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Patterns of employment and inequalities in sickness absence in a large community and mental health organisation – an observational study.

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Abstract

Objectives:

One way the NHS can help address health inequalities is through its role in the local economy, for example by increasing recruitment from more disadvantaged communities. We do not know, however, the extent to which NHS organisations already recruit from more disadvantaged communities or how poor health varies by socioeconomic position within the NHS workforce.

Methods:

We mapped the share of the working age population that was employed at the NHS organisation in the financial year 2018-19, by area deprivation. We then used negative binomial regression models to investigate the extent to which wage level, occupational group and area deprivation were associated with sickness absence amongst employees.

Results:

In the most deprived areas, an additional 82 people per 100,000 working age population were employed at this NHS organisation compared to the most affluent areas. Overall, 61% of employees were absent within the year for a median of 3 days. Employees from the most deprived quintile had 1.41 times the higher sickness rates than the employees from the least deprived quintile, when adjusting for age and sex. These differences were largely explained by differences in wage levels with the lowest wage employees having 2.5 times the sickness absence rate as the highest wage group.

Conclusion:

This large NHS organisation employed people disproportionately from deprived areas. They were considerably more likely to experience sickness absence. Workplace health policies need to target these workers, adapting to their needs whilst enabling improvements in their working conditions, pay and career progression.

Strengths and limitations of this study

- One of the strengths of this study is that the use of routine electronic data provided by the Mersey Care ESR overcomes some issues with non-response bias occurring in survey-based research on sickness absence.
- The focus on one large community and mental health NHS organisation provides a useful case study, highlighting the potential for the NHS to improve health in deprived areas through improving the health of its workforce.
- As with all routine data sources a limitation is the quality of coding in the data. For example, employee's ethnicity was not consistently coded in the data and therefore we were not able to investigate the extent to which sickness absence rates vary across the different ethnic groups.
- Employment sickness absent rates by level of deprivation would probably be very different in acute hospital-based NHS organisations, and we cannot say how the pattern we observe in Mersey care differs from other similar NHS organisations.

Introduction

Employment and working conditions are one of the most important determinants of health and health inequalities. Evidence shows that people in long-term unemployment have a lower life expectancy than those in work[1] and that poor working conditions are detrimental to health[2]. Sickness absence has been linked to working conditions and improvement in psychosocial working conditions can reduce the risk of illness among the employees.[3] Vahtera et al[4] has shown that workers in jobs with poor participation in decision making, poor skill discretion, high job demands and low job control had more than double the risk for a sick leave than workers in jobs without these adverse conditions.

The National Health Service (NHS) is one of the largest employers in the world, and is the biggest in Europe, with over 1.3 million staff (3.5% of the working age population). The employment practices of the NHS can therefore have a major impact on health inequalities. The role of the NHS not just as a provider of health services but also as a major influence on local economies has become increasingly recognised, with the NHS long term plan[5] recognising the role of the NHS as an "Anchor Institution" [6] - that can positively influence the social, economic and environmental factors that help create good health. One way the NHS can do this is by increasing recruitment from more disadvantaged communities and improving the working conditions of staff from these communities. Recent analysis has shown that the NHS makes up a greater share of employment in more deprived regions such as the North West than other parts of the country, and in those regions NHS salaries are generally higher than average for those regions.[7] To effectively address health inequalities, NHS organisations need to not only increase employment from disadvantaged communities but also to have policies and practice in place to promote health amongst these employees. Policies to improve workplace health can increase

inequalities if they are most effective amongst more advantaged groups[8]. The NHS has however not always had the best record on promoting the health of its employees, with sickness absence costing the NHS an estimated £1.1 billion according to NHS digital report in 2017[9]– higher than in the general workforce. Previous studies of NHS sickness absence have shown sickness absence in NHS organisations is concentrated in particular occupational groups[10] and the main causes were respiratory disorders, digestive disorders and musculoskeletal disorders.[11,12] Whilst some studies have shown higher sickness absence rates amongst junior grade civil servants[10] compared to senior grades, there has been limited analysis of inequalities in sickness absence within the NHS. There is also little evidence assessing the socioeconomic profile of employees of NHS organisations in relation to the communities in which they are based.

To understand the potential for NHS organisations to address health inequalities through their employment and workplace health policies, we investigate the distribution of the workforce by socioeconomic deprivation and how sickness absence rates vary based on wage level, occupational group and level of deprivation using workforce data from a large community and mental Health NHS organisation based in the North West of England.

Methods

Setting and population

Mersey Care NHS Foundation Trust is one largest NHS Providers of mental health, learning disabilities, addictions and community physical health care in England, providing community health service to areas of high socioeconomic deprivation in the North West of England .[13]

Data and measures

Anonymised staff data was extracted from Mersey Care Electronic Staff Record (ESR) for the financial year 20018-19. The sample included 7,274 substantive staff, where a member of staff held two roles the higher salary role was used in this analysis. It also includes demographic information in relation to age group (18-30, 31-40, 41-50, 51-60, 61-70 and 71-80), gender (male, female), as well as the wage band (9 pay band classes based on the NHS pay scales[14] (band 1 – lowest pay rate and band 9 – highest pay rate), and occupational group (5 classes). To avoid small number effects introduced in our analysis, we combined pay bands 1 and 2 along with pay bands 8 and 9. Each NHS staff member is assigned to one of the 5 occupational groups in the Mersey Care ESR: a) Scientific, Technical and Allied Health Professionals, b) Additional Clinical Services (Health Care Assistants), c) Estates and Ancillary, d) Nursing and Midwifery Registered, and e) Administrative and Clerical group. As Mersey care is a primarily a community health provider it has relatively few medical staff. To ensure that no individuals could be identified from the data, all medical (junior to consultant grade) staff, Executive Directors and Board members have been excluded, leaving 7,005 staff members for analysis. Postcode

data was mapped to Lower Super Output Area (LSOA) which are small geographical zones (mean population 1,500) routinely in England for statistical analysis. Each LSOAs was then linked to a small area based measure of deprivation – the indices of multiple deprivation (IMD)[15] The IMD is a composite indicator of the level of deprivation for small geographical areas (LSOAs) across England, based on seven domains: Income, Employment, Education, Skills and Training, Health , Crime, Housing and the Environment. Quintiles are calculated by ranking the LSOAs in England from most deprived (quintile 1) to least deprived (quintile 5) and dividing them into 5 equal groups. For 179 people their postcode could not be mapped to LSOA, and they were therefore excluded from the analysis giving 6,826 included in the analysis.

Statistical Analysis

First, we investigated the geographical distribution of Mersey care staff and how this related to the level of socioeconomic deprivation. We defined the area from which Mersey Care workers could potentially come as all local authority areas in which at least 5 Mersey care employees were resident – this gave 28 local authority areas from across the North West with a total working age population of 3,825,255. We mapped the share the working age population that worked for Mersey Care (per 1,000) for each LSOA in this area and plotted the share for each deprivation quintile (per 100,000).

