

**Estimating Responsiveness Level and Distribution for 191 Countries:
Methods and Results**

Nicole B. Valentine
Amala de Silva
Christopher J.L. Murray

GPE Discussion Paper Series: No. 22

EIP/GPE/FAR
World Health Organization

Table of Contents Page

1. Introduction	1
1.1. <i>The Key Informant Survey</i>	1
1.2. <i>Overview of Paper Structure</i>	2
2. Methodology	3
2.1. <i>Level of Responsiveness</i>	3
(a) <i>Overview of Survey Data and Estimation Steps</i>	3
(b) <i>Adjustment of Scores for Systematic Non-responsiveness Related Variation</i>	4
(c) <i>Regressions for Modelling Element Scores</i>	8
(d) <i>Estimating Out-of-Sample Responsiveness Level Scores and Uncertainty Intervals</i>	12
(e) <i>Estimating Responsiveness Level Scores and Uncertainty Intervals for Surveyed Countries</i>	13
2.2. <i>Distribution of Responsiveness</i>	13
(a) <i>Overview of Survey Data</i>	13
(b) <i>Calculating Responsiveness Inequality Scores: survey countries</i>	14
(c) <i>Estimating Responsiveness Inequality Scores for Non-survey Countries</i>	16
3. Results	19
3.1. <i>Ranking of Scores: Level and Distribution</i>	19
3.2. <i>Responsiveness and Other Goals</i>	21
4. Discussion	22
4.1. <i>How Much Does Wealth Matter?</i>	22
4.2. <i>Relationships Between Goals</i>	24
4.3. <i>Critique of Methodology Used for Estimating Responsiveness</i>	24
(a) <i>Level of Responsiveness</i>	24
(b) <i>Distribution of Responsiveness</i>	25
4.4. <i>Future Work</i>	26
References	27
Appendix 1: Calculation of Responsiveness Distribution Scores For Surveyed Countries	29
Appendix 2: Responsiveness of Health Systems, Level and Distribution in All Member States	31
Appendix 3: Responsiveness of Health Systems, Level and Distribution in All Member States by Region	39

List of Tables

Page

Table 1:	Results of Difference of Means Tests	5
Table 2:	Results from the Adjustment Regression	7
Table 3:	Ranking of Overall Performance Before and After Adjustment for Non-Substantive Systematic Variations	8
Table 4:	The Best Regression Models for the Responsiveness Elements	10
Table 5:	Results from Other Regression Models for Estimating Responsiveness Elements	12
Table 6:	Weights for the Responsiveness Elements	13
Table 7:	Results from the Responsiveness Distribution Regression	18
Table 8:	Responsiveness Goal Attainment Compared with Other Goals: correlation coefficients for scores	21
Table 9:	Responsiveness Goal Attainment Compared with Other Goals: correlation coefficients for ranks	22

List of Figures

Page

Figure 1:	Gender Development Index and Key Informant Intensity Scores	16
Figure 2:	Map of the Level of Responsiveness in Different Countries	20
Figure 3:	Rank Intervals for the Level and Distribution of Responsiveness	21
Figure 4:	Level of Responsiveness Scores and Average Health Expenditure Per Capita	23

1. Introduction

WHO's work on responsiveness forms part of the overall strategy to measure and monitor the performance of health systems. The responsiveness of health systems refers to the ability of health systems to meet the legitimate expectations of populations for the non-health enhancing aspects of the health system. It is a goal of health systems, which can be measured in terms of its level and its distribution across a population. As with the other 3 goals of the health system (improving health status, improving the equality of health status distribution and ensuring fairness in the financing of the health system), the responsiveness level and distribution concepts and their measurement are independent of the measurement of other goals.

The philosophy behind the measurement of responsiveness, as for the measurement of the other goals, is to get the best available data on responsiveness for policy making. To this end, over the last year WHO embarked upon a research programme to derive a firm conceptual base for delineating the goal and to develop strategies for measuring the performance of health systems with respect to responsiveness. In addition to a major literature review [1], a series of instruments were developed over the last year. A household survey instrument was piloted in 3 countries. Key informant surveys were also piloted and run in 35 countries [2]. In addition, WHO ran a web survey of over 1000 respondents in different countries in the world to begin studying the importance attached to the different elements of responsiveness [3].

