What role does socio-economic position play in the link between functional limitations and self-rated health: France vs. USA?

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Background: Our objective was to analyse the influence of education on the link between functional limitation (FL) and self-rated health (SRH) in two countries, France and the USA. Methods: The data of the North American NHANES study (n = 9254) and the French National Health Survey (n = 25 559) were used. FL was measured by the ADL and IADL scales. We constructed a logistic regression model with SRH as the outcome and included variables for education, FL and the interaction between education and FL. All results were adjusted for age.

Results: Poor SRH was more frequently reported in France than in the USA (24.1% vs. 18.4% for men, 29.0% vs. 19.7% for women). The most highly educated persons in the USA had similar FL (25.4% for men, 32.9% for women) to the least educated French persons (22.8% for men, 31.8% for women). In the USA, FL was associated more strongly with poor SRH in the most educated men than in the least educated. In France, the same interaction was observed although the link was weaker than in the USA. FL was more strongly associated with poor SRH in the most educated women than in the least educated in both countries. Conclusion: Functional limitation had a greater impact on the most highly educated persons in both France and the USA. Using SRH as a measure of health for evaluating social inequalities could lead to underestimation of the true magnitude of functional health inequalities existing within and between countries.

Introduction

Since the original study by Mossey and Shapiro in 19821, many studies have shown that self-rated health (SRH), based on a single item asking how people rate their health, is associated with mortality even after adjusting for a variety of factors.2,3 SRH is thus an attractive measure of health because it is easy to use, refers to a multi-dimensional definition of health and is a good predictor of mortality. Therefore, some studies aimed at analysing health inequalities have used this indicator as a measure of health and is a good predictor of mortality. Therefore, some studies aimed at analysing health inequalities have used this indicator as a measure of health.

One possible explanation for this phenomenon is differences in the expectations and aspirations people may have regarding their health according to educational attainment. In this case, the impact of a same health condition on SRH could be higher for those who have the highest expectations, such as socially advantaged groups or those with a high level of education. The fact that for a same health condition people with a high socio-economic position may experience a greater negative impact on their perceived health than people with lower socio-economic position could lead to an underestimation of health inequalities between socio-economic groups when using SRH as an indicator of health.

If we consider that this phenomenon is true, in the aim of using SRH as a measure of health for analysing social inequalities across countries, a logical question is to ask if the influence of socio-economic position on the relationship between health status and SRH is stable and the same in different social and cultural contexts. Studies have shown that the proportion of poor SRH varies across countries.4,6 Such cross-country comparisons may be most useful. However, they need to be made with caution, since many factors have been suggested to influence SRH: population structure in terms of individual characteristics (social position, lifestyle, health status), differences in social capital,4,5 culture, health-care systems14 and/or linguistic factors.14 When comparing social inequalities in health across countries using SRH, another pitfall may arise if the influence of socio-economic position on the relationship between health status and SRH also differs from country to country. Little attention has been given to this possibility, although it could shed light on the results from international comparative studies. Exploring the possibility that socio-economic position has an influence...
on the link between health conditions and SRH is thus of main interest and constitutes the purpose of this study.

As an example of an overall measure of health, functional limitation (FL), defined here as an individual’s report of limitations or an inability to conduct basic daily activities due to health problems, has been shown to lead to poorer SRH. It has been suggested that the relationship between functional health and SRH may differ according to social status. FL could, therefore, be used as a relevant measure of health condition to study the role of socio-economic position on the relationship between health status and SRH. If socio-economic position has a different impact on this relationship in different countries, then intercultural comparisons using SRH as a marker of functional status would be meaningless, or would require stratification according to social status. We, therefore, aimed to compare the influence of educational attainment on the link between FL and SRH in two countries, France and the USA.

**Methods**

Two sets of data were used for the current study. The first set of data, NHANES, is a representative sample of the US population. The second set, the National Health Survey (NHS) (http://www.insee.fr/fr/methodes/default.asp?page=sources/ope-enq-sante.htm) is a representative sample of the French population.

**French sample**

The French data were those of the NHS, the only source of systematic statistical data about the health, health-care consumption and socio-economic characteristics of French households. This study has been described in detail elsewhere. Briefly, data were collected through a multilevel, stratified, random survey of households that, on the basis of data from the 1999 national population census, are representative of the French population. People who live in institutions (e.g. retirement homes, religious communities, prisons and hospitals), in mobile homes or who are homeless are not included, therefore ~98% of the entire population is covered by the survey. Using a combination of face-to-face interviews and self-administered questionnaires, the NHS collects data at both individual and household levels, including information about demographic characteristics, socio-economic and health status, complementary insurance coverage and medical care consumption.

