

Intergenerational educational trajectories and lower back pain in young women and men

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ABSTRACT

We examined the association between intergenerational educational trajectories and lower back pain (LBP) outcomes in young women and men from the general population. Participants were part of the 21 years old follow-up of the EPITeen cohort study, which was set up during the 2003/2004 school year and recruited subjects born in 1990 attending schools in Porto, Portugal (n=1657, 51.6% women). Parental and individual educational levels were used to define intergenerational educational trajectories as stable-high, upward, stable-low, and downward. Data on the presence, severity and chronicity of LBP were also assessed. Gender-specific adjusted odds ratios (OR) with 95% confidence intervals (95% CI) were computed to estimate the associations between educational trajectories and LBP outcomes. When compared to women with stable-high educational trajectories, those with stable-low educational trajectories were significantly more likely to report moderate/severe (adjusted OR=1.76, 95% CI: 1.21-2.57) and chronic (adjusted OR=1.82, 95% CI: 1.02-3.22) LBP. The magnitude of these associations was even stronger among females with downward educational trajectories (moderate/severe: adjusted OR=2.58, 95% CI: 1.49-4.46; chronic: adjusted OR=2.42, 95% CI: 1.12-5.27). Educational trajectories were not significantly associated to LBP outcomes among men. In conclusion, intergenerational educational trajectories may contribute to LBP as reported in early adulthood, particularly in women.

Keywords: Lower back pain; Population-based studies; Education; non specific back pain risk factors

INTRODUCTION

Lower back pain (LBP) ranks highest in terms of disability and sixth in terms of worldwide burden in the general adult population¹. Although acute LBP commonly improves within one to three months, low level of pain will often persist, and the majority of those affected will have at least another episode of acute pain within a year². Proximal individual factors such as age and overweight, adverse occupational exposures and psychological distress have been consistently identified as determinants of non-specific LBP^{3,4}. However, the effects of more distal influences such as changes in social environment and related experiences during the life course remain unclear⁵, even though the assessment of the extent to which disease aetiology can be traced back to societal issues is an ultimate focus of public health⁶.

The few studies on the relation between formal education and LBP in the contemporary Western societies have shown that current social disadvantage – as measured through low educational level – is directly related to LBP^{7,8}. Nevertheless, literature has comparatively disregarded that long-term educational exposures during childhood and adolescence might have an observable effect on the experience of LBP^{9,10}, even if partly mediated by the current low educational level¹¹⁻¹³. This highlights the importance of studying the role of intergenerational educational trajectories on LBP, since this approach is expected to be more reliable when the effect on LBP of different – but combined – social environment exposures throughout the life course is being investigated^{14,15}. Moreover, both educational level achievement and prevalence of LBP are expected to vary according to gender^{16,17}, which suggests that gender specificity should be considered when this relation is

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being investigated. These hypotheses have scarce support from empirical data, namely in the younger generations in Western countries where educational trends have remarkably improved¹⁸.

Within this framework, this study aims to estimate the associations between intergenerational educational trajectories and LBP in a community sample of women and men born in 1990.

PATIENTS AND METHODS

PARTICIPANTS

This study uses cross-sectional data collected from young adults of the Epidemiological Health Investigation of Teenagers in Porto (EPITeen) in the period of 2011-2013. The EPITeen cohort was first assembled during the 2003/2004 school year, when all the public and private schools in the city of Porto (Portugal) that provided teaching to adolescents born in 1990 were approached. We identified 2787 eligible adolescents, of whom 2159 (77.5%) agreed to participate. In 2007/2008, the sample initially recruited was re-evaluated and 783 students born in the same year but who moved to Porto after 2003/2004 were additionally recruited to the cohort. Sampling procedures and detailed methods have been described elsewhere¹⁹.

Between 2011 and 2013, 1761 (of the 2942 eligible) participants attended the 21 years old follow-up. Among those, 23 individuals (1.3%) were excluded due to cognitive impairment (e.g. autism spectrum disorders) and 81 (4.6%) due to missing data in the main exposures or covariates. Thus, 1657 young adults (51.6% women) constituted the final sample for this investigation.

