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National IQs: A review of their educational, cognitive, economic, political, demographic, sociological, epidemiological, geographic and climatic correlates

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ABSTRACT

This paper summarizes the results of 244 correlates of national IQs that have been published from 2002 through 2012 and include educational attainment, cognitive output, educational input, per capita income, economic growth, other economic variables, crime, political institutions, health, fertility, sociological variables, and geographic and climatic variables.

Contents

1. Introduction

Our publication of IQs for all 185 nations in the world with populations over 50,000 (Lynn & Vanhanen, 2002), and for all 192 nations in the world with populations over 40,000 (Lynn & Vanhanen, 2006), updated in Lynn (2010), has generated a research program that has shown that national IQs are significantly and substantially correlated with a wide range of phenomena. These include educational attainment, cognitive output, educational input, per capita income, economic growth, various other economic variables, crime, political institutions, health, demographic and sociological variables,

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Table 1
Educational attainment correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Math: TIMSS 1999	38	.88	Lynn and Vanhanen (2002)
2	Science: TIMSS 1999	38	.87	Lynn and Vanhanen (2002)
3	Math/science: 1964/86	38	.81	Lynn and Vanhanen (2006)
4	Math: age 10, 1994	27	.86	Lynn and Vanhanen (2006)
5	Science: age 10, 1994	26	.79	Lynn and Vanhanen (2006)
6	Math: age 14, 1994	30	.89	Lynn and Vanhanen (2006)
7	Science: age 14, 1994	37	.81	Lynn and Vanhanen (2006)
8	Math: PISA, 2000	40	.88	Lynn and Vanhanen (2006)
9	Science: PISA, 2000	40	.83	Lynn and Vanhanen (2006)
10	Math: PISA, 2003	39	.87	Lynn and Vanhanen (2006)
11	Reading: age 10	35	.81	Barber (2006)
12	Math: age 10, 2003	46	.87	Lynn and Mikk (2007)
13	Science: age 10, 2003	46	.85	Lynn and Mikk (2007)
14	Math: age 14, 2003	46	.92	Lynn and Mikk (2007)
15	Science: age 14, 2003	46	.91	Lynn and Mikk (2007)
16	Math, science	63	.89	Rindermann (2007)
17	Math, science, literacy	56	.84	Lynn and Mikk (2009)
18	Math, science	73	.90	Meisenberg (2009)
19	Math, science, literacy	108	.91	Lynn and Meisenberg (2010)
20	Math, science, literacy	82	.92	Meisenberg and Lynn (2011)

and geographic and climatic variables. These correlates fall into the categories of those that have been proposed as effects of national IQs, reviewed in Section 2, and those that have been proposed as the causes of national IQs, reviewed in Section 3.

2. Effects of national IQs

Table 1 summarizes 20 studies reporting correlations ranging from .79 to .92 between national IQs and scores obtained by school students in math, science and reading comprehension. The correlation given in row 19 of .91 between national IQs and educational attainment is based on scores aggregated from all the PISA and TIMSS studies published hitherto can be corrected for attenuation to 1.0 (Lynn & Meisenberg, 2010).

Table 2 summarizes 11 studies of various cognitive output correlates of national IQs defined as variables for which a high IQ is a major necessary condition including academic publications; patents; "intellectual autonomy" defined as follows: "in cultures that emphasise intellectual autonomy individuals are encouraged to create and innovate, and to pursue their own ideals" (Gelade, 2008, p.172); STEM, a measure of scientific and technological excellence; Nobel prizes awarded for literature, peace and science. It may be surprising that the correlation with literature is as low as .13 and is not statistically significant. The reason for this appears to be that the Nobel Committee has not been good at picking works of literature that have endured. Who now reads or has even heard of the early literature Nobel prizewinners Sully Prudhomme (1901), Theodor Mommsen (1902) and Frédéric Mistral (1904)? Yet remarkably the Nobel Committee did not award the prize to Leo Tolstoy who did not die until 1910.

The correlations of national IQs with peace and science. Nobel prizes are statistically significant, although the correlation with science (.34) may seem surprising low. One reason for this is that the nations of Northeast Asia (China, Japan, South Korea, Singapore, Taiwan and Hong Kong) have the highest IQs but win few Nobel Prizes. We have proposed that the explanation for this is the Northeast Asian peoples have lower creativity than the Europeans, who have won nearly all the Nobel prizes for science (Lynn, 2007).

Further correlates of national IQs given in the last three rows of Table 2 are the numbers of scientists and engineers working in research, technology exports as percentage of all manufactured exports, and the cognitive ability of politicians 1990–2009 estimated from their educational qualifications.

