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The Relationship Between Health Efficacy, Educational Attainment, and Well-Being Among 30 Nations

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Data from 30 nations on the relationship between educational performance in reading, mathematical, and scientific literacy as assessed in the PISA survey and the health performance indicators of the World Health report are analyzed. Health level was unrelated to any of the three educational performance variables, but disability-related life expectancy was significantly related to reading literacy and educational attainment. Specifically, mathematical and reading literacy were related to such health care indicators as goal level, goal distribution, fairness, and overall goals. In addition, correlational analysis was conducted between socioeconomic variables and educational attainment for these nations; GDP and economic growth were very weakly related to educational performance. On the other hand, inflation and the human development index (HDI) were significantly related to all three literacy scores. HDI and economic growth emerged as the strongest predictors of health performance rating of a nation. Finally, the association between subjective well-being (happiness) and educational performance was explored. Happiness was consistently related to the three literacy scores, the magnitude of the association being highest for reading literacy. The implications of these findings for educational and health programs were discussed.

Keywords: PISA, educational performance, subjective well-being, happiness, socio-economics, health care systems

Introduction

Using archival data, this study aims to examine the relationship between specific economic, educational, and health-related variables. There is considerable macroeconomic evidence that national economic figures relate systematically to both the nation's health (i.e., longevity) as well as the education (i.e., literacy) of the citizens but less on the relationship between the two latter variables, which may indeed be moderated by economic factors.

This study is clearly in the psychological tradition first began by Cattell (1949) and still very much alive today (Lynn & Vanhanen, 2002), and which attempts through multivariate statistics to examine the relationship of essential factors at a national level, often using the techniques developed to examine the relationship between variables at an intraindividual level (Furnham, Kirkcaldy, & Lynn, 1996).

We begin by looking at two impressive data sets and the variables that they measure, which drives our hypotheses and strategies of data analysis.

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Cross-Cultural Differences in Educational Performance

The PISA survey was an ambitious attempt to assess various facets of educational attainment by collating questionnaire data from a representative sample of 250,000 adolescent pupils (15-year-olds) attending secondary schools in 32 countries. Few attempts to date have tried to establish benchmarking on this scale in the educational arena. The goal of the survey was to monitor "young people's ability to use knowledge and skills in order to meet real life challenges rather than how well they had mastered a school curriculum. The emphasis was placed on the mastery of processes, the understanding of concepts, and the ability to function in various situations within each domain" (Pisa, 2000).

No doubt it is assumed by policymakers that intensive and judicious spending in primary and secondary education would result in improved performance. There is, however, only a slight positive relationship between cumulative expenditure per student (in $) and average scores across literacy scales. This must partly be due to how the money is spent: that is, on school buildings, teacher salaries, reducing class sizes, school equipment, etc. "For other countries, many of whom spend more money per student, PISA has been a rude awakening to the urgent need for change. In Germany, it has stirred an intense debate—aside from the mutual finger-pointing that usually follows bad results—as to how to achieve a long overdue and radical overhaul of the country's educational system" (Moore, 2002). Similarly, nations such as Italy, Denmark, and Switzerland display high spending in their educational systems, but perform lower than would be expected. The lower educational performance of countries such as Brazil and Mexico, however, is probably due to less investment in educational spending mainly because they are less affluent societies.

Countries like Finland, Korea, and Japan not only displayed superior performances on the scholastic attainment variables but revealed a small disparity between the lowest and highest performers. Conversely, Germany was one of the nations with a substantial difference between the lowest and highest performers, with much of the variation observed due to between school differences, presumably attributable to socioeconomic factors playing a major role (although migrant status may have had a significant influence). There was also some evidence that the countries investing more in education tended to display better than average performance. Nations attaining above average reading literacy scores included Canada, Finland, Sweden, Iceland, Korea, and Japan, but they further showed a below average impact of social background on scholastic achievement. On the other hand, Germany, Czech Republic, Luxembourg, and Hungary showed quite different trends. In these countries, students from privileged social backgrounds tended to perform better. In other words, for countries such as Germany, high-income families show high performers among their offspring, but immigrant or poor children seem significantly less proficient in their learning skills. There was no single factor that explained better results of nations on the literacy skills, but some social and educational factors do seem implicated. For example, diverse school resources with an increased availability of specialist teaching personnel seem valuable, as does allowing the school a role in influencing decision-making processes: a high set of expectations and morale of the teachers, a good social climate within the classroom, and good discipline. Expenditure in education is not the sole determinant of educational outcome. In this study we intend to integrate national data sets to explore the role of other variables that may better explain these observed national differences.

Kirkcaldy, Furnham, and Lynn (1992a, 1992b) have published studies based on national differences in work attitude scales among young adults, mainly university undergraduates. By focusing on only those 30 nations involved in both the Pisa and their work attitude study, comparisons could be made of countries in terms of measures of national trait competitiveness and work ethic. Competitiveness was lowest for the European nations Switzerland, Sweden, Germany, Norway, France, Spain, and the UK (in that order) and highest for Greece, Mexico, Romania, Korea, Ireland, and the USA. Another dimension, "work ethic," was lowest for nations Japan, Germany, Belgium, Switzerland, and France, and highest for Mexico, Portugal, Brazil, Greece, Romania, USA, and Korea. For both theses scales, it seems that high-scoring nations (whether in work ethic or competitiveness), with the exception of Korea, did not emerge as the high scorers in terms of educational performance as observed in the PISA study, albeit the latter data were collated 10 years later.