We then estimated the number of sick days per employee and the % of staff with any sickness absence in the year for each deprivation quintile. To investigate the multi-variable associations between days of sickness absence and wage level, occupational group, level of deprivation and demographics we used a negative binomial regression model to account for overdispersion of the data. Firstly, modelled the extent to which the days of sickness absence of staff members was associated with deprivation quintiles whilst controlling for age and sex, then in a second model we additionally included the wage band and the occupational group to explore the extent to which these explained the any association with deprivation. All analysis was carried out in R version 3.6.3.

Patient and public involvement

No patients were involved in setting the research question or the outcome measures, nor were they involved in the design or implementation of the study.

Results

Figure 1a shows the geographical distribution of the Mersey Care workforce as a share of the working age population. Employees are spread across the North West although concentrated in the relatively deprived areas of Merseyside area as well as in the more affluent areas of the Ribble Valley (see figure1b, for a map of deprivation in the same area).

Overall, the share of the working age population from the most deprived areas that worked at Mersey Care was very high 197 per 100,000 working age population (figure 2a). This represented 38% of the total Mersey care workforce coming from these deprived area areas as compared to 35% of the total working age population. The highest share of the working age population employed at Mersey care was from areas of intermediate deprivation (quintile 3). Figure 2b and 2c shows that there was a clear gradient across deprivation quintiles in levels of sickness absence. This was true in terms of the proportion of staff that had any sickness absence as well as the median number of sick days.

The negative binomial regression analysis for both models is shown in Table 1. Results from the model 1 showed that the sickness absence rate for the most deprived quintile was 1.41 times higher than in the for the least deprived quintile (reference group) (95% CI 1.16 to 1.70), when just adjusting for age and sex.

After controlling for wage band and occupational group the relationship with deprivation was reduced with the most deprived quintile exhibiting only slightly higher risk of sickness absence, that is no longer statistically significant at the 5% level. This is explained by the higher sickness rate in the lower wage bands. Employees at bands 1-2 (Salaries of ~ £18,000 to £19,000 per annum) and 3 (£19,000-£21,000) had 2.53 and 2.25 times the sickness absence rate than high wage band employees (bands 8-9 : 45,500 to £104,000). The corelation between low wages and area deprivation was high with 47% of the workforce from the most deprived areas being on wage bands 1-3, compared to 7% of those living in less deprived areas. Adjusted sickness absence rates for the staff in Additional Clinical services group (largely care assistants) and the Nursing and Midwifery Registered group were 1.72 and 1.84 time higher than the Administrative and Clerical group.

Table 1: Results from two negative binomial regression models: Model 1 includes only demographic variables and Model 2 includes additional wage bands and Staff group variables.

		Model 1 (without Wage Bands & Staff Groups)			Model 2 (with Wage Bands & Staff Groups)		
	n (%)	IRR	95% Conf Intervals		IRR	95% Conf Intervals	
			LCL	UCL		LCL	UCL
IMD: quint1	2,478 (36)	1.41***	1.16	1.70	1.15	0.95	1.40
IMD: quint2	1,169 (17)	1.22*	0.98	1.50	1.07	0.85	1.30
IMD: quint3	1,397 (20)	1.21*	0.98	1.48	1.14	0.93	1.39
IMD: quint4	1,125 (16)	1.13	0.91	1.39	1.12	0.90	1.38
IMD: quint5 (reference group)	657 (11)	1.00	-	-	1.00	-	-
Age group: 18-30 (reference group)	913 (13)	1.00	-	-	1.00	-	-
Age group: 31-40	1,465 (21)	1.35**	1.13	1.62	1.62***	1.34	1.94
Age group: 41-50	1,676 (24)	1.71***	1.43	2.05	1.93***	1.61	2.31

Age group: 51-60	2,198 (32)	1.93***	1.62	2.29	2.17***	1.82	2.58
Age group: 61-70	553 (8)	1.77***	1.41	2.24	1.90***	1.51	2.41
Age group: 71-80	21 (1)	1.30	0.57	3.99	1.03	0.45	3.12
Gender:Female	4,974 (73)	1.00	0.89	1.13	1.13**	1.01	1.28
Gender:Male (reference group)	1,852 (27)	1.00	-	-	1.00	-	-
Band:1-2	805 (12)	-	-	-	2.53***	1.87	3.42
Band:3	1,755 (26)	-	-	-	2.25***	1.70	2.96
Band:4	691 (10)	-	-	-	1.85***	1.38	2.47
Band:5	1,171 (17)	-	-	-	1.59***	1.24	2.03
Band:6	1,247 (18)	-	-	-	1.32**	1.03	1.69
Band:7	683 (10)	-	-	-	1.09	0.83	1.42
Band: 8-9 (reference group)	474 (7)	-	-	-	1.00	-	-
Staff_group: Scientific, Technical and Allied Health Professionals	725 (11)	-	-	-	1.14	0.90	1.45
Staff_group: Additional Clinical Services (Health Care Assistants)	1,911 (28)	-	-	-	1.72***	1.44	2.05
Staff_group: Estates and Ancillary	454 (6)	-	-	-	1.04	0.80	1.35
Staff_group: Nursing and Midwifery Registered	2,182 (32)	-	-	-	1.84 ***	1.50	2.24
Staff_group: Administrative and Clerical group (reference group)	1,554 (23)				1.00	-	-

Models based on n = 6826 observations *** $p<0.01$, ** $p<0.05$, * $p<0.1$

IRR = incident rate ratio

Discussion

We found that a relatively high proportion of the workforce of one of the largest community and mental health NHS organisations in England comes from relatively deprived areas with greater share of the working age population in deprived areas working at Mersey Care compared to the most affluent areas. Employees from these areas were however more likely to be absent from work due to sickness. This appears to be because they were more likely to be in lower wage employment and those on lower wages tended to have higher sickness absence. Staff working in nursing and nursing assistant roles also had higher sickness rates when compared to the staff working in admin and clerical roles. [16]

Strengths and limitations

Before discussing the implications of our findings, we highlight some of the strengths and limitations of the analysis. One of the strengths of this paper is that the use of routine electronic data provided by the Mersey Care ESR overcomes some issues with non-response bias occurring in survey-based research on sickness absence. It also provides greater detail on occupation, wages, and place of residence than some analysis of data derived from sickness benefit claims. The focus on one large community and mental health NHS organisation provides a useful case study, highlighting the potential for the NHS to improve health in deprived areas through improving the health of its workforce. As with all routine data sources a limitation is the quality of coding in the data. For example, employee's ethnicity was not consistently coded in the data and therefore we were not able to investigate the extent to which sickness absence rates vary across the different ethnic groups. We were only able to access

data from one NHS organisation and therefore our analysis will not be representative of inequalities in sickness absence across the NHS. As a community and mental health provider Mersey Care has a high proportion of staff from nursing and non-medical clinical services groups compared to the NHS as a whole[17], probably leading to a greater share of the workforce in relatively lower wage jobs compared to the NHS as a whole. Employment sickness absent rates by level of deprivation would therefore probably be very different in acute hospital-based NHS organisations, and we cannot say how the pattern we observe in Mersey care differs from other similar NHS organisations.