The aims of this paper are to give a detailed account of the methodology used to estimate the responsiveness scores in the WHR 2000. The data from the key informant survey, described in detail elsewhere [2], was used to estimate levels and distributions of responsiveness for surveyed countries, as well as for non-surveyed countries. Before the methodology, it is useful to review the key informant survey process and the contents of the questionnaire.

1.1. The Key Informant Survey

The countries forming part of the key informant survey were selected according to the criteria of obtaining a cross-section of countries with different types of health systems, in different WHO regions and with large populations. Focal persons were contacted in each of these countries to co-ordinate the surveys. The criteria for selection of the focal persons were that they should be working in the health sector, have experience with research survey methodology and have a good professional reputation in their field. The focal people were sent instructions on how the key informant surveys should be run. This included instructions on how to select the various key informants. These instructions included ensuring that they selected key informants were from different parts of the health sector, including the private sector and government as well as different levels and different professions and they were requested to ensure that they obtained a balanced gender profile. The specific phrasing of the instructions were that "key informants should be individuals drawn from different organisations such as the Ministry of Health, Provincial Health Authorities, universities, research institutions, private medical practitioners, government medical practitioners, professional bodies in the health sector, patient organisations, health insurance groups, disease groups, and social workers".

The questionnaire contained 42 questions and was 4 to 5 pages in length, translation dependent. In each country, the focal person had the questionnaire translated. The questions included close-ended and open-ended questions. The close-ended questions used four types of scales. The main types of scales used were a never-to-always 4-point scales and a very poor-to-very good 4- point scale. These scales are commonly known as Likert scales [2]. Other scales used were categories for age groups and percentages, as well as a boxes for scoring from 0 to 10. The open-ended questions were used for identifying vulnerable groups with the specific intention of not biasing the interviewees and thereby potentially leaving out certain vulnerable groups.

Questions on responsiveness level attainment included questions on 4-point scales, as well as those with 0 to 10 ratings. Questions were grouped around the different elements of responsiveness identified from the literature review. These elements were dignity, autonomy, confidentiality, prompt attention, access to social support networks, quality of basic amenities and choice of care provider. The elements appeared in this order in the questionnaire. The following paragraph briefly describes the essence of each of the elements of responsiveness.

Dignity involves the right of individuals to be treated as persons in their own right rather than merely as patients who due to asymmetric information and physical incapacity have rescinded their right to be treated with respect. **Autonomy** is self-directing freedom with regard to deciding between alternative treatment, testing and care options, including the decision to refuse treatment, if of sound mind. **Confidentiality** is about safeguarding privacy in the context of privileged communication (i.e. doctor patient consultations) and medical records. **Prompt attention** relates to ability to access care speedily through conveniently located health care units, short waiting times and waiting lists for consultation and treatment. **Access to social support networks** during care is included because patient welfare is best served by integrating health care activities into community interactions. **Quality of basic amenities** focuses on non-health enhancing physical attributes of health care units such as cleanliness of the facility, adequacy of furniture and quality of food. **Choice** of care provider covers choice between and within health care units, including opportunities for gaining specialist care and second opinions.

1.2. Overview of Paper Structure

Most of this paper is devoted to a description of the methodology used to derive the estimated responsiveness scores for 191 countries in the world. The methodology for estimating levels and distributions for surveyed and non-surveyed countries is described in detail in the next section of this paper. The first part of this section describes the process of estimating level scores of health system responsiveness, while the second part reviews the methodology for estimating inequality scores. The results section discusses some of the general findings with regard to the rankings and uncertainty estimates of responsiveness level and distribution scores. It also explores any observed patterns between responsiveness and other health system goals. It presents some of the results in the context of WHO regions, due to the expressed interest of regional offices. It then goes on to report on the observed relationships between health expenditure and levels and distributions of responsiveness. The final section briefly discusses key findings of the research and outlines how to further improve the measurement of responsiveness.

2. Methodology

2.1. Level of Responsiveness

(a) Overview of Survey Data and Estimation Steps

The respondents to the key informant survey were people identified on the basis of their being knowledgeable about the health system in their respective countries. The total number of respondents reached was 1,791 in 35 different countries. As mentioned above, there were differently scaled questions asked about the attainment of the country's health system with respect to the seven different elements. In the estimation procedure to be discussed in more detail below, only the questions about 0 to 10 ratings for each element were used. The question asking for a rating by element between 0 and 10 was phrased as follows:

"Considering all the factors that you have reported on above, how would you rate the health system in your country in terms of treating patients with (element name) on a 0 to 10 scale, with 0 being the poorest score and 10 being the best."