In this study, however, we are going to concentrate on published economic data and explain how they relate specifically to educational variables.

Cross-Cultural Differences in Health

Just as the Pisa study is an attempt at large-scale cross-cultural comparisons or "benchmarking" of educational performance, so the World Health Report (2000) represents an ambitious attempt to evaluate national health

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care services across the world with the prospect of comparing performance, and enabling policy makers to better appreciate the complexity of health care. Thus, to an "unprecedented degree it takes account of the role of people as providers and consumers of health services, as financial contributors to health systems, as workers within them, and as citizens engaged in their responsible management, or stewardship" (WHO, 2001).

The efficiency of a nation's health care and educational system are likely to reflect significant competitive advantages for the nation both at a global and European economic level. A well-educated and health conscious indigenous population coupled with superior physical and psychological health is likely to contribute to sustained economic advantages for that nation. This in itself lends credence to the value of maintaining efficient educational and medical systems. Furthermore, in developed industrialized communities a substantial proportion of the working population is engaged in the medical health and educational sectors. As a consequence, ever increasing costs incurred by such "human social services" impose tremendous financial burdens on many nations, straining an economy to its "breaking point."

More recently, there have been increased calls for alternative private financial resources, thus bringing some relief from the over-reliance on local and governmental public expenditure. Financial constraints have adverse ramifications on funding of preventative measures in the health care system and/or the financial support of education. Both health care and educational competency seem to be areas in urgent need of reform. Conversely, such long established social systems are frequently resistant to change. Despite the immense value of both systems and their concomitant development in certain aspects, there has been a dearth of studies aimed at exploring the efficiency of these systems and their degree of interrelationship.

This study is an attempt to address this problem by comparing recently compiled international data from both domains, particularly with a view to exploring the impact of different organizational structures and configurations on the system's efficiency. As a result, it may provide novel impetus to understand causal links and assist in the development of reform. It is essentially an explanatory, multivariate study not driven by politico-economic theory but one which seeks to describe patterns in robust data sets and offer tentative explanations for those findings.

In a recent study, Kirkcaldy, Veenhoven, and Furnham (2004) examined the data from the World Health Organization (WHO), which considered the effectiveness of health care in nations by comparing the outcomes in disability adjusted life-years. The best systems had been shown to be not necessarily the most expensive ones. They extended this work by exploring the relationship between health care and subjective well-being. Health care in nations was measured by several health performance indicator variables (WHO, 2000). Subjective well-being in nations was measured by responses to questions on mood and satisfaction (including job and life satisfaction) in representative surveys. Data on both variables are available for 41 nations in the 1990s. The analysis revealed that people are inclined to feel better in nations with good health care systems and that differences in subjective well-being are smaller in nations with the most equitable health care systems.

Cross-Cultural Differences in Subjective Well-Being

Over the last decade there have been several empirical studies which have examined the correlates of national well-being, including democratic political standards and economic prosperity. Some of these studies considered national care systems. Veenhoven (2000) for example, compared social security systems and found that people are equally happy in nations characterized by lavish welfare as in equally affluent countries where provision is more modest. He concluded that health care has only a minimal impact on subjectively perceived happiness. Kirkcaldy, Veenhoven, and Furnham (2004) have tried to study the relationship between health care systems and well-being, and similar conclusions were reached.

In recent years a focus of research has been comparing countries according to the level of subjective well-being. For example, Veenhoven (2003) reports a total of 330 empirical studies focusing on happiness catalogued in his World Database of Happiness. The construct of well-being and happiness can be assessed simply by asking people to provide an overall judgment of their feeling of happiness (general appraisal of life) or well-being. Standardized questions of this kind have been shown to be both valid and quite reliable (Diener, 1984, 1999). An examination of Veenhoven's data base of happiness scores for those nations included in the current study reveal that those nations with the highest ratings for subjectively perceived happiness include Iceland, followed by Sweden, Australia, Switzerland, Ireland, and the USA. The five nations scoring lowest were Russia, Hungary, Brazil, Portugal, Poland, Mexico, and Greece.

Another psychological construct trait, neuroticism, which is more related to emotionality and negative affect—in many senses the opposite of happiness—was examined. Using Barratt and Eysenck's (1984) cross-cultural data for neuroticism, the nations scoring highest in neuroticism were Greece, followed by Russia, Egypt, Japan, Italy, and Spain. In contrast, neuroticism scores were lowest for Norway, Canada, Germany, Ireland, and Czechoslovakia.

There have been few attempts to date relating the educational literacy ratings that emerged from the Pisa study with other data bases such as health care effectiveness and subjective well-being. Despite methodological deficiencies inherent in such attempts of cross-cultural comparison (Van der Vliert, Kluwer, & Lynn, 2000), this form of health evaluative research has been shown to be creative and offers insight for future social policy making. It not only allows for direct hypothesis testing but further provides correlational evidence of the relationship between macroeconomic variables and psychological data (Kirkcaldy, Furnham, & Veenhoven, 2004).