The study protocol was approved by the Ethics Committee of São João University Hospital (Porto) and written informed consent was obtained from all participants.

DATA COLLECTION AND DEFINITION OF VARIABLES

PARENTAL AND INDIVIDUAL EDUCATIONAL LEVELS AND EDUCATIONAL TRAJECTORIES (EXPOSURES)

Indicators of social environment should be tailored to the target setting and methodologically robust, mainly because it is a complex construct and its assessment

is by no means straightforward or universal. In this study, the indicator of social environment chosen was the educational level. This methodological option was based on the following assumptions: a) education has been considered one of the most important elements in determining the unequal distribution of resources and opportunities with strong impact on health^{20,21}; b) education has been widely used as a generic measure of social exposures and it is one of the most well-established socioeconomic correlates of relevant health-related behaviours and conditions such as musculoskeletal pain⁷; and c) it has been consistently associated with several health outcomes in the Portuguese population^{22,23}.

Following this, both parental and young adults' educational levels were defined using the total number of schooling years attained. Higher educational level was considered to be present when parents (more than 70% had six years of mandatory schooling) and young adults (all had nine years of mandatory schooling) achieved at least one more cycle of education than mandatory schooling, i.e., at least nine years in parents and at least 12 years in young adults. The remaining participants were considered as having lower educational level. Intergenerational educational trajectories were then defined as follows: a) stable-high: higher parental & higher individual educational level; b) upward: lower parental education & higher individual educational level; c) stable-low: lower parental & lower individual educational level; and d) downward: higher parental & lower individual educational level.

As in Portugal the number of mandatory schooling years has increased substantially over the past decades²⁴, it is expected that the birth cohort of parents has influenced their level of formal education. Consequently, we considered the analysis for parental birth cohort using the year of birth of the parent with highest education.

LOWER BACK PAIN (OUTCOMES)

Regional musculoskeletal pain was assessed using the Nordic Musculoskeletal Questionnaire²⁵, which evaluates the presence of musculoskeletal pain during the preceding 12 months in nine different anatomical regions including the lower back. LBP was considered moderate/severe if the reported intensity was higher than 40 millimetres in the visual analogue scale²⁶, and chronic if it was persistent or recurrent during at least three months in the preceding 12 months.

STATISTICAL ANALYSIS

Socioeconomic characteristics and LBP outcomes in young women and men were presented as counts and proportions for all the categorical variables, and the statistical significance of differences between groups was estimated using the chi-square test.

Associations between intergenerational educational trajectory and presence, severity and chronicity of LBP were quantified using logistic regression models and considering as reference young adults classified as stable-high. Crude and adjusted odds ratios (OR) with 95% confidence intervals (95% CI) were stratified by gender and all estimates were adjusted for year of birth of parents.

Statistical analyses were performed using Stata® version 11.2 for Windows (Stata Corp. LP, College Station, Texas, USA).

RESULTS

In this population-based sample of young women and men, educational stability was the most frequently observed trajectory (stable-high: 50.3%; stable-low: 23.2%). While upward educational mobility was more frequently found in women (20.2% vs. 11.5% in men, $p < 0.001$), downward educational mobility was more frequently observed in men (13.8% vs. 7.4% in women, $p < 0.001$). When compared to males, females reported more frequently LBP considering either presence (38.5% vs. 53.2%, $p < 0.001$), severity (12.7% vs. 28.3%, $p < 0.001$) or chronicity (5.0% vs. 9.0%, $p < 0.001$) in the past year (Table I).

Women whose parents had lower educational level were more likely to report LBP in the previous year when compared to those with higher parental educational level (58.0% vs. 49.7%, $p = 0.016$). Similar results were observed regarding moderate/severe and chronic LBP. Individual educational level was also significantly associated to the presence, severity and chronicity of LBP in women (respectively, lower vs. higher: 58.3% vs. 51.1%, $p = 0.049$; 37.3% vs. 24.5%, $p < 0.001$; 13.1% vs. 7.3%, $p = 0.007$). In men, neither parental nor individual educational levels were consistently associated to the presence, severity or chronicity of LBP (Figure 1).

