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# Regional differences in intelligence in 22 countries and their economic, social and demographic correlates: A review

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ABSTRACT

Differences in intelligence have previously been found to be related to a wide range of inter-individual and international social outcomes. There is evidence indicating that intelligence differences are also related to different regional outcomes within nations. A quantitative and narrative review is provided for twenty-two countries (number of regions in parentheses): Argentina (24 to 437), Brazil (27 to 31), British Isles (12 to 392), Chile (15), China (31), Colombia (33), Denmark (7), Finland (4), France (90), Germany (16), India (33), Italy (12 to 19), Japan (47), Mexico (31 to 32), Peru (1468), Portugal (5), Russia (29 to 79), Spain (15 to 48), Switzerland (47), Turkey (12), the USA (30 to 3100), and Vietnam (61). Between regions, intelligence is significantly associated with a wide range of economic, social, and demographic phenomena, including income ($r_{unweighted}$ = .56), educational attainment ($r_{unweighted}$ = .59), health ($r_{unweighted}$ = .49), general socioeconomic status ($r_{unweighted}$ = .55), and negatively with fertility ($r_{unweighted}$ = −.51) and crime ($r_{unweighted}$ = −.20). Proposed causal models for these differences are noted. It is concluded that regional differences in intelligence within nations warrant further focus; methodological concerns that need to be addressed in future research are detailed.

## 1. Introduction

It has been shown in numerous studies that intelligence among individuals is positively associated with a wide range of economic, social, and demographic phenomena, including educational attainment, intellectual achievement, income, socio-economic status (SES), health, and longevity, and negatively associated with variables such as infant mortality and crime (e.g. Hunt, 2011; Mackintosh, 2011). This relationship has also been shown for groups including (1) the districts in cities; (2) cities in countries; (3) nations; and (4) regions in countries. In Section 1, we review studies of the first three of these levels of analysis; in Sections 2 and 3, we give a review of the fourth.

### 1.1. The Districts in Cities

The first of these studies was carried out by Maller (1933a, 1933b) on 310 districts of New York City. IQs for the districts were obtained for approximately 100,000 10-year-olds and shown to be correlated positively with educational attainment ($r$ = .70), and negatively with rates of juvenile delinquency ($r$ = −.57); fertility ($r$ = −.34); the death rate ($r$ = −.43); and infant mortality ($r$ = −.51).

The second study was carried out for 29 districts of London by Burt (1937). He used percentages of educationally backward children as a measure of intelligence and showed that this was correlated with rates of delinquency ($r$ = .69); poverty ($r$ = .57); unemployment ($r$ = .68); overcrowded housing ($r$ = .89); family size ($r$ = .35); fertility ($r$ = .62); death rates ($r$ = .87); and infant mortality ($r$ = .93). (The correlations are positive because a higher percentage of educationally backward children in a district indicates lower intelligence for that district). A later study of the 32 London boroughs found similar results (Kirkegaard, 2016d).

The third study was carried out for 30 districts of Manchester (England) by Wiseman (1964). He used the results of a verbal intelligence test given to 14-year-olds and showed that average scores per district were positively correlated with attainment in reading ($r$ = .89) and arithmetic ($r$ = .94), and negatively correlated with rates of delinquency ($r$ = −.44); poverty assessed by public provision of free clothing ($r$ = −.32); cruelty and neglect of children ($r$ = −.51); and illegitimacy rates ($r$ = −.35), but, unusually, not with infant mortality ($r$ = .01).

### 1.2. Cities in Countries

The first study to show that the intelligence of the populations of

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cities is associated with a number of economic, social and demographic phenomena was carried out by E. L. Thorndike (1939). He obtained data for 37 of these phenomena for 295 American cities with populations of more than 30,000 and combined these to give a measure of "General Goodness". He proposed that General Goodness was determined by intelligence and personality qualities, although he did not provide measures of either of these. He was evidently aware that the lack of a measure of intelligence made this a not wholly convincing thesis because in a further study he provided more evidence for the thesis (E. L. Thorndike & Woodyard, 1942). In this study, IQ data were given for sixth-grade children in 30 cities, and shown to be highly correlated with the General Goodness scores at $r = .86$ and with per capita income at $r = .78$. A further study the intelligence of the populations of American cities was published by R. L. Thorndike (1951). He obtained IQs of children from 154 cities, and reported that these were significantly positively correlated with percentage of native-born whites ($r = .28$); high-school graduates ($r = .33$); educational achievement ($r = .45$); owner-occupied housing ($r = .37$); and professional workers ($r = .28$); and significantly negatively correlated with percentages of adult illiteracy ($r = -.43$); overcrowded housing ($r = -.30$); and employed women ($r = -.26$).

### 1.3. Nations

The relation between the intelligence of nations and a wide range of economic, social and demographic phenomena, and with general indices of development and socioeconomic status, has been shown in a series of studies by Lynn and Vanhanen (2002, 2006, 2012a) and confirmed in numerous studies reviewed in Lynn and Vanhanen (2012b).