A new data collection was carried out between October 2002 and September 2003 and constitutes our sample. People were interviewed in five waves, throughout the year to account for seasonal variability. Three face-to-face interviews were conducted at 1-month intervals. The overall response rate during the 2003 NHS survey was >85%. The global sample was composed of 16,821 households, representing 40,796 individuals. We restricted our analyses to participants who completed self-administered questionnaires on their health. We excluded participants younger than 18 years (n = 9,800), pregnant women (n = 269). The final sample consisted of 12,110 men and 13,718 women.

**US sample**

The US data came from the 2001–02 to 2003–04 National Health and Nutrition Examination Survey (NHANES), described in detail elsewhere. In brief, NHANES is a cross-sectional, nationally representative survey of the civilian non-institutionalized population of the USA. The NHANES uses a stratified, multistage, probability sample. This multi-stage sample is based on a selection of counties, blocks, households and persons within households. Data are collected through an in-person home interview and a physical examination, conducted by physicians, at mobile examination centres.

Of the 25,917 persons selected in the study, 21,161 (81.6%) persons completed the in-person home interview and 20,120 (77.6%) subsequently completed a physical interview/examination. We restricted our analyses to respondents who completed both the home interview and the physical interview/examination. We excluded participants aged <20 years (n = 10,351) and pregnant women (n = 515). The final sample consisted of 4,661 men and 4,593 women.

**Self-rated health**

In the French sample, SRH was measured using the WHO definition, by asking participants to rate their health as very good, good, fair, poor or very poor. The responses were dichotomized in our analyses: individuals reporting very good or good health were classified as having good SRH and those reporting fair or poor or very poor health as having poor SRH. In the US sample, SRH was measured using the US definition, by asking participants to rate their health as excellent, very good, good, fair or poor. Those reporting excellent, very good or good health were classified as having good SRH and those reporting fair or poor health as having poor SRH. It has been shown that associations of SRH with socio-economic status were similar for the two self-rated item versions, and that comparisons of how these factors relate to SRH across surveys using a different 5-point self-rated scale were unlikely to be biased.

**Socio-economic position**

To assess socio-economic position in the two studies, we used level of education categorized according to the number of years of education: <12, 12 and >12 years.

**Health status**

We assessed the relation between SRH and FL, which was defined in the same way in both studies. FL was assessed using the scale of activities of daily living (ADLs), instrumental activities of daily living (IADLs), mobility and upper/lower body strength and social participation. Participants who reported some difficulty, much difficulty or who were unable to do one of the activities were considered as having FL.

**Statistical analysis**

Education may affect SRH and the relationship between FL and SRH differently according to gender, so all our analyses were conducted separately for men and for women. Age-adjusted prevalence of poor health and FL were compared between France and the USA. To test if educational level modifies the relationship between FL and SRH, we constructed a logistic regression model with SRH as the outcome and included variables for education, FL and the interaction between education and FL in the model. We then compared results observed in France and in the USA. As educational level can be influenced by age, all these analyses were adjusted for age both in the USA and the French samples.

Sampling weights were used to account for the sampling structure and to correct for systematic non-response bias for both samples. This procedure allows data to be weighted in an inversely proportional relationship to the non-response probabilities of individuals, in order to represent the true population.

Statistical analyses were performed using SAS version 9.1 (SAS Institute, Cary, NC, USA).

**Results**

**Educational level**

Among US men, 54.4% had >12 years of education compared with 28.0% of French men (P < 0.0001). Among US women, 55.1% had >12 years of education, compared with 25.5% of French women (P < 0.0001). The distribution by age according to educational level differed between the two countries (table 1). Among US men aged over 60 years, 48.8% had >12 years of education, compared with 13.5% of their French counterparts. Among US women, 39.1% had >12 years of education compared with 7.9% of their French counterparts.
Self-rated health

After adjustment for age, the proportion of people reporting poor SRH was higher in France than in the USA, for both men (24.1% in France vs. 18.4% in the USA, P < 0.0001) and women (28.8 vs. 19.7%, P < 0.0001). Lower educational level was associated with poorer SRH in both countries, regardless of gender (table 2). The gradient according to educational level was steeper in the USA than in France. The proportion of people reporting poor health was similar in France and the USA among the lowest educated group, for both men and women, whereas the difference was significant for people with 12 years of education or more.

Functional limitation

French men with a lower level of education were more likely to report FL than those with the highest level. This was also the case for US men, those with a lower level of education being more likely to report FL than those with the highest level. Among the women of both countries, those with a lower level of education were more likely to report FL than those with a higher level.

The proportion of people reporting FL was higher in the USA than in France (table 2), whatever the gender and the level of education. Differences between countries were so big that the most highly educated persons in the USA had a similar proportion of FL (25.4% for men, 32.9% for women) as the least educated French persons (22.8% for men, 31.8% for women).

