Ethnic differences in longitudinal latent verbal profiles in the millennium cohort study*

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Introduction

Early childhood development is an influential predictor of later life academic and employment outcomes. The development of verbal capacities in the early years and school age years is consequential for children’s educational achievement, college completion, and adult labour force outcomes. Describing any observed differences in early childhood verbal abilities and the associated explanatory factors is important given the links between verbal skills in early childhood and school age years and adult outcomes. We examine ethnic differences in longitudinal latent verbal profiles and assess the contribution of family process and family resource factors to observed differences.

Methods: Using data from the UK Millennium Cohort Study and the latent profile analysis, we estimate longitudinal latent verbal profiles using verbal skills measured 4 times from age 3–11 years. We investigate the odds of verbal profiles by ethnicity (reported in infancy), and the extent observed differences are mediated by the home learning environment, family routines, and psychosocial environment (measured at age 3). Results: Indian children were twice as likely (OR = 2.14, CI: 1.37–3.33) to be in the high achieving profile, compared to White children. Socioeconomic markers attenuated this advantage to nonsignificance. Pakistani and Bangladeshi children were significantly more likely to be in the low performing group (OR = 2.23, CI: 1.61–3.11; OR = 3.37, CI: 2.20–5.17, respectively). Socioeconomic and psychosocial factors had the strongest mediating influence on the association between lower achieving profiles and Pakistani children, whereas for Bangladeshi children, there was mediation by the home learning environment, family routines, and psychosocial factors. Conclusion: Family process and resource factors explain ethnic differences in longitudinal latent verbal profiles. Family resources explain verbal advantages for Indian children, whereas a range of home environment and socioeconomic factors explain disparities for Pakistani and Bangladeshi children. Future policy initiatives focused on reducing ethnic disparities in children’s development should consider supporting and enhancing family resources and processes.

Family resources, which include family socioeconomic position, often proxied by family income and language spoken at home, are strongly associated with academic achievement for children. Family process factors, such as the home learning environment, warm and supportive parenting, family routines, and maternal mental health, have also been linked to academic performance and favourable developmental outcomes.

In this study, we consider the heterogeneity in children’s verbal scores over time by using a latent profile analysis and four waves of data from the Millennium Cohort Study. We examine what longitudinal latent verbal profiles are observed; what are the ethnic...
differences in longitudinal latent verbal profiles; and what is the contribution of the home learning environment, family routines, and psychosocial environment in explaining observed ethnic differences in longitudinal latent verbal profiles.

Methods

Millennium Cohort Study
The Millennium Cohort Study (MCS) is a nationally representative longitudinal study of infants born in the UK in 2000–2002. The MCS sample was clustered within electoral wards. Disadvantaged residential areas and areas with a high proportion of ethnic minority people are over-represented. Parents were interviewed when cohort members were approximately 9 months old, 3, 5, 7, and 11 years. Trained interviewers carried out cognitive assessments at ages 3, 5, 7, and 11.

Verbal skills
Verbal skills were assessed using a subset of the British Ability Scales II (BAS II), which is a battery of cognitive abilities and educational achievement tests suitable for use from ages 2 years 6 months to 17 years 11 months. The individual subscales are widely validated, age appropriate, can be analysed separately, and have been shown to predict later child cognitive performance.

Ethnicity
Ethnic categories for analysis were: White, Indian, Pakistani, Bangladeshi, Black Caribbean, Black African, and other. The ‘other’ group includes mixed ethnic groups and ethnic minority groups that could not be categorized into any of the otherwise defined groups.

Explanatory factors
All variables were assessed at 3 years unless noted otherwise. Demographic controls were whether or not the cohort member was a firstborn and mother’s age at the time of birth. Socioeconomic and home environment variables are considered as mediators. Socioeconomic markers were equivalised family income in quintiles and whether the primary household language was English or another language. Three domains of the home environment were measured at age 3: learning, family routines, and psychosocial environmental factors. Home learning environment measures were: parental basic skills difficulties (9 month data); and frequency of learning activities: someone reads stories to the child, visits to the library, help with alphabet, numbers/counting, learning songs, poems and rhymes, and does drawing and painting. Family routines were whether the child had regular bedtimes and mealtimes. Markers of the psychosocial environment were: maternal psychological distress, parent-child relationship, discipline strategies—a composite score (x = 0.71) of seven items from the Conflict Tactics Scale, nine parent-child items from the Home Observation for Measurement of the Environment (HOME) Inventory, whether the mother felt she was a competent parent, whether the family had lots of rules, and whether these rules were enforced.

