The contribution of employment and working conditions to occupational inequalities in non-communicable diseases in Europe

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Background: Social inequalities in non-communicable diseases (NCDs) are evident across all European regions. Employment and working conditions are important determinants of NCDs, however, few comparative studies have examined how these conditions contribute to health inequalities. This study therefore examines the association of non-standard employment and poor working conditions with occupational inequalities in multiple NCDs and whether there are differences by gender and across European regions. **Methods:** We used cross-sectional data from 20 European countries for women and men aged 25–75 ($n = 19876$), from round 7 of the European Social Survey. Data were analyzed for self-rated health (SRH) and 9 NCDs: heart/circulatory problems, high blood pressure, arm/hand pain, breathing problems, diabetes, severe headaches, cancer, obesity and depression. We used logistic regression models, stratified by gender, and adjusted rate ratios to examine whether occupational inequalities in NCDs were reduced after adjusting for non-standard employment and poor working conditions, across European regions. **Results:** After adjustment, occupational inequalities were significantly reduced across all regions of Europe. Reductions were particularly large among the lowest occupational group and for poor-SRH, depression and obesity. For these conditions, reductions were in the range of 60–99%. **Conclusions:** Employment and working conditions are important determinants of occupational inequalities in NCDs. Labour market regulations should therefore be considered in the formulation of NCD prevention strategies.

Introduction

Non-communicable diseases (NCDs) are a major health burden for European societies.[1] Consequently, their reduction has been deemed a political imperative.[2] While socioeconomic inequalities in the prevalence of NCDs exist across all regions of Europe,[3,4] few have considered the factors that may contribute to explain these inequalities[5] and their regional variation. Without an understanding of why inequalities in NCDs persist in Europe, progress towards their reduction will be limited.

Previous work has linked a number of NCDs to different employment and working conditions. Whereas employment conditions constitute the contractual relationship between an employer and employee, working conditions are related to the nature of tasks performed by workers and the environment in which the tasks are undertaken. An important aspect of employment conditions for example, is the precariousness of the contract terms, while important components of working conditions include the physical and chemical work environment. Employment conditions related to job insecurity and contract status have been associated with NCDs in the European context—particularly mental ill health.[6,7] On the other hand, exposures related to material workplace hazards (e.g. physical and chemical) have been linked to cancer, respiratory illness and musculoskeletal disorders.[8] Employment and working conditions are often seen as intertwined determinants of health, as workers with precarious employment conditions have been found to experience higher exposures to poor working conditions.[6]

Arguably, neoliberalism and austerity have meant that precarious forms of employment have become an increasingly defining feature of countries' labour markets.[9,10] For example, rates of insecure and temporary work in Spain and Portugal account for over 20% of the workforce compared with an EU average of 14%.[11] In this context, fewer workers are employed according to the 'Standard Employment Relationship' (SER), involving full-time employment, permanent contracts, stable and adequate levels of income, social protection and high levels of occupational health and safety standards.[6]

Further, non-standard employment and poor working conditions are strongly socially patterned across Europe, with worse conditions being more prevalent in lower socioeconomic groups.[12] Women and other disadvantaged groups such as migrants are also more likely to be engaged in non-standard employment.[13,14]

However, there are few comparative studies that have examined the contribution of employment and working conditions to health inequalities and those that exist have typically done so by separately considering the role of employment conditions *or* workplace conditions (often contrasting physical and psychosocial working conditions).[13,15–19] This relatively small body of literature finds that occupational factors contribute substantially to inequalities in

health, with some variation according to the precise risk factor and health outcome under consideration.[7] However, by only examining employment *or* workplace conditions separately, these studies may well have under-estimated the role of occupational conditions in health inequalities.

This study is the first to cross-nationally examine simultaneously the impact of *both* employment and working conditions on inequalities in a large set of NCDs. It thereby provides estimates of the impact of a wider range of occupational factors to more fully capture their influence on health inequalities. We examine both the individual and joint contributions that non-standard employment and poor working conditions make to inequalities in NCDs across Europe so as to ascertain whether there are differences by NCD, gender and European region in terms of the relative importance of these conditions.

We used data from the 2014 European Social Survey (ESS) which included a special module on health inequalities and their social determinants[20] to examine the following research question: 'To what extent does adjusting for non-standard employment and poor working conditions reduce occupational inequalities (i.e. differences between occupational classes) in self-reported NCDs among women and men in different regions of Europe?'.