This study combines diverse data bases from those countries included in the PISA educational survey. Funds spent on health and education are clearly related in both absolute and comparative terms. Usually countries with left wing (socialist and social democrat) governments spend more on health and education than, say, defense, because they argue that both maximize the well-being of their citizens. To what extent this is true is debatable. In particular, the health indicators of the World Health Report data help to explore correlates of the efficiency of health systems and educational performance. This study will follow the methodology of the above mentioned studies (e. g., Furnham, Kirkcaldy, & Lynn, 1994, 1996; Kirkcaldy, Furnham & Martin, 1998; Kirkcaldy, Furnham, & Veenhoven, 2004).

A number of specific, tentative questions were formulated to explore in the data. What are the socioeconomic predictors of educational attainment across nations? More specifically, which social and economic factors correlate, and to what extent, with the specific scholastic scales (mathematical, reading, and scientific literacy)? Are the educational attainment variables of a nation related to that population's self-perceived psychological well-being (happiness) ratings?

To what extent do a nation's ratings in educational attainment (of adolescents) relate to the ratings of the effectiveness of its health care system?

This study will predominantly focus on the relationship between the educational and health data bases as well as three others identified in previous research in this field. The analyses do not pursue hypothesis testing or causal modeling at this stage as the aim was to systematically explore the dataset in anticipation of future work in this area.

Method

Several separate data bases listed below were collated for 30 nations. These included health care system variables, socioeconomic factors, ratings of subjective well-being, and educational literacy attainment. Attempts were made to obtain data for the same year (or in close proximity) for as many countries as possible.

Several data bases were incorporated in the study including;

1. *Educational attainment* was defined as performance on standardized questionnaires assessing scientific, mathematical, and reading literacy (PISA, 2001). Over a quarter of a million high school students from 32 countries participated in the survey. The sample focused on 15-year-olds who were required to take a 2-hour paper and pencil test including 45% multiple choice questions, another 45% self-generated answers, and 10% limited range questions. Three educational performance ratings were yielded for reading literacy, mathematical literacy, and scientific literacy. For each nation the population aggregate mean scores for each of the three domains were used, as well as a global educational attainment score (summed across all 3 scales). In addition to the OECD nations, data had been obtained for 4 non-OECD countries including Russian Federation, Latvia, Brazil, and Liechtenstein.
2. *Subjective well-being and happiness*. Three variables were used. First, Veenhoven's (2001) 'World Database of Happiness', which lists research findings on satisfaction with life as a whole. A subset from this database contains the distribution of responses to single questions about that matter in general population surveys all over the world (catalogue of happiness in nations). From this collection we used average happiness in nations (means), and Happiness-adjusted Life Years (a combination of average happiness and life-expectancy, analogous to Disability-adjusted Life Years). In addition, a measure of negative affect was included (Diener, 1999).
3. The WHO statistics for *"health indicators"* were used incorporating

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– Dale (disability-adjusted life expectancy). It is estimated from the fraction of the population surviving to each age, calculated from the birth and death rates; incidence of each disability at each age, and the weight assigned to each disability,
– Distribution of responsiveness (in fulfilling the population's expectations),
– Two factors of responsiveness (autonomy, confidentiality, choice or provider or facility, dignity, quality of basic amenities, access to social support networks, respect of persons, and client orientation) include Goal level and Goal distribution,
– Fairness (this refers to the risk each household faces due to whether the costs of the health system are related more to an individual's ability to pay rather than to their level of illness. A fair system ensures that low income individuals are not forced into poverty as a result of their illness),
– Overall goal,
– Expenditure (costs incurred for the health system),
– Health level, and
– Overall health (Overall attainment is an absolute measure, but it provides little insight about how the outcome was attained compared to the resources of a nation: hence, achievement relative to resources was used as the critical index of a health system's performance.) (World Health Report, 2000).

4. *Intelligence quotient ratings* (Lynn & Vanhanen, 2002). The method of calculation of national IQs for 185 nations is provided in the Appendix of Lynn and Vanhanen (2002). It represents an ambitious project aimed at gaining cross-national IQ data. Intelligence questionnaires have been used throughout the years and fairly reliable measures are available as population aggregates. The mean IQ in Britain was set as 100 (standard deviation being 15) and the mean IQ of other nations was calculated relative to this measure. An adjustment was made for countries where the test had been administered some years before and for the secular rise in IQ. More specifically, in instances where the Standard Progressive Matrices had been used for the calculation of national IQs, the British mean IQ increased at the rate of approximately 2 IQ points per decade from 1938. Mean IQs on the Wechsler tests increased approximately 3 IQ points per decade over a similar period. On those occasions where other IQ tests had been used, the secular rise was deemed to be 2 IQ points per decade.
5. The *social and economic variables* used in this study include GDP, economic growth, HDI index, and annual inflation rate. These research data were reported in 1996 (The Economist, 1996). The HDI is assumed to be a more accurate measure than GDP or GDP per head, because these latter, though frequently used as indicators of how developed a nation is, are limited to economic welfare. The decision of the UN development program to publish estimates of the HDI in 1990 was an attempt at yielding a combined statistic that incorporates life expectancy and adult literacy as well as the more traditional measure of income levels (In 1991, schooling was combined with literacy). It could be assumed, therefore, that this indicator is most closely associated with educational performance.

Results

Table 1 reveals the results of the country mean aggregate score for the three scholastic performance scales. Liechtenstein was omitted from all subsequent statistical analyses because the WHO health care data and happiness scales were missing for this nation.

