Abstract

Ethnic differences in measured cognitive ability is of interest to social scientists, since these differences, whether or not they represent latent ability ones, can exasperate social inequalities. As such, it is important to monitor them, particularly in multi-ethnic societies. To this end, we analyzed cognitive test score data for 84,138 British adults across six national samples from the 21st century (AMP, 2000; Skills for Life, 2003; AMP, 2007; UKHLS, 2011-13; PIAAC, 2012; MCS, 2015). Grand mean cognitive scores by ethnicity (*SD* = 15), relative to a White mean set to 100, were: Jews, 107 (*N* = 77); Chinese, 98 (*N* = 154); South Asians, 89 (*N* = 4,032); and Blacks, 88 (*N* = 2,439). Notably, substantial heterogeneity in scores existed depending on various factors, including the type of test (e.g., verbal, numeric), ethnic subgroup (e.g., Indian, Pakistani), age group, first language spoken, and migrant generation (e.g., foreign born, UK born). As to the latter, Blacks and Asians born in the UK scored about 6-7 points higher than ones born elsewhere. Because selection tests are commonly used in the UK and also because human well-being correlates strongly with measured cognitive differences, we conclude that these effects warrant more detailed investigation.

Keywords: Ethnicity, cognitive ability, UK

Measured Cognitive Differences among UK Adults of Different Ethnic Backgrounds: Results from National Samples

1. Introduction

Following the British Nationality Act of 1948, the United Kingdom (UK) experienced an unprecedented influx of non-European migrants. By 1981, the UK population was 6% non-European (Owen, 1995). Today, this value is 13% (2011 census), and will likely increase to 26% by 2051 (Rees et al., 2017). Moreover, migrants to the UK come from various localities. Roughly 38% of them are South Asian; whereas, 16% are Chinese and other Asian, 25% are African/Black, and 22% are mixed/other (2011 census). These minority groups are also geographically concentrated, being mostly located in either Greater London, the West Midlands, Greater Manchester, West Yorkshire, or the Leicester/Nottingham region.

The migration of different ethnic groups raised concerns about potential disparities in human well-being.[1] These concerns led to the production of several government reports. Recent examples of these reports include the Racial Disparity Audit of 2017 (Cabinet Office, 2017), The McGregor-Smith Review (McGregor-Smith, 2017), and The Lammy Review (Lammy, 2017). In these reports, and across many measures, Chinese, Whites, and Indians experience relatively better social outcomes; whereas, Blacks, Pakistanis, Bangladeshis, and those of mixed ethnic backgrounds tend to experience worse outcomes. It is thus critical to determine why well-being correlates with ethnicity in the UK (documented in Table 1; see Pesta, McDaniel, & Bertsch, 2010, for similar results in the USA).

Researchers often attribute well-being differences to the direct effects of discrimination and racism (see, e.g., McGregor-Smith, 2017; Ashe & Nazroo, 2016). For example, according to the McGregor-Smith Review (2017) on disparities in the workplace:

> In the UK today, there is a structural, historical bias that favours certain individuals. This does not just stand in the way of ethnic minorities, but women, those with disabilities and others...Overt racism that we associate with the 1970s does still disgracefully occur, but unconscious bias is much more pervasive and potentially more insidious because of the difficulty in identifying it or calling it out. Race, gender or background should be irrelevant when choosing the right person for a role – few now would disagree with this. But organisations and individuals tend to hire in their own image, whether consciously or not. Those who have most in common with senior managers and decision makers are inherently at an advantage. We have to question how much of this bias is truly 'unconscious' and by terming it 'unconscious,' how much it allows us to hide behind it. Conscious or unconscious, the end result of bias is racial discrimination, which we cannot and should not accept...There is discrimination and bias at every stage of an individual's career, and even before it begins. (McGregor-Smith, 2017, *p*. 2-3.)

This view has also been echoed by some in academia. For example, Kamasak, Özbilgin, Yavuz, and Akalin (2019) noted:

> Racism is defined as 'the ideology that makes use of essentialized phenotypical, biological and sometimes cultural differences to express and reinforce these inequalities' (Miles, 1982, p. 157). Racism leads to racial inequalities and unequal outcomes not only in institutions but also in every aspect of life (i.e. income, education, employment, health, social care, justice) (Ford et al., 2018; McGregor-Smith, 2017; Modood & Khattab, 2016; Wellman, 1993).

Table 1. *Social Outcome Differences between UK Ethnic Groups.*

	Arrest Rate[1]	Hourly Pay[2]	Percentage Unemployed[3]	Percentage Homeless[4]	Percentage deprived[5]	Relative Poverty[6]	Infant Mortality[7]
White	**19**	**11.11**	**5.29**	**0.77**	**8.7**	**15.4**	
British		11.16	5.29		8.6	15.5	3.3
Other White (w/ Irish)		10.61	4.86		9.7	12.2	2.6
Mixed	**37**	**11.04**	**11.57**	**1.28**	**14.6**	**17.6**	
All Asian		**10.67**	**8.71**	**0.99**	**17.1**		
Chinese & Other Asian	**14**	**10.57**	**7.43**				
Chinese					9.7	12.5	
Other Asian					11.2		
South Asian	**18**					**27.8**	
Indian		12.34	6.71		8.3	18.8	3.9
Pakistani & Bangladeshi		8.93	12.86			35.8	
Pakistani					30.9	39.8	6.7
Bangladeshi					27.9	29.6	5.0
Black	**52**	**10.34**	**12.71**	**4.27**	**19.6**	**28.2**	
Caribbean					18.1	23.7	6.6
African					20.0	32.6	6.3
Other					21.4		
Other		**10.20**	**9.86**	**4.09**	**16.8**		
Arab					19.0		
Any Other					15.2		

Note: Not reported when missing or not directly computable from source data. [1]Average arrest rates / per 1000 from 2006 to 2016 (UK Government, 2019b); [2]Average median hourly pay (£) from 2013 to 2018 (UK Government, 2018a); [3]Percentage unemployed of the economically active population from 2012 to 2018 (UK Government, 2018b); [4]Percentage homelessness from 2006 to 2017 as a fraction of the group's percentage of the 2011 population (UK Government, 2018c); [5]Percentage living in the most deprived neighborhoods in the 2012-13 year (UK Government, 2018d); [6]Relative Poverty Rate from 2009 to 2012 based on *Understanding Society* (Fisher and Nandi, 2015; Table 2); [7]Infant rate mortality per 1,000 live births (ONS, 2019).