Table 3 summarizes 38 studies of the correlations between national IQs and various measures of per capita income. Rows 1 through 10 summarize our early results

Table 2
Cognitive output variables correlated with national IQ.

	Variable	N countries	r × IQ	Reference
1	Academic publications	139	.87	Morse (2008)
2	Patent index	112	.51	Gelade (2008)
3	Intellectual autonomy	63	.63	Gelade (2008)
4	STEM	90	.74	Rindermann, Sailer, and Thompson (2009)
5	Patents: 1960–2007	76	.40	Rindermann et al. (2009)
6	Nobel prizes: literature	97	.13	Rindermann et al. (2009)
7	Nobel prizes: peace	97	.21	Rindermann et al. (2009)
8	Nobel prizes: science	97	.34	Rindermann et al. (2009)
9	Scientists, engineers	51	.61	Rindermann et al. (2009)
10	Technology exports	61	.38	Rindermann et al. (2009)
11	Politicians' ability	90	.36	Rindermann et al. (2009)

Table 3
Correlations between national IQ and per capita income.

	Variable	N countries	r × IQ	Reference
1	GNP per capita, 1998	81	.66	Lynn and Vanhanen (2002)
2	GDP per capita, 1996	81	.66	Lynn and Vanhanen (2002)
3	Real GDP per capita, 1998	81	.73	Lynn and Vanhanen (2002)
4	GNP–PPP per capita, 1998	65	.77	Lynn and Vanhanen (2002)
5	GNP per capita, 1998	185	.57	Lynn and Vanhanen (2002)
6	Real GDP per capita, 1998	185	.62	Lynn and Vanhanen (2002)
7	GDP per capita, 1996	185	.62	Lynn and Vanhanen (2002)
8	GNP–PPP per capita, 1998	141	.70	Lynn and Vanhanen (2002)
9	GNI–PPP per capita, 2002	113	.68	Lynn and Vanhanen (2006)
10	GNI–PPP per capita, 2002	192	.60	Lynn and Vanhanen (2006)
11	Log GDP, 1975–2003	81	.82	Meisenberg (2004)
12	GNP per capita, 1976: linear	81	.54	Barber (2005)
13	GDP per capita: linear	81	.73	Dickerson (2006)
14	GDP per capita: linear	185	.62	Dickerson (2006)
15	GDP per capita: quadratic	81	.78	Dickerson (2006)
16	GDP per capita: quadratic	185	.67	Dickerson (2006)
17	GDP per capita: exponential	81	.84	Dickerson (2006)
18	GDP per capita: exponential	185	.69	Dickerson (2006)
19	GDP per capita, PPP, 1992	70	.89	Jones and Schneider (2006)
20	GDP per capita, 2002: quadratic	185	.65	Whetzel and McDaniel (2006)
21	GDP per capita	98	.51	Ram (2007)
22	Log GDP	57	.74	Lynn, Meisenberg, Mikk, and Williams (2007)
23	GDP per capita	185	.63	Rindermann (2008a)
24	Log GDP per capita	185	.78	Rindermann (2008a)
25	GDP per capita,1998	17	.78	Rindermann (2008b)
26	GDP per capita, 2004	152	.76	Morse (2008)
27	GDP per capita, 2003–5	112	.56	Gelade (2008)
28	Log GDP per capita, 2003–5	112	.71	Gelade (2008)
29	GDP per capita	129	.61	Templer (2008)
30	GDP per capita, 1998	77	.72	Hunt and Wittmann (2008)
31	Log GDP per capita, 1998	77	.82	Hunt and Wittmann (2008)
32	Log GDP per capita, 2005	35	.79	Saadat (2008)
33	GNI–PPP per capita, 2002	113	.58	Rushton and Templer (2009)
34	Log GDP–PPP, 1990–2005	170	.69	Meisenberg (2009)
35	GDP per capita, 2003	84	.61	Rindermann et al. (2009)
36	Log GDP	192	.65	Dama (in press)
37	Log GDP–PPP, 1975–2005	126	.73	Meisenberg (in press)
38	Log GDP, 1995–2005	82	.74	Meisenberg (in press)