Two things are of interest in Table 1: (1) the differences and similarities between columns/ratings, and (2) differences in wealth (GDP) of nations. When scientific literacy and mathematical achievements are examined, Korea and Japan top the list, with Finland and United Kingdom following closely behind. Canada, New Zealand, and Australia come next. Overall, the English-speaking nations and Nordic countries (Finland, Sweden, Norway, and Iceland) occupy positions in the upper half of the performers. As for reading literacy, Japan and Korea drop to positions 6 and 8. Overall, the Southern and Eastern European nations occupy the lower positions, together with Mexico and Brazil.

Of the EU nations, spending has been shown to be highest for Luxembourg ($9570), but its performance in terms of reading attainment was ranked lowest of the European nations. The other EU nations ranked immediately behind Luxembourg in terms of spending per student in secondary education (Economist, 2001 "figures for 1996") are Austria ($7589), Denmark ($6360), France ($6314), Italy ($5701), and Sweden ($5396). Italy emerged as a relatively low performer despite relatively high investment in secondary education.

The table below (Table 2) reveals the results of the comparison between the PISA total educational attainment scores, which were aggregated over all three scales of literacy, and the IQ population means (Lynn & Vanhanen, 2002). If we can assume that educational attain-

Table 1
Rankings of performance on the literacy scales between countries (non-European nations in italics) (with thanks for permission to produce this based on PISA original data).

PISA Rating	Reading	PISA Rating	Mathematical	PISA Rating	Scientific
546	Finland	557	*Japan*	552	*Korea*
534	*Canada*	547	*Korea*	550	*Japan*
529	*New Zealand*	537	*New Zealand*	538	Finland
528	*Australia*	536	Finland	532	United Kingdom
527	Ireland	533	*Australia*	529	*Canada*
525	*Korea*	533	*Canada*	528	*New Zealand*
523	United Kingdom	529	Switzerland	528	*Australia*
522	*Japan*	529	United Kingdom	519	Austria
516	Sweden	520	Belgium	513	Ireland
507	Austria	517	France	512	Sweden
507	Belgium	515	Austria	511	Czech Republic
507	Iceland	514	Denmark	500	France
505	Norway	514	Iceland	500	Norway
505	France	510	Sweden	499	*United States*
504	*United States*	503	Ireland	496	Iceland
497	Denmark	499	Norway	496	Hungary
494	Switzerland	498	Czech Republic	496	Belgium
493	Spain	493	*United States*	496	Switzerland
492	Czech Republic	490	Germany	491	Spain
487	Italy	488	Hungary	487	Germany
484	Germany	478	Russian Federation	483	Poland
480	Hungary	476	Spain	481	Denmark
479	Poland	470	Poland	478	Italy
474	Greece	463	Latvia	461	Greece
470	Portugal	457	Italy	460	Russian Federation
462	Russian Federation	454	Portugal	460	Latvia
458	Latvia	447	Greece	459	Portugal
441	Luxembourg	446	Luxembourg	443	Luxembourg
422	*Mexico*	387	*Mexico*	422	*Mexico*
396	*Brazil*	334	*Brazil*	375	*Brazil*

ment is in part determined by intelligence, it seems sensible to examine this relationship here. Japan and Korea were the two nations that displayed the highest scores both in the PISA ratings and the IQ data profiles. On the other hand, nations such as Finland, Canada, Australia, and Ireland had scores below 100, in contrast to countries such as Austria, Germany, and Italy, which emerged as among the top 5 IQ ratings, but were quite average in the PISA study.

The magnitude of the correlation coefficients between the three educational attainment variables ranged from 0.93 (mathematics and reading) to 0.95 (reading and scientific). The correlation between mathematical and scientific ratings were also highly statistically significant ($r = +0.95$, $p < 0.001$). The correlation between the PISA variables for educational attainment and IQ scores (Lynn & Vanhanen, 2002) also confirmed significant associations with the product-moment correlation coefficients ranging from +0.57 ($p < .001$) to +0.73 ($p < .001$) for reading and mathematical literacy, respectively (IQ and scientific literacy $r = +0.69$, $p < .001$). These results indicate two things: First, the three educational variables are highly related indicating that they may usefully be combined in future analysis. Second, that educational attainment is highly related to IQ indicating what psychologists have known for a long time: the intelligent do better on intelligence measures.

Based on the overall educational ratings (scores aggregated across all 3 educational measures), three groups of nations were generated (low, mid, and high-scoring). The wealth of these nations were compared (using GDP). The lowest 10 scoring nations displayed a mean GDP of $10613 /head, significantly different ($t =$

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Table 2
Population means for aggregate educational attainment scores (PISA) and intelligence quotient (Lynn & Vanhanen, 2002).

Total educational attainment	Nation	IQ
1629	**Japan**	105
1624	**Korea**	106
1620	Finland	97
1596	Canada	97
1594	New Zealand	100
1589	Australia	98
1584	United Kingdom	100
1543	Ireland	93
1541	**Austria**	102
1538	**Sweden**	101
1523	Belgium	100
1522	France	98
1519	**Switzerland**	101
1517	Iceland	98
1504	Norway	98
1501	Czech republic	97
1496	USA	98
1492	Denmark	98
1464	Hungary	99
1461	**Germany**	102
1460	Spain	97
1432	Poland	99
1422	**Italy**	102
1400	Russian federation	96
1383	Portugal	95
1382	Greece	92
1381	Latvia	97
1330	**Luxembourg**	101
1231	Mexico	87
1105	Brazil	87

Bold print indicates those nations with IQ means above 100.