Women with downward educational trajectory were more likely to report LBP in the preceding year when compared to those with stable-high educational tra-

jectory (63.5% vs. 47.7%, $p = 0.009$). Similar associations were found when the severity and chronicity of LBP were the outcomes (respectively, downward vs. stable-high: 44.4% vs. 23.0%, $p < 0.001$; 15.9% vs. 7.0%, $p = 0.041$). No significant associations between educational trajectory and LBP outcomes were observed among men, with the exception of males with upward educational trajectory, i.e., this group of individuals was less likely to report moderate/severe LBP when compared to the group with stable-high educational trajectory (4.3% vs. 11.4%, $p = 0.008$) (Table II).

Women with upward educational trajectory were significantly more likely to report LBP when compared to those with stable-high educational trajectory (adjusted OR=1.61, 95% CI: 1.12-2.30). This was not observed when the outcomes were moderate/severe or chronic LBP. Stable-low educational trajectory was significantly associated with severe (adjusted OR=1.76, 95% CI: 1.21-2.57) and chronic (adjusted OR=1.82, 95% CI: 1.02-3.22) LBP among women using as reference group those with stable-high educational trajectory. The magnitude of these associations was even stronger among females moving from higher parental to lower individual educational levels, i.e., with downward educational trajectory (moderate/severe: adjusted OR=2.58, 95% CI: 1.49-4.46; chronic: adjusted OR=2.42, 95% CI: 1.12-5.27). Overall, intergenerational educational trajectories were not associated to LBP presence, intensity or chronicity among men (Figure 2).

DISCUSSION

When both parental and individual educational levels were combined, our findings supported the existence of a gender-specific effect of intergenerational educational trajectories on LBP outcomes: young women with stable-low and downward educational trajectories were more likely to report LBP in the preceding year when compared to those with stable-high educational trajectories. These associations were even stronger when severe or chronic LBP were the outcomes, particularly among young women with downward educational trajectory. Overall, intergenerational educational trajectories were not associated to LBP among young men.

This study added insightful data on the potential effect of intergenerational educational trajectories on LBP presence and severity in early stages of life such as

TABLE I. PARENTAL AND INDIVIDUAL SOCIOECONOMIC CHARACTERISTICS AND LOWER BACK PAIN PRESENCE, SEVERITY AND CHRONICITY IN THE PAST YEAR ACCORDING TO GENDER (EPITEEN COHORT, 2011-2013)

	Overall n (%) n=1657	Gender		p
		Female n (%) 855 (51.6)	Male n (%) 802 (48.4)	
Socioeconomic characteristics				
Year of birth of parents (2003-2004) ^{a,b}				
Until 1957	490 (29.6)	233 (27.3)	257 (32.0)	0.033
1958 or more	1167 (70.4)	622 (72.7)	545 (68.0)	
Parental educational level ^c				
≤9 years (lower)	650 (39.2)	362 (42.3)	288 (35.9)	0.007
>9 years (higher)	1007 (60.8)	493 (57.7)	514 (64.1)	
Individual educational level				
≤12 years (lower)	559 (33.7)	252 (29.5)	307 (38.3)	p<0.001
>12 years (higher)	1098 (66.3)	603 (70.5)	495 (61.7)	
Educational trajectories ^d				
Stable-high	833 (50.3)	430 (50.3)	403 (50.2)	p<0.001
Upward	265 (16.0)	173 (20.2)	92 (11.5)	
Stable-low	385 (23.2)	189 (22.1)	196 (24.4)	
Downward	174 (10.5)	63 (7.4)	111 (13.8)	
Lower back pain (past year)				
Presence				
Absent	893 (53.9)	400 (46.8)	493 (61.5)	p<0.001
Present	764 (46.1)	455 (53.2)	309 (38.5)	
Severity				
Absent/Mild	1313 (79.2)	613 (71.7)	700 (87.3)	p<0.001
Moderate/severe	344 (20.8)	242 (28.3)	102 (12.7)	
Chronicity				
Absent/acute only	1540 (92.9)	778 (91.0)	762 (95.0)	p<0.001
Chronic	117 (7.1)	77 (9.0)	40 (5.0)	

a. Year of birth of the parent with the highest number of schooling years.