showing correlations in the range between .57 and .77. Meisenberg (2004) refined this association by measuring per capita income as log GDP and showed that this increases the correlation with national IQ to .82, and is higher than any of the correlations previously reported (row 11). Dickerson (2006) analyzed further the relationship between national IQs and per capita income by fitting linear, quadratic and exponential curves to the data and found that fitting exponential curves gives the highest correlations of .84 shown in row 17. His interpretation was that "a given increment in IQ, anywhere along the IQ scale, results in a given *percentage* in GDP, rather than a given dollar increase as linear fitting would predict" (Dickerson, 2006, p. 291). He suggests that "exponential fitting of GDP to IQ is logically meaningful as well as mathematically valid. It is inherently reasonable that a given increment of IQ should improve GDP by the same proportional ratio, not the same number of dollars. An increase of GDP from $500 to $600 is a much more significant change than a linear increase from $20,000 to $20,100. The same proportional change would increase $20,000 to $24,000. These data tell us that the influence of increasing IQ is a proportional effect, not an absolute one" (p. 294). The author also noted that his correlations were consistently higher for the 81 nation sample than for the 185 nation sample and suggested this is attributable to more errors in the 185 nation sample.

Row 20 (Whetzel & McDaniel, 2006) gives a correlation between national IQ and per capita income (GDP, 2002) of .65, based on 185 countries, in a study that assumed that the lowest national IQ is 90 on the grounds that the IQs of a number of countries with IQs lower than this could be too low and inaccurate. Their result shows that the restriction of range entailed by this assumption makes little difference to the magnitude of the correlation.

Rows 21 through 38 give the results of further studies all showing substantial and significant correlations between national IQs and various measures of per capita income, based on different years, different numbers of nations, and different measures of national per capita income, including log GDP, and different statistical analyses including quadratic and exponential correlations. These refinements have generally given higher correlations with national IQs than those we originally reported.

Table 4 summarizes 16 studies of the correlations of national IQ with economic growth. These studies show that national IQs predict economic growth rates well over very long time periods, such as 1500–2000 given in row 10, for which the correlation is .71. Over shorter time periods such as 1950–1990 given in row 14, the correlation is lower at .44. Over very short time periods such as 1990–2002 the correlation is effectively zero (−.06). The explanation for this is that various economic shocks such as wars, large increases in the price of oil and so on, reduce the growth rate of some countries in the short term, but over the long term these have little effect and national IQ emerges as a major determinant of economic growth rates.

This conclusion may be surprising to economists because theoretically it would be expected that low IQ countries would have faster economic growth rates than high IQ countries because of what Weede and Kampf (2002) call "the advantage of backwardness". This advantage should be present because of the potential ability of poor countries to adopt the technologies and management practices of wealthier countries, whereas wealthier countries depend on innovation. However,

Table 4
Economic growth correlates of national IQ.

	Economic growth variables	N countries	r × IQ	Reference
1	GDP per capita, 1820–1900	26	.57	Lynn and Vanhanen (2002)
2	GDP per capita, 1820–1992	26	.73	Lynn and Vanhanen (2002)
3	GDP per capita, 1890–1910	28	.21	Lynn and Vanhanen (2002)
4	GDP per capita, 1910–1992	47	.53	Lynn and Vanhanen (2002)
5	GDP per capita, 1950–1990	166	.45	Lynn and Vanhanen (2002)
6	GNP per capita, 1976–1998	148	.45	Lynn and Vanhanen (2002)
7	GDP per capita, 1983–1996	181	.28	Lynn and Vanhanen (2002)
8	GDP per capita, 1987–1998	127	−.01	Lynn and Vanhanen (2002)
9	GNP per capita, PPP, 1995–1998	123	−.01	Lynn and Vanhanen (2002)
10	GDP per capita, 1500–2000	109	.71	Lynn and Vanhanen (2006)
11	GDP per capita%, 1950–2001	132	.39	Lynn and Vanhanen (2006)
12	GDP per capita $, 1950–2001	132	.75	Lynn and Vanhanen (2006)
13	GDP per capita, 1990–2002	145	−.06	Lynn and Vanhanen (2006)
14	Economic growth, 1950–1990	185	.44	Rindermann (2008a,b)
15	Economic growth, 1975–2005	126	.37	Meisenberg (in press)
16	Economic growth, 1975–2005	71	.47	Meisenberg (in press)

the studies summarized in this section show that this is not so, and that the correlation between national IQs and economic growth over the long term is positive. Meisenberg and Lynn (2011) suggests that the explanation may be that a high IQ population has greater ability to establish effective economic institutions that favor economic growth.

Table 5 summarizes five studies of positive correlations ranging between .52 and .76 between national IQs and economic freedom defined and measured as the extent of personal choice, voluntary exchange, economic competition, the rule of law providing legal protection of the person and property, legal security of property rights, sound money, and free trade across countries. These positive correlations indicate that countries with higher IQs have better developed market economies and is one of the ways by which higher IQ countries achieve higher rates of economic growth.

