalejo

1 Department of Preventive Medicine and Public Health, Universidad Autónoma de Madrid/Idipaz and CIBER of Epidemiology and Public Health (CIBERESP), Madrid, Spain.

2 Department of Psychiatry, Universidad Autónoma de Madrid/Instituto de Investigación del Hospital de la Princesa and CIBER of Mental health (CIBERSAM), Madrid, Spain.

Introduction: Housing conditions are an important social determinant of health. No previous study has systematically assessed the association between housing conditions and physical function limitations in older adults; moreover, whether this association is independent of socioeconomic status achieved earlier in life is uncertain.

Methods: Cross-sectional analysis conducted among 2012 non-institutionalized individuals aged ≥60 years, who participated in the Seniors-ENRICA cohort. Participants reported the following poor housing conditions: living in a walk-up building, lacking heating, or feeling cold frequently. We assessed lower extremity performance with the Short Physical Performance Battery [SPPB], mobility or agility limitations with standardized questions, frailty according with the Fried criteria, and disability in instrumental activities of daily living [IADL] with the Lawton & Brody questionnaire.

Results: In analyses adjusting for demographic, behavioral, and comorbidity variables, when compared to those living in homes without poor housing conditions, those with ≥2 poor conditions showed worse scores in the SPPB (beta:-1.06; 95%CI:-1.46;-0.65) and higher frequency of agility limitation (OR:1.62; 95%CI:1.00;2.61) and frailty (OR:8.78; 95%CI:3.00;25.6). These associations held after adjustment for educational and occupational level. Living in a walk-up building was associated with higher frequency of frailty, while lacking heating was linked to lower scores in the three SPPB tests, as well as with increased frequency of frailty and four of its components (exhaustion, slow walking speed, low physical activity and weakness).
Feeling cold was linked to increased exhaustion. No association was found between housing conditions and IADL disability.

**Conclusions:** Poor housing conditions are independently associated with limitations in physical function in older adults. This entails serious inequalities in functional status, which should be firmly addressed.

**Funding:** FIS grant nº 12/1166 (ISCIII, State Secretary of R+D+I, FEDER/FSE), the FRAILOMIC Initiative (EU FP7-HEALTH-2012-proposal nº 305483-2) and the ATHLOS project (EU H2020-project ID: 635316)
The association of lead and cadmium exposure with frailty in US older adults.

Esther García-Esquinasa,b, Ana Navas-Acienb,c,d, Beatriz Pérez-Gómez,e, Fernando Rodríguez Artalejoa.

a Department of Preventive Medicine and Public Health. School of Medicine. Universidad Autónoma de Madrid/ IdiPAZ, and CIBER of Epidemiology and Public Health (CIBERESP), Madrid, Spain
b Department of Environmental Health Sciences, Johns Hopkins University Bloomberg School of Public Health, Baltimore, Maryland
c Department of Epidemiology, Johns Hopkins University Bloomberg School of Public Health, Baltimore, Maryland
d Welch Center for Prevention, Epidemiology, and Clinical Research, Johns Hopkins University Bloomberg School of Public Health, Baltimore, Maryland
e Environmental Epidemiology and Cancer Unit, National Center for Epidemiology, Carlos III Institute of Health, and CIBER of Epidemiology and Public Health (CIBERESP), Madrid, Spain

Background: Environmental lead and cadmium exposure is associated with higher risk of several age-related chronic diseases, including cardiovascular disease, chronic kidney disease and osteoporosis. Moreover, these diseases may also lead to the frailty syndrome. However, no previous study has evaluated the association between lead or cadmium exposure with frailty in older adults.

Methods: Cross-sectional study among individuals aged ≥60 years who participated in the third U.S. National Health and Nutrition Examination Survey (NHANES III) and had either blood lead (N=5,272) or urine cadmium (N=4,887) determinations. Frailty was ascertained based on a slight modification of the Fried criteria. The association
between lead and cadmium with frailty was evaluated using logistic regression with adjustment for relevant confounders.

**Results:** Median (intertertile range) concentrations of blood lead and urine cadmium were 3.9 µg/dl (2.9-4.9) and 0.69 µg/g (0.52-0.98), respectively. The prevalence of frailty was 7.1%. The adjusted odds ratio (95% confidence interval) of frailty comparing the second and third to the lowest tertile of blood lead were, respectively, 1.40 (0.96-2.04) and 1.75 (1.33-2.31); p value for linear trend <0.01. Lead concentrations were also associated with the frequency of exhaustion, weakness and slowness. The corresponding odds ratios (95% confidence interval) for cadmium were, respectively, 0.70 (0.45-1.09) and 1.67 (1.05-2.66); p value for trend 0.03, but this association did not hold after excluding participants with reduced glomerular filtration rate: 1.12 (0.67-1.86) and 1.12 (0.82-1.53).

**Conclusions:** In the US older adult population, blood lead concentrations showed a direct dose-response relationship with frailty; by contrast, the results did not support an association between cadmium and frailty.

**Funding:** FIS grant nº 12/1166 (ISCIII, State Secretary of R+D+I, FEDER/FSE), the FRAILOMIC Initiative (EU FP7-HEALTH-2012-proposal nº 305483-2) and the ATHLOS project (EU H2020-project ID: 635316)