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## Original Research

# Role of lifestyle behaviours in the ethnic pattern of poor health outcomes in Leicester, England: analysis of a survey data set



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## ABSTRACT

**Objectives:** Mediation analyses were conducted to explore the contribution of lifestyle behaviours in the ethnic pattern of poor health outcomes in Leicester, England.

**Study design:** Cross-sectional study.

**Methods:** The study used data on 1959 participants from the Leicester Health and Well-being Survey (2015). Lifestyle behaviours were physical activity, diet, smoking and alcohol drinking. Poor health outcomes were the presence of long-term illness and poor self-reported health.

**Results:** Poor health outcomes were less common in Black and Minority Ethnic groups (BMEs) than Whites. Smoking was less common in BMEs than Whites. Poor health outcomes were more common in ex-smokers and current smokers than never smokers. Health outcomes were associated with smoking even after adjusting for ethnicity. The association of ethnicity and health outcomes reduced after adjusting for smoking, suggesting that the effect was mediated by smoking.

**Conclusions:** In Leicester, Whites had poorer health outcomes than BMEs, which were not mediated by physical activity, diet and alcohol drinking but were mediated by smoking.

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## Introduction

Lifestyle behaviours, such as physical activity, diet, smoking and alcohol drinking, are modifiable factors.<sup>1,2</sup> Variations in

health between different population groups, because of factors like these, are called health inequities, which are unfair and avoidable.<sup>1</sup> In England, health inequity is a major issue, and the costs associated with health inequities are substantial.<sup>3</sup> Its reduction is a key goal of public policy.<sup>1–3</sup> Thus,

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understanding the behavioural determinants of health inequities are important for achieving such a goal.

England is an ethnically diverse country.<sup>4</sup> Variations in health have been reported between Whites and Black and Minority Ethnic groups (BMEs, comprises of mixed, Asian or Asian British, Black and Black British and other ethnic group). Usually, BMEs are at higher risk of poor health outcomes compared with Whites.<sup>5–7</sup> Studies on the extent to which lifestyle behaviours contribute to ethnic inequities in health are growing. For example, analysis of the Health Survey for England (HSE) 2003–2006 data showed that lifestyle behaviours are one of the major contributors explaining ethnic inequities in health, especially explaining poor health outcomes in South Asians.<sup>8</sup> When determining the mechanisms through which ethnicity is related to health outcomes, it is important to note that health outcomes are determined by factors associated with ethnicity. The distribution of these factors, such as lifestyle behaviours, manifest unequally in different population groups and can be conceptualised broadly as ethnic differences.<sup>6–9</sup>

Leicester is the largest city in the East Midlands region of England.<sup>10</sup> It is one of the most ethnically diverse cities—around 50% of the population are from BME backgrounds compared with around 15% in England.<sup>4</sup> Leicester exhibits some of the most complex health needs and biggest health inequities.<sup>10,11</sup> The aim of the study was to explore the contribution of lifestyle behaviours in the ethnic pattern of poor health outcomes in this multiethnic city population. It was hypothesised that the association of ethnicity and health outcomes was mediated by lifestyle behaviours, and ethnicity was still affecting health outcomes. The proposed mediational model was a causal model, as shown in Fig. 1.

## Methods

### Study design, participants, data source and collection procedure

This study used data from the Leicester Health and Well-being Survey (2015). This survey was commissioned by the Leicester City Council (Public Health Division). The data were collected by an independent research agency, Ipsos MORI. Trained interviewers conducted face-to-face interviews with the participants using a quantitative questionnaire, under the Market Research Society Code of Conduct and the Data Protection Act, 1998. The aim of the survey was explained to the potential participants, and consent was obtained from those interested in participating. The survey was conducted from January to June 2015. A total of 2321 residents, aged 16 years or above, were interviewed in pre-assigned sample points across