Sample
Child verbal skills are moderated by multiple births and therefore we analysed data on singleton-born cohort members with observed ethnicity and who had at least one verbal assessment across the four sweeps. The analytic sample was 16 704 after multiply imputing missing values on explanatory factors and verbal assessments. We applied Multiple Imputation by Chained Equations (MICE) techniques and imputed 25 datasets. Further information on the imputation model and missingness in analysis variables is in Appendix A of the online Supplementary Material.

Analytical approach
To identify and characterize longitudinal latent verbal profiles, we used a three-step latent profile analysis (LPA). Further detail on the methodology can be found in Appendix B, online Supplementary Material. In the base model (Model 0) we present estimates of ethnic differences. Then we separately adjusted for 5 sets of controls and mediators: Model 1: demographic controls; Model 2: socio-economic characteristics; Model 3: home learning environment; Model 4: family routines; Model 5: psychosocial environment; and Model 6: simultaneously adjusts for all covariates. We use multinomial regression models and present odds ratios. All analyses accounted for sample design and non-response.

Results
LPA revealed the optimal solution to be three longitudinal latent verbal profiles. Fit indices are presented in table 1. Models beyond five profiles were contraindicated by the fit indices. The additional one or two profiles beyond a three-profile solution reflected variants of low and average verbal performances, did not offer distinct substantive insight related to verbal performance, and lastly these additional profiles were small, with prevalence below 5%. These verbal profiles are depicted in figure 1. The largest group was named the “average” (74.9% of the sample). The scores of this group at each age of assessment were closer to the overall sample mean, with mean scores ranging between 51 and 57 across the four assessment periods. In contrast to this group, a “low” group (5.6% of the sample) had the poorest verbal performance across childhood, with mean scores ranging from 37 to 44. In contrast to these two groups, the “high” (19.5% of the sample) group included children with the highest verbal scores, with means ranging from 54 to 70 across the four assessment points.

Table 1 Fit indices for latent profile analyses (N = 16 704)

| Number of profiles | 2    | 3    | 4    | 5    |
|-------------------|------|------|------|------|
| Log-likelihood    | −276,535 | −276,390 | −276,303 | −276,259 |
| BIC               | 487,280 | 487,032 | 486,942 | 487,032 |
| BIC adj.          | 487,194 | 486,931 | 486,824 | 486,784 |
| AIC               | 487,071 | 486,785 | 486,656 | 486,785 |
| Entropy           | 0.91  | 0.73  | 0.72  | 0.66  |

Notes: BIC = Bayesian information criterion, a measure of model fit; smaller values indicate better fit; BIC adj. = BIC adjusted for sample size; smaller values again indicate better fit; Entropy = measure of the accuracy of classification of children in latent profiles and of profile differentiation; higher values indicate better classification; AIC = Akaike information criterion, a measure of model fit; smaller sizes indicate better fit. Bolded columns indicate the profile solution retained for subsequent modelling. All analyses are weighted with MCS overall weights. Sample sizes are limited to those who have observations on ethnicity.
Table 2 Cross-sectional mean scores on BAS tests by ethnicity using T-Scores

| Ethnicity          | Age 3 | Age 5 | Age 7 | Age 11 |
|--------------------|-------|-------|-------|--------|
| Overall mean       | 50.0  | 54.7  | 56.7  | 58.3   |
| White              | 51.1  | 55.8  | 56.6  | 58.4   |
| Indian             | 43.8***| 51.2***| 60.8***| 61.5***|
| Pakistani          | 36.2***| 41.9***| 56.6  | 54.9** |
| Bangladeshi        | 33.8***| 41.2***| 58.3  | 52.4***|
| Black Caribbean    | 47.0***| 51.7***| 55.3  | 57.6   |
| Black African      | 42.0***| 46.4***| 58.2**| 58.9   |
| Other              | 44.8***| 49.0***| 57.2  | 58.9   |
| N                  | 14,198| 14,675| 13,136| 12,720 |

Notes: All tests are standardized to a mean of 50 and standard deviation of 10. Means are adjusted for age and gender at sweep. BAS, British Ability Scales.