Interaction between educational level and FL in relation to SRH

Tables 2 and 3 show the relationship between FL and poor SRH stratified by educational level for men and women. For men, FL was associated with SRH at every educational level in both countries. In the USA, the proportion of men reporting poor SRH in the presence of FL increased to a relatively greater extent for those with >12 years of education than for those with <12 years of education (interaction test P = 0.02). After adjusting for age, FL was associated more strongly with poor SRH in more highly educated men than in those with lower educational attainment (OR = 7.62, 95% CI 5.02–11.58 for the most educated vs. OR = 4.23, 95% CI 2.80–6.38 for the least educated). The situation was slightly different in France, where FL did not have a greater impact on participants with >12 years of education than on those with <12 years (interaction test P = 0.09). After adjusting for age, the odds ratio for poor SRH in presence of FL was 6.15 (95% CI 4.40–8.59) for the most educated men compared with 5.21 (95% CI 4.26–6.39) for the least educated.

Women

Age in years [mean (SE)]

 france 58.0 (0.3) 43.9 (0.2) 41.6 (0.3) 47.2 (0.5) 43.6 (0.5) 45.1 (0.3)

 usa 18.4% (1.9) 27.4 (1.8) 53.4 (2.2)

 France 20.8 (2.0) 63.5 (3.0)

 USA 31.6 (2.9)

 France 22.8% (1.5) 24.0 (1.6) 48.8 (2.1)

 USA 38.3 (1.3) 33.1 (1.1) 25.4 (0.8) 45.3 (1.4) 40.1 (1.2) 32.9 (0.8)

 *Percentages adjusted for age in the US and French samples.

 a: Comparison between France and the USA: significant difference at a threshold of 0.01.

 b: Comparison between France and the USA: significant difference at a threshold <0.0001.
those with <12 years in the USA (interaction test \(P = 0.003\)) as well as in France (interaction test \(P = 0.001\)). After adjusting for age, FL was associated more strongly with poor SRH in more highly educated women than in those with lower educational attainment in both countries (OR = 8.06, 95% CI 5.41–12.03 for the most educated vs. OR = 3.61, 95% CI 2.65–4.92 for the least educated in the USA, and OR = 7.18, 95% CI 5.49–9.39 for the most educated vs. OR = 4.55, 95% CI 3.85–5.37 for the least educated in France).

Discussion

To the best of our knowledge, this is the first study that directly compares the moderating role of education on the relationship between FL and SRH in two different countries. As shown in a previous study,\(^7\) our results confirm that the impact of certain self-reported physical health conditions, such as FL, on SRH is different according to level of education. But our results suggest, for the first time, that this effect may be observed across countries, at least in France and in the USA. In both countries, FL has relatively greater repercussions on SRH in people with a higher education level. They may have higher expectations regarding health, and so in the event of disease the impact on SRH may be greater. This explanation is supported by other findings showing the influence of education on the relationship between SRH and ‘morbidity’ and between SRH and mortality.\(^4-6\) It is noteworthy that the gradient seems similar in France and in the USA, with the most highly educated Americans reporting comparable rates of FL to those of the least educated French people.

An important limitation of our study is that health conditions were self-reported, so may be influenced in the same way as SRH and be susceptible to misreporting.\(^27\) However, information on health conditions is a subjective report of factual matters.\(^11\) As showed by Haapanen et al.,\(^28\) the agreement between questionnaire data and medical records may be good for chronic diseases that have a clear definition. Therefore, the results are unlikely to be biased with regard to FL, which is measured and defined in the same way in the French and the US samples. Moreover, in a previous study using NHANES data,\(^7\) we showed that education influenced the relationship between health conditions (measured using clinical variables) and SRH, reinforcing the results that we found using variables based on self-reported information.\(^8\) Banks et al.\(^29\) also showed that a socio-economic status gradient appears whether self-reports or biological measures of health are used.

The French NHS and NHANES were not designed to enable international comparisons. However, the US and French samples are very similar in their construction and are representative of the general population, reinforcing the validity of this comparison. Health conditions are not measured in the same way in the French and the US samples, with the exception of FL, which is why it was selected for the comparison between the two countries.

The measure of SRH was different in the two countries and could partly explain the lower proportion of poor health observed in the USA compared with France: the US definition (excellent, very good, good, fair and poor) vs. the WHO definition (very good, good, fair, bad and very bad) used in France. Jurges et al.\(^21\) showed that people seem to be in better health using the US definition, and that the WHO variable could lead to a higher prevalence of poor SRH.\(^20\) However, Jurges et al.\(^21\) have shown that ‘associations of SRH with demographic factors such as socio-economic status were similar for the two self-rated item versions. Thus comparisons of how demographic and other factors relate to SRH across surveys using a different 5-point self-rated scale are unlikely to be biased’. Thus, using two differing definitions for SRH may not limit our analysis of the impact of education on the link between health conditions and SRH in France and the USA.