Table 5
Correlations between national IQ and economic freedom.

	Variable	N countries	r × IQ	Reference
1	Economic freedom	59	.76	Meisenberg (2004)
2	Economic freedom	123	.61	Lynn and Vanhanen (2006)
3	Economic freedom, 1960–2000	165	.52	Meisenberg (2012)
4	Economic freedom	126	.53	Meisenberg (2012)
5	Economic freedom	82	.56	Meisenberg (in press)

Table 6
Correlations between national IQ and income inequality.

	Variable	N countries	r × IQ	Reference
1	Income inequality	51	−.60	Meisenberg (2004)
2	Income inequality	146	−.54	Lynn and Vanhanen (2006)
3	Income inequality	52	−.52	Lynn et al. (2007)
4	Income inequality	148	−.51	Rindermann (2008a)
5	Income inequality	127	−.51	Kanazawa (2009)
6	Income inequality	126	−.58	Meisenberg (in press)

Table 6 summarizes six studies of negative correlations ranging between −.51 and −.60 between national IQs and income inequality measured by the Gini index. This index gives values that range from zero (perfect equality of incomes) to 1 (one person has all the national income). The negative correlations show that high IQ countries have less income inequality. The explanation for this proposed by Meisenberg and Lynn (2011) is that "a more-or-less equal income distribution leads to the greatest happiness of the greatest number. We can expect that societies whose members are capable of reasoning at this (higher IQ) level will develop mechanisms to restrain the exploitation of the weak by the strong and to redistribute wealth from the rich to the poor."

Table 7 summarizes eight studies of a variety of other economic variables correlated with national IQs. Row 1 (Jones & Schneider, 2010) gives a correlation of .47 between national IQs and the incomes of immigrants from these nations in the United States. The explanation suggested by the authors is that the immigrants have the same average IQs as the countries from which they come, so those who come from countries with higher IQs have higher incomes in the US. Rows 2 and 3 give negative correlations of −.71 and −.70 between national IQs and the percentage of the labor force engaged in agriculture. Barber (2005, p. 280) suggests "the most parsimonious explanation is that the lower level of education received in agricultural societies means that there is less opportunity for academic ability to develop. As countries become economically developed and as the importance of agricultural labor declines, parents produce fewer offspring and invest more in their education and cognitive development."

Row 4 (Ram, 2007) gives a correlation of .61 between national IQs and investment as the average ratio of investment to GDP over the years 1960–85.

Table 7
Correlations between national IQ and other economic variables.

	Variable	N countries	r × IQ	Reference
1	Incomes in US	59	.47	Jones and Schneider (2010)
2	Employment: % agriculture	81	−.71	Barber (2005)
3	Employment: % agriculture	170	−.70	Meisenberg (2009)
4	Investment: GDP	98	.61	Ram (2007)
5	Poverty: %	96	−.63	Lynn and Vanhanen (2006)
6	Savings	129	.48	Jones and Podemska (2010)
7	Self-employment	117	.49	Vinogradov and Kolvereid (2010)
8	Unemployment	107	−.76	Lynn and Miller (in press)

Row 5 (Lynn & Vanhanen, 2006) gives a correlation of −.63 between national IQs and the percentage of the population in poverty measured as having an income below $2 a day. The negative correlation indicates that higher IQ countries have smaller percentages of the population in poverty. This reflects their higher per capita incomes.

Row 6 (Jones & Podemska, 2010) gives a correlation of .48 between national IQs and the savings rate calculated from the ratio of the holdings of US treasury bonds to nominal GDP over the years 1980–2005. The authors suggest the explanation that higher IQ populations have a lower time preference (a greater propensity to postpone immediate gratification for future benefits) and this is expressed in higher savings rates.

Row 7 (Vinogradov & Kolvereid, 2010) gives a correlation of .49 between national IQs and the rate of self-employment among 117 immigrant groups in Norway. The authors note that this is consistent with results at the individual level showing that the self-employed have above average IQs, reported by De Wit and Winden (1989).

Row 8 (Lynn & Meisenberg, in press, Lynn & Miller, in press) shows a negative correlation of −.76 between national IQs and the rate of unemployment averaged for the years 2001 and 2008, showing that high IQ nations have lower rates of unemployment. This is possibly attributable to high IQ populations being able to provide cognitively demanding goods and services for which there is world-wide demand, and that cannot be provided by low IQ populations.