Leicester. Quotas were set by age, sex, ethnicity and work status to ensure demographic representativeness. The interviewers continued to knock on the doors until they reached the target. Data were not collected on those who opted against taking part. In this study, data on 1959 (out of 2321) participants aged between 16 and 65 years were analysed, and data on the remaining 362 participants aged above 65 years were excluded. Age is a strong confounder, and thus, participants above 65 years of age were excluded. Older people are usually different in terms of their lifestyle behaviours and health outcomes.<sup>12</sup>

### Study variables

Relevant data were extracted from the survey data set. The standard UK census survey question for ethnicity was used for data collection.<sup>4</sup> Participants were asked the following question: 'to which of the groups on this card do you consider you belong? Just read out the letter that applies.' The main categories available were as follows: White, Mixed, Asian or Asian British, Black or Black British and other ethnic group. Under each of these categories, further options were available. In our study, potential confounders were age (in years), sex and index of multiple deprivation 2015 (IMD) (represented the socio-economic status; IMD combines seven domains of deprivation—income, employment, education, skills and training, health and disability, crime, barriers to housing and services and living environment; five quintiles of IMD with one and five representing the most and least deprived groups, respectively).<sup>13</sup> Four lifestyle behaviours (potential mediator variables) were physical activity (moderate-intensity;  $\geq 150$  min/week and  $< 150$  min/week),<sup>14</sup> diet (fruit and vegetables;  $\geq 5$  portions/day and  $< 5$  portions/day),<sup>15</sup> smoking (included cigarettes and bidi; never, ex-smoker and current smoker) and alcohol drinking (never, ex-drinker and current drinker). In the survey, participants were asked validated questions like 'Do you have any long-standing illness, disability or infirmity? By long-standing I mean anything that has troubled you over the last 12 months, or that is likely to affect you over the coming 12 months' and 'How is your health in general?'.<sup>16</sup> Poor health outcomes were the presence of long-term illness and poor self-reported health (i.e. fair, bad and very bad options).

### Ethics

This study was approved by the Research Ethics Committee, Division of Epidemiology and Public Health, The University of Nottingham (UK).

### Statistical analyses

For categorical variables, numbers and percentages were calculated. For normally distributed continuous variables, mean and standard deviation were calculated. Simple logistic regression methods were used to investigate the association between different variables. Health outcomes were dichotomous variables. Mediation analyses for dichotomous variables are not fully developed, unlike for continuous variables.<sup>17,18</sup> Thus, to determine the role of lifestyle

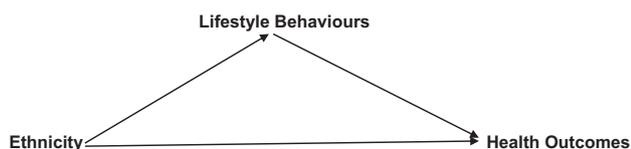


Fig. 1 – Mediational model.

behaviours in the ethnic pattern of poor health outcomes, we followed the steps (logistic regression mediation) suggested by Nathaniel Herr:<sup>19</sup>

- (1) Estimate the association between ethnicity and lifestyle behaviour
- (2) Estimate the association between lifestyle behaviour and the health outcome, controlling for ethnicity
- (3) Estimate the association between ethnicity and the health outcome (the total effect)
- (4) Estimate the association between ethnicity and the health outcome, controlling for lifestyle behaviour (the direct effect).

For every potential mediator variable, the indirect effect, *P* value (using the Sobel test to determine if the indirect effect of ethnicity on the health outcome through lifestyle behaviour was significant or not) and percentage of the effect that was mediated ( $[(\text{the indirect effect}/\text{the total effect}) \times 100]$ ) were calculated. Two models were made—(a) unadjusted and (b) adjusted for potential confounders (age, sex and IMD). All data were analysed using Stata V.14 for Windows software.