The hypothesis that racial discrimination directly causes outcome differences in well-being is seemingly bolstered by employment audit studies. These show that certain non-White UK groups receive less interview callbacks, despite having similar qualifications with matched, White applicants (Growth, Equal Opportunities, Migration and Market Project, 2019; Department for Work and Pension, 2009). However, the limitations of using audit studies to infer discrimination have been previously discussed (Heckman, 1998; Dalliard, 2014). Importantly, individuals of different ethnic groups cannot be matched on all variables valued by employers, such as communication and social skills (Mobius & Rosenblat, 2006). Moreover, while these studies typically match on education, there are often unmatched human capital differences, such as ones in cognitive ability or personality traits, between ethnic groups of similar educational levels.

An alternative account for well-being differences across ethnicities in the UK appeals to cognitive ability as defined by Rindermann (2018, *p*. 43): "[T]he ability to think (intelligence), knowledge (the store of true and relevant knowledge) and the intelligent use of knowledge." Differences in average cognitive ability levels by ethnicity may mediate the association between ethnicity and well-being. As it is, the finding that cognitive ability varies across ethnic groups in certain countries, such as the USA, is one of the most replicated effects in psychology (Baron, Martin, Proud, Weston, & Elshaw, 2003). But, whether ethnic groups in the UK, specifically, differ in cognitive ability, and whether such differences are antecedent to social outcomes has been disputed. Indeed, many academics and organizations dismiss or deride human capital or

"deficit" models (Alexander, 2015; Mountford-Zimdars, Sanders, Jones, Sabri, & Moore, 2015; Miller, 2016; Universities UK, 2019), which focus on "attributes and characteristics of the student as the main contributing factors for attainment differentials" (Universities UK, 2019, *p*. 16). Instead, these authors warn against "deficit" approaches, understandings, and models.

Cognitive and other human capital models, of course, are not incompatible with discrimination models. For example, cognitive ability differences could be consequent of socioeconomic inequalities, which are themselves due to inequalities resultant from past discrimination and other factors (as in Cottrell, Newman, & Roisman's, 2015, three-step model for ethnic differences in the USA). Cognitive capital models simply propose that cognitive ability differences are antecedent to social outcome ones and thus addressing the former – and so focusing on characteristics of individuals – is necessary to address the latter.

In the case of the USA, it is often now agreed that this is the case. For example, consider the "challenge question" voted as Number 4 in the top 10 list of social science's "grand challenge questions that are both foundational and transformative" (Giles, 2011). The question is: "How do we reduce the '[cognitive] skill gap' between black and white people in America?" The question is deemed important because it is recognized that, in the USA, cognitive ability gaps are antecedent to many important social outcomes (Fryer, 2014). Given the relevance of measured cognitive differences, much research in the USA focuses on preventing unnecessary adverse impact via use of cognitively loaded selection tools (Ployhart & Holtz, 2008). Also, much research focuses on monitoring the magnitudes of ethnic differences (e.g., Roth, Bevier, Bobko, Switzer, & Tyler, 2001; Roth et al., 2017). However, there is no reason to expect differences to generalize from one country to the next, since ethnic diaspora often have radically

different histories and are often not representative of their region-of-origin populations (e.g., South Asians in the USA, the UK, Guyana, Kenya, Trinidad & Tobago).

The hypothesis above presumes that measured cognitive differences are commensurate with latent broad or general ability ones. However, even if this is not so, measured cognitive differences can still be impactful. This is because cognitive selection tests are frequently used. For example, a survey by the Chartered Institute of Personnel and Development (CIPD, 2017) found that 41%, 53%, and 38% of organizations in the UK rely on tests of general ability, specific skills, and literacy/numeracy, respectively. As a result, even if differences are psychometrically biased (or measurement non-invariant) between groups, they could lead to disparities in educational and employment opportunities by way of adverse impact.

In the UK, concerns about ethnic discrimination has led to the passage of the Equality Act 2010, which outlaws both direct discrimination and indirect discrimination (in absence of an objective justification). By current law, employers have to show that selection tests are justified, and that they took reasonable measures to prevent ethnic discrimination. However, Employers are not required to conduct validity studies showing that their measures are statistically unbiased (Shen, Sackett, Lievens, Schollaert, & Van Hoye, 2017). Given the prevalent use of cognitive selection tests and the relatively relaxed legal environment, indirect discrimination by way of cognitive tests is a potential serious concern.

Regarding measured differences in the UK, earlier research has shown that Black and South Asian children generally score lower on cognitive ability tests relative to White British children (Tomlinson, 1980; Tomlinson, 1983; Taylor & Hegerty, 1985; Lynn, 2008). Additionally, literature reviews from the early 21st century have noted ethnic differences on occupational and military selection tests (Baron et al. 2003; Evers, Nijenhuis, & van der Flier,

2005). However, this literature is based primarily on convenience samples. It is also dated and relies mostly on adolescent samples from the 1960s to the 1990s, or on adult samples from the 1990s and early 2000s. Given possible secular and also age-related changes in the magnitudes of ethnic gaps (Dickens & Flynn, 2006), and also continual compositional changes owing to immigration (e.g., African British now comprise a majority of "Black British," displacing the Caribbean as the major source of Afro-descent migrants), both the magnitude and the direction of differences cannot be generalized across time or geography. Thus, the literature continually needs to be updated (Roth et al., 2001).

Since our concern is with the antecedents of contemporaneous social outcome differences, we investigate adult (i.e., individuals 18 years of age or older) cognitive ability differences. We limit consideration to surveys conducted this century, since it is not evident that differences based on the second half of the 20th century reflect current differences among adults. Moreover, we focus on national samples, as occupational selection samples may not give a true indication of national-level differences.

We leave more detailed analyses for future research and focus on mean differences in measured cognitive ability. This is done because it is uncertain to what extent these exist. While it is necessary to understand the psychometric nature of ability differences to understand their cause, assessing the magnitude of measured differences is of importance in itself (e.g., Roth et al., 2001; Roth et al. 2017), because via adverse impact and other pathways, measured differences can lead to social inequalities without necessarily representing gaps in latent cognitive ability.

2. National Samples

For the present paper, we focus only on national or nationally representative samples. These samples have the advantage over selection tests, for example, by being representative. Thus, we searched the UK Data Service for samples that met five criteria. These included that the: (1) sample was comprised of UK adults, (b) sample had a nontrivial number of specific non-White groups (e.g., "Indian"; $n > 50$), (c) survey contained a reasonable measure of cognitive ability, as defined by Rindermann (2018), (d) data were publicly available, and (e) the survey was published this century. We were able to identify five datasets which met these criteria: The Adult Psychiatric Morbidity Survey 2000; Skills for Life, 2003/11; The Adult Psychiatric Morbidity Survey 2007; UK Household Longitudinal Study, 2009; and The Millennium Cohort Study, 2015. We further conducted a Google Scholar search for papers on ethnic differences in cognitive ability. Through this search, we identified an additional study, the Programme for the International Assessment of Adult Competencies (PIAAC, 2013). We obtained this dataset via a Freedom of Information Act request. Results from all six samples are discussed and analyzed below.