–2.12, $p > .05$) from the top ten nation performers (M $21019/head). The mid-scoring nations had a mean GDP of $18767/head, which, while not significantly different from the high-scoring group ($t = –0.57$, $p > .05$), was almost significantly different from the low scoring nations ($t = –1.96$, $p > .10$), thus, supporting the notion that while high and average (mid) scoring PISA nations may not differ in terms of GDP, they tend to be richer nations than the low scorers.

The next central question was the extent to which a range of economic variables predicted both education and IQ. Table 3 shows correlations between three economic variables and two "sociological" variables. The magnitude of the correlation coefficients ranged from –0.66 (inflation and mathematical literacy) through +0.79 (human development index and mathematical literacy).

There was a weak relationship between the GDP and scholastic performance suggesting (as before) that rich countries are inclined to perform better in educational attainment, but this does not necessarily occur across all levels of educational attainment (e.g., reading and scientific literacy). Furthermore, economic growth does not appear to be a significant correlate of educational achievement as measured by the literacy scales of the PISA study. HDI was strongly correlated with all four educational/intelligence variables. HDI would be expected to display the highest magnitude of association with educational ratings because it is itself a composite measure, which combines a life expectancy measure with "literacy" of a nation. Figure 1 illustrates the relationship for specific nations.

There is a clear linear relationship between ratings for overall educational attainment and HDI. On the other hand, some countries are "outliers," such as Luxembourg and to a lesser extent Germany and Greece. They tend to perform worse than what would have been predicted on the basis of their HDI scores,whereas Poland,

Table 3
Relationship between socio-economic variables and scholastic achievement of nations.

Socio-economic variable	Mathematical literacy	Reading literacy	Scientific literacy	National IQ
Inflation	**–0.66*****	**–0.60*****	**–0.63*****	**–0.51*****
GDP	**+0.45***	+0.35	+0.30	**+0.52****
Economic growth	+0.17	+0.28	+0.27	+0.24
HDI	**+0.79*****	**+0.75*****	**+0.69*****	**+0.63*****
Family size	**–0.63*****	**–0.56****	**–0.49****	**–0.60*****

*$p < .05$, **$p < .01$, ***$p < .001$ $N = 30$ nations data (as with below scores). **Bold print** indicates statistical significance.

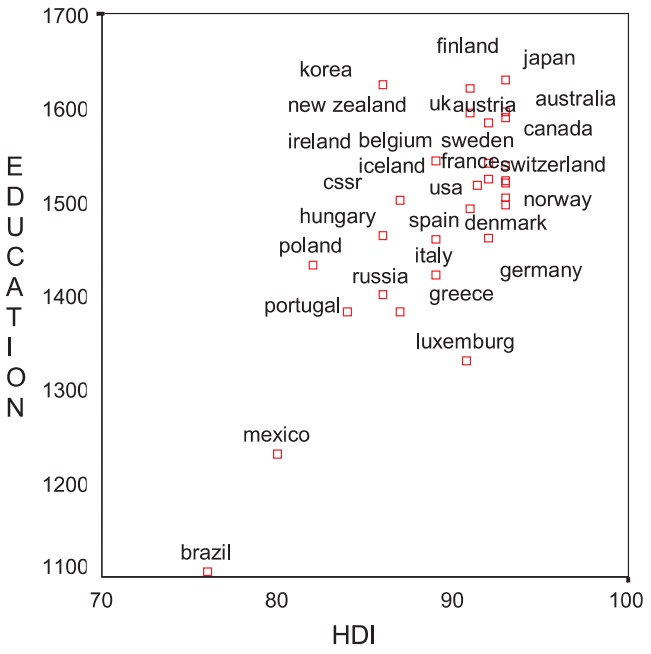

Figure 1
Overall ratings across educational attainment scales as a function of human development index.

Finland, and Korea appear to perform better than would have been anticipated based on their HDI scores.

A nation's performance on the educational variables does appear to be associated with psychological well-being as measured by Veenhoven's happiness scale. Happiness ratings were consistently positively correlated with all three educational literacy variables, explaining as much as 40% of the variation between these variables. It may be that negative affect resembles a trait such as "test-taking anxiety" and, thus, is intimately related to scholastic performance.

We turn next to a detailed analysis of the health data. The table below provides summaries of the rankings of those nations included in the PISA study for which data exist from the World Health Report. Among those nations ranked amongst the top ten in terms of overall health performance of the World Health Report are France (1), Italy (2), San Marino (3), Andorra (4), Malta (5), Singapore (6), Spain (7), Oman (8), Austria (9), and Japan (10). San Marino, Andorra, Malta, Singapore, and Oman are not included here because they are not in the PISA study and represent quite small nations for which presumably health care is quite different to organize than for the larger nations.

Hence, Column 1 in the table shows the health effectiveness rankings of those countries in the PISA survey, and the third column shows their "global" educational attainment rankings (the aggregate score across all PISA literacy scales taken and then ranked accordingly). If we now sum the ranking for each nation included in the PISA survey (Column 3) and its ranking from the modified World Health Report (Column 1) an estimate is obtained of overall medical and educational ranking ("Human Service's Index ranking").