## Results

Table 1 (and Table S1 and S2) shows the characteristics of participants in Leicester. Health outcomes were associated with ethnicity and lifestyle behaviours (physical activity, smoking and alcohol drinking), such that poor health outcomes were less common in BMEs than Whites, poor health outcomes were more common in those doing <150 min/week of physical activity than those doing  $\geq 150$  min/week of physical activity, poor health outcomes were more common in ex-smokers and current smokers than never smokers, and the presence of long-term illness was more common in ex-drinkers than never drinkers.

Table 2 reports the association between ethnicity and lifestyle behaviours. Ethnicity and lifestyle behaviours were associated, such that doing  $\geq 150$  min/week of physical activity and eating  $\geq 5$  portions/day of diet were more common in BMEs than Whites, and smoking and alcohol drinking were less common in BMEs than Whites.

Tables 3 and 4 (and Table S3) report the mediation analyses. The association of ethnicity and health outcomes

**Table 1 – Characteristics of participants in Leicester.**

	Total sample size [N]	Presence of long-term illness N (%)	Presence of long-term illness Unadjusted OR (95% CI)	Poor self-reported health N (%)	Poor self-reported health Unadjusted OR (95% CI)
<b>Ethnicity</b>	1959	513 (26)		497 (25)	
Whites	976	304 (31)	1	275 (28)	1
BMEs	983	209 (21)	0.60 (0.49–0.73)	222 (23)	0.74 (0.60–0.91)
<b>Age (in years)</b>	36.9 (13.6) <sup>a</sup>	45.3 (13.1) <sup>a</sup>	0.07 (0.06–0.07) <sup>b</sup>	44.1 (13.5) <sup>a</sup>	0.05 (0.05–0.06) <sup>b</sup>
<b>Sex</b>					
Male	949	229 (24)	1	220 (23)	1
Female	1010	284 (28)	1.22 (1.00–1.51)	277 (27)	1.24 (1.01–1.53)
<b>IMD</b>					
Quintile 1	834	250 (30)	1	250 (30)	1
Quintile 2	679	148 (22)	0.65 (0.51–0.82)	151 (22)	0.66 (0.53–0.84)
Quintile 3	307	95 (31)	1.05 (0.79–1.39)	84 (27)	0.87 (0.65–1.17)
Quintile 4	125	18 (14)	0.39 (0.23–0.66)	11 (9)	0.22 (0.12–0.42)
Quintile 5	14	2 (14)	0.39 (0.09–1.75)	1 (7)	0.18 (0.02–1.37)
<b>Physical activity</b>					
$\geq 150$ min/week	1208	270 (22)	1	247 (20)	1
<150 min/week	713	226 (32)	1.63 (1.35–1.96)	231 (32)	1.90 (1.58–2.29)
Don't know	38	17 (45)	2.81 (1.46–5.41)	19 (50)	3.89 (2.03–7.46)
<b>Diet</b>					
$\geq 5$ portions/day	373	107 (29)	1	90 (24)	1
<5 portions/day	1586	406 (26)	0.86 (0.67–1.10)	407 (26)	1.09 (0.84–1.42)
<b>Smoking</b>					
Never	1223	281 (23)	1	245 (20)	1
Ex-smoker	283	92 (33)	1.61 (1.22–2.14)	84 (30)	1.68 (1.26–2.25)
Current smoker	453	140 (31)	1.50 (1.18–1.91)	168 (37)	2.38 (1.88–3.01)
<b>Alcohol drinking</b>					
Never	894	234 (26)	1	237 (27)	1
Ex-drinker	92	34 (37)	1.65 (1.06–2.59)	31 (34)	1.48 (0.94–2.33)
Current drinker	957	240 (25)	0.94 (0.77–1.16)	226 (24)	0.86 (0.69–1.06)
Don't know/prefer not to say	16	5 (31)	1.28 (0.44–3.73)	3 (19)	0.64 (0.18–2.26)

OR, odds ratio; CI, confidence interval; BMEs, Black and Minority Ethnic groups; IMD, index of multiple deprivation.

<sup>a</sup> Mean (standard deviation).

<sup>b</sup> Coefficient (95% confidence interval).