Table 8 summarizes studies of the correlations between national IQs and educational input defined as the quantity of education obtained by the population, expenditure on education and the effects of these indexed by adult literacy. All the correlations are positive and range between .25 and .81. We propose that the positive correlations between these educational input variables and national IQs arise from a positive feedback loop in which national IQ is a determinant of per capita income, and per capita income is a determinant of the educational input.

Table 8
Educational input variables correlated with national IQ.

	Variable	N countries	r × IQ	Reference
1	Education: years, literacy	78	.77	Meisenberg (2004)
2	Literacy	81	.71	Barber (2005)
3	Education: % secondary	81	.72	Barber (2005)
4	Tertiary percent	192	.74	Lynn and Vanhanen (2006)
5	Adult literacy, 2002	192	.66	Lynn and Vanhanen (2006)
6	Youth literacy: percent	49	.52	Lynn et al. (2007)
7	Education: public expenditure	52	.25	Lynn et al. (2007)
8	Education: % secondary	98	.78	Ram (2007)
9	Education: adults	173	.78	Rindermann (2008a)
10	Education: school quality/quantity	158	.74	Rindermann (2008a)
11	Adult literacy	187	.74	Meisenberg (2009)
12	Education: years	170	.77	Meisenberg (2009)
13	Education: years	126	.77	Meisenberg (in press)
14	Education: years	82	.81	Meisenberg (in press)

Table 9
Correlations between national IQs and crime.

	Variable	N countries	r × IQ	Reference
1	Crime: homicide, 1970s	70	−.50	Lester (2003)
2	Crime: homicide, 1990s	–	−.82	Templer, Connelly, Lester, Arikawa, and Mancuso (2007)
3	Crime—homicide, 1990s	116	−.25	Rushton and Templer (2009)
4	Crime—rape, 1990s	116	−.29	Rushton and Templer (2009)
5	Crime—assault, 1990s	116	−.21	Rushton and Templer (2009)

Table 9 summarizes five studies of correlations between national IQs and crime. The correlations are all negative and range between −.21 and −.82.

Table 10 summarizes eight studies of correlations between national IQs and the extent of corruption measured by the Corruption Perception Index for various years. The correlations are all negative, range between −.27 and −.68, and show that corruption is more prevalent in low IQ nations. Potrafke (2012, p. 109) suggests the explanation that "intelligent people have longer time horizons".

Table 11 summarizes 21 studies of correlations between national IQs and the extent of democracy and associated political institutions of civil liberties, political freedom, property rights, the rule of law, the independence of the judiciary and the efficiency of government bureaucracy. All except two of the correlations are positive, showing that higher IQ nations are more democratic. We have proposed that the explanation for this is that "people in countries with low national IQs are not as able to organize themselves, to take part in national politics, and to defend their rights against those in power as people in countries with higher national IQs" (Vanhanen, 2009, p. 270). The two exceptions are Rindermann's (2008b) correlation of −.47 between national IQs and "big government" defined as government expenditure as percentage of GDP, 1980–89 (row 1), and Voracek (in press) correlation of −.58 between national IQs and the Failed State Index, a measure of vulnerability to political breakdown and hence the instability of democracy (row 11).

Table 10
Correlations between national IQs and corruption.

	Variable	N countries	r × IQ	Reference
1	Corruption, 1999–2003	81	−.68	Meisenberg (2004)
2	Corruption, 1999–2003	126	−.54	Meisenberg (2004)
3	Corruption, 2003	132	−.59	Lynn and Vanhanen (2006)
4	Corruption, 1999–2005	55	−.62	Lynn et al. (2007)
5	Corruption, 1980–2003	132	−.60	Rindermann (2008a)
6	Corruption, 2006	125	−.64	Potrafke (2012)
7	Corruption, 1996	120	−.27	Meisenberg (in press)
8	Corruption, 1990–2000	120	−.67	Meisenberg and Lynn (2011)

Table 11
Correlations between national IQs and democracy.