2.1 APM (2000) and APM (2007)

Since 1993, The Adult Psychiatric Morbidity Survey has been conducted every seven years. This nationally representative survey provides data on the prevalence of specific psychiatric disorders. In 2000, the participants were from England, Scotland, and Wales, and ranged in age from 16 to 74 years. In 2007, participants were from England only, and all were 16 years old or older. For English speaking participants only, the APM includes the administration of the National Adult Reading Test (NART; Nelson & Wilson, 1991). The NART is a vocabulary exam which requires participants to correctly pronounce irregularly spelled words (e.g., "NAÏVE," "EPITOME"). The exam was developed to predict premorbid cognitive ability

in patients with neuropsychological conditions. It has been found to strongly correlate with Wechsler Test of Adult Reading (WTAR) Scores measured at the same age (r = .89; Dykiert & Deary, 2013) and also with cognitive ability measured in childhood (r = .63; McGurn et al., 2004; r = .68; Dykiert & Deary, 2013).

For the 2000 wave, scores were available for the following ethnic groups: White; Oriental and other Asian; South Asian; Black; and Other. For the 2007 wave, scores were available for: White British; White non-British; South Asian; Black; Mixed, and Other. We requested data from the 2014 wave but were unable to gain access owing to restrictions on data use. For the 2007 wave, it was also possible to compute scores for individuals whose self-identified religion was Jewish. This latter group was a subset of the White group.

For comparisons across waves, we derived the category, "White," by weighting the White British and White non-British means by the respective Weighted-*N*s. For both the 2000 and 2007 waves, the effects of age and sex (dummy coded with female = 1, male = 0) were regressed out via OLS regression. Scores were then weighted to be nationally representative. The actual *N* and weighted-*N* are both reported. The results for both AMP (2000) and AMP (2007) appear in Table 2. Consistent with previous reports, the *N*-weight average across the two survey waves shows that Jews score the highest (105.11), followed by combined East and other Asians (100.61), Whites (100), South Asians (95.59), and Blacks (92.74). Interpretation of these results is limited by the relatively small samples sizes of the non-White groups, and the incomplete validity of NART as an index of mental ability. However, the general trend is concordant with that found for other assessments discussed below.

Table 2. *Mean Scores by Ethnicity from the AMP (2000; 2007) Surveys.*

Year	2000			2007		
Ethnic Group	*N*	Weighted-*N*	NART *M*	*N*	Weighted-*N*	NART *M*

White	7864	14992.68	100.00	6576	6361.15	100.00
White British				6390	6161.55	100.04
White non-British				186	199.6	98.69
East & Other Asian	7	18	100.61			
South Asian	66	169.77	94.32	67	96.4	97.82
Black	143	247.93	92.99	134	152.71	92.34
Other & Mixed	94	194.04	100.66	84	105.25	95.80
Jewish				19	20	105.11

Note: NART mean is the NART correct score set on an IQ-metric, with the White mean set to 100 for each survey wave and with standard deviations (*SDs*) of 15; *SDs* were pooled across all ethnic groups. The *N* is the number of participants, while the weighted-*N* is the sample weighted-*N*, which represents the sample size weighted by the number of people in the population who are represented by each member.

2.2 PIAAC (2012) and Skills for Life (2003)

The Programme for the International Assessment of Adult Competencies (PIAAC) is a worldwide study of cognitive skills (literacy, numeracy, and problem solving) coordinated by The Organization for Economic Co-operation and Development (OECD; OECD, 2013). The first assessment was conducted in 2012 and involved individuals ranging in age from 16 to 65 years. OECD reports 10 possible values for each test. For reproducibility, we use the posterior mean values for numeracy and literacy. To note, OECD recommends using plausible values, instead, for certain analyses since the posterior mean values produce slightly biased standard deviations (OECD, 2013), though not biased estimates of the mean. However, the average bias with posterior mean values is small, with standard deviations at around 95% of those derived using plausible values; because we use the standard deviations pooled across all ethnic groups, the bias is consistent in magnitude across groups.

From the posterior mean values for numeracy and literacy, the effects of age and sex (dummy coded as female = 1, male = 0) were regressed out with OLS regression. Next, the scores were weighted, by the final full sample weight, for representativity. The ethnic categories were: White; Mixed (Caribbean-White, African-White, Asian-White); South Asian (Indian, Pakistani, Bangladeshi); Other Asian (Chinese, Other Asian); Black (Caribbean, African, Other

Black); and Arab. It was also possible to compute scores for individuals whose self-identified religion was Judaism. The actual *N* and weighted *N* are both reported. We further split the scores by region of birth (UK or foreign). Thus, the total scores represent the weighted average of the scores by region of birth (weighted using the sample weight, not *N*, to maintain representativeness). For consistency, the total White score was used as a reference, and was set to a mean of 100, as in the analysis above.

The results appear in Table 3. Among South Asians and Blacks, a 5 to 10 point difference exists between UK and foreign-born individuals. This is consistent with the international results discussed by Batalova and Fix (2016), who found a generational convergence for migrants in Canada, France, Germany, the United Kingdom, and the United States. This likely reflects the effects of enculturation, particularly language acquisition and improved living conditions. Depending on the group, it may also reflect the effect of secular changes in migrant composition and selectivity.

Table 3. *Mean Scores by Ethnicity from the PIAAC (2012) Survey.*

Group	UK born			Foreign born			All		
	N	Weighted *N*	PIAAC *M*	*N*	Weighted *N*	PIAAC *M*	*N*	Weighted *N*	PIAAC *M*
White	7593	27778318	100.16	544	2516685	98.24	8137	30295003	100.00
Mixed	38	229298	98.51	10	77511	91.83	48	306809	96.82
Caribbean-White	20	121521	97.87	1	6898	91.72	21	128419	97.54
African-White	7	30548	85.72	6	45054	93.09	13	75602	90.11
Asian-White	11	77229	104.57	3	25559	89.64	14	102788	100.86
Chinese & Other Asian	11	71324	99.99	70	448536	86.59	81	519860	88.43
Chinese	2	19423	92.84	14	90849	92.32	16	110272	92.41
Other Asian	9	51901	102.67	56	357687	85.14	65	409588	87.36
South Asian	105	915100	94.23	138	1030494	83.64	243	1945594	88.62
Indian	60	565272	96	84	626228	86.62	144	1191500	91.07
Pakistani	30	254148	92.9	42	308586	80.07	72	562734	85.86
Bangladeshi	15	95679	87.33	12	95679	75.67	27	191358	81.5
Black	71	446551	91.77	111	706125	84.51	182	1152676	87.32
Caribbean	48	287108	90.29	25	160370	82.41	73	447478	87.47
African	19	127837	93.84	83	532180	84.87	102	660017	86.61