Implications for policy and practice.

Our findings have a number of implications for NHS organisation aiming to increase employment and improve the health of disadvantaged communities through their workforce policies. Firstly, we demonstrate that a sizeable portion of this Mersey Care workforce comes from deprived neighbourhood. This demonstrates that this is feasible and if this is not the case in other similar organisations this could indicate the potential to increase recruitment form these communities. Secondly this highlights that where NHS organisations do have a large proportion of their work force living in disadvantaged areas, as we find here, improving their health and working conditions does have the potential to reduce health inequalities. Thirdly if NHS organisations are looking to recruit from deprived communities, then this may increase the prevalence of health problems in their workforce. Offering support to deal with potential unmet health needs need could be one of the strategies to reduce sickness. Support needs to reflect the health needs of the population from which staff are recruited. For example, if recruiting from more disadvantaged areas there may be a higher prevalence of mental health issues. For example, Mersey Care reviewed its Health & Wellbeing at Work strategy and is now recruiting psychologists to support staff with psychological therapy and interventions where required within the organisation. Traditional "one size fits all" ways of managing sickness absence and promoting workplace health will need revising to address inequalities in sickness absence within the workforce.

Conclusion

NHS organisations potentially have large share of their workforce living in disadvantaged areas, however, these groups are likely to experience higher level of sickness absence. By increasing recruitment from these communities and developing effective policies for improving health and working conditions for these groups, the NHS can contribute to reducing health inequalities through its workforce policies.

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Competing interests

BB and KD are supported by the NIHR Applied Research Collaboration North West Coast; BB is supported by the NIHR School for Public Health Research; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Contributors

KD and BB conducted the analysis. KD, WB and BB drafted the manuscript. KD, BB, WB, SW, AO, LE, JR all critically edited the manuscript. All authors approved the manuscript before submission.

Ethics committee approval

None required.

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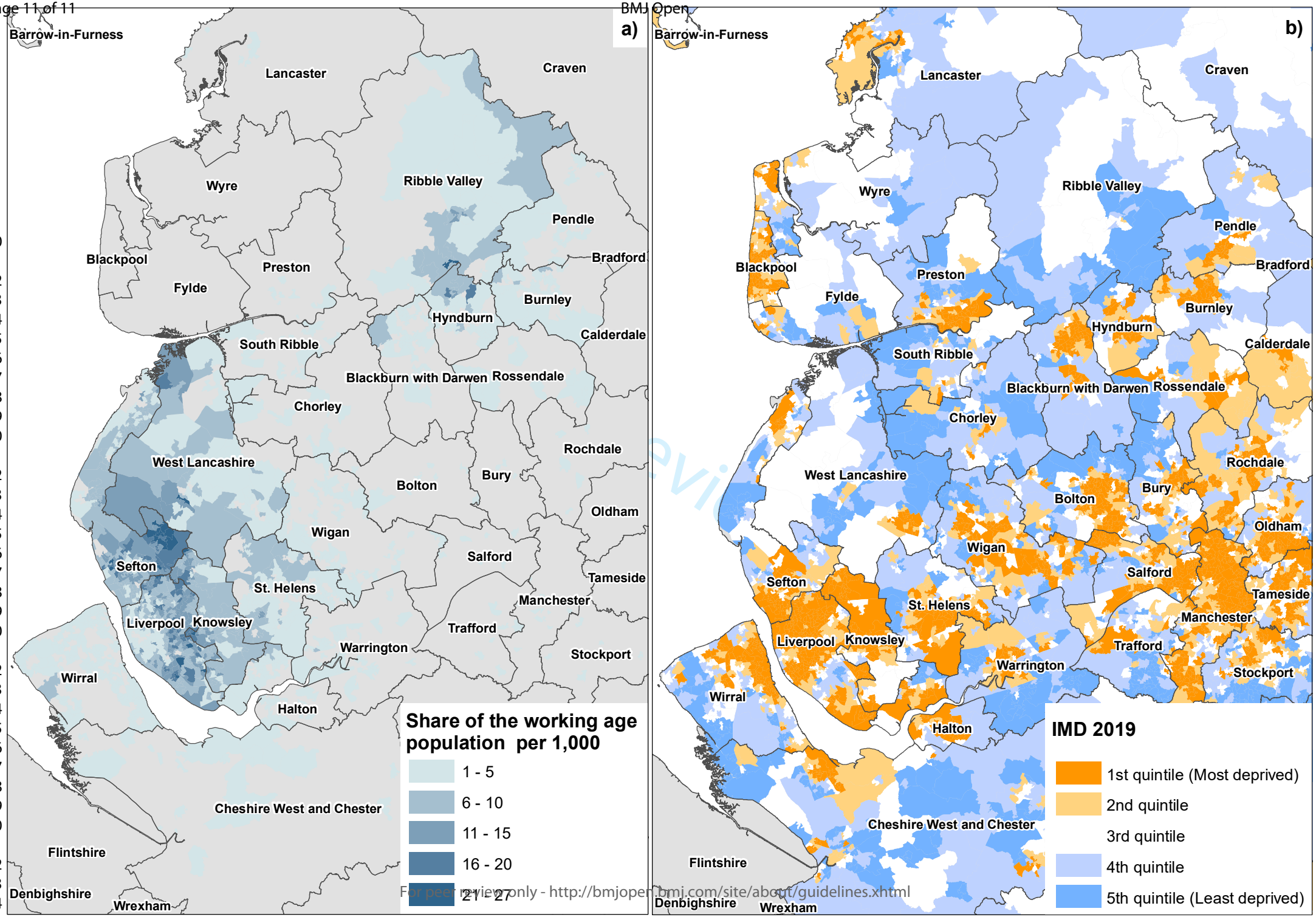