	Variable	N countries	r × IQ	Reference
1	Big government	138	−.47	Rindermann (2008b)
2	Bureaucracy: quality	140	.64	Rindermann (2008b)
3	Democracy, 2002	192	.53	Lynn and Vanhanen (2006)
4	Democracy, 1950–2004	183	.56	Rindermann (2008a)
5	Democracy, 1996–2000	17	.79	Rindermann (2008b)
6	Democracy	170	.65	Meisenberg (2009)
7	Democracy	172	.58	Vanhanen (2009)
8	Democracy, 1950–2004	84	.60	Rindermann et al. (2009)
9	Democracy/freedom	126	.57	Meisenberg (2012)
10	Democracy/freedom	82	.58	Meisenberg (2012)
11	Failed state index	117	−.58	Voracek (2011)
12	Institutional quality	21	.70	Jones (2011)
13	Political freedom	81	.65	Meisenberg (2004)
14	Political freedom	55	.61	Lynn et al. (2007)
15	Political freedom/rights	17	.77	Rindermann (2008b)
16	Political freedom	170	.49	Meisenberg (2009)
17	Political freedom, 1997	86	.62	Rindermann et al. (2009)
18	Power resources	172	.75	Vanhanen (2009)
19	Property rights	98	.17	Ram (2007)
20	Rule of law, 1970–2000	131	.64	Rindermann (2008a)
21	Rule of law, 2000	17	.82	Rindermann (2008b)
22	Rule of law, 1970–2000	84	.62	Rindermann et al. (2009)

Table 12
Health correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Low birth weight	81	−.48	Barber (2005)
2	HIV/AIDS	129	−.46	Templer (2008)
3	HIV: percent, 2001–3	165	−.48	Rindermann (2008a)
4	HIV: percent	165	−.48	Rindermann and Meisenberg (2009)
5	HIV: percent, 2001–3	82	−.30	Rindermann et al. (2009)
6	AIDS: percent, 2001–3	83	−.21	Rindermann et al. (2009)
7	HIV: percent	113	−.52	Rushton and Templer (2009)
8	HIV/AIDS deaths	104	−.47	Reeve (2009)
9	Infant mortality	81	−.34	Barber (2005)
10	Infant mortality	149	−.77	Lynn and Vanhanen (2006)
11	Infant mortality	126	−.84	Kanazawa (2006)
12	Infant mortality	129	−.84	Templer (2008)
13	Infant mortality	116	−.67	Rushton and Templer (2009)
14	Infant mortality	191	−.69	Reeve (2009)
15	Life expectancy, 2002	192	.75	Lynn and Vanhanen (2006)
16	Life expectancy: men	126	.78	Kanazawa (2006)
17	Life expectancy: women	126	.82	Kanazawa (2006)
18	Life expectancy	56	.76	Lynn et al. (2007)
19	Life expectancy	98	.51	Ram (2007)
20	Life expectancy	129	−.84	Templer (2008)
21	Life expectancy	116	.74	Rushton and Templer (2009)
22	Life expectancy	190	.75	Reeve (2009)
23	Mortality: maternal	149	−.73	Lynn and Vanhanen (2006)
24	Mortality: maternal	131	−.65	Reeve (2009)
25	Undernourishment	124	−.50	Lynn and Vanhanen (2006)
25	Malnourishment	120	−.49	Lynn and Meisenberg (2012)

Table 13
Suicide correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Suicide, 1970/1980	70	.53	Lester (2003)
2	Suicide—men	85	.39	Voracek (2004)
3	Suicide—women	85	.46	Voracek (2004)
4	Suicide, age 65 +	48	.06	Voracek (2005)
5	Suicide	85	.54	Voracek (2008)
6	Suicide—men	–	.70	Templer et al. (2007)
7	Suicide—women	–	.46	Templer et al. (2007)
8	Suicide—men	73	.37	Voracek (2009)
9	Suicide—women	73	.48	Voracek (2009)

Table 12 summarizes 24 studies of correlations between national IQs and health. All the correlations are negative, showing that the populations of higher IQ nations are more healthy.

Table 13 summarizes 13 studies of correlations between national IQs and rates of suicide. All the correlations are positive, showing that the populations of higher IQ nations have higher rates of suicide. A theory to explain this has been proposed by Voracek (2009a), who suggests that suicide can increase a person's inclusive fitness, and that a certain level of intelligence is required to understand that a person's kin would benefit from one's death.

Table 14 summarizes nine studies of correlations between national IQs and fertility. All the correlations are negative showing that fertility is higher in low IQ nations.

Table 15 summarizes six studies of correlations between national IQs and various other demographic variables.

Table 16 summarizes five studies of correlations between national IQs and religiosity. All correlations are negative showing that high IQ nations have less religious belief.

Table 17 summarizes 17 studies of correlations between national IQs and a variety of sociological variables.