Other Black	4	31605	96.8	3	13575	94.97	7	45180	96.25
Arab	1	3473	68.45	12	89984	86.69	13	93457	86.01
Jewish	8	134296	106.04	18	53349	108.14	26	187645	106.64

Note: PIAAC mean is the average of the age- and sex-adjusted literacy and numeracy score set on an IQ-metric, with the total White mean set to 100 and standard deviations (*SDs*) of 15; *SDs* were pooled across all ethnic groups. The *N* is the number of participants, while the Weighted *N* is the sample-weighted *N*, which represents the sample size weighted by the number of people in the population who are represented by each member.

National origin was reported for foreign-born individuals, as shown in Table 4. For several countries (e.g., South Africa) many of the immigrants were not from the country's majority ethnic/racial group. However, owing to the small sample sizes, we did not try to decompose results further by ethnicity. For the African countries (specifically, Kenya, Nigeria, and South Africa) the scores were notably higher than the national means reported by Lynn and Becker (2019). These relatively high scores are somewhat surprising, as one would expect that the tests would be more biased against foreign-born migrants. The relatively good performance here could be due to a national origin by ethnicity compositional effect, for countries such as South Africa, or, alternatively, to a migrant selection effect, in the case of more ethnically homogenous countries, such as Nigeria (Model, 2008; Easterly & Nyarko, 2008).

Table 4. Mean Scores by Nationality from the PIAAC (2012) Survey for Foreign Born Individuals.

County	*N*	Weighted *N*	PIAAC *M*
Australia	12	75414	108.45
Bangladesh	11	85175	71.65
France	11	24723	108.91
Germany	42	235237	102.44
India	68	466796	87.27
Ireland	124	252065	96.17
Kenya	18	112368	94.78
Nigeria	19	107222	88.89
Pakistan	41	308392	80.06
Philippines	16	67258	81.95
Poland	75	364687	91.97

South Africa	28	138308	106.84
United States	26	92264	107.86
Other Country	457	2916629	91.46

Note: This data was based on the summary variable J_Q04bUK ("Background - Country of birth"). There was an additional variable, J_S04b ("Background - Country of birth (other)"), which included additional countries (e.g., Barbados, $N = 5$), many with very small sample sizes.

Previous surveys, namely the Life and Skills (SfL) surveys, have used essentially the same tests featured in the PIAAC (2012) one. However, the underlying continuous scores have been discretized to a series of variables called "Minimum basic skills level - literacy and numeracy." A FOI request was made for the datasets with continuous values, but this was unavailable for the SfL surveys. As such, we outputted the sample weighted values for the three pass rates that would allow discrimination (i.e., At least L3 in both, At least L1 in both, and L2 in both) in the 2003 wave. We then converted these into deviation scores using an inverse cumulative function transformation. And then we averaged the three deviation scores. See Ho and Reardon (2012), also Reardon and Ho (2015), for a similar method (specifically, the ADTPAC method). After, we converted these into quotient metric scores.

Region of birth was not reported was not reported for 2003, but was reported for the 2011 sample. Results appear in Table 5. These generally concord with the PIAAC (2012) ones. Chinese and Indians are exceptions in that they do substantially better in the SfL (2003) survey than in PIAAC (2012). This difference, however, may result from the transformation used to convert the discretized values back to continuous ones. Note, descriptively similar results have been found for the 2011 SfL survey (Department for Business Innovation & Skills, 2012). However, this later survey is not included in the review owing to the overlap with the PIAAC (2012) one.

Table 5. *Mean Scores by Ethnicity from the SfL (2003) Survey.*

	All Participants			English as a First Language		
	N	Weighted *N*	SLF *M*	*N*	Weighted *N*	SLF 2003 *M*
White	8084	6872.80	100.00	7927	6733.16	100.00
British	7733	6541.08	99.96	7705	6526.88	99.97
Irish	94	86.11	97.28	93	85.44	97.43
Other White	257	245.61	102.13	129	120.84	105.51
Mixed	64	69.80	94.31	56	61.52	96.07
White and Caribbean	20	22.44	88.52	20	22.44	88.52
White and African	15	13.62	88.76	9	7.86	94.49
White and Asian	15	16.34	103.56	15	16.34	103.56
Any Other Mixed	14	17.40	97.44	12	14.88	100.07
Chinese & Other Asian*	65	70.29	94.33	12	13.91	112.49
Other Asian	42	45.38	90.69	8		
Chinese	23	24.91	100.95	4		
South Asian	254	272.27	91.44	107	108.47	100.32
Indian	154	150.38	94.38	71	68.84	101.44
Pakistani	81	102.11	88.53	27	33.52	98.63
Bangladeshi	19	19.78	84.15	9	6.12	96.95
Black	205	165.93	88.56	145	115.09	89.13
Caribbean	104	77.62	88.17	104	77.62	88.17
African	92	79.02	89.15	34	29.31	92.19
Other Black	9	9.29	86.83	7	8.16	87.28
Other	56	62.79	96.55	21	26.77	105.35

Note: SfL mean is the SfL literacy and numeracy score set on an IQ-metric, with the total White mean set to 100 and standard deviations (*SDs*) of 15; The *N* is the number of participants, while the weighted-*N* is the sample weighted-*N*, which represents the sample size weighted by the number of people in the population who are represented by each member. *There were too few Chinese who spoke English as a first language to compute scores, so we computed scores for the combined Chinese & Other Asian group.

2.3 The UK Household Longitudinal Study (UKHLS)

The UK Household Longitudinal Study (UKHLS) is a large panel survey covering England, Scotland, Wales and Northern Ireland. Data collection began in 2009. In wave three of the survey, conducted between 2011 and 2013, measures of cognitive ability were given to those age 16 years and older. There were six elements to the cognitive module:

1. Immediate word recall – a ten-word assessment of episodic memory.
2. Delayed word recall – a ten-word assessment of episodic memory.
3. Serial 7 subtraction – a five question measure of working memory.
4. Number series – a six question (two sets of three) measure of fluid reasoning.
5. Verbal fluency – a measure of semantic fluency based on the number of animals that the participant could list in one minute.
6. Numerical ability – a five question measure of numerical ability and ability to solve everyday problems.