Table 3 illustrates the odds of having high and low performing profiles by ethnic group. The reference category is average performing. The first panel presents results for the highest performing group compared to the average performing profile. In Model 0, Indian children, as compared to White children, were significantly more likely to be in the high achieving profile (odds ratio, OR = 2.14, confidence interval, CI = 1.37–3.33). Adjustment for demographic controls did not influence this estimate (Model 1) whereas socio-economic characteristics attenuated the difference to non-significant levels (Model 2). Adjustment for markers of home learning, family routines, and psychosocial environment amplified the association for Indian children (Models 3–5). In fully adjusted models, the higher odds for Indian children were no longer statistically significant but were of meaningful magnitude (OR = 1.77, CI = 0.94–3.32).

The second panel of table 3 shows the odds of being in the low performing profile compared to being in the average profile. In the unadjusted model, as compared to White children, Pakistani and Bangladeshi children were significantly more likely to be in the low performing group (OR = 2.23, CI = 1.61–3.11; OR = 3.37, CI = 2.20–5.17, respectively). Adjustment for demographic confounders attenuated differences for Pakistani and Bangladeshi children (Model 1). Adjustment for socio-economic factors attenuated the difference between Pakistani and White children to non-significant levels, but did not completely explain the differences for Bangladeshi children (Model 2). Both home learning and family routines partially explained the highest odds for these two groups (Models 3 and 4). Adjusting for psychosocial factors explained the highest odds for Pakistani children and attenuated the odds for Bangladeshi children (Model 5). In fully adjusted models, the highest odds for Pakistani and Bangladeshi children were no longer apparent (OR = 1.26, CI = 0.67–2.34; OR = 1.75, CI = 0.84–3.65, respectively).

We separately adjusted for individual markers of the psychosocial environment (Appendix C, table A2, online Supplementary Material). Each marker explained 1–24% of the higher odds of being in the low achieving profile for Pakistani and Bangladeshi children, with the HOME inventory reducing estimates the most (OR = 1.84, CI = 1.32, 2.56; OR = 2.60, CI = 1.66–4.07, respectively).

Black Caribbean and Black African children were no more or less likely than White children to be in either the high or low achieving profiles.

Discussion

Our analyses found three longitudinal verbal latent profiles: low (5.6%), average (74.5%), and high (19.5%) performing groups.
Indian children were twice as likely (unadjusted estimates) as White children to be in the high achieving profile and socioeconomic and demographic markers, as operationalized here, explained this advantage. Pakistani and Bangladeshi children in unadjusted models were significantly more likely to be in the low achieving profile than their White peers. Socioeconomic and psychosocial disadvantage did most to explain the lower achieving profiles of Pakistani children, while a range of markers of ethnic disadvantage—socioeconomic, home learning, family routines, and psychosocial mediators—explained the observed inequality in low verbal scores for Bangladeshi children. We found no differences in the longitudinal latent verbal profiles between White and Black Caribbean and Black African children.

Investigating verbal profiles during early childhood using a data-driven process has revealed verbal profiles similar to our findings. This research has underscored the importance of latent profiles to highlight heterogeneity in verbal performance, particularly when examining ethnic disparities. A recent study using the MCS similarly finds different verbal performance profiles and emphasizes the use of multiple assessments of verbal performance to avoid regression to the mean, a potential pitfall of only using one measurement occasion.

High and low longitudinal latent verbal profiles were associated with minority status, but the factors that explain the ethnic patterning appear to be different. Sociodemographic measures explained the high achieving profiles of Indian children who on average grow up in economically advantaged families and have mothers who are primarily English proficient. Family sociodemographic measures and parental English proficiency are key factors in children’s verbal skills development. Conversely, the low achieving profile of Pakistani children was also accounted for after adjusting for sociodemographic measures. Two-thirds of Pakistani families are in the bottom income tertile and mothers of Pakistani children have one of the lowest rates of English proficiency. Our results underscore the importance of exposure to an English-speaking home environment, not just for verbal skills acquisition but because parents who are English proficient can negotiate and navigate UK schools and social institutions to their children’s benefit.