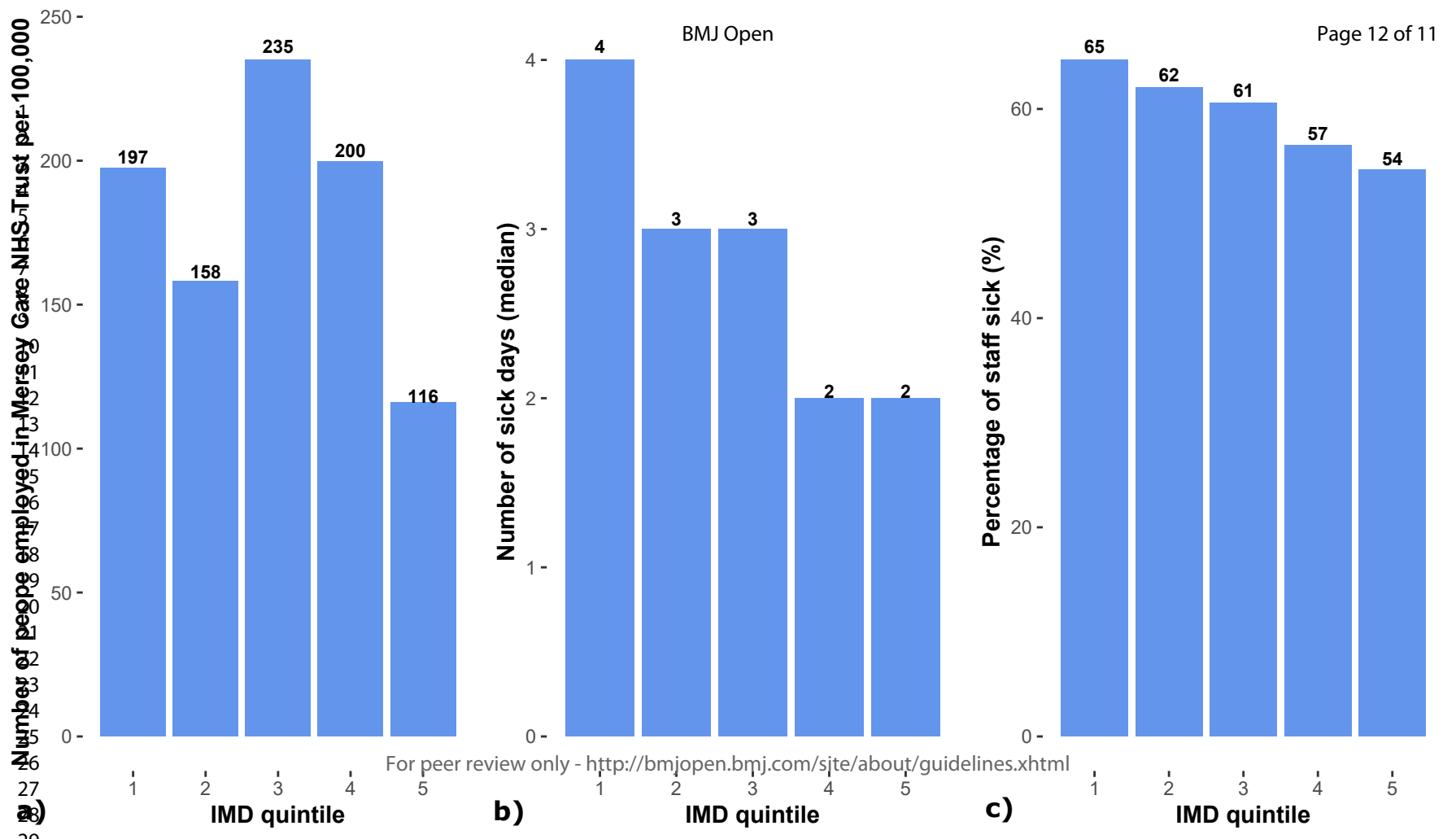

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Keywords: public health policy, health inequalities, workplace health, sickness absence
Word count: 2,882

Abstract

Objective:

This study investigates the distribution of the workforce of one large National Health Service (NHS) employer in relation to socioeconomic deprivation and how sickness absence rates varied across these levels of deprivation.

Design:

Share of the working age population that was employed at the NHS organisation mapped by area deprivation. The study utilized negative binomial regression models to investigate the extent to which wage level, occupational group and area deprivation were associated with sickness absence amongst employees.

Setting:

The study used electronic staff records (2018-19) of a large NHS organisation in the North West of England.

Results:

In the most deprived areas, an additional person per 1,000 working age population were employed at this NHS organisation compared to the most affluent areas. Employees from the most deprived quintile had 1.41 (95% CI 1.16 to 1.70) times the higher sickness rates than the employees from the least deprived quintile, when adjusting for age and sex. These differences were largely explained by differences in wage levels and occupation groups, with the lowest wage employees having 2.5 (95% CI 1.87 to 3.42) times the sickness absence rate as the highest wage group and the nursing and midwifery employees having 1.8 (95% CI 1.50 to 2.24) times the sickness absence rate as the administrative and clerical group.

Conclusion:

This large NHS organisation employed people disproportionately from deprived areas. They were considerably more likely to experience sickness absence compared to people from affluent areas. This appears to be because they were more likely to be in lower wage employment and employed in nursing and nursing assistant. Workplace health policies need to target these workers, adapting to their needs whilst enabling improvements in their working conditions, pay and career progression.

Strengths and limitations of this study

- One of the strengths of this study is that the use of routine electronic data provided by the Mersey Care Electronic Staff Record overcomes some issues with non-response bias occurring in survey-based research on sickness absence.
- The focus on one large community and mental health NHS organisation provides a useful case study, highlighting the potential for the NHS to improve health in deprived areas through improving the health of its workforce.
- As with all routine data sources a limitation is the quality of coding in the data. For example, employee's ethnicity was not consistently coded in the data and therefore we were not able to investigate the extent to which sickness absence rates vary across the different ethnic groups.
- Sickness absent rates by level of deprivation would probably be very different in acute hospital-based NHS organisations, and we cannot say how the pattern we observe in Mersey Care differs from other similar NHS organisations.

Introduction

The National Health Service (NHS) is one of the largest employers in the world, and is the biggest in Europe, with over 1.3 million staff (3.5% of the working age population). The role of the NHS, not just as a provider of health services but also as a major influence on local economies has become increasingly recognised, with the NHS long term plan[1] recognising the role of the NHS as an "Anchor Institution" [2] - that can positively influence the social, economic and environmental factors that help create good health and reduce health inequalities. One way the NHS could do this is by increasing recruitment from more disadvantaged communities, whilst improving the health of staff from these communities through workplace health policies. There is strong evidence showing that work is generally good for physical and mental health and well-being.[3] This depends, however, on the nature of working conditions. Evidence shows that poor working conditions are detrimental to health[4] and have been linked to sickness absence while improvement in psychosocial working conditions can reduce the risk of illness among the employees.[5] Vahtera et al[6] has shown that workers in jobs with poor participation in decision making, poor skill discretion, high job demands and low job control had more than double the risk of sick leave than workers in jobs without these adverse conditions. It therefore follows that, for the NHS to contribute to reduced health inequalities through its recruitment

and workplace policies, it needs to increase recruitment from more disadvantaged communities. NHS employers also need to understand the health needs of these members of staff, relative to those from less disadvantaged communities, so that they can target policies and practice to promote their health. Often policies to improve workplace health are not tailored to the differences in health needs of different socioeconomic groups and therefore can increase inequalities as uptake is often greater amongst more advantaged groups. [7]

Whilst there is evidence that the NHS makes up a greater share of employment in some of the less affluent regions of England such as the North West than other parts of the country[8] , there is little evidence assessing the socioeconomic profile of employees of NHS organisations in relation to the communities in which they are based. Whilst previous studies have shown that sickness absence in NHS organisations is concentrated in particular occupational groups[7], there has been limited research investigating how sickness absence varies across other socioeconomic groups of NHS employees. Studies in other workplaces such as the Whitehall II study of civil servants, have shown higher sickness absence rates amongst junior grade compared to senior grades[7,9,10] , however, there has been limited similar analysis of NHS employee. In particular previous studies have not analysed patterns of sickness absence in relation to the level of deprivation of the communities from which employees are recruited, or whether these patterns are explained by individual socioeconomic characteristics such as wages bands or occupation. Understanding both the patterns of recruitment in relation to these levels of deprivation and how health needs vary across deprivation levels will be important to inform strategies that aim to utilise NHS recruitment and workplace health policies to reduce health inequalities.