Prior to assessment, Gray, D'Ardenne, Balarjan and Uhris (2011) conducted a qualitative assessment of potential language biases with the measures. Their recommendations were implemented. To further minimize bias, the test questions were translated into nine languages -- Arabic, Bengali, Cantonese, Gujarati, Punjabi (in either Gurmukhi or Urdu script), Somali, Urdu and Welsh -- for those with English language difficulties.

The effects of age and sex (female = 1, male = 0) were regressed out of the subtest scores using OLS regression. The correlation matrix for the residualize scores, $M = 0$ and $SD = 1.0$ in all cases, is shown in Table 6. The subtests were then submitted to factor analysis. Note, multiple imputations was not used since scores were not missing at random. When including all six tests, we found a two-factor solution, with both episodic memory tests loading highest on the first factor. This is a result of the high covariance between immediate and delayed memory recall (see Table 6). Since we desired a measure of general ability, rather than of memory, we discarded the immediate word recall variable. Factor analysis of the five remaining subtests yielded a one-factor solution which explained 32% of the variance; for comparison, on standard general cognitive ability batteries the first principal component usually accounts for 40% of the variance (Plomin & Spinath, 2004). The factor loadings were: Delayed Word Recall (.47); Subtraction (.44); Number sequences (.64); Verbal Fluency (.50); and Numeracy (.73). While the loadings were acceptable, given the content and number of items, this battery is not an ideal measure of general cognitive ability.

Table 6. Correlation Matrix for UKHLS Tests.

	1	2	3	4	5	6
1. Immediate recall	1.00 (44556)	0.72 (44398)	0.22 (43143)	0.3 (41437)	0.42 (44253)	0.41 (44157)
2. Delayed recall		1.00	0.20	0.29	0.39	0.38

	(45677)	(43807)	(42100)	(44974)	(44864)
		1.00	0.30	0.21	0.38
3. Subtraction		(43876)	(41736)	(43644)	(43703)
			1.00	0.31	0.50
4. Number Sequence			(42124)	(41978)	(42047)
				1.00	0.41
5. Verbal Fluency				(45079)	(44720)
					1.00
6. Numeracy					(44938)

Results appear in Table 7. Note, as done previously, the total White group, not the British White group, was set as the reference group. This is to allow summary across analyses, since for some surveys (e.g., AMP, 2000), British and non-British Whites were not disaggregated. On this measure, the difference between UK and foreign-born individuals is smaller at around five to ten points. It is notable that Jews performed relatively average on this test, while Chinese participants did better here than they did on the previously discussed, verbally loaded tests.

Table 7. *Mean Scores by Ethnicity from the* UKHLS *(2011-13) Survey by Region of Birth.*

Group	UK born			Foreign born			All		
	N	Weighted *N*	UKHLS *M*	*N*	Weighted *N*	UKHLS *M*	*N*	Weighted *N*	UKHLS *M*
White	33460		100.04	1683		99.32	35143		100.00
British White	32564	33057	100.02	744	767	101.63	33308	33824	100.06
Irish	599	276	99.09	197	185	95.82	796	461	97.78
Other White	297	289	102.62	742	1014	98.22	1039	1303	99.19
Mixed	417		97.19	185		94.22	602		96.19
Caribbean-White	216	125	94.43	26	12	92.21	242	137	94.23
African-White	31	17	95.23	53	29	87.70	84	47	90.49
Asian-White	102	75	100.27	48	42	96.80	150	116	99.02
Other Mixed	68	42	100.75	58	47	96.52	126	89	98.50
Chinese & other Asian	83		101.2	461		92.60	544		93.84
Chinese	31	21	103.52	127	71	99.50	158	92	100.41
Other Asian	52	31	99.64	334	240	90.55	386	271	91.60

South Asian	1058		93.03	1413		88.62	2471		90.55
Indian	413	290	96.12	732	472	91.09	1145	762	93.00
Pakistani	411	204	89.75	400	188	84.18	811	393	87.08
Bangladeshi	234	74	89.99	281	72	84.09	515	146	87.08
Black	514		92.73	914		86.32	1428		88.48
Caribbean	352	157	92.04	278	120	85.16	630	277	89.06
African	123	67	94.94	620	342	86.87	743	409	88.20
Other Black	39	18	90.45	16	13	82.45	55	31	87.02
Arab	30	20	97.25	109	93	87.39	139	93	89.17
Jewish	11	13	102.33	3	3	115.79	14	16	105.2
Gypsy / Irish Traveller	6	5	99.45	1	1	65.17	7	5	94.55
Other Ethnic	55	40	96.49	101	65	91.94	156	105	93.68
Missing	36	46	95.02	13	7	97.75	49	53	95.37

Note: UKHLS mean is the average of the age- and sex-adjusted UKHLS *g* score set on an IQ-metric, with the total White mean set to 100 and standard deviations (*SDs*) of 15; *SDs* were pooled across all ethnic groups. The *N* is the number of participants, while the weighted-*N* is the sample weighted-*N*, which represents the sample size weighted by the number of people in the population who are represented by each member.

The dataset also included national origins for foreign born participants. However, for several countries (e.g., South Africa), many emigrants were not from their country's majority ethnic group. Owing to the larger sample sizes here than with the PIAAC (2012) survey, we were able to decompose results by self-reported ethnicity. We did this for National x Ethnic Groups with $N > 6$. Following the UKHLS classifications, we grouped "White British" and "White Other" separately. For the purposes of these classifications, "White Other" includes "Irish" and "Any Other White Background." Typically, this refers to members of the dominant ethnic group (e.g., ethnic Germans in Germany). "South Asian" refers to people who identify as Bangladeshi, Pakistani, Indian, and Sri Lankan. For "Black," Black Africans and Black Caribbean were grouped together regardless of whether the country was African or Caribbean. Results appear in

Table 8. Note, owing to the legacy of the British Empire, the number of British Whites born outside of the UK was non-trivial.

A point of interest is that the scores of foreign-born Black African and Caribbean immigrants were substantially higher, with a median advantage of 17 points, than one would expect based on Lynn and Becker's (2019) quality *N*-weighted (QNW) National IQs (Ghana: 89 vs. 62; Jamaica: 84 vs. 75; Kenya: 92 vs. 75; Nigeria: 88 vs. 68; South Africa: 96 vs. 80; Uganda: 86 vs. 76). It is not clear why this is the case, since one would expect tests taken in a foreign culture (UK) to be more biased than ones taken in the home country. Migrant selection is a possible explanation, since it has been reported that both Black African and Caribbean emigrants are highly selected in educational attainment (Model, 2008; Easterly & Nyarko, 2008).