What emerges is that Japan (ranked 6th in terms of health efficacy, and 1st in PISA ratings) occupies first position overall, followed by equal rankings for France (best WHO health performance ratings and 12th in PISA study) and Austria (4th and 9th rankings for health an educational ratings respectively). Then follow the United Kingdom, Ireland, Finland, Norway, Canada (the last three are equally ranked), Iceland, and Spain. These would appear to be the nations with superior educational *and* health systems. Interestingly, Korea slips out of its ratings when health effectiveness is included (down to 16–17 ranking out of 30 nations). The countries with inferior medical and educational systems are Brazil, Latvia, Mexico, Hungary, Poland, Czech Republic, United States, Denmark, and Luxembourg.

A stepwise multiple linear regression analysis was computed using the major socioeconomic variables as independent variables (e. g., GDP, economic growth, HDI, etc.) and the global "Human Service's Index" (composite of health care and educational system efficiency) as the outcome variables. Some data were missing for a few nations, but the overall regression was

Table 4
Product-moment correlations between PISA scholastic achievement variables and affect.

	Mathematical literacy	Reading literacy	Scientific literacy	IQ-score
Happiness	**+0.59*** **	**+0.63*** **	**+0.57** **	**+0.44***
Negative affect	**–0.44***	**–0.52***	**–0.43***	–0.33

*$p < .05$, **$p < .01$, ***$p < .001$. **Bold print** indicates statistical significance.

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Table 5
Ranking of nations according to their performance in educational (PISA) and health efficiency (WHO) and on the composite score, Human Service Index (the top 10 nations are presented in **bold print**).

	N = 30 Adapted WHO ranking	*(N = 188) Original WHO ranking*	PISA educational overall ratings	Human Service's Index ranking
France	1	*(1)*	12	**2.5**
Italy	2	*(2)*	23	12.5
Spain	3	*(7)*	21	**10**
Austria	4	*(9)*	9	**2.5**
Japan	5	*(10)*	1	**1**
Norway	6	*(11)*	15	**7**
Portugal	7	*(12)*	25	18
Greece	8	*(14)*	26	19
Iceland	9	*(15)*	14	**9**
Luxembourg	10	*(16)*	28	22
United Kingdom	11	*(18)*	7	**4**
Ireland	12	*(19)*	8	**5**
Switzerland	13	*(20)*	13	15
Belgium	14	*(21)*	11	12.5
Sweden	15	*(23)*	10	12.5
Germany	16	*(25)*	20	20
Canada	17	*(30)*	4	**7**
Finland	18	*(31)*	3	**7**
Australia	19	*(32)*	6	12,5
Denmark	20	*(34)*	18	22
USA	21	*(37)*	17	22
New Zealand	22	*(41)*	5	16.5
Czech Republic	23	*(48)*	16	24
Poland	24	*(50)*	22	25.5
Korea	25	*(58)*	2	16.5
Mexico	26	*(61)*	29	28.5
Hungary	27	*(66)*	19	25.5
Latvia	28	*(105)*	27	28.5
Brazil	29	*(125)*	30	30
Russia	30	*(130)*	24	27

highly significant ($F[2,24] = 18.10$, $p < .001$; $R = 0.78$, adjusted $R^2 = 0.57$). Two economic variables were major determinants of health service's index, human development index (beta = –0.66, $t = –.09$, $p < .001$), and economic growth ($\beta = –0.32$, $t = –2.49$, $p < .02$), which indicates that those countries with a higher human development index score and higher economic growth were more likely to display better ranking in the efficiency of their health service index.

Correlation statistics were computed between World Health indicators and the PISA educational ratings for 30 nations. Health expenditure and health level were initially unrelated to a nation's educational performance. On the other hand, variables such as disability-adjusted life expectancy (DALE), distribution goal level and distribution and fairness within a health care system do appear related to educational performance of a na-

Table 6
Correlation coefficients (partialing for GDP) between educational attainment variables and health indicators (negative correlations indicate a positive relationship, because in contrast to performance ratings, low rankings for health indicator variables imply superior health performance).

	Mathematics	Reading	Scientific
Dale	**–0.42***	**–0.56****	**–0.51****
Distribution	**–0.58*****	**–0.61*****	**–0.62*****
Goal level	**–0.64*****	**–0.67*****	**–0.65*****
Goal distribution	**–0.50****	**–0.69*****	**–0.56****
Fairness	**–0.55****	**–0.68*****	**–0.61*****
Overall intr. goal	**–0.53****	**–0.61*****	**–0.62*****
Heath expenditure	–0.22	**–0.42***	–0.31
Health level	+0.18	–0.03	–0–06

*$p < .05$, **$p < .01$, ***$p < .001$. **Bold print** indicates statistical significance.

tion. The statistical analyses in Table 6 were performed partialing out for the potentially confounding effects of economic differences between nations with respect to gross domestic product. The significant relationships remained, suggesting that the association cannot be attributable to differences between nations in economic strength. Moreover, expenditure in the health system does not appear to be associated with educational attainment scores for mathematics and scientific literacy, although reading literacy was significantly related to medical health expenditure.