Table 14
Fertility correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Birth rate	129	−.85	Templer (2008)
2	Birth rate	116	−.76	Rushton and Templer (2009)
3	Fertility	57	−.80	Lynn et al. (2007)
4	Fertility	192	−.73	Lynn and Harvey (2008)
5	Fertility	111	−.71	Shatz (2008)
6	Fertility, 1960–84	130	−.73	Rindermann (2008a)
7	Fertility	192	−.73	Reeve (2009)
8	Fertility, 2000–2005	170	−.83	Meisenberg (2009)
9	Fertility	192	−.72	Dama (2011)

Table 15
Other demographic correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Polygyny	187	−.61	Kanazawa (2009a)
2	Polygyny	119	−.53	Dama (2011)
3	Population growth rate	111	−.52	Shatz (2008)
4	Population pyramids	162	.81	Lynn and Vanhanen (2006)
5	Sex ratio	192	.57	Dama (2011)
6	Maternal age	172	.29	Dama (2011)

Table 16
Religiosity correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Religiosity: atheism	137	−.60	Lynn, Harvey, and Nyborg (2009)
2	Religiosity: atheism	137	−.60	Reeve (2009)
3	Religiosity: % belief	58	−.58	Kanazawa (2009)
4	Religiosity: importance	60	−.75	Kanazawa (2009)
5	Religiosity: % religious	60	−.56	Kanazawa (2009)

3. Variables causal to national IQs

Here we review studies of variables proposed as causal to national IQs. Table 18 summarizes 14 studies of correlations between national IQs and climatic variables. Rows 1 through 4 show negative correlations between national IQ and temperature, showing that national IQs are higher in countries with lower temperatures. These results confirm the theory that population differences in IQ evolved over tens of thousands of years in response to the cognitive demands of survival in cold winters that we presented in Lynn and Vanhanen (2002) and Lynn (2006). Rows 5, 6 and 7 show positive correlations between national IQ and latitude, showing that national IQs are higher in countries with higher latitudes measured as distance from the equator, and hence with lower temperatures.

Rows 8 through 11 show positive correlations between national IQ and skin color, showing that light skinned populations have higher IQs. These provide further confirmation of the association between national IQ and temperature, because lighter skin evolved in colder climates to facilitate the absorption of vitamin D from sunlight.

Rows 12 through 14 show positive correlations between skin reflectance and national IQ. Skin reflectance is the amount of light reflected off the skin, so the lighter the skin the greater the reflectance. These correlations provide additional confirmation of the association between national IQ and lighter skin color shown in rows 8 through 11.

Table 19 summarizes five studies of other hypothesized causal correlates of national IQ.

Row 1 shows Kanazawa's (2008) report of a positive correlation of .23 between national IQ and longitude. His theory is that higher intelligence evolved in environments that were novel and these were more distant from the evolutionary environment close to the equator in sub-Saharan Africa in which humans evolved. In further support of this theory, he reports a higher correlation of 0.45 (row 2) between national IQ and a more accurate measure of distance from the evolutionary environment.

Row 3 shows a negative correlation of −.76 between national IQ and consanguinity measured by the inbreeding coefficient defined as the probability that an individual has received both alleles of a pair from an identical ancestor. High inbreeding coefficients are present in countries where marriages between cousins are common, and the negative correlation across countries shows that national IQs are lower in these countries.

Row 4 shows Woodley's (2009) confirmation of the negative correlation between national IQ and consanguinity measured as inbreeding depression assessed by the percentage of consanguineous marriages. He notes that this is predictable from the known effect of inbreeding depression on reducing IQ at the individual kevel. However, he notes also that the

Table 17
Sociological correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Acquiescence	79	−.55	Meisenberg and Williams (2008)
2	Books in home	63	.59	Rindermann (2008)
3	Extremity	79	−.78	Meisenberg and Williams (2008)
4	Happiness	62	.03	Lynn and Vanhanen (2006)
5	Human Development Index	176	.78	Lynn and Vanhanen (2006)
6	Human Development Index	85	.36	Rindermann et al. (2009)
7	Interpersonal trust	41	.49	Rindermann (2008a)
8	Liberalism	127	.51	Kanazawa (2009)
9	Life satisfaction	62	.03	Lynn and Vanhanen (2006)
10	Modernism	45	.74	Meisenberg (2004)
11	Post-Modernism	45	.43	Meisenberg (2004)
12	Son preference	119	.18	Dama (2011)
13	Speed of life	31	.59	Rindermann (2008a)
14	Subjective well-being	51	.12	Meisenberg (2004)
15	Subjective well-being	50	.25	Lynn et al. (2007)
16	Time preference	10	.70	Jones (2011)
17	War	186	−.22	Rindermann (2008a)

Table 18
Climatic and geographic correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Temperature: winter low	129	−.61	Templer and Arikawa (2006)
2	Temperature: summer low	129	−.40	Templer and Arikawa (2006)
3	Temperature: mean annual	192	−.63	Kanazawa (2008)
4	Temperature: mean annual	172	−.66	Vanhanen (2009)
5	Latitude	90	.72	Templer (2008)
6	Latitude	192	.68	Kanazawa (2008)
7	Latitude	192	.68	Dama (2011)
8	Skin color	129	.92	Templer and Arikawa (2006)
9	Skin color	129	.91	Templer (2008)
10	Skin color	90	.84	Templer (2008)
11	Skin color	113	.92	Rushton and Templer (2009)
12	Skin reflectance	58	.89	Meisenberg (2004)
13	Skin reflectance	57	.69	Lynn et al. (2007)
14	Skin reflectance	90	.87	Templer (2008)

Table 19
Other hypothesized causal correlates of national IQ.