A final point of interest is that ethnic group differences show up between foreign born individuals from certain countries (Ghana, India, Kenya, Nigeria, and South Africa) but not others (Hong Kong, Jamaica, and Uganda). The reason for this is not clear; though, the sample sizes are quite small, so not much should be made of these results.

Table 8. *Mean Scores by Ethnicity from the* UKHLS *(2011-13) Survey by Nation of Birth and Self-reported Ethnicity for Foreign Born Individuals.*

Country	**Ethnic/Racial Group**	***N***	**UKHLS *M***	**Country**	**Ethnic/Racial Group**	***N***	**UKHLS *M***
Australia		50	105.21	Jamaica		172	84.39
	White British	29	103.1		White-Black	12	82.66
	White Other	20	107.86		Black	152	83.61
Bangladesh		279	83.57	Kenya		129	96.42
	South Asian	270	83.69		White British	21	100.43
Canada		44	103.49		South Asian	87	95.46
	White British	30	104.31		Black African	15	92.07
	White Other	11	101.48	New Zealand		44	110.99
Cyprus		31	97		White British	20	108.32
	White British	24	100.79		White Other	20	113.77

France		55	98.74	Nigeria		190	88.55
	White British	7	98.89		White British	7	95.03
	White Other	37	100.14		Black African	176	88.23
Germany		163	101.83	Pakistan		380	84.55
	White British	115	100.44		South Asian	371	84.21
	White Other	42	105.22	Poland		172	92.58
Ghana		111	90.63		White Other	171	92.54
	White British	7	94.61	Spain		32	99.83
	Black African	98	89.29		White British	7	105.83
Hong Kong/ China		110	99.52		White Other	23	97.39
	White British	18	101.34	South Africa		112	100.52
	Asian Chinese	86	99.21		White British	49	100.59
Ireland		252	95.16		White Other	39	102.78
	White British	62	94.88		Black	8	95.98
	White Other	189	95.28	Sri Lanka		144	90.3
India		583	91.72		South Asian	134	89.15
	White British	25	100.12	Turkey		33	89.62
	White and Asian	10	100.13		White Other	13	85.8
	Asian Indian	542	90.88	Uganda		63	86.77
Italy		50	96.28		South Asian	33	85.52
	White British	8	100.58		Black	23	85.64
	White Other	36	95.61	USA		89	106.84
					White British	26	107.83
					White Other	48	107.63

It was also possible to analyze the data by age group. We report the scores for South Asians and Blacks for five age groups (16-24, 25-34, 35-44, 45-54, and 55-65). For the other ethnic groups, sample sizes were too small for reliable analysis. We calculated the scores using the pooled standard deviations for Whites, South Asians, and Blacks of all ages and birth regions. We also report the results for UK born individuals too, because of a possible Age x Generation interaction. Results appear in Table 9. For both South Asians and Blacks there was a cohort effect, such that the differences were smaller in younger age groups (though this effect was less clear when limiting analysis to UK born individuals).

Table 9. Asian-White and Black-White Standard Differences (d) by Five Age Groups and Region of Birth.

Age Group	Birth Region	*N* (S. Asian)	South Asian *M*	*N* (Black)	Black *M*
16-24	All	573	94.66	264	90.45
	UK born only	457	95.14	130	93.79
25-34	All	638	94.18	258	89.99
	UK born only	293	96.02	96	92.39
35-44	All	644	87.90	329	87.71
	UK born only	228	91.91	129	91.67
45-54	All	339	86.71	343	89.47
	UK born only	44	90.22	145	93.55
55-65	All	282	87.99	234	83.67
	UK born only	10	96.60	8	94.28
All Ages	All	2476	90.55	1428	88.44
	UK born only	1032	92.85	508	92.61

Note: The mean scores were created using the pooled *SD* for Whites, Asians, and Blacks for all age groups and regions of birth.

2.4 MCS (2015)

The Millennium Cohort Study (MCS) is a survey conducted by the Centre for Longitudinal Studies. It follows a sample of over 18,000 individuals born in the UK between 2000 to 2001. Results for children in this samples have been previously reported (Lynn & Cheng, 2013; Zilanawala, Kelly, & Sacker, 2016; Skopek & Passaretta, 2018; Hoffmann, 2018) Parents were interviewed extensively. In Wave 6, collected from 2015 to 2016, parental verbal ability was assessed with a 20 question (multiple choice) vocabulary test, wherein participants selected synonyms for presented words (e.g., MOAN: WAIL).

Household survey weights were available for only a subset of individuals with vocabulary scores, and so the data were weighted first, using the Round 6, "Overall Weight (inc NR adjustment) whole UK analyses." After, the effect of age and sex (female = 1, male = 0) were regressed out of the scores. Ethnic categories included: White, Mixed, South Asian (Indian, Pakistani, Bangladeshi), Other Asian (Chinese, Other Asian), Black (Caribbean, African, Other Black), and Other Ethnic. It was also possible to compute scores for individuals whose self-identified religion was Jewish. This group was a subset of the White sample. Finally, scores were split by region of birth (UK or foreign).

The results appear in Table 10. As seen, for most broad ethnic groups, there is approximately a ten-point difference between UK and foreign-born individuals. This is most likely because the test featured vocabulary items which could exhibit substantial linguistic bias against non-native English speakers. That said, the issue of psychometric bias is best evaluated using multigroup confirmatory factor analysis, the performance of which is outside the scope of the current paper. Despite this, all second-generation non-White groups (except for the mixed one) perform substantially worse than the White ethnic group. Also notable is that Jews score around 110. The advantage for this group is higher than that found in the other three samples. It is possible that the Jewish advantage is concentrated on verbal ability, and the measure here was indeed verbally loaded.

Table 10. *Mean Scores by Ethnicity from the* MCS *(2015) Survey by Region of Birth.*

	UK born			**Foreign born**			**All**		
Group	***N***	**Weighted *N***	**MCS *M***	***N***	**Weighted *N***	**MCS *M***	***N***	**Weighted *N***	**MCS *M***
White	8810	9018	100.36	677	749	95.7	9487	9766	100.00
Mixed	70	91	99.93	33	43	89.23	103	134	96.51
Chinese & Other Asian	31		90.02	88		75.92	119		79.45

Chinese	12	8	90.3	11	13	89.25	23	21	89.66
Other Asian	19	18	89.89	77	66	73.38	96	84	76.92
South Asian	414		89.18	517		79.93	931		84.22
Indian	168	123	92.61	121	82	84.09	289	205	89.21
Pakistani	224	150	86.39	234	149	80.41	458	299	83.41
Bangladeshi	22	11	88.91	162	97	75.69	184	108	76.98
Black	154		91.04	193		79.78	347		84.43
Caribbean	98	113	89.48	33	38	81.54	131	152	87.48
African	48	53	94.01	148	186	79.29	196	239	82.55
Other Black	8	5	95.02	12	19	81.02	20	24	83.8
Other Ethnic	23	19	93.54	45	56	76.38	68	75	80.81
Jewish	15	14	108.89	3	2	121.12	18	16	110.41

Note: MCS mean is the average of the age and sex adjusted MCS vocabulary score set on an IQ-metric, with the total White mean set to 100 and standard deviations (*SDs*) of 15; *SDs* were pooled across all ethnic groups. The *N* is the number of participants, while the weighted-*N* is the sample weighted-*N*, which represents the sample size weighted by the number of people in the population who are represented by each member.