A combination of socioeconomic, home learning, family routines, and psychosocial mediators explains the low performing profiles of Bangladeshi children. Evidence suggests warm caring home environments and favourable psychosocial contexts interacting with family routines, such as regular bed and meal times and story reading, are beneficial for child development. Markers of the psychosocial environment attenuated the higher odds of low performance for Pakistani children to nonsignificance and for Bangladeshi children by 45%. Each marker of the psychosocial context reduced the higher odds by 1–24%. The HOME inventory, maternal psychological distress, and parent-child relationship (Pianta scale) each attenuated odds by 16–24%. Nurturance, discipline, and language routines, such as regular bed and meal times and story reading, are beneficial for child development.

Verbal performance was also sensitive to maternal psychological distress, supporting evidence of higher prevalence of maternal distress among mothers of ethnic minority children and the deleterious effects of mental distress on children’s verbal skills. Thus, socioeconomic factors are not always sufficient to explain the variation in children’s longitudinal verbal performance. Indeed, the family stress model suggests that financial hardship can disrupt parents’ socioemotional resources and compromise parent-child interactions, which may in turn affect child verbal performance.

Two other UK studies examine differences in verbal abilities by ethnicity or migration status. A cross-national study examining differences in verbal skills by maternal migration status reported that

### Table 3 Odds Ratios (95% CI) from Multinomial Logistic Regressions Predicting Longitudinal Latent Verbal Profiles by Ethnicity (N = 16,704)

|            | Model 0 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|------------|---------|---------|---------|---------|---------|---------|---------|
| **High**   |         |         |         |         |         |         |         |
| Indian     | 2.14**  | 2.20**  | 1.56    | 2.52*** | 2.27*** | 2.40*** | 1.77    |
|            | (1.37, 3.33) | (1.39, 3.49) | (0.83, 2.91) | (1.56, 4.08) | (1.45, 3.56) | (1.51, 3.82) | (0.94, 3.32) |
| Pakistani  | 0.82    | 0.98    | 0.81    | 1.01    | 0.87    | 1.07    | 0.98    |
|            | (0.51, 1.29) | (0.61, 1.56) | (0.44, 1.5) | (0.62, 1.65) | (0.54, 1.4) | (0.66, 1.74) | (0.51, 1.96) |
| Bangladeshi| 0.51    | 0.66    | 0.55    | 0.77    | 0.54    | 0.75    | 0.75    |
|            | (0.17, 1.46) | (0.22, 2.01) | (0.19, 1.59) | (0.28, 2.1) | (0.18, 1.58) | (0.27, 2.06) | (0.27, 2.11) |
| Black Caribbean | 0.86 | 0.85 | 1.06 | 0.92 | 0.88 | 0.95 | 0.94 |
|            | (0.06, 1.62) | (0.44, 1.63) | (0.56, 2.02) | (0.48, 1.77) | (0.51, 1.77) | (0.46, 1.72) | (0.53, 2.04) |
| Black African | 1.32 | 1.26 | 1.24 | 1.72 | 1.52 | 1.52 | 1.39 |
|            | (0.80, 2.17) | (0.74, 2.14) | (0.7, 2.2) | (1.01, 2.94) | (0.92, 2.53) | (0.91, 2.55) | (0.77, 2.51) |
| Other      | 1.29    | 1.20    | 1.10    | 1.46    | 1.37    | 1.47    | 1.14    |
|            | (0.78, 2.13) | (0.72, 2.01) | (0.6, 2) | (0.88, 2.42) | (0.83, 2.27) | (0.87, 2.49) | (0.62, 2.12) |
| **Low**    |         |         |         |         |         |         |         |
| Indian     | 0.47    | 0.43    | 0.52    | 0.38    | 0.42    | 0.37    | 0.47    |
|            | (0.18, 1.21) | (0.16, 1.17) | (0.19, 1.46) | (0.14, 0.99) | (0.17, 1.06) | (0.15, 0.94) | (0.16, 1.38) |
| Pakistani  | 2.23*** | 1.86*** | 1.50    | 1.93    | 1.80**  | 1.36    | 1.26    |
|            | (1.61, 3.11) | (1.33, 2.61) | (0.84, 2.66) | (1.07, 2.2) | (1.27, 2.54) | (0.96, 1.93) | (0.67, 2.34) |
| Bangladeshi| 3.37*** | 2.71*** | 2.25*   | 2.15**  | 2.90*** | 1.95**  | 1.75    |
|            | (2.20, 5.17) | (1.76, 4.17) | (1.15, 4.37) | (1.34, 3.44) | (1.86, 4.52) | (1.20, 3.16) | (0.84, 3.65) |
| Black Caribbean | 1.32 | 1.30 | 0.95 | 1.20 | 1.10 | 1.23 | 0.96 |
|            | (0.75, 2.33) | (0.74, 2.29) | (0.53, 1.71) | (0.68, 2.12) | (0.62, 1.93) | (0.69, 2.18) | (0.54, 1.7) |
| Black African | 0.83 | 0.87 | 0.65 | 0.60 | 0.62 | 0.63 | 0.54 |
|            | (0.40, 1.69) | (0.42, 1.79) | (0.29, 1.44) | (0.29, 1.21) | (0.3, 1.28) | (0.31, 1.28) | (0.23, 1.26) |
| Other      | 0.56    | 0.58    | 0.51    | 0.51    | 0.48    | 0.45    | 0.48    |
|            | (0.22, 1.14) | (0.23, 1.19) | (0.2, 1.13) | (0.21, 1.03) | (0.19, 1.001) | (0.19, 0.93) | (0.18, 1.11) |