Methods

This study is based on the data from the seventh round of the ESS, fielded in 2014/15. The ESS is comprised of 20 European countries which can be organized into five regions (Supplementary 2 box S1). The organization of countries into these regions follows broad welfare state characterizations.[21,22] The average response level for all countries was 51.6%, ranging from 31.4% in Germany to 68.9% in Lithuania. Data were collected via face-to-face interviews with individuals aged 15 and over, living in private households. In line with several studies on earlier ESS rounds, we only included respondents aged 25–75 in this study.[23] Estonia and the Czech Republic were not included in the analyses due to missing data on NCDs. We further excluded individuals with no working conditions information, all of which reported being self-employed, and respondents who had never had a paid job (and therefore had no information on working conditions and employment quality). The final sample size was 22 749 responses. After list-wise deletion of missing responses across outcomes and explanatory variables, a total of 19 876 complete data observations were available for analysis.

Non-communicable diseases

Data were analyzed for self-rated health (SRH) and nine self-reported NCDs (Supplementary 2 box 2): heart/circulatory problems, high blood pressure, arm/hand pain, breathing problems, diabetes, severe headaches, cancer, obesity and depression. In previous work, we observed large occupational inequalities [adjusted risk ratio (ARR) > 1.5] in these conditions.[3]

Occupational class

Occupational class was defined according to the European Socioeconomic Classification (ESeC) scheme which is a widely used development of the Erikson–Goldthorpe–Portocarero classification.[24] The ESeC classifies people with special attention to their employment relations. Assignment to EseC occupational class categories was undertaken using tools developed by Ganzeboom and Treiman.[25] Those who were not currently in paid employment were allocated to an ESeC class on the basis of their last main paid job. We used the scheme's established three class model to categorize respondents as salariat, intermediate or working class.[24]

Employment and working conditions

This study utilizes a multidimensional concept of employment quality since contemporary labour markets generate a number of different non-standard employment arrangements.[6,26] As such, the following concepts were employed to account for workers' deviation from the SER (Supplementary 2 box S3): working times, contract security, income and rights, empowerment and representation. In terms of working conditions, we examine the contribution of both physical (ergonomic and material) and psychosocial conditions. Psychosocial working conditions are measured with just one dimension, as this is the only dimension captured in the module of the Survey (Supplementary 2 box S4).

Analysis

To ascertain the contribution of employment and working conditions to inequalities in NCDs, we calculated age-controlled ARRs, with 95% confidence intervals (CIs), on regional European samples using predicted probabilities, generated by means of binary logistic regression.[27] We chose to calculate ARRs rather than odds ratios, as the latter are likely to be artificially high for non-rare conditions.[28] ARRs are calculated from predicted probabilities, which are a preferred estimation method for cross-national comparisons of health inequalities.[29] Data were weighted using population weights which are reported in the ESS and combined with a post-stratification weight which uses information on age-group, gender, education and region to reduce the sampling error and potential nonresponse bias of the survey. We accounted for the nesting of individuals within countries by estimating clustered standard errors. Stata 14.1 was used for the main analyses. Stata 16.0 was used in the sensitivity analyses.

To measure the extent of inequalities, we included in our base model, Model A, the NCD as the dependent variable, occupational class as the main independent variable and controlled for age and education. Our analyses separately compared the working class and medium occupational class with the salariat occupational class. To assess the impact of controlling for employment and working conditions, we then separately added each individual employment quality (Supplementary 2 box S3) and working condition (Supplementary 2 box S4) to the base model in Models B and C, respectively. In our final model, Model D, we controlled both for employment quality and working conditions. We did not adjust for health behaviours in any of the models because they were assumed to be on the causal pathway between employment and working conditions and health. The inclusion of these intervening variables would have resulted in over-adjustment, biasing estimates of the association between occupational risk factors and health.[30] To calculate the percentage reduction in adjusted risk between models we used the formula [(ARR Model A − ARR Model B, C or D)/(ARR Model A − 1)]×100. These percentage changes were calculated for initially statistically significant inequalities with an ARR > 1. Country-specific prevalence rates are presented in Appendix 1 in Supplementary Materials.

Sensitivity analysis

The proportion of missing values in the data after list-wise deletion across all outcome and explanatory variables was 12.63%. The largest share of missing values was for working hours in the Central region (7.9%) and the Southern region (8.7%). After excluding these, the average share of missing values per variable across regions was 0.9%. Sensitivity analyses were performed using Multiple Imputations with Chained Equations (MICE) to explore the impact of missing observations on complete-data results. With the exception of obesity and depression, all model variables were imputed. Missing values in the obesity variable ($n = 613$) resulted from individuals selectively not reporting their weight (e.g. a large share were women), in these cases the use of imputation methods can introduce

more bias. The psychometric scale used to measure depression explicitly asks to exclude those cases where respondents are inconsistent in their answers to the scale items, and all the missing values in our data for depression corresponded to this situation ($n = 408$). Results with MICE can be found in Supplementary 1 and were consistent with the main conclusions of the complete-case analyses. Associations with obesity after imputations were no longer statistically significant for women in the South and North (details in Supplementary 1). Caution should therefore be exercised in interpreting results for obesity in those regions.