The way SRH is translated could also influence the proportion of people reporting poor health. Bzostek et al.\(^31\) showed that translation issues between Spanish and English language versions of the SRH question may give rise to some of the differences between Hispanic and non-Hispanic US respondents. This may also be relevant for differences observed between French and English language versions, particularly regarding the use of the word ‘fair’, which is translated by ‘moyen’ in French, a word that could connote a more negative meaning than ‘fair’ does in English.

The proportion of people reporting FL increased as level of education decreased in both countries. This gradient was similar in France and the USA, suggesting that strong social health inequalities exist for FL in both countries. However, the most highly educated Americans reported similar FL rates to French people with the lowest education level. Banks et al.\(^29\) have also shown that Americans with the highest levels of education have comparable rates of diabetes and heart disease to those in the bottom educational stratum in England. Reasons for health differences between countries are complex, and are likely to be affected by differences between health systems and access to care. Health insurance coverage is not universal in the USA and is much more dependent on socio-economic resources than in France. Some Americans have no health insurance, even among people with the highest level of education. However, the proportion of those with no health insurance in the top income tertile is low,\(^29\) suggesting that access to care is not likely to be the main explanation for health differences between the USA and France. Differences between France and the USA in the prevalence of risk factors such as obesity or income inequality as well as differences in social capital\(^52\) may also be relevant in explaining this phenomenon. However, Banks et al.\(^29\) showed that differences in the distribution of risk factors were not the main explanation for the poorer health of Americans compared with the equivalent English population. Why highly educated Americans present rates of disease comparable to poorly educated people living in countries like France or England is worthy of future investigation.

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**Table 3** Proportion of people reporting poor SRH, according to educational level and presence or absence of FL, in France and the USA

<table>
<thead>
<tr>
<th>FL (%)</th>
<th>&lt;12 years</th>
<th>=12 years</th>
<th>&gt;12 years</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>21.7</td>
<td>11.8</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Yes*</td>
<td>4.23 (2.80–6.38)</td>
<td>4.34 (2.85–6.62)</td>
<td>7.62 (5.02–11.58)</td>
<td>0.02b</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FL (%)</th>
<th>&lt;12 years</th>
<th>=12 years</th>
<th>&gt;12 years</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>25.9</td>
<td>12.3</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Yes*</td>
<td>3.61 (2.65–4.92)</td>
<td>4.39 (3.09–6.23)</td>
<td>8.06 (5.41–12.03)</td>
<td>0.003b</td>
</tr>
</tbody>
</table>

a: Results from logistic regression models adjusted for age, reference group = No.

b: Interaction between FL and SRH according to educational level. Results for educational level <12 years compared with educational level >12 years, adjusted for age.
It is noteworthy that though they reported more FL than French people, Americans with at least 12 years of education were less likely to report poor SRH than their French counterparts. As we said before, US and French categories for SRH were different and could partly explain this paradox. However, regardless of the indicator used, cultural differences in the understanding and meaning of health could also play a role. The reference point or normative category in the scale may be different in different cultural environments. As Idler and Benyamini suggest, the response scale measuring SRH may be used differently depending on cultural and linguistic conventions in describing normal health. This is in accordance with Jurges who showed that the French tend to underestimate their health, as do the Germans. Desesquelles et al. also showed that French people with IADLs rated their health as being worse than Italians in the same situation, highlighting the influence of cultural environments on perceptions of health status.

Our results show that the relationship between health conditions and SRH is modified by educational level and that this phenomenon exists in both France and the USA. The impact of FL on SRH was greater for the highest educational level compared with the lowest, in France and in the USA. Therefore the use of SRH as a measure of health for evaluating social inequalities could lead to underestimation of the real magnitude of health inequalities existing within and between countries. Future studies using social indicators other than education are needed, as are international studies evaluating how people from different cultures understand and evaluate the notion of health, how they understand SRH and select their specific health category. These are important considerations that need to be taken into account in attempting to understand health differences between socio-economic groups or populations.

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Conflicts of interest: None declared.

Key points
- Educational attainment is reported to directly influence the relationship between health status and SRH.
- The influence of education may differ from country to country, and could shed light on the results from international comparative studies using SRH as a health indicator.
- FL had a greater impact on SRH for highly educated than for low educated persons, in both France and the USA.
- Use of SRH as a measure of health could underestimated the true magnitude of health inequalities existing within and between countries.

References