	Variable	N countries	r × IQ	Reference
1	Longitude	192	.23	Kanazawa (2008)
2	Distance evolutionary environment	192	.45	Kanazawa (2008)
3	Consanguinity	35	−.76	Saadat (2008)
4	Inbreeding depression	72	−.62	Woodley (2009)
5	Infectious diseases	184	.89	Eppig, Fincher, and Thornhill (2010)

effect of inbreeding depression in reducing IQ at the individual level is quite small and was estimated by Jensen (1983) at approximately 3 IQ points. Hence, he concludes that the direct causal effect of the percentage of consanguineous marriages in reducing national IQs must also be quite small.

Row 5 shows a high negative correlation of −.89 between national IQ and the intensity and prevalence of infectious diseases. The authors propose that the widespread presence of infectious diseases impairs the intelligence of populations in low IQ countries. We accept that this is likely the case, but we suggest that the relationship between national IQs and the intensity of infectious diseases is probably a two way causal relationship. The intensity of infectious diseases is a determinant of low national IQs, as the authors argue, but we suggest that low national IQs are also a cause of widespread infectious diseases because low IQ populations have less understanding of the ways that infections are contracted, and sometimes have erroneous beliefs about how to prevent infection, as suggested by Oesterdiekhoff and Rindermann (2007). In contrast, people with high IQ are better able to avoid infectious diseases by adopting, a prudent lifestyle (for example avoiding HIV infection), and the establishment of effective health care systems. Thus, we suggest that the causal sequence is not only from infectious diseases to national IQ, but also from low national IQ to a high prevalence of infectious diseases.

4. Discussion

Three general conclusions can be drawn from the studies summarized in this paper. First, we believe that these establish beyond reasonable doubt the validity of our national IQ. This was initially disputed by a number of critics. For instance, Ervik (2003, pp. 405–6) asked "are people in rich countries smarter than those in poorer countries?" and concluded that "the authors fail to present convincing evidence and appear to jump to conclusions." Nechyba (2004, p. 1178) wrote of the "relatively weak statistical evidence and dubious presumptions." Barnett and Williams (2004, p.) rejected our national IQ as "virtually meaningless"; Volken (2003, p. 411) described them as "highly deficient"; and Hunt and Sternberg (2006, pp. 133, 136) rejected them as "technically inadequate… and meaningless".

The answer to these criticisms is that our national IQs are validated by their high correlations with scores in tests of mathematics, science and reading, as shown in Table 1, and also with the numerous other economic and social phenomena documented in subsequent tables. These high correlations would not be present if our national IQs were meaningless.

Second, we propose that the studies summarized in this paper support a three stage causal model in which geographic and climatic factors have been responsible for differences in national IQs, and differences in national IQs are responsible for significant proportions of the variance in national differences in educational, economic and a large number of other social phenomena summarized in this paper. We regard the geographic and climatic variables of low winter temperatures and latitude as causal to national IQs because we regard national IQs as having evolved as adaptations to the cognitive demands of different climatic and geographic environments. In the second link in the causal model, the national IQs that are present today contribute to the explanation of national differences in numerous social phenomena documented in this paper. However, for many of these we envision positive feedback loops such that, for instance, national IQs are a determinant of per capita income (Table 1), educational attainment (Table 6), and health (Table 8), and these exert a reciprocal causal effect on national IQs. However, we regard national IQs as the fundamental causal variable because we regard these as having a significant evolved genetic basis.

Third, many of the correlates of national IQ summarized in this paper are predictable from the correlations that are present among individuals. Thus, it is well established that IQ predicts educational attainment, earnings, health, longevity, crime, etc. among individuals. Nations are aggregates of individuals, and hence it is predictable that the same correlations would be present across nations. The results reviewed here therefore extend the explanatory power of the construct of intelligence from the individual to the national level and go some way towards establishing intelligence as a fundamental explanatory construct for the social sciences.

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