Results

The distribution of respondents across the study variables is presented in Supplementary tables. These tables demonstrate that respondents in the different regions have roughly similar occupational class distributions, but that the percentage of working class is greater in the Central/Eastern, Southern and North-West region. Social gradients were found for almost all occupational conditions, with the exception of working hours for men, and material working conditions among women.

Supplementary tables 3–7 indicate the magnitude of occupational inequalities in NCDs (ARRs) and the percentage reduction in ARRs after adjustment (Models A–D), by region. In the age- and education-only adjusted analyses (Model A), the ARRs were larger among those with lower SES, with few exceptions. Each region was characterized by a different set of inequalities, however, inequalities in poor-SRH and depression were observed across all regions, for both women and men (with the exception of depression among women in the Central/East and poor-SRH among men in the South). Among women, inequalities in obesity were observed across all the regions except the Central/East.

In subsequent models, ARRs were reduced to varying degrees for different NCDs and for different regions of Europe, although not all results were statistically significant. Controlling for non-standard employment (Model B) substantially reduced occupational inequalities in poor-SRH and NCDs across all regions for both women and men, with few exceptions. Inequalities were generally reduced to a greater extent among the working class than the medium occupational group, a pattern observed among both women and men. Reductions were generally lowest in the Central/East region. Among both working class women and men, adjusting for non-standard employment had a particularly large impact on the association between occupational class and health in the West and North-West regions. In the West, adjusting for non-standard employment among the working class reduced ARRs by 45–69% for women and by 66–92% for men. In the North-West, adjusting for non-standard employment among working class women reduced ARRs by 41–56% and reversed them for heart/circulation problems (ARR 0.92, CI 0.87–0.98) and obesity (ARR 0.99, CI 0.94–1.04). Adjusting for these conditions among working class men in the North-West reduced ARRs by 95–99% and reversed them for poor-SRH (ARR 0.94, CI 0.87–1.01). Large reductions were also found among working class women in the North for poor-SRH (65%) and in the South for depression (63%).

Substantial reductions in ARRs for poor-SRH and NCDs were also observed across all regions after controlling for poor working conditions (Model C), with few exceptions. Again, inequalities were generally reduced to a greater extent among the working class than the medium occupational group among both women and men. Here, reductions were generally lowest in the Southern region. Among both working class women and men, reductions were typically largest in West and North-West regions. In the West, adjusting for poor working conditions among the working class reduced ARRs in NCDs by 10–60% for women. Among working class men in this region, inequalities were reduced by 65% for poor-SRH and reversed for depression (ARR 0.94, CI 0.81–1.10). In the North-

West, adjusting for poor working conditions among working class women reduced occupational inequalities by 30–66% and reversed them for obesity (ARR 0.98, CI 0.92–1.04). Among working class men in this region, ARRs were reduced by 31% for depression and reversed for poor-SRH (ARR 0.93, CI 0.91–0.96). Large reductions were also found among working class women in the North and Central/East for poor-SRH (67% and 48%, respectively) and among working class men in the Central/East for cancer (85%).

Generally, inequalities among women were reduced to a larger degree after controlling for non-standard employment (Model B) vs. poor working conditions (Model C). For men, no obvious pattern emerged. With regards to regions, adjustment for non-standard employment generally reduced inequalities to a greater extent in the South and North-West. In other regions, no clear pattern emerged. Finally, non-standard employment conditions typically explained a larger extent of social inequalities in poor-SRH, obesity and depression. However, differences between the two models were not always large and the CIs between the models almost always overlapped.

We also observed substantial reductions in inequalities when non-standard employment and poor working conditions were controlled for together (Model D), with few exceptions. These reductions, as with the two previous models, were generally larger among the working class than the medium occupational group. Differences between the regions were less pronounced than with the previous models. Among women and men, notably large reductions were found for poor-SRH (in the range of 18–98% for women and 48–97% for men, with a reversal of inequalities among men in the North-West region (ARR 0.89, CI 0.84–0.95)) and depression (in the range of 49–89% for women and 42–95% for men, with a reversal of inequalities in the West among working class men (ARR 0.86, CI 0.73–1.01)). Large reductions were also found among working class women in the West (48%) and South (46%) for obesity, and among working class women in the North-West for breathing problems (66%). In the North-West, inequalities in obesity among working class women reversed after adjustment for both conditions (ARR 0.97, CI 0.90–1.04). Among working class men, notably large reductions were also found in the North for heart/circulation problems (64%) and diabetes (71%) and in the Central/East region for cancer (81%).