To control for possible linguistic bias, an alternative approach is to restrict scores to individuals who report speaking only English at home. These results, again split by region of birth, appear in Table 11. Except for Indians (and South Asians in general), these results were substantially the same as those in Table 10 above. Regarding Indians, it is not clear if the relative advantage is due to reduced linguistic bias or if, instead, there was selection for a cognitively advantaged subgroup. A compositional effect is nonetheless suggested, given that foreign born Indians who were reared to speak English scored about ten points above all foreign-born Indians.

Table 11. *Mean Scores by Ethnicity from the* MCS *(2015) Survey by Region of Birth for Those Who Only Speak English at Home.*

	UK born			**Non-UK born**			**All**		
Group	***N***	**Weighted *N***	**MCS *M***	***N***	**Weighted *N***	**MCS *M***	***N***	**Weighted *N***	**MCS *M***
White	8767	8981	100.31	638	711	96.03	9405	9693	100
Mixed	67	90	99.86	24	27	96.71	91	117	99.13
Chinese & Other Asian	22		91.4	17		84.59	39		88.34
Chinese	9	6	93.36	5	7	97.02	14	13	95.22
Other Asian	13	13	90.42	12	9	75.57	25	22	84.25

South Asian	162		95.76	94		87.96	256		92.86
Indian	85	66	99.29	20	19	93.36	105	85	97.98
Pakistani	72	52	91.34	48	35	88.32	120	87	90.13
Bangladeshi	5	2	94.93	26	17	81.48	31	19	82.74
Black	143		91.09	113		81.87	256		86.75
Caribbean	98	113	89.38	31	36	81	129	149	87.36
African	37	40	95.43	75	94	81.49	112	134	85.67
Other Black	8	5	94.95	7	11	88.19	15	15	90.28
Other Ethnic	15	13	98.5	11	8	79.87	26	22	91.3
Jewish	15	14	108.9	3	2	121.21	18	16	110.43

Note: MCS mean is the average of the age and sex adjusted MCS vocabulary score set on an IQ-metric, with the total White mean set to 100 and standard deviations (*SDs*) of 15; *SDs* were pooled across all ethnic groups. The *N* is the number of participants, while the weighted-*N* is the sample weighted-*N*, which represents the sample size weighted by the number of people in the population who are represented by each member.

2.5 General discussion of National samples

Results from the six national studies discussed above are summarized in Table 12 for major ethnic groups. Two alternative averages are provided: The simple median and the *N*-weighted average, though here we discuss only the latter. Relative to White scores set to 100, cognitive scores across these six samples were as follows: Jews, 107; Chinese, 98; South Asians, 89; and Blacks, 88. However, significant heterogeneity existed across generations, subgroups, and surveys. The latter could be due to both sampling and to the measures used. Nonetheless, these overall group scores are roughly consistent with those reported by Lynn (2008), according to which medians for Jews, South Asians, and Blacks were 110.2 and 92 and 86, respectively. The scores for Chinese here were lower than those reported by Lynn (2008), though our sample was small ($N = 154$).

Table 12. *Results from national studies of ethnic differences in cognitive abilities among UK Adults.*

Survey	**Tests**	***N***	**Jews**	***N***	**Chinese**	***N***	**South Asians**	***N***	**Blacks**
AMP (2000)	NART (Reading)					66	94.32	143	92.99
SfL (2003)	Lit. & Num.			23	100.95	254	91.44	205	88.56

AMP (2007)	NART (Reading)	19	105.25			67	97.82	134	92.34
UKHL (2011-12)	Various	16	105.20	92	100.41	2471	90.55	1428	88.48
PIAAC (2012)	Lit. & Num.	26	106.64	16	92.41	243	88.62	182	87.32
MCS (2015)	Vocabulary	16	110.43	23	89.66	931	84.22	347	84.43
Median			105.95		96.41		91.00		88.52
N-Weight Mean		77	106.78	154	98.05	4032	89.21	2439	88.30

Notably, heterogeneity exists by birthplace and generation. Table 13 summarizes our results for the three samples for which it was possible to decompose scores by region of birth along with previously reported ones. As to these, we were able to locate six studies which reported results for UK born Asian or Black (Caribbean) children (born between 1950 and 1980). Note, we limited consideration to results which could be compared to a British White group in the same study. Weighting the UK-Foreign born differences by the harmonic mean for each set of sample sizes produced a 7.30 and 6.22 point increase, across all studies, for Blacks and Asians, respectively (moving from the foreign born to the UK born generation). Of interest is that the effects are comparable across ages, with those now 30 to 40 years of age showing a similar place-of-birth effect as those 10 to 16 years of age (in the 1970s and 1980s).

The reason for this increase is not clear. Acculturation is likely a substantial part of the explanation; however, changes in the emigrant source populations may also play a role. For comparison, in the USA, a smaller intergenerational narrowing has been found for self-identified (primarily Caribbean origin) Blacks (Fuerst, 2014). Specifically, based on an exploratory meta-analysis of 18 national samples, results showed that second generation USA Blacks scored 0.84 standard deviations below Whites as compared with 0.99 and 1.0 for first and third-plus generations, respectively. For USA Asians, who are proportionately more East Asian in origin, members of the first generation scored 0.16 standard deviations below Whites, as compared with -0.18 and -0.01 for those of the second and third-plus generations, respectively. It is unclear why

these two countries exhibit a markedly different pattern of intergenerational transmission of cognitive differences. A better understanding of the pattern in the UK may help to evaluate causal models for the gaps in the USA (e.g., Cottrell's, 2017, three-step model).