To inform these strategies this study aimed to investigate the distribution of the workforce of one large NHS employer in relation to socioeconomic deprivation and how sickness absence rates varied across levels of deprivation using workforce data from a large community and mental Health NHS organisation based in the North West of England.

Methods

Study design and setting

This cross-sectional study used anonymised data on 7,274 substantive staff employed during the financial year 2018-19 at Mersey Care NHS Foundation Trust extracted from their Electronic Staff Records (ESR). Mersey Care is one largest NHS Providers of mental health, learning disabilities, addictions and community physical health care in England, providing community health service across Merseyside in the North West of England .[11]

Data and measures

To understand the distribution of the workforce and variation in levels of sickness absence we define 3 outcomes. Firstly, the Mersey Care workforce as a share of the working age population calculated as the number of employees divided by the estimated population (per 1000 people) living in each area in 2018 obtained from the Office for National Statistics. [12] Secondly the sickness absence rate calculated as the average number of sick days per employee and thirdly, the sickness absence prevalence as the percentage of staff with at least one sickness absence during the year.

Age was categorised into 6 age groups (18-30, 31-40, 41-50, 51-60, 61-70 and 71-80) and gender into two groups (male, female) as recorded in the ESR. Wages were defined based on the 9 pay bands used by the NHS [13] (band 1 – lowest pay rate and band 9 – highest pay rate). To avoid small number effects introduced in our analysis (pay band 1, included only 5 employees, whilst pay band 9, included only 9 employees), we combined pay bands 1 and 2 along with pay bands 8 and 9.

Each NHS staff member is assigned to one of the 5 occupational groups: a) Scientific, Technical and Allied Health Professionals, b) Additional Clinical Services (Health Care Assistants), c) Estates and Ancillary, d) Nursing and Midwifery Registered, and e) Administrative and Clerical group. As Mersey Care is a primarily a community health provider it has relatively few medical staff. To ensure that no individuals could be identified from the data, all medical (junior to consultant grade) staff, Executive Directors and Board members were excluded from the analysis, leaving 7,005 staff members for analysis. Postcode data was mapped to Lower Super Output Area (LSOA) which are small geographical zones (mean population 1,500) in England that are routinely used for statistical analysis. Each LSOAs was then linked to a small area based measure of deprivation – the indices of multiple deprivation (IMD).[14] The IMD is a composite indicator of the level of deprivation for small geographical areas (LSOAs) across England, based on seven domains: Income deprivation, Employment deprivation, Education, Skills and Training deprivation, Health and Disability deprivation, Crime, Barriers to Housing & Services and the Living Environment deprivation. Quintiles are calculated by ranking the LSOAs in England from most deprived (quintile 1) to least deprived (quintile 5) and dividing them into 5 equal groups. For 179 people their postcode could not be mapped to LSOA, and they were therefore excluded from the analysis giving 6,826 employees in the final analysis.

Statistical Analysis

First, to investigate patterns of recruitment of employees to Mersey Care, we investigated the geographical distribution of Mersey Care staff and how this related to the level of socioeconomic deprivation. We defined the area from which Mersey Care workers could potentially have been recruited as all local authority areas in which at least 5 Mersey Care employees were resident – this gave 28 local authority areas from across the North West with a total working age population of

3,825,255. We mapped the share the working age population that worked for Mersey Care for each LSOA in this area and plotted the share for each deprivation quintile (per 1,000 people).

We then estimated the number of sick days per employee and the percentage of staff with any sickness absence in the year for each deprivation quintile. To investigate the relationship between the average number of days of sickness absence per employee and area deprivation, whilst adjusting for the age and gender of employees, we used a negative binomial regression model. The exponentiated coefficients from this model provide an estimate of the adjusted sickness absence rate ratio (RR) for each group relative to the baseline.

In a second model to investigate whether the relationship with area deprivation was explained by patterns of sickness absence between wage and occupational groups we additionally included the wage band and the occupational group to explore the extent to which these explained the any association with deprivation. We used a negative binomial model rather than a Poisson model to account for overdispersion of the data. We also examined the multicollinearity between the variables in both models using the Variance Inflation Factor (VIF) measure. All analysis was carried out in R version 3.6.3.

Patient and public involvement

No patients were involved in setting the research question or the outcome measures, nor were they involved in the design or implementation of the study.

Results

Figure 1a shows the geographical distribution of the Mersey Care workforce as a share of the working age population. Employees are spread across the North West although concentrated in the relatively deprived areas of Merseyside as well as in the more affluent areas of the Ribble Valley (see figure1b, for a map of deprivation in the same area).

Overall, the share of the working age population from the most deprived areas that worked at Mersey Care was very high 1.97 per 1,000 working age population (figure 2a). In the most deprived areas, an additional person per 1,000 working age population were employed at this NHS organisation compared to the most affluent areas. This meant that 36% of the Mersey Care workforce lived in the most deprived areas, whereas only 11% lived in the least deprived areas (see supplemental Table 1). The highest share of the working age population employed at Mersey Care was from areas of intermediate deprivation (quintile 3). Overall, the mean number of sickness absence days per employees was 22 days (median 3 days) and 61% of employees where on sick leave at least once during the year. Figure 2b and 2c shows

that there was a clear gradient across deprivation quintiles in levels of sickness absence. This was true in terms of the proportion of staff that had any sickness absence as well as the mean number of sick days per employee.

The negative binomial regression analysis for both models is shown in Table 1. Results from the model 1 showed that the sickness absence rate for the most deprived quintile was 1.41 times higher than the least deprived quintile (reference group) (95% CI 1.16 to 1.70), when just adjusting for age and sex. After controlling for wage band and occupational group the association with deprivation was reduced with the most deprived quintile exhibiting only slightly higher adjusted risk of sickness absence, that was no longer statistically significant at the 5% level. This analysis indicates that the association with area deprivation was largely explained by the higher sickness rate in the lower wage bands, who were more likely to live in deprived areas. Employees at bands 1-2 (Salaries of ~ £18,000 to £19,000 per annum) and 3 (£19,000-£21,000) had 2.53 (95% CI 1.87 to 3.42) and 2.25 (95% CI 1.70 to 2.96) times the sickness absence rate than high wage band employees (bands 8-9: £45,500 to £104,000). The corelation between low wages and area deprivation was high with 47% of the workforce from the most deprived areas being on wage bands 1-3, compared to 7% of those living in less deprived areas. Adjusted sickness absence rates for the staff in Additional Clinical services group (largely care assistants) and the Nursing and Midwifery Registered group were 1.72 (95% CI 1.44 to 2.05) and 1.84 (95% CI 1.50 to 2.24) times higher than the Administrative and Clerical group. These groups were also more likely to live in deprived areas than other occupational groups indicating that occupation also explained some of the relationship between sickness absence and area deprivation.

Table 1: Results from two negative binomial regression models: Model 1 includes only demographic variables and Model 2 includes additional wage bands and occupational groups variables.