b. In Portugal, parents born before 1958 had 4 years of mandatory school; parents born between 1958 and 1979 had 6 years of mandatory school (the youngest parent was born in 1979).

c. Parent with the highest number of schooling years.

d. Stable-high: higher parental educational level-higher individual educational level; upward trajectory: lower parental educational level-higher individual educational level; stable-low: lower parental educational level-lower individual educational level; downward trajectory: higher parental educational level-lower individual educational level.

young adulthood. The use of trajectories has been suggested as fundamental to clarify the mechanism whereby socioeconomic indicators such as education affect LBP report¹³, especially because this approach is expected to enable the typing of different combinations of social exposures throughout life, i.e., it considers not only individual characteristics but also the potential role of parental social experiences and expectations in relation to their children throughout life²⁷.

The effect of individual educational level and concomitant social exposures on health outcomes is ex-

pected to be partly a consequence of the educational level and social background provided by parents²⁸. In agreement, we observed that women with stable-low educational trajectories had higher odds of reporting LBP when compared to those continuously exposed to higher educational levels (stable-high). Prior research is in line with the obtained results among women, even though the role of lower levels of parental and own education on musculoskeletal pain outcomes has been analysed separately and disregarding potential gender specificity^{29,30,14,15}.

TABLE II. LOWER BACK PAIN AMONG YOUNG WOMEN AND MEN FROM THE EPITEEN COHORT (2011-2013) ACCORDING TO INTERGENERATIONAL EDUCATIONAL TRAJECTORY

Intergenerational educational trajectory ^a		Lower back pain (past year)						
		Total n (%)	Present (vs. absent)		Moderate/severe (vs. absent/mild)		Chronic (vs. absent/acute only)	
			n (%)	n (%)	p	n (%)	p	n (%)
Women	Stable-high	430 (50.3)	205 (47.7)	0.009	99 (23.0)	p<0.001	30 (7.0)	0.041
	Upward	173 (20.2)	103 (59.5)		49 (28.3)		14 (8.1)	
	Stable-low	189 (22.1)	107 (56.6)		66 (34.9)		23 (12.2)	
	Downward	63 (7.4)	40 (63.5)		28 (44.4)		10 (15.9)	
Men	Stable-high	403 (50.2)	159 (39.5)	0.377	46 (11.4)	0.008	21 (5.2)	0.241
	Upward	92 (11.5)	28 (30.4)		4 (4.3)		2 (2.2)	
	Stable-low	196 (24.4)	76 (38.8)		35 (17.9)		8 (4.1)	
	Downward	111 (13.8)	46 (41.4)		17 (15.3)		9 (8.1)	

a. Stable-high: higher parental educational level-higher individual educational level; upward trajectory: lower parental educational level-higher individual educational level; stable-low: lower parental educational level-lower individual educational level; downward trajectory: higher parental educational level-lower individual educational level