Discussion

The key finding of this paper is that adjusting for non-standard employment *and* poor working conditions significantly reduced occupational inequalities in NCDs across *all* regions of Europe. Reductions were particularly large among the lowest occupational group and for the following health outcomes: depression, poor-SRH and obesity. Taking both non-standard and poor working conditions into account led to a reduction in observed inequalities in these conditions in the range of 60–99% in most regions of Europe. Large reductions in other NCDs were also found in individual regions.

These findings corroborate other studies that have also found employment and working conditions to contribute substantially to health inequalities.[15–18] While some of these studies have suggested that employment conditions, as opposed to working conditions, explain a limited role of inequalities in health,[15,17] they have focused on single countries and have not included a wide range of non-standard employment arrangements. At the same time, psychosocial working conditions are measured in our study by one variable. Since previous work has found significant impacts of the psychosocial work environment on health,[31] this could potentially explain the slightly smaller reduction in ARRs we see when adjusting for working conditions. Previous work which has examined the contribution of occupational risk factors in a comparative manner across Europe has focused on the separate contribution of psychosocial and physical conditions, finding physical work to be particularly important

among manual workers when compared with psychosocial conditions.[15] Our study suggests that beyond the physical-psychosocial divide, non-standard employment may explain a larger part of the association between occupational class and health than previously acknowledged, particularly for lower occupational groups across Europe.

We also found some variation by gender and European region in terms of the relative importance of employment and working conditions to inequalities in NCDs. This is in keeping with previous comparative literature[15] in terms of the differential effects of occupational conditions on health and may well reflect differences in terms of regional and national approaches to labour market regulations, income security measures and other institutional factors such as health and safety regulation.[13,32–34] That non-standard employment reduced inequalities in NCDs to a larger extent than poor working conditions among women may reflect gendered labour market trends and gender-related inequalities in European labour markets. Compared with European men, for example, European women are more likely to be employed in service sector work, in part-time or 'flexible' positions, in less unionized sectors and earn 16.3% less pay.[35] Larger reduction in inequalities in the South and North-West following adjustment for non-standard employment may be explained by the relatively weak and fragmented systems of social protection in these regions. For example, previous research found that the association between stressful work and depressive symptoms was particularly strong in the welfare regimes that characterize these regions.[36] Non-standard employment conditions also typically explained a larger extent of social inequalities in poor-SRH, obesity and depression, suggesting that these health outcomes could be particularly sensitive to adverse employment conditions. This is something that needs to be examined further in terms of developing interventions to reduce inequalities in NCDs.

Limitations

There are some limitations to the data and analysis. First, the study used a cross-sectional research design which is limited in the identification of causal effects. While CIs were in some cases too wide to establish statistically significant reductions, considering the large reductions we observed, we argue that our findings are substantially, if not statistically, significant.[37] Moreover, this work relies on self-reported data rather than clinical diagnosis. Substantial accuracy, however, has been found between physician reported medical histories and self-reports for many conditions.[38] Our measurement of occupational class was based on an individual's present job (for those who were employed) and on an individual's past job (for those who were not currently employed). At the same time, our health outcomes can be characterized by different etiologic periods and were based both on respondents' current and past health experiences. Although this makes the interpretation of our results difficult, we believe our findings offer a starting point for further investigations. Finally, although the ESS maintains a high standard of data collection, the survey is still prone to differences in response rates and cross-cultural quality of questions.[20]

Conclusions

This study provides the first overview of the extent to which non-standard employment *and* poor working conditions reduce occupational inequalities in poor-SRH and NCDs among women and men in Europe. Our results suggest that Europeans from lower occupational groups experience cumulative vulnerability in their exposures to both precarious employment and poor working conditions. Non-standard employment seems to explain a relatively greater proportion of inequalities among women, among individuals in the North-West and Southern regions and for poor-SRH, obesity and depression. These findings are of particular importance in the context of labour market trends towards increasingly precarious

employment related to austerity[10] and support calls for greater focus on the macro-structural determinants of health in addressing NCDs.[39]

Supplementary data

Supplementary data are available at *EURPUB* online.

Key points

- This study is the first to cross-nationally examine the individual and joint impact of both employment and occupational factors for inequalities in a large set of NCDs in Europe.
- Both non-standard employment and poor working conditions are found to substantially reduce occupational inequalities in NCDs across all regions of Europe.
- Employment and occupational factors are particularly important for explaining the association between occupational class and health for lower occupational groups.
- Non-standard employment seems to explain a relatively larger extent of inequalities among women, among individuals in the North-West and Southern regions and for poor-SRH, obesity and depression in particular.
- The potential of labour market regulations to reduce social inequalities in health should be considered in the formulation of NCD-related health policies and prevention strategies.

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