		Model 1 (without Wage Bands & Occupational groups)			Model 2 (with Wage Bands & Occupational groups)		
	n (%)	Rate Ratio	95% Conf Intervals		Rate Ratio	95% Conf Intervals	
			LCL	UCL		LCL	UCL
Area deprivation							
Quintile 1 (most deprived)	2,478 (36)	1.41***	1.16	1.70	1.15	0.95	1.40
Quintile 2	1,169 (17)	1.22*	0.98	1.50	1.07	0.85	1.30
Quintile 3	1,397 (20)	1.21*	0.98	1.48	1.14	0.93	1.39
Quintile 4	1,125 (16)	1.13	0.91	1.39	1.12	0.90	1.38
Quintile 5 (least deprived - reference group)	657 (11)	1.00	-	-	1.00	-	-
Age groups							
71-80	21 (1)	1.30	0.57	3.99	1.03	0.45	3.12
61-70	553 (8)	1.77***	1.41	2.24	1.90***	1.51	2.41
51-60	2,198 (32)	1.93***	1.62	2.29	2.17***	1.82	2.58
41-50	1,676 (24)	1.71***	1.43	2.05	1.93***	1.61	2.31
31-40	1,465 (21)	1.35**	1.13	1.62	1.62***	1.34	1.94

18-30 (reference group)	913 (14)	1.00	-	-	1.00	-	-
Sex							
Female	4,974 (73)	1.00	0.89	1.13	1.13**	1.01	1.28
Male (reference group)	1,852 (27)	1.00	-	-	1.00	-	-
Wage Bands							
1-2	805 (12)	-	-	-	2.53***	1.87	3.42
3	1,755 (26)	-	-	-	2.25***	1.70	2.96
4	691 (10)	-	-	-	1.85***	1.38	2.47
5	1,171 (17)	-	-	-	1.59***	1.24	2.03
6	1,247 (18)	-	-	-	1.32**	1.03	1.69
7	683 (10)	-	-	-	1.09	0.83	1.42
8-9 (reference group)	474 (7)	-	-	-	1.00	-	-
Occupational groups							
Scientific, Technical and Allied Health Professionals	725 (11)	-	-	-	1.14	0.90	1.45
Additional Clinical Services (Health Care Assistants)	1,911 (28)	-	-	-	1.72***	1.44	2.05
Estates and Ancillary	454 (6)	-	-	-	1.04	0.80	1.35
Nursing and Midwifery Registered	2,182 (32)	-	-	-	1.84 ***	1.50	2.24
Administrative and Clerical group (reference group)	1,554 (23)	-	-	-	1.00	-	-

Models based on n = 6826 observations *** *p<0.01,* ** *p<0.05,* * *p<0.1*

Analysis of multicollinearity between the variables in both models (see supplemental Table 2) indicated using Variance Inflation Factors (VIF) of less than 2.0 suggesting that multicollinearity was not a cause for concern.

Discussion

We found that a relatively high proportion of the workforce of one of the largest community and mental health NHS organisations in England comes from relatively deprived areas with greater share of the working age population in deprived areas working at Mersey Care compared to the most affluent areas. Employees from these areas were however more likely to be absent from work due to sickness. This appears to be because they were more likely to be in lower wage employment and employed in nursing and nursing assistant. Those on lower wages and in those occupations tended to have higher sickness absence.

Socio-economic differences in sickness absence are well established and previous studies have found that sickness absence increases with decreasing socioeconomic status [15–17] but few specifically concentrated in the health sector [18–20] and considered the breadth of deprivation experienced by employees in the communities in which they live in. [21] This study supports the need for further investigation of sickness absence outside of employees' narrow work-related environment by understanding the patterns of recruitment by area deprivation. Potentially this could provide a basis for strategy intended for reducing health inequalities where employers could ensure recruitment from

deprived neighbourhoods and ensure those cohorts are supported with effective workplace health policies that work in more disadvantaged groups.

A recent systematic review [22] by National Institute for Health and Care Excellence (NICE) found some weak evidences for workplace health intervention reducing recurrent short-term sickness absence but there was no evidence that evaluated differences in effectiveness by socioeconomic status. This highlights the importance of (1) targeting such policies at more disadvantaged groups and also (2) developing evidence base for effective interventions in these groups. Whilst this study doesn't provide evidence for the latter, it does highlight the need to target such policies in NHS organisation similar to Mersey Care by occupation and wage band which would largely address difference between deprivation groups. Intervention studies examining sickness absence rates should consider the combination of all 3 factors (occupation, wage band and deprivation background).

Strengths and limitations

Before discussing the implications of our findings, we highlight some of the strengths and limitations of the analysis. One of the strengths of this paper is that the use of routine electronic data provided by the Mersey Care ESR overcomes some issues with non-response bias occurring in survey-based research on sickness absence. It also provides greater detail on occupation, wages, and place of residence than some analysis of data derived from sickness benefit claims. The focus on one large community and mental health NHS organisation provides a useful case study, highlighting the potential for the NHS to improve health in deprived areas through improving the health of its workforce. As with all routine data sources a limitation is the quality of coding in the data. For example, employee's ethnicity was not consistently coded in the data and therefore we were not able to investigate the extent to which sickness absence rates vary across the different ethnic groups. We were only able to access data from one NHS organisation and therefore our analysis will not be representative of inequalities in sickness absence across the NHS. As a community and mental health provider Mersey Care has a high proportion of staff from nursing and non-medical clinical services groups compared to the NHS as a whole, probably leading to a greater share of the workforce in relatively lower wage jobs compared to the NHS as a whole. Sickness absent rates by level of deprivation may be different in acute hospital-based NHS organisations, and we cannot say how the pattern we observe in Mersey Care differs from other similar NHS organisations.

Implications for policy and practice.

Our findings have a number of implications for NHS organisation aiming to address health inequalities through recruitment from disadvantaged communities and improving the health of these employees through workplace health policies. Firstly, we demonstrate that a sizeable portion of this Mersey Care

workforce comes from deprived neighbourhoods, highlighting the potential for NHS employment policies to have an impact on the employment and health of these communities, through its recruitment and workplace health policies. Secondly the higher level of sickness absence in employees from these communities mean that NHS organisations aiming to recruit from deprived communities are likely to see an increase in sickness absence in their workforce. Effective workplace health policies offering support to deal with potential unmet health needs need could be one of the strategies to reduce sickness. Support needs to reflect the health needs of the population from which staff are recruited. For example, if recruiting from more disadvantaged areas there may be a higher prevalence of mental health issues. For example, Mersey Care reviewed its Health & Wellbeing at Work strategy and is now recruiting psychologists to support staff with psychological therapy and interventions where required within the organisation. Traditional "one size fits all" ways of managing sickness absence and promoting workplace health will need revising to address inequalities in sickness absence within the workforce.