**Table 2 – Association between ethnicity and lifestyle behaviours.**

	OR (95% CI)
<b>Physical activity<sup>a</sup></b>	
<b>Ethnicity</b>	
Whites	1
BMEs	1.23 (1.03–1.48)
<b>Diet</b>	
<b>Ethnicity</b>	
Whites	1
BMEs	1.64 (1.31–2.07)
<b>Smoking</b>	
<b>Ethnicity</b>	
Whites	1
BMEs	0.21 (0.17–0.26)
<b>Alcohol drinking<sup>b</sup></b>	
<b>Ethnicity</b>	
Whites	1
BMEs	0.12 (0.10–0.15)

OR, odds ratio; CI, confidence interval; BMEs, Black and Minority Ethnic groups.  
<sup>a</sup> Includes don't know.  
<sup>b</sup> Includes don't know/prefer not to say.

increased after adjusting for physical activity, and hence, physical activity was not a mediator. Similarly, alcohol drinking was not a mediator. Health outcomes were not associated with diet after adjusting for ethnicity, and hence, diet was not a mediator. Health outcomes were associated with smoking, even after adjusting for ethnicity. The association of ethnicity and health outcomes reduced after adjusting for smoking, suggesting that the effect was mediated by smoking. In the case of the presence of long-term illness and poor self-reported health, 18% and 92% of effects were mediated by smoking, respectively. In the adjusted models, similar results were found.

## Discussion

### The main finding of this study

Poor health outcomes were less common in BMEs than Whites. Smoking was less common in BMEs than Whites. Poor health outcomes were more common in ex-smokers and current smokers than never smokers. Health outcomes were

**Table 3 – Mediation analyses.**

	Presence of long-term illness		Poor self-reported health	
	Unadjusted coefficient (SE)	Adjusted coefficient (SE)	Unadjusted coefficient (SE)	Adjusted coefficient (SE)
<b>Physical activity<sup>a</sup></b>				
(1) Association between ethnicity and physical activity	0.06 (0.03)	0.07 (0.03)	0.06 (0.03)	0.07 (0.03)
(2) Association between physical activity and the health outcome, controlling for ethnicity	0.15 (0.03)	0.11 (0.03)	0.19 (0.03)	0.16 (0.03)
(3) Association between ethnicity and the health outcome (the total effect)	–0.14 (0.03)	–0.11 (0.03)	–0.08 (0.03)	–0.04 (0.03)
(4) Association between ethnicity and the health outcome, controlling for physical activity (the direct effect)	–0.15 (0.03)	–0.12 (0.03)	–0.09 (0.03)	–0.05 (0.03)
<b>Diet</b>				
(1) Association between ethnicity and diet	0.14 (0.03)	0.13 (0.03)	0.14 (0.03)	0.13 (0.03)
(2) Association between diet and the health outcome, controlling for ethnicity	–0.02 (0.03)	0.02 (0.03)	0.03 (0.03)	0.06 (0.03)
(3) Association between ethnicity and the health outcome (the total effect)	–0.14 (0.03)	–0.11 (0.03)	–0.08 (0.03)	–0.04 (0.03)
(4) Association between ethnicity and the health outcome, controlling for diet (the direct effect)	–0.14 (0.03)	–0.11 (0.03)	–0.09 (0.03)	–0.05 (0.03)
<b>Smoking</b>				
(1) Association between ethnicity and smoking	–0.40 (0.03)	–0.40 (0.03)	–0.40 (0.03)	–0.40 (0.03)
(2) Association between smoking and the health outcome, controlling for ethnicity	0.06 (0.03)	0.07 (0.03)	0.19 (0.03)	0.21 (0.03)
(3) Association between ethnicity and the health outcome (the total effect)	–0.14 (0.03)	–0.11 (0.03)	–0.08 (0.03)	–0.04 (0.03)
(4) Association between ethnicity and the health outcome, controlling for smoking (the direct effect)	–0.12 (0.03)	–0.09 (0.03)	–0.02 (0.03)	0.03 (0.03)
<b>Alcohol drinking<sup>b</sup></b>				
(1) Association between ethnicity and alcohol drinking	–0.50 (0.02)	–0.53 (0.03)	–0.50 (0.02)	–0.53 (0.03)
(2) Association between alcohol drinking and the health outcome, controlling for ethnicity	–0.10 (0.03)	–0.07 (0.03)	–0.11 (0.03)	–0.07 (0.03)
(3) Association between ethnicity and the health outcome (the total effect)	–0.14 (0.03)	–0.11 (0.03)	–0.08 (0.03)	–0.04 (0.03)
(4) Association between ethnicity and the health outcome, controlling for alcohol drinking (the direct effect)	–0.19 (0.03)	–0.15 (0.03)	–0.13 (0.03)	–0.08 (0.03)

