

1 **Cardboard floor: About the barriers for social progression and their impact on the**  
2 **representativeness of epidemiological studies.**

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23 **Abstract (111 words)**

24 The most disadvantaged extreme of the social continuum is usually underrepresented in  
25 epidemiological studies. We discuss the consequences of excluding this segment of the  
26 population and suggest different approaches for addressing this issue. In particular, we  
27 describe/analyse a barrier that tends to perpetuates people in the most disadvantaged  
28 extreme of the social continuum, hereinafter referred to as the “cardboard floor”. Besides,  
29 we propose different approaches to accessing to the least favoured, segment in order to  
30 study the cardboard floor. The adoption of these strategies could help to visualize this  
31 barrier, allowing to better monitoring social mobility and their expected health  
32 improvements, as well as increasing the representativity of population health studies.

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34 A continuum of socioeconomic status ranging from the least to the most privileged  
35 persons is evidenced in population studies, with profound implications for health and care  
36 [1]. Individuals in the most disadvantaged social group suffer from extreme poverty and  
37 face several specific challenges to their health and health care [2]. They frequently cannot  
38 meet their most basic needs (including their physiological needs, most acutely  
39 exemplified by homelessness) and are at a higher risk of health problems and accelerated  
40 aging due to unhealthy habits (e.g. unhealthy diet and drug consumption), harmful  
41 environmental and biological factors, and social isolation [1–4]. As a result, the most  
42 socially disadvantaged persons have higher rates of premature mortality, especially  
43 caused by suicide and violence, and higher prevalence of all types of diseases, particularly  
44 infectious diseases and mental disorders [2,5]. Besides, care for chronic conditions is  
45 compromised for this population group, which relies to a substantial degree on emergency  
46 care, particularly in health systems that do not guarantee universal health coverage [5].

47 Even considering the relative size of the most deprived extreme of the social continuum  
48 (e.g. about 0.5% of the U.K. adult population in 2018 was considered homeless) [6], the  
49 scale of unmet health and health care needs would imply that improving their social  
50 mobility might have a significant impact on the overall health status of the population.  
51 However, several barriers significantly hinder this upward mobility. If a glass ceiling is  
52 used as a metaphor for the barrier to higher achievement, success, or recognition for  
53 individuals of certain groups within different careers or industries (e.g. women becoming  
54 CEOs), an even more appropriate one in this case would be a *cardboard floor*, making  
55 reference to the surface that is a daily experience for many extremely deprived people [7].  
56 Studying the impact of this barrier on health, could help to understand it better, hopefully  
57 favouring social mobility. Conducting such studies, however, is not exempt from

58 difficulties, one which being particularly relevant: the lack of access to data from persons  
59 in the least favoured extreme of the social continuum.

60 The most disadvantaged group is very unlikely to be included in research and, as a result,  
61 is usually inadequately represented in health studies. This recruitment bias has important  
62 implications [3,4,8]. It limits the representativeness and external validity of surveys and  
63 population health studies and, furthermore, results in underestimation of the health risks,  
64 morbidity and mortality across the entire population. Importantly, it also hides the true  
65 scope of the specific issues affecting this group from researchers, policy makers and the  
66 public.

67 Different approaches focusing on improved sampling strategies to guarantee the  
68 representation of this group in population studies could be used. [3,8,9]. Proposed  
69 complementary strategies include: assigning greater sampling weights to individuals in  
70 this group, targeted over-recruitment, and/or intensifying fieldwork in marginal areas or  
71 suburbs through involvement of social organisations at local level. Nevertheless, these  
72 methods require some a priori knowledge of the number of people in this situation when  
73 defining the reference population for a specific study.

74 The use of data from administrative data and Electronic Health Records (EHR), such as  
75 the Medicaid claims data in the U.S. and the Clinical Practice Research Datalink (CPRD)  
76 in the U.K. [9,10], could also be a suitable way to access to the most socially  
77 disadvantaged persons. Relevant health and healthcare information for this population are  
78 often registered within these data sources. Some limitation of this data needs to be  
79 acknowledged in relation to their completeness, and ability to capture circumstances of  
80 maximum vulnerability and the inclusion of information on key mediating mechanisms  
81 relevant to determine biological, behavioural, and psychosocial pathways. However, such  
82 data also have strengths: they are in many cases mandatory, population-wide and usually

83 contain relevant information on different health outcomes, such as mortality or hospital  
84 admissions. Besides, most such data are potentially linkable to other relevant datasets for  
85 the study of this population (e.g. social care or demographic records) bringing together  
86 their strengths and, in some cases, allowing to overcome the abovementioned limitations  
87 [9,11]. Hence, the use of linked data from EHR could be a suitable way to capture relevant  
88 aspects of the most socially vulnerable individuals and, furthermore, might represent an  
89 adequate approach to obtain valid and reliable estimations of the health status in this part  
90 of the population. In addition linked EHR data, would allow estimating the relative  
91 numbers of the most disadvantaged group, providing relevant additional information on  
92 morbidity and outcomes and facilitating the implementation of improved sampling  
93 strategies [9].

94 The access to the most disadvantaged extreme segment of the social continuum remains  
95 a challenge for population health studies. Using a combination of approaches based on  
96 the use of HER linked data and strengthening the sampling strategy for the specific  
97 studies, might be a synergistic way to improve the validity of population health  
98 estimations. The adoption of these strategies could help to visualize the barriers for social  
99 mobility and the access to the most disadvantaged social groups. This will help to better  
100 understand the phenomena that perpetuate the cardboard floor and to shape care systems  
101 that truly “do not leave one behind” [12].

## 102 **Contributorship Statement**

103 All authors (JA-T, JMV, FGV and JA) were involved in all phases of the development of  
104 this manuscript, from the initial idea to the review and acceptance of the final draft for  
105 submission.

## 106 **Competing interests**

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