Conclusion

In summary, our findings suggest that a relatively high proportion of the workforce of one of the largest NHS organisations in England comes from relatively deprived areas with employees from these areas more likely to be absent from work due to sickness. While most of the differences in sickness absence rates was associated with employee's wage band and occupation group, other factors outside of employee's working environment such as community factors in which they live in may explain some of the remaining differences in sickness absence. By increasing recruitment from these communities and developing effective policies for improving health and working conditions for these groups, the NHS can contribute to reducing health inequalities through its workforce policies.

Contributors

KD and BB conducted the analysis. KD, WB and BB drafted the manuscript. KD, BB, WB, SW, AO, LE, JR all critically edited the manuscript. All authors approved the manuscript before submission.

Competing interests

BB and KD are supported by the NIHR Applied Research Collaboration North West Coast; BB is supported by the NIHR School for Public Health Research; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Data availability statement

Data may be obtained from a third party and are not publicly available.

Ethics committee approval

None required.

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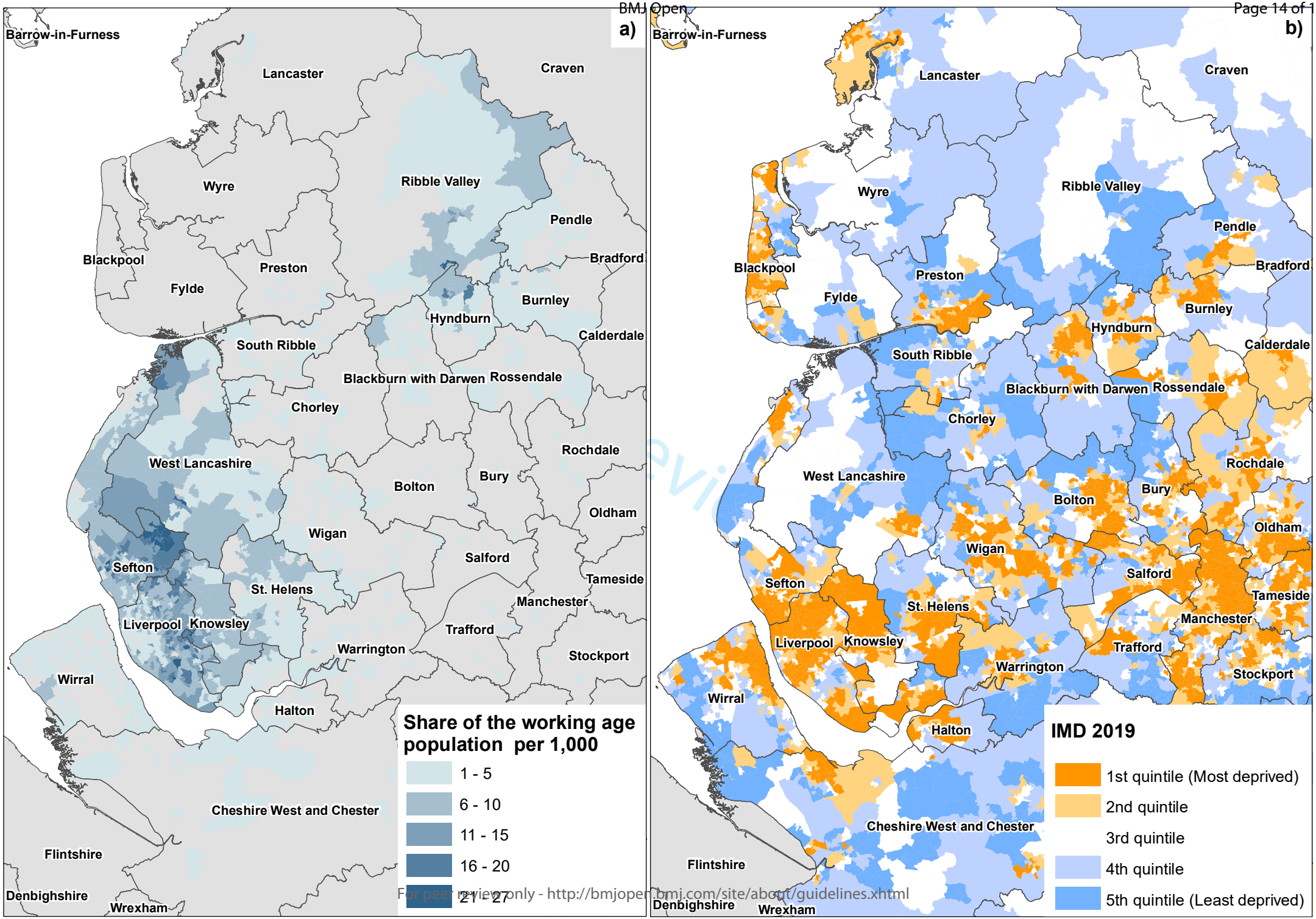