### 1.4. Regions within nations

The fourth set of studies consists of the relation of the intelligence of populations of regions within countries with a wide range of economic, social and demographic phenomena. The results of studies for 22 countries, primarily from the intelligence research literature, are summarized in this paper.

## 2. Correlates of regional differences in intelligence: A quantitative analysis

The main results showing consistencies in the studies of the regional differences in intelligence along with their economic and social correlates are given in Table 1. A more detailed narrative review noting additional demographic correlates for individual countries is provided in Section 3. Table 1 summarizes the results from studies published in the intelligence research literature relating socioeconomic outcomes to measures of cognitive ability assessed by intelligence or academic achievement tests. Five socioeconomic outcomes were selected, chosen for general relevance and because data for these outcomes was widely available. These five outcomes were income, educational attainment, health, fertility, and crime. The variable "income" was created using both per capita income and/or per capita gross product, as available, since these are statistically and conceptually related. The variable "health" was created using both infant mortality and life expectancy, since these two variables tended to be collinear and have a part-whole relationship. Several studies reported correlations for general socioeconomic status (henceforth, general SES) calculated through factor analysis, principal component analysis, or by averaging a number of social indicators. These coefficients are also reported if available.

For this quantitative review, studies were included if they: (1) provided non-redundant information; (2) measured cognitive ability with intelligence or academic achievement tests (but not with cognitive proxies such as literacy, as in Grigoriev, Lapteva, & Lynn, 2016); (3) provided correlations between relatively contemporaneous measures of cognitive ability and socioeconomic outcomes (but not between cognitive ability and outcomes from many decades apart, as in Daniele & Malanima, 2011); (4) provided zero-order correlation coefficients or a table from which these could be computed; (5) were published in peer-reviewed journals. Based on these inclusion criteria, 46 studies were identified covering 22 countries.

For two studies – de Baca and Figueredo (2014) and León and León (2014) – authors did not report correlation coefficients in their papers but provided them in personal communications. Some studies provided correlations for cognitive ability and socioeconomic outcomes for multiple years (e.g., Lynn, 2012b). In this case the coefficients for the most recent and contemporary years were used. Other studies provided correlations between closely related variables. For example, Dutton and Lynn (2014) give life expectancy for women and men separately. In this instance, the correlations were averaged for the purpose of computing overall country-level correlations. Some authors provided administrative unit-weighted and unweighted values (e.g., Carl, 2016a,b; Lynn, Antonelli-Ponti, Mazzei, Da Silva, & Meisenberg, 2017). For consistency of comparison, only unweighted values were used.

Several studies looked at different administrative levels for the same country (e.g., US states and counties; UK regions and authorities). Table 1 shows results by administrative level. To summarize, cross-country average correlations were computed using untransformed values, as $r$ to $z$ transformations lead to upwards bias (Schmidt & Hunter, 2014). To create the untransformed values, firstly, multiple correlations from the same study for the same outcome were averaged; secondly, correlations for the same level were averaged; and finally, correlations across countries were averaged, providing the cross-country correlation. The resulting cross-country average correlations between test scores and the socioeconomic outcomes of interest are as follows: income ($r = .56$; $n$ of countries = 16); educational attainment ($r = .59$; $n = 14$); health ($r = .49$; $n = 14$), fertility ($r = -.51$; $n = 9$); crime ($r = -.20$; $n = 6$); and general SES ($r = .55$; $n = 12$).

A few issues deserve further comment. Crime was inconsistently related to cognitive ability; in some countries, it was positively associated while in others it was negatively associated. (See the discussion section for further comment.)

For two countries, Chile and Japan, general SES and cognitive ability did not seem to be robustly related. In the case of Chile, when population weights were used, the correlation became moderately positive ($r = .30$; Fuerst & Kirkegaard, 2016b). The authors did not provide an explanation for this or explore the issue. Japan yielded inconsistent and often near zero correlations between prefectural cognitive ability and socioeconomic outcomes. Moreover, Kirkegaard (2016a) was unable to identify a general SES factor when applying the same method as used for other countries. To identify a coherent general factor, he had to control for population density. Kirkegaard noted he was uncertain why this was the case.

Concern about using unweighted values was raised by Hunt and Sternberg (2006) in the context of cross-country analyses, and later by Fuerst and Kirkegaard (2016a) in the context of both intra-country and cross-country analyses. Arguably, it is problematic to give administrative units with one or two orders of a magnitude differences in population size equal weight, as outcomes for small populations may be more easily influenced by idiosyncratic factors. Regarding population weighing, Fuerst and Kirkegaard (2016a) compared methods for taking population sizes into account and provided a rationale for using a square-root transformation, a method which was later adopted by Carl (2016b) and Lynn et al. (2017). Another concern is the wide variability in the number of regions by county – which, in this analysis, ranged from 4 (Finland) to 1468 (Peru). Results based on few regions are likely less reliable than results based on many regions. Given these concerns, we provide a robustness check on our results as follows: we weighted correlations by the square root of the administrative unit's population size and the square root of the number of administrative units. The results of this analysis check are reported in Table 1.