SE, standard error.

<sup>a</sup> Includes don't know.

<sup>b</sup> Includes don't know/prefer not to say.

**Table 4 – Mediation analyses-indirect effects.**

	Presence of long-term illness		Poor self-reported health	
	Unadjusted model	Adjusted model	Unadjusted model	Adjusted model
<b>Physical activity<sup>a</sup></b>				
Indirect effect (SE)	0.01 (0.00)	0.01 (0.00)	0.01 (0.01)	0.01 (0.00)
P-value (Sobel test)	0.039	0.025	0.034	0.013
% of effect that was mediated	–6	–7	–8	–27
<b>Diet</b>				
Indirect effect (SE)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.00)
P-value (Sobel test)	0.460	0.491	0.363	0.071
% of effect that was mediated	2	–2	–4	–18
<b>Smoking</b>				
Indirect effect (SE)	–0.03 (0.01)	–0.03 (0.01)	–0.08 (0.01)	–0.08 (0.01)
P-value (Sobel test)	0.029	0.038	<0.001	<0.001
% of effect that was mediated	18	24	92	189
<b>Alcohol drinking<sup>b</sup></b>				
Indirect effect (SE)	0.05 (0.02)	0.04 (0.02)	0.05 (0.02)	0.04 (0.02)
P-value (Sobel test)	0.002	0.035	0.001	0.041
% of effect that was mediated	–36	–35	–64	–86

SE, standard error.

<sup>a</sup> Includes don't know.

<sup>b</sup> Includes don't know/prefer not to say.

associated with smoking even after adjusting for ethnicity. The association of ethnicity and health outcomes reduced after adjusting for smoking, suggesting that the effect was mediated by smoking.

#### What is already known on this topic?

In our study, poor health outcomes were less common in BMEs than Whites. This finding is consistent with other surveys.<sup>16,20</sup> In 2012, the prevalence of limiting long-standing illness or disability in Great Britain was 20% and 11% in Whites and BMEs, respectively.<sup>20</sup> In the 2011 Census, the poor self-reported health in Leicester was 22% and 17% in Whites and BMEs, respectively.<sup>16</sup> Better self-reported health in BMEs could be an indication of the positive impact of past actions introduced by the relevant authorities to address health inequities faced by BMEs (e.g. better access to quality healthcare services). On the other hand, long-term illness was less common in BMEs, and this could be the result of undiagnosed cases/unawareness of their illness (e.g. type 2 diabetes) or they might have restrained from disclosing their personal information in a survey.<sup>21–23</sup> In our study, poor health outcomes were more common in Whites, and this serves as an alert to relevant authorities. There is a clear need to do an in-depth study on this issue and take necessary actions accordingly.