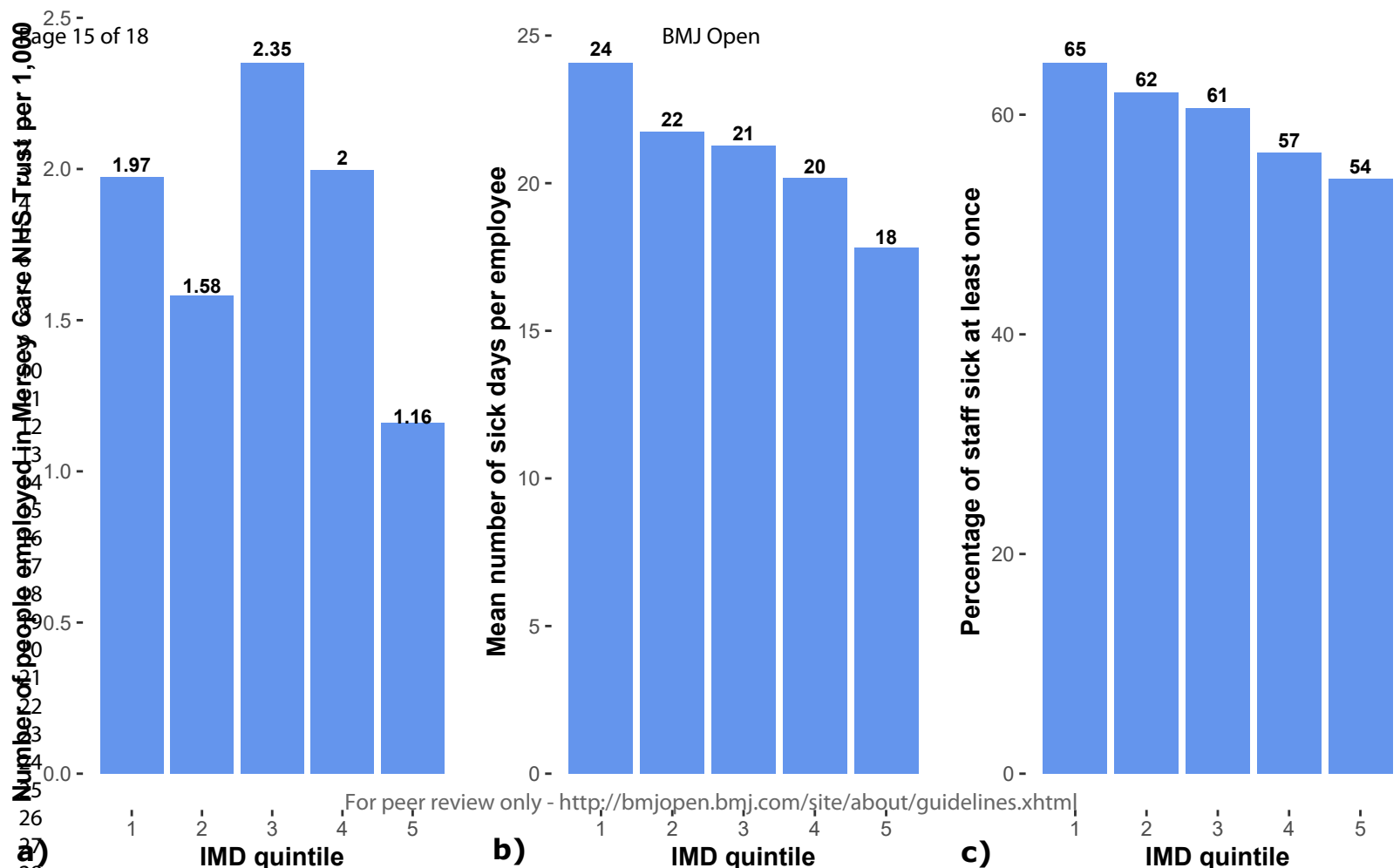

Supplementary material

Table 1: Mean, Median and Standard Deviation of employees on sick leave (days) by area deprivation, age group, sex, wage band and occupational group.

	Employees: All				Employees: On sick leave at least once			
	n (%)	Sickness absence (days)			n (%)	Sickness absence (days)		
		Mean	Median	SD		Mean	Median	SD
Area deprivation								
Quintile 1 (most deprived)	2,478 (36%)	24.1	4	47.8	1,603 (39%)	37.2	14	55.2
Quintile 2	1,169 (17%)	21.7	3	44.1	725 (17%)	35.1	11	51.7
Quintile 3	1,397 (20%)	21.3	3	45.5	846 (20%)	35.1	11	54.1
Quintile 4	1,125 (16%)	20.2	2	46.7	636 (15%)	35.7	11	57.5
Quintile 5 (least deprived)	657 (11%)	17.8	2	41.4	356 (9%)	32.9	9	51.7
Age groups								
71-80	21 (1%)	17.1	0	41.4	9 (<1%)	40.0	26	57.0
61-70	553 (8%)	23.9	3	43.6	329 (8%)	40.2	17	50.4
51-60	2,198 (32%)	26.0	4	52.7	1,369 (32%)	41.7	14	61.6
41-50	1,676 (24%)	23.1	3	48.1	1,019 (25%)	38.0	13	56.9
31-40	1,465 (21%)	18.5	3	39.3	891(21%)	30.4	10	46.7
18-30	913 (14%)	13.9	2	33.0	549 (13%)	23.1	7	40.1
Sex								
Female	4,974 (73%)	21.7	3	45.1	3,076 (74%)	35.1	12	53.1
Male	1,852 (27%)	22.3	3	48.2	1,090 (26%)	37.8	12	57.9
Wage Bands								
1-2	805 (12%)	23.7	4	50.1	510 (12%)	37.4	12	58.7
3	1,755 (26%)	28.5	6	51.7	1,238 (30%)	40.4	15	57.5
4	691 (10%)	22.9	3	50.4	437 (11%)	36.3	11	59.4
5	1,171 (17%)	21.8	3	43.2	722 (17%)	35.4	13	50.5
6	1,247 (18%)	18.5	3	40.9	761 (18%)	30.4	9	48.8
7	683 (10%)	15.0	0	39.1	324 (8%)	31.6	9	52.0
8-9	474 (7%)	11.1	0	31.9	174 (4%)	30.4	8	46.9
Occupational groups								
Scientific, Technical and Allied Health Professionals	725 (11%)	11.4	0	32.3	357 (8%)	23.1	6	43.0
Additional Clinical Services (Health Care Assistants)	1,911 (28%)	30.4	6	55.3	1,354 (33%)	42.9	16	61.4
Estates and Ancillary	454 (6%)	22.1	4	47.7	284 (7%)	35.3	11	56.3
Nursing and Midwifery Registered	2,182 (32%)	21.9	3	44.2	1,333 (32%)	35.9	13	52.0
Administrative and Clerical group	1,554 (23%)	16.1	1	38.3	838 (20%)	29.8	8	48.0
Total	6,826 (100%)	21.9	3	46.0	4,166 (100%)	35.8	12	54.4

SD = Standard Deviation

Assessment of multicollinearity.

We also examined the multicollinearity between the variables in both models using Variance Inflation Factors (VIF). VIF results for both models were less than 2.0 when considering the number of coefficients (Df) in the variable, suggesting that multicollinearity was not a cause for concern (Table 2).

Table 2: Results from VIF analysis for both models: Model 1 includes only demographic variables and Model 2 includes additional wage bands and Staff group variables.

	Model 1 (without Wage Bands & Staff Groups)			Model 2 (with Wage Bands & Staff Groups)		
	VIF	Df	VIF^(1/(2*Df))	VIF	Df	VIF^(1/(2*Df))
IMD	1.01	4	1.00	1.10	4	1.01
Age group	1.02	5	1.00	1.14	5	1.01
Gender	1.01	1	1.00	1.06	1	1.03
Band	-	-	-	7.13	6	1.18
Staff group	-	-	-	6.83	4	1.27

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	p1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	p1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	p2
Objectives	3	State specific objectives, including any prespecified hypotheses	p3-¶3
Methods			
Study design	4	Present key elements of study design early in the paper	p3-¶4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	p3-¶4
Participants	6	(*a*) ~~*Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up~~ ~~*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls~~ *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	p3-¶4
		~~(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed~~ ~~*Case-control study*—For matched studies, give matching criteria and the number of controls per case~~	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	p4
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	p4
Bias	9	Describe any efforts to address potential sources of bias	p4
Study size	10	Explain how the study size was arrived at	p3-4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	p4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	p4-5
		(*b*) Describe any methods used to examine subgroups and interactions	p4-5
		(*c*) Explain how missing data were addressed	N/A
		(*d*) ~~*Cohort study*—If applicable, explain how loss to follow-up was addressed~~ ~~*Case-control study*—If applicable, explain how matching of cases and controls was addressed~~ *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	p5

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	N/A
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	N/A
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		~~(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)~~	
Outcome data	15*	~~*Cohort study*—Report numbers of outcome events or summary measures over time~~	
		~~*Case-control study*—Report numbers in each exposure category, or summary measures of exposure~~	
		Cross-sectional study—Report numbers of outcome events or summary measures	p5
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	p6-7
		(*b*) Report category boundaries when continuous variables were categorized	p5-7
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	p7
Discussion			
Key results	18	Summarise key results with reference to study objectives	p7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	p8
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	p8
Generalisability	21	Discuss the generalisability (external validity) of the study results	p8-9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	p9

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.