***: P < 0.001.
**: P < 0.01.
*: P < 0.05.

Notes: All estimates are weighted with analytic weights.

1: White is the reference group for ethnicity and average performing is the reference latent profile.

Model 0 (M0): Ethnicity; Model 1: M0 + Demographic controls; Model 2: M0 + Socioeconomic; Model 3: M0 + Home learning; Model 4: M0 + Family routines; Model 5: M0 + Psychosocial; Model 6: Fully adjusted model.
4–5 year old children of immigrants perform more poorly than children of natives. This study aggregated all ethnic minority children in a catchall group of ‘children of foreign-born parents’, making it difficult to compare with our results. Using a detailed ethnic classification revealed variations in the odds of high performing, low performing, or similar performance profiles compared with White peers. Our results compare to the aforementioned study in finding adverse verbal performance for children growing up in families in which English is not the primary spoken language. Another study, using the MCS and more detailed ethnic categories, revealed verbal disadvantages at ages 3, 5, and 7 for all ethnic minorities as operationalized in our study. However, this study investigated repeated cross-sectional means, which may obscure patterns of verbal achievement across early childhood. The authors also found verbal disadvantages at ages 3, 5 and 7 for Black Caribbean children and at ages 3 and 5 for Black African children (unadjusted estimates), whereas our results indicate no disparities in verbal performance between Black Caribbean and African children and the White majority group from ages 3 to 11. The same study finds verbal disadvantages for Indian children (ages 3 and 5), and our results highlight a positive profile for Indian children. These differences between the previous study and our findings may very well be attributable to the design approaches; a virtue of using a longitudinal design, such as LPA, is revealing stable profiles across time instead of relying on mean differences at one point in time. Highlighting such variation in developmental pathways has been significant in other areas of child development, for example child behaviour and substance use, leading to more effective intervention strategies.

Our findings on Black Caribbean and Black African children lie in stark contrast to previous findings. Although ethnic minority status has been linked to disadvantages in child health and developmental, the distribution of parental sociodemographic and economic factors differ between ethnic minority groups. For example, Black Caribbean children are raised in families in which the primary language spoken at home is English and this exposure to an English-speaking environment has been associated with better performance on standardized tests. Black Caribbean families have a long migration history to the UK and the vast majority of mothers of Black Caribbean children are UK born. Successive generations following migration are associated with upward economic mobility, which in turn is predictive of child cognitive development. That we do not find disadvantages for Black African children is not surprising as there is evidence of health advantages for Black African children and adolescents. Over one-half of mothers of Black African children have at least NVQ4 education (first degree/diploma or higher) and nearly one-third of Black African mothers are employed full-time, and these markers are correlated with child health and development.