We found that smoking mediated the association of ethnicity and health outcomes. Smoking has a harmful effect on nearly all the body organs and causes many diseases and negatively affects a person's overall health.<sup>24</sup> In England, smoking is the single biggest cause of preventable illness and death.<sup>25,26</sup> In our study, the prevalence of smoking was 23%. In 2017, the Public Health England's health profile for Leicester reported an 18% prevalence.<sup>10</sup> In Leicester, smoking, the biggest lifestyle risk factor, is more common in Whites (29%) than BMEs (13%).<sup>11</sup> Similarly, in England, smoking rates are

generally less common in BMEs compared with the general population. However, these rates vary greatly between BME subgroups.<sup>27,28</sup> Because our study found that Whites had poorer health outcomes compared with BMEs, which in turn was mediated by smoking, so the relevant authorities should conduct a health equity audit of evidence-based actions to change this unhealthy behaviour (e.g. access to, take-up and outcome of NHS Health Checks and Smoking Cessation services). The health inequities that are driven by variations in smoking prevalence will only be reduced through actions that have a greater effect on smokers in higher prevalence groups. This means using both population-level interventions which these smokers are more sensitive to and targeting interventions on these smokers.<sup>25,27</sup> It should be noted that smoking is only one form of tobacco usage, especially in BMEs.<sup>27</sup> Thus, future research on this topic must include other forms of tobacco usage.

Lifestyle behaviours are one of the major contributors explaining ethnic inequities in health.<sup>8</sup> However, this concept is not without objections. Experts have argued that ethnic groups are, conveniently, seen as the cause of their own problems by supposedly following unhealthy lifestyles associated with their cultures. Research on lifestyle behaviours has led to mixed conclusions—for some lifestyle behaviours, BMEs generally fare well, and for others, they fare less well. At the same time, there are huge variations in lifestyle behaviours across ethnic groups, age, genders, socio-economic deprivation, religions and generations. Their recommendation is to focus on socio-economic causes, as the socio-economic inequities associated with ethnicity are the main drivers of ethnic inequities in health.<sup>7</sup>

#### Strengths and limitations of this study

This study has a number of strengths and weaknesses. This is the first study to determine the role of lifestyle behaviours in

the ethnic pattern of poor health outcomes in a multi-ethnic population in Leicester. In terms of generalisability, the study findings could be valid in settings with similar populations. The questions were adapted from the health and well-being measurement section of the UK census survey questionnaire, which has been used several times and has improved over time. This ensured the validity and reliability of the questionnaire. The trained interviewers used a standardised protocol for data collection. Missing data could lead to bias, but it was nil in this study. Quota sampling has its own limitations (e.g. problems in making inferences from the sample to the population). All the data were self-reported, and subjectivity, recall bias and social desirability bias could have been an issue. Thus, studies incorporating objective measures and existing records could be used in the future, which would cross-check our study findings and provide a more complete picture. Around 89% of all respondents spoke and read English 'very' or 'fairly' well, and language was an issue with some participants. In such cases, a family member or a professional interpreter was involved in the interview process, which might have influenced a small number of responses. Health outcomes may vary between BME subgroups. For example, analysis of HSE 2003–2006 data showed that some BME subgroups reported poor health outcomes, while some others reported better health outcomes than Whites.<sup>8</sup> In our study, they were combined as a single group as the sample size in each subgroup was not adequately large enough. Thus, further research is needed to explore health outcomes in BME subgroups, including those that are invisible in the standard Office for National Statistics classification of ethnicity.<sup>25</sup> Although someone's ethnicity does not change over time, being a self-assessed characteristic, it can change with the changing views of national identity. In our study, this chance was negligible as we had only two broad groups (Whites and BMEs). The assumed causal association between lifestyle behaviours and health outcomes might not be valid, and these lifestyle behaviours could be the result of health outcomes (i.e. reverse causality). This would be better explored through a long-term longitudinal study. However, a long-term longitudinal study would be much more expensive and challenging to conduct compared with our study.

In conclusion, in Leicester, Whites had poorer health outcomes than BMEs, which were not mediated by physical activity, diet and alcohol drinking but were mediated by smoking.

## Author statements

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### Ethical approval

The study was approved by the Research Ethics Committee, Division of Epidemiology and Public Health, The University of Nottingham (UK).

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## Competing interests

No potential conflict of interest was reported by the authors.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhe.2019.03.003>.