Table 13. *Results from National Studies of Ethnic Differences in Cognitive Abilities by Place of Birth.*

Author	**Survey**	**Age**	**Born**	**Test**		**UK Born**		**Foreign Born**	
						N	***M***	***N***	***M***
Essen & Ghodsian (1979)	NCDS	16	1958	Math & Reading	Caribbean	58	90.03	41	84.48
Yule et al. (1975)		10	1970	Non-Verbal IQ	Caribbean	201	93.13	143	84.65
Maughan et al. (1985)		14	1970	NFER Reading	Caribbean	185	93.19	113	87.29
Brewer & Haslum (1986).	CHES	16	1970	Ability Scale	Caribbean	343	91.00		
Meunier et al. (2010)	BCS	10	1970	Math & Word Recognition	Caribbean	168	92.32		
Fuerst & Pesta (this analysis)	UKHL	39	1970	Various	Black	514	92.73	914	86.32
Fuerst & Pesta (this analysis)	PIAAC	37	1975	Lit. & Num.	Black	71	91.77	111	84.51
Fuerst & Pesta (this analysis)	MCS	45	1970	Vocabulary	Black	154	91.04	193	79.78
Median							92.04		84.58
N-weight Mean						1694	92.15	1515	85.22
Sharma (1971)		7 to 8		WISC	S. Asian	19	91.43	19	91.50
Essen & Ghodsian (1979)	NCDS	16		Math & Reading	S. Asian	71	103.38	87	92.20
Brewer & Haslum (1986).	CHES	16		Ability Scale	S. Asian	179	90.30		
Meunier et al. (2010)	BCS	10		Math & Word Recognition	S. Asian	168	92.32		
Fuerst & Pesta (this analysis)	UKHL	37	1972	Various	S. Asian	1058	93.03	1413	88.62
Fuerst & Pesta (this analysis)	PIAAC	34	1978	Lit. & Num.	S. Asian	105	94.23	138	83.64
Fuerst & Pesta (this analysis)	MCS	41	1974	Vocabulary	S. Asian	414	89.18	517	79.93
Median							92.32		88.62
N-weight Mean						2014	92.35	2174	86.61

Note: Sharma (1971) reports scores for British Whites ($N = 43$, $IQ_{WISC} = 107.88$) and early arrival Indians ($N = 43$, $IQ_{WISC} = 99.05$) in one sample and between UK born Indians ($N = 16$, $IQ_{WISC} = 99.31$) and early arrival Indians $N = 16$, $IQ_{WISC} = 99.38$) in another. We report the WISC scores for the latter two groups rescaled against the British White and early arrival Indian group difference.

For some ethnicities, large discrepancies also existed between verbal and non-verbal based tests. For example, the Chinese scored 100.41 on the numerically loaded UKLS general factor, but only 89.66 on the MCS vocabulary test. This finding, which warrants further investigation, may be relevant to concerns about disparate impact resulting from use of certain cognitive selection tests. Moreover, given the large differences for at least some ethnic groups, it would be worthwhile to investigate to what extent the measures were psychometrically biased by testing for Differential Item Functioning (DIF) or measurement non-invariance. The results here suggest that verbal tests may underpredict the latent ability of Asians.

Several international databases have been developed based on educational and other cognitive test results (e.g., Altinok, Angrist, & Patrinos, 2018; Lim et al. 2018; Kraay, 2019). These consistently show that individuals in African, South Asian, and Latin American countries perform, for unclear reasons, poorly compared to those in European, North East Asian, and Anglo-American ones. Thus, it is not surprising that similar patterns would show up among emigrants from these regions (especially of the first generation). Such a pattern need not show up, though, owing to possible immigrant selection, as emigrants are not random samples of the source population (Model, 2008; Easterly & Nyarko, 2008). The issue needs to be evaluated on a country by country basis and periodically reexamined.

Since measured cognitive ability has consistently been found to be associated with social outcomes (in education, occupation, and well-being) it is important to monitor ethnic differences in cognitive ability also, as they can directly and indirectly (e.g., via adverse impact from use of cognitive ability tests) exasperate social inequalities. The significance of cognitive differences between ethnic groups has been well recognized in the USA. Given the concern about social inequality between ethnic groups in the UK (Cabinet Office, 2017; McGregor-Smith, 2017;

Lammy, 2017), surprisingly little attention has been paid to variability in measured cognitive ability in the UK. This analysis partially addresses the gap in the literature by examining the measured abilities of UK adults of different ethnic groups.

2.6 Limitations and Future Analyses

While mostly representative, the samples analyzed here have relatively low sample sizes and high standard errors for many of the ethnic groups. Whilst this concern is negated in the case of the larger ethnic groups (e.g., Asians, Blacks) for which it was possible to meta-analyze data, the estimates for the smaller ethnic subdivisions (e.g., Chinese, Other Asian) are uncertain. Moreover, the measures of ability used in these samples were often not ideal; either being measures of singular cognitive abilities (e.g., verbal ability), or composites of individually poor indexes (in the case of UKLS). As such, it would be worthwhile to complement this study by reviewing scores on employment selection tests (for example in the case of the USA: Roth et al., 2003). These latter measures have considerably better psychometric properties, albeit the samples are not representative of the general population.

Additionally, this analysis focused on measured cognitive ability and did not explore the issue of psychometric bias, for example, by testing for DIF. Such an exploration is necessary to understand the psychometric nature (and ultimately the cause of) the measured differences. Since, via adverse impact, measured differences can lead to social inequalities without necessarily representing gaps in latent ability, the issue of measured differences is nonetheless of interest, regardless of their cause (Roth et al., 2001; Baron et al., 2003; Roth et al., 2003; Evers et al., 2017; Roth et al., 2017) . For this reason, it is important to determine if there are consistent measured differences in the population.

In sum, the cognitive differences we observed among contemporary adults in the UK are roughly consistent with what has been reported among children and adolescents in the second

half of the 20th century. This might indicate temporal stability. However, this does not imply that they will be reproduced in subsequent generations born in the 21st century. Indeed, educational data from the current century suggests minimal academic achievement gaps (e.g., Strand, 2014). Determining if cognitive differences reproduce will require separate analyses.

As discussed above, cognitive ability has been found to correlate strongly with well-being. Thus, research should attempt to determine if the cognitive differences present among the current adult generation account for a portion of the social inequalities of concern (e.g., Cabinet Office, 2017; McGregor-Smith, 2017; Lammy, 2017). Such a finding could help policy makers more effectively address well-being differences across ethnicities.

Endnotes:

[1] In certain governmental reports, groups which are distinguishable by hereditary traits, are called "racial groups". However, the terminology used to describe European and non-European groups has changed. Currently, the UK government prefers the term "ethnic group" (UK Government, 2019a). As such, we follow contemporary terminology and refer to the groups described herein as "ethnic groups."

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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