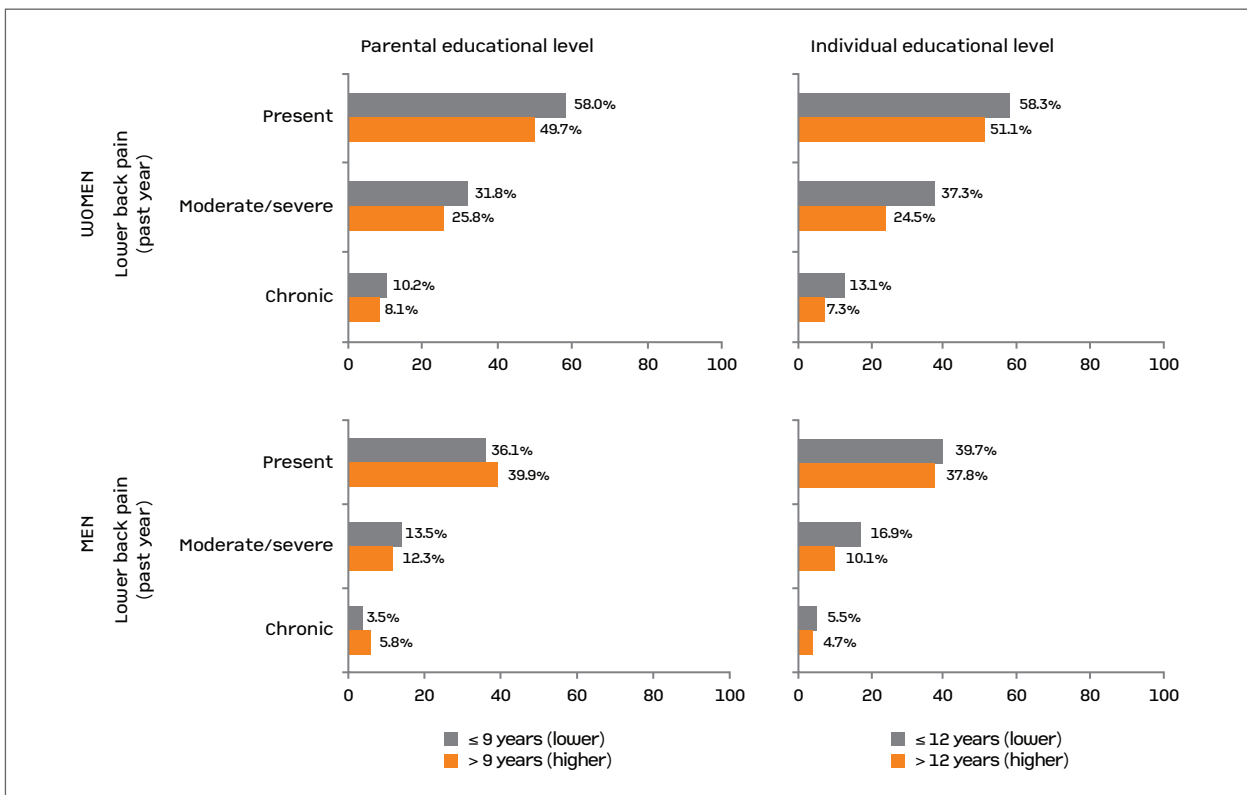


FIGURE 1. Parental and individual educational levels and lower back pain in the past year (presence, severity and chronicity) among young women and men from the EPITeen cohort (2011-2013)