A virtue of this study is that we examined data on objective measures of verbal ability in children. Secondly, we took advantage of the longitudinal nature of the data to capture the heterogeneity of children’s verbal skills. Despite the rich information on family processes and resources, it could be the case that we have underestimated the effects if socioeconomic measures and family environment variables lack precision, as they are proxies for a myriad of ill-defined socio-environmental factors. It is undoubtedly possible that children may experience differential treatment by teachers and such classroom-based racism may influence variation in verbal scores. Data constraints limited our ability to control for unmeasured characteristics, which may be correlated to both ethnicity and verbal development, for example, parental motivation, personality, and educational beliefs.

Children’s verbal skills are consequential to their future life chances. Our work found both family process and resource factors mediated ethnic differences in longitudinal latent verbal profiles. Given the economic and long-term benefits to early childhood investments, policy interventions can be developed to support and enhance family resources and processes to reduce ethnic inequalities in children’s development. For example, successful interventions alongside welfare reforms have focused on helping parents promote child development and verbal skills in the home and directly teaching socially and economically disadvantaged children. It is essential for policies to continue to develop to close the gap in ethnic inequalities in verbal skills.

Supplementary data

Supplementary data are available at EURPUB online.

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Conflicts of interest: None declared.

Key points

- In the UK, family resources account for Indian children’s high verbal profiles.
- A combination of family resources and process factors explain Pakistani and Bangladeshi children’s low verbal profiles.
- No ethnic differences between White children and Black African and Black Caribbean children were found.
- Policies can be developed to support and enhance family resources and processes to reduce ethnic inequalities in children’s development.

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Introduction

Health inequalities between the unemployed and their employed counterparts have been observed across the landscape of advanced capitalist countries. However, the magnitude of these unemployment-related health inequalities differs considerably across countries. Although sophisticated theoretical frameworks exist with which to explain this cross-national diversity, few attempts have been made to test theoretical explanations for this cross-national variation. Moreover, existing studies suffer from important theoretical and methodological limitations. This study addresses these limitations and investigates whether differences in the generosity of social protection policies and in public attitudes towards those policies explain why unemployment-related health inequalities are steeper in some societies than in others.

Methods: Multilevel logistic modelling was used to link contextual-level variables on social protection policies and public attitudes in 23 European countries to individual-level data on self-rated health from the 2012 wave of the European Social Survey. Results: The magnitude of inequalities in self-rated health between the unemployed and their employed counterparts varies significantly across countries as a function of cross-national differences in the level of social protection awarded to the unemployed and the level of public support for the welfare state. Conclusions: The results provide empirical support for the claim that governments can play a more active role in mitigating unemployment-related health inequalities by expanding the generosity and scope of social protection policies. Whether such an expansion of social protection will take place in the current climate of fiscal austerity is a political question whose implications merit the attention of population health scholars.

Unemployment and health

Population health researchers have long been interested in the relationship between unemployment and health. Much of this interest is attributable to the role of unemployment as a fundamental determinant of health: one that influences multiple pathways—both material and psychosocial—that lead to multiple sources of morbidity and mortality. Materialist explanations, whose theoretical underpinnings are rooted in classical sociological accounts of economic deprivation, argue that the loss of earnings associated with unemployment deteriorates the socioeconomic position of unemployed persons and, by extension, undermines their ability to secure the material pre-requisites for health. Psychosocial accounts of the association between unemployment and health argue that unemployment strips individuals of a principal mechanism through which status and esteem are defined and perceived. Those who experience unemployment are said to suffer from status-related anxieties attributable to their relative position in the social hierarchy that are not conducive to good health. Given that employment constitutes a central means through which individuals meet both the material and the psychosocial demands characteristic of life in capitalist societies, there is a strong case to be made that unemployment incurs both material and psychosocial disadvantages to the individual.

While the materialist and psychosocial approaches shed important light on the micro-level pathways that link unemployment to poor health outcomes, there is also a need to understand the macro-level (e.g. national) contexts that condition these pathways. These macro-level contexts may play an important role in modifying these pathways and, by extension, in explaining differences in the magnitude of unemployment-related health inequalities that are observed across those contexts.

Explaining cross-national differences

Although social inequalities in health have been observed in all societies, they are noticeably steeper in some societies than in others. Several theoretical frameworks have been proposed to explain this cross-national variation. Research on the association between unemployment and health has largely neglected these theoretical accounts. Indeed, few empirical studies have awarded explicit empirical attention to the effect on this association of the