Discussion

Comparing large scale international data bases can serve to explore criteria for verifying the efficiency of human service systems such as educational and health care. This has been demonstrated using, primarily, two recent surveys, the World Health Report and the PISA study. When, in addition to exploratory analysis between these data sets, further information is considered about the relative national ratings in psychological constructs such as "happiness" and "negative affect," this provides insight into the extent of the interrelationship of mental well-being and health appraisal. These parameters offer further evaluative criteria for estimating the relative efficacy of both the health care and the educational system of a nation, while taking into consideration possible moderating and mediating variables. Comparing the ranking of countries provides a useful descriptive profile of a nation or society, which can be elaborated over time (e. g., in cross-curricular competencies). For example, the PISA survey will attempt to provide additional data for other non-OECD countries not previously considered.

Educational Attainment

On the other hand, descriptive statistics including information about discrepancies and congruencies in efficiency-related parameters do not necessarily provide details of the source or direction of causality. In the same way, the cross-cultural data examined in this study give few explanatory details of the developmental and dynamic processes of the various countries. The data cannot explain causal patterns, though social policy experts may believe otherwise. In fact, both the publication of the World Health Report and the PISA educational survey have met up with substantial resistance to changes within a country's system. This may, in part, be due to distribution and power struggles (cf. Siefen & Kirkcaldy, 2000).

An examination of the results from the socioeconomic analyses reveal that wealth as determined by the GDP and economic growth of a country appear partly related to educational attainment (as defined by the PISA study). On the other hand, inflation does appear (negatively) associated with educational ratings: Possibly nations with high inflation rates have more unstable economic systems and this uncertainty combined with severely limited financial resources prevents too much investment in schooling. The other socioeconomic factor that was consistently and highly related to all three PISA performance variables was HDI. Kirkcaldy, Furnham, and Martin (1998) commented that HDI is supposedly a better measure of the quality of life because it incorporates income levels, life expectancy, adult literacy, and educational schooling, and hence is contextually more proximal to educational attainment. Indeed, a clear relationship was observed between HDI and global educational performance. No doubt the two are bidirectionally causally related—the better educated enjoy a better quality of life which leads to more education.

Between-Country Differences in Educational Attainment

Some critics of the international survey of educational performance suggest that the PISA study tends to focus too narrowly on abilities such as knowledge, writing, and arithmetic. On the other hand, the authors of PISA underline the fact that "PISA provides international comparisons of the performance of education systems, with strong, cross-culturally valid measures of competency that are relevant to everyday, adult life. Assessments that test only mastery of school curriculum can offer a measure of the *internal* efficiency of school systems. They do not reveal how effective schools prepare students for life after they have completed their formal education" (PISA, p. 26).

Certainly, the results that emerged from the study have provided data for a controversial debate depending in large part on where a particular country found itself on the hierarchy of scholastic attainment. "PISA has once again made education a hot topic for all of society—our schools and educational system have become the focus of public and political interests. But political pressure has made it difficult for policymakers to engage in objective discussions and analyses of the problem. The danger in this is that the necessary fundamental reform will not be implemented, and we will end up

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treating the symptom instead of the disease . . . looking beyond individual symptoms and delving to the root of the problem" (Bertelsmann, 2003).

Struck (2001, WDR) has commented that there are two clusters of nations who perform well on the educational attainment variables. One group included Japan and Korea, which adopt a strategy not unlike that in countries such as Germany in the 1950s: They are nations which implement a strict set of rote learning strategies, which, as Struck claims, are not compatible with the German legal system. The high incidence of adolescent suicide in these two nations may in part be a result of such harsh discipline educational systems but there are, no doubt, many other contributory factors. In contrast are the Nordic nations, particularly Finland, which was the most highly rated of the European nations offering a more "promising" educational system. Such a system emphasizes the value of interdisciplinary subjects in which exploratory competence and networked thinking, a longer period as a communal class society, and self-experiential learning within an anxiety-free and self-motivated learning context are fostered.

Two non-European nations that outperformed most countries in educational attainment were Japan and Korea. These nations took the first two rankings among all the 32 nations studied by PISA in terms of mathematical and scientific reasoning. The superiority in performance could not be attributed to spending in education per se but rather is possibly more related to their evaluation of teaching as a meritocratic profession carrying high social status. Lynn and Vanhanen (2002) have argued that these nations have overall higher IQ scores together with Hong Kong and Taiwan. Skynner and Cleese (1998) discuss the unique characteristics of the educational system in Japan, which are not only advantageous . . ."They designed a system like our grammar schools, with very high standards. Those compete with each other for the best pupils on the basis of their university entrance results. There's no interest in ideas about equality; everything is aimed at establishing and maintaining a hierarchy of merit. There's intense competition among all the pupils to make it to the top, and tremendous pressure on them from parents and teachers alike. The poor students facing university exams are the most anxious category of people in Japan! Not much health at this stage, I'm afraid; the suicide rate in teenagers, and even children, is cause for national concern" (p. 197). This suggests that it is much more the style/content of education than simply the money spent on education that is important. Yet it is essential to recognize that the two are inextricably linked—one certainly cannot have a particular style of education if certain facilities are not present.