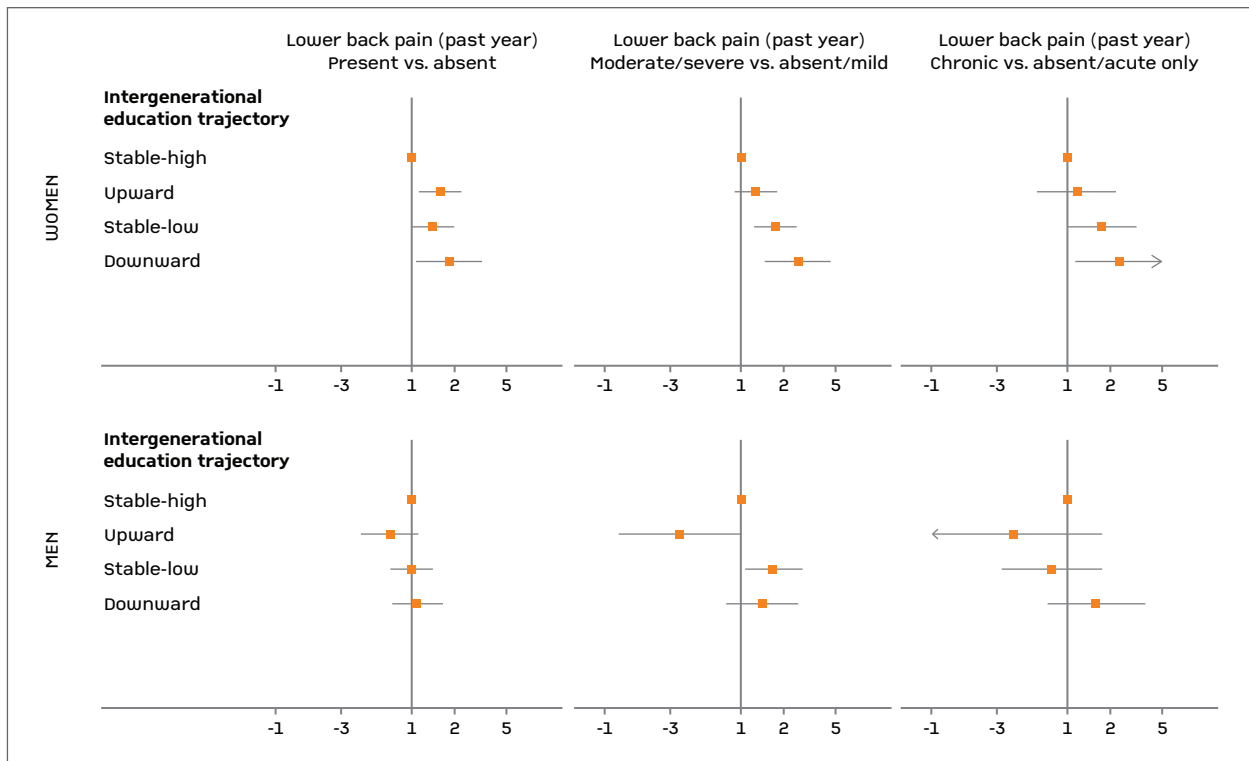


FIGURE 2. Associations between intergenerational educational trajectories and lower back pain in the past year (presence, severity and chronicity) among young women and men from the EPITeen cohort (2011-2013)

Stable-high (reference category): higher parental educational level-higher individual educational level; upward trajectory: lower parental educational level-higher individual educational level; stable-low: lower parental educational level-lower individual educational level; downward trajectory: higher parental educational level-lower individual educational level. Squares and horizontal lines represent, respectively, the adjusted (for year of birth of parents) odds ratios and 95% confidence intervals estimated by logistic regression.

On the other hand, young adults with upward educational trajectories were less likely to report LBP than those with stable-low trajectories in our study, which may suggest that individual circumstances may partially overcome parental disadvantage. However, this finding was not consistent across all the LBP outcomes. In fact, and especially among women, those with lower educational levels still showed increased frequency of LBP than those with higher educational level, whatever the category of parental education or the LBP outcome in consideration. Moreover, when the educational trajectory was downward, women presented more frequently LBP than those who remained in stable-high or stable-low educational trajectories. This suggests that moving from higher to lower educational contexts between childhood and early adulthood may be more damaging regarding LBP presence and severity than being exposed to disadvantageous social environments (lower educational levels) the whole life.

From a life course perspective, this would be an unexpected result if a cumulative effect of exposure to social disadvantage on LBP throughout life was the main mechanism accounting for the associations found in our investigation. Rather, it argues for an important role for the trajectory itself, posing parental influence as a possible modifier of the effect of individual educational level on health^{9,13}.

Intergenerational educational trajectories were especially associated to LBP among women. One plausible reason for a gender-specific effect is related to the social and cultural contexts that shaped the access to education in Portugal in the last decades. Our sample comprises adults born in 1990, a generation that grew up after important national socio-political changes that contributed to a notable improvement of educational level and consequent social conditions (e.g. 39% of parents vs. 7% of young adults had nine or less years of schooling). Women, in particular, changed consi-

derably their role in the society and are now expected to be more involved and more successful in the labour market and educational system. Therefore, women from the EPITeen cohort who experienced a downward trajectory are probably representing a particularly disadvantaged group since their intergenerational educational trajectory is contrary to the national trend.