Students are more likely to experience stress through continuous, demanding examinations when results may have long term consequences throughout life. If indeed, those nations that performed well on the PISA study experience more stress, we may expect that their population's overall subjective reports of happiness would be lower, while, presumably reports of negative affect would be higher. The correlational analysis exploring the relationship between subjective reports of happiness and its obverse, negative affect, did show a significant association, but the direction of the relationship suggested that nations with better performances on the PISA scales actually displayed higher happiness scores. Clearly there may be specific countries which are outliers and do not "adhere" to this relationship. For example, there is evidence that subjective well-being is low for nations such as Korea and Japan, both of which displayed high educational rankings. Furthermore, the issue of causality remains unclear. Overall, countries with a more positive self-evaluation are more inclined to display superiority in their educational literacy scores e. g., Iceland, Sweden, Australia, Ireland, and Switzerland. However, we accept that the data indicate that there are many determinants of national well-being/happiness scores.

If the focus is shifted toward the European nations that performed well on the educational data, immediate attention is drawn to the Nordic nations, in particular Finland. In Finland, 95% of pupils take the equivalent of a university entrance examination and almost three-quarters go on to higher education. This results in Finland being the European nation with the most number of years of formal educational learning (Economist, 2001). What other characteristics are found in Finland? It is frequently the case that local educational authorities allow teachers sabbaticals to pursue extracurricular pursuits, which are considered beneficial for both students and teachers. The educational curriculum is partly nationally determined (basic requirements) but schools are allowed to exert a significant degree of autonomy in designing their own curricula. Schooling is generally state run and is full-day, including careful attention to a child's social background, offering compensation where necessary for the underprivileged.

Health Indicators and Their Relationship with Educational Performance

Considering ranking of health care system variables and educational ratings from the PISA study, some interesting

results emerge. Foremost is the finding that the *overall health efficiency outcome* ratings of a nation did not appear to relate to educational ratings on any of the literacy scales with the exception of mathematical competency, nor did health expenditure relate significantly to health performance indicators. (On the other hand, poorer nations (in terms of GDP) did appear to show inferior educational performance overall as demonstrated by the between group comparisons of low, mid, and high overall PISA rating nations. GDP had little influence in distinguishing between the middle and high PISA ranking nations, suggesting that the relationship may be curvilinear with the effects of wealth on scholastic achievement levelling off.) Theoretically this would be expected because they are independent domains. The question remains as to the extent that this is independent of macroeconomic factors. On the other hand, six of the eight health system variables did significantly and meaningfully relate to the variables mathematical, scientific, and reading literacy. Countries with, for example, high ratings on the literacy scales were more likely to be ranked higher on the health variables, fairness, goal level, and goal distribution. In addition, the countries which displayed higher effectiveness in terms of DALE, were also more likely to yield superior educational attainment scores.

An interesting finding was that of the physical health outcome variable "disability-adjusted life expectancy" being significantly related to a country's educational literacy ratings. The association was not influenced by socioeconomic factors since controlling for the potentially confounding effects of such economic variables as GDP and economic growth did not change the level of significance of the relationship. On the other hand, countries that performed better in their educational ratings across the three domains of testing (mathematical, reading, and scientific) were more likely to be those nations that emphasize fairness of costs and distribution (equality) within their health care systems.

If the health effectiveness rankings are screened out for those countries included in the PISA study (with the exception of Liechtenstein), the most highly ranked nations are France, Italy, Spain, Austria, Japan, and Norway (Finland was ranked 31st of over 180 nations) in descending order. In contrast, Russia, Brazil, Latvia, Hungary, Mexico, and Korea were the nations with a comparatively inferior health performance. Again, it is Korea which seems to display a rather unique trend, otherwise it appears that nations with low ratings in the effectiveness of their health care systems are also more likely to have shown low ratings in the PISA survey, and this cannot be attributable to spending or the wealth of a nation. A new measure was incorporated in this study, labelled "Human Service's Index," which is a composite index of mean health and educational effectiveness ranking of those nations included in the PISA study. Japan seems to be the nation with the best medical and educational system, followed by France, Austria, United Kingdom, Ireland, Finland, Norway, and Canada.

There are clearly limitations to scientific studies of this kind aimed at analyzing societal causes of educational and health care system problems and the subsequent political, economic, and social options for change. Notwithstanding certain methodological and statistical deficiencies, such exploratory analyses may offer social policy makers useful points of entry for social change.

Methodological deficiencies in such exhaustive, large scale surveys, whether based on health or educational performance data, must be considered. The authors of the PISA project are cautious, commenting "If one's PISA's score are higher than those of another country, it cannot automatically be inferred that the schools in the former are more effective, since learning starts well before school and occurs in a range of institutional and out of school settings. Nevertheless, if a country's PISA's scores are higher, one can legitimately conclude that the cumulative impact of all the learning experiences in that country, from early childhood up to the age of 15, in and out of school, has resulted in more desirable outcomes in the domain that PISA assesses" (PISA, 2000, p. 26).

The PISA study revealed three areas that impact on educational performance: School resources, classroom practice, and school policies. When other factors were controlled for, those schools with higher available resources tended to perform better. The PISA survey further revealed that several aspects of school policy and practice tended to be associated with superior educational performance and these include: teacher-related factors affecting school climate such as teacher expectations of students; teacher morale and commitment; and school autonomy.

It may be useful to explore in a similar fashion those specific characteristics that define the socioeconomic profiles of the health systems across Europe and elsewhere. Thus, a better understanding would be gained of how and to what extent money is invested in health care spending. The characteristics of the health care structure and professional training of its medical and nursing personnel could subsequently be evaluated and compared. Furthermore, we need to explore cross-cultural differences in the availability and access to certain areas of health care and more detailed analysis of health outcome measures.

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