Notwithstanding, the abovementioned gender-specific effects may additionally be explained by the expected decreased threshold for pain presence and severity among female participants with downward trajectory^{31,32}, since the coping strategies to deal with pain are commonly more negative and passive and less effective (e.g. praying or hoping) among women with lower educational level³³. Lastly, these findings may also be partly explained by the biological predisposition of women to experience pain, i.e., females often exhibit more negative pain responses when focusing on the sensory component of pain (i.e. decreased threshold and tolerance and higher sensory pain) when compared to males³⁴.

The interpretation of our findings needs to take into account some methodological issues. Firstly, by defining and analysing specific intergenerational educational trajectories, we aimed to assess whether groups of individuals characterized by different educational trajectories may experience the same health outcome differently. Therefore, we cannot exclude that both individual and parental educational levels may result from unmeasured confounders, such as birth cohort or calendar period effects at the societal level (e.g. the country's overall welfare), that may be at the same time the true cause of LBP. Nevertheless, this potential limitation was partly accounted for by design – all the young adults were born in 1990 – and by analysis – all estimates were adjusted for parental birth cohort.

Secondly, we did not attempt to quantify the relative importance of individual vs. parental effects or to distinguish their direct from indirect effects. The procedure of analysing trajectories may obscure the decomposition of effects due to conditioning on an intermediate step (individual educational level): for instance, when compared to a stable-low educational trajectory, it is more likely that a downward educational trajectory results from an unmeasured background health condition that might also cause LBP. In order to address common biological causes of trajectories and LBP, we adjusted the estimates for the presence of chronic health conditions and we did not observe substantial changes on the main estimates (data not shown).

Despite that, we cannot unequivocally affirm that the effects that we are assigning to trajectories are not shared with other high-level upstream influences.

Thirdly, our focus regarding the role of social exposures on LBP outcomes was analysed using educational level only. Other indicators of socioeconomic position could have added important knowledge, but indicators such as occupation or individual monthly income in this sample had little meaning, as most participants remained students at the time of assessment (near 80%). We believe that future follow-ups of the EPITeen cohort will allow for a more extensive characterization of the social exposures of young adults as well as of how these different social indicators relate with LBP over time.

Fourthly, as adults enrolled in this investigation were particularly young, a fraction of them are likely to achieve more years of formal education hereafter and some of them may even change from lower to higher educational category – yet, only 2% of the young adults remained in secondary school at the moment of evaluation. Thus, we believe that this small fraction of young adults that may change their educational level over time would not be large enough to change our main findings.

Finally, the extent to which any cohort represents the source population throughout follow-up is likely to decrease over time because of differential losses to follow-up. Particular, participants from families with lower educational levels seemed to be selectively lost to follow-up in our sample. Nevertheless, we do not expect that this interferes with our findings significantly, since there are no reasons to believe that the group of participants with social disadvantage lost to follow-up would report different levels of severity of LBP when compared to those attending to the 21 years old follow-up with similar background social conditions.

Strengths of this study include our large population-based sampling of women and men, where we could elucidate gender-specific results on the potential effect of educational trajectories on LBP. This was particularly relevant because changes in educational level and consequent social exposures throughout the life course are fundamental to clarify the mechanism whereby socioeconomic indicators affect LBP report¹³ and a lack of empirical support existed when this study was setup. Furthermore, adding to the fact that our sample included a broad spectrum of severity of LBP as expected for the general population, we also evaluated different features of the symptom (presence, severity and

chronicity). We believe that this approach argues for the consistency of our findings across a spectrum of outcomes, which supports the validity of our results.

CONCLUSIONS

Stable-low and downward educational trajectories contributed to a higher odds of LBP report among young women, but not in men. This supports that social disadvantageous environments up to early adulthood are probably involved in the aetiology of LBP, particularly in women.

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