The answers to the above questions, of which there were 7 (for the 7 elements) per key respondent, were then used to estimate country level scores using the steps described below:

1. The first step in the estimation process was to assess to what extent the reported scores reflected what actually happened rather than what was perceived as happening. In the previous paper on the key informant surveys [2], there were several plausible explanations for the differences in scores observed across countries. However, in the case of certain countries, there seemed to be no rational explanation for their having attained the average responsiveness scores they did. This conundrum led us to explore whether there were any systematic differences in our data. Systematic differences between what happened and what was perceived as happening were found at the individual level and between countries. This led to a set of adjustments, which are explained in detail below.
2. Once individual level scores were adjusted, country means were calculated for each element. These mean scores were then regressed against a number of exogenous variables and regression models relating to each element were compared with the aim of finding the regression model with the highest explanatory power. Using the regression model with the highest explanatory power, 1000 estimates were generated for each element in each country, based on the univariate normal distribution of the coefficient errors and the residual error term from the regressions.
3. To derive the overall level of performance scores, the 1000 element scores for each country were weighted according to weights derived from the web values survey and summed [3]. The mean value of the 1000 summed, weighted estimates was then used to represent the point estimate for the level of attainment in a non-surveyed country. Taking an 80 % uncertainty intervals around the

mean generated the uncertainty interval presented in Annex 6 to the 2000 World Health Report.

4. In surveyed countries, the means of the weighted and summed key informant responses were used. Their uncertainty intervals were calculated by weighting and summing the 80 % uncertainty intervals created from the variances around the individual key informant responses for each element.

(b) Adjustment of Scores for Systematic Non-responsiveness Related Variations

Rationale for Adjustment

Various studies have highlighted the effect that demographic, health, cultural and political or ideological variables have on the reporting of health status, opinion surveys, well-being and patient satisfaction. Some of these studies include the finding that health status reporting is affected by race, income, age, education and gender [4]. Analysis of Eurobarometer Surveys showed that numbers of variables affected opinions presented, including age, gender, education, employment, population size, political ideology, health status, satisfaction, recent GP visit/inpatient stay, ability to cope, and living with children [5]. On reported well-being indicators, Diener and Suh found that there were differences in subjective well-being between nations [6]. This finding was based on "convergence validity" tests that included friends and family reports, observation of the amount of smiling and gestures in interviews, and number of positive versus negative memories recalled. The authors went on to comment that "subjective indicators should not substitute for measures of external conditions". This conclusion suggested the need to adjust the responsiveness indicators, which were measuring external conditions by variables such as subjective well-being, which might be causing different nations to have different *perceptions* of their responsiveness experience. Finally, recent studies of patient satisfaction focussing on gender found that women tended to give lower satisfaction scores than men [7]. In the study, the researchers said that the systematic difference in ratings was attributed to women being "harsher raters".

Based on the above literature, it was hypothesised that the key informant surveys *reported* ratings could be systematically affected by factors such as age, gender, culture and the socio-political environment. The affect would be to systematically affect the variance in responsiveness so that the measurement instrument would record systematic deviations in responsiveness reporting that were not based on what actually happened. Rather, it depended systematically on the presence of some other variable, which was not related to the experience of worse or better responsiveness, but merely to the *reporting or perception* of this experience. In the key informant instrument used to measure responsiveness, the inclusion of frequency response questions leading up to the rating question was designed to minimise the capturing of data on variances in *reported* responsiveness which were not reflecting variances in *actual* responsiveness. In spite of this approach, systematic variations, not attributed to differences in *actual* responsiveness, were observed across individuals within populations, as well as across different countries. While, as evidenced by the literature, there might have been several different variables causing systematic, non-substantive differences in responsiveness across individuals and societies, adjustments to key informant responses were limited by

two factors: firstly, the number of demographic and other data collected about the respondents; and secondly, the data series available for the surveyed countries.

An evaluation of the mean scores across subgroups of individuals within countries revealed that gender and place of work had a statistically significant impact on the mean reported scores. Women reported lower scores than men and people working for the government reported higher scores than those not working for the government, both at the 95 % confidence level. The rationale behind the lower score for women might accord with the "harsher rater" hypothesis mentioned in the literature [7]. The hypothesis behind government employees reporting higher ratings was that they would be inclined to be less strict raters because their comments reflected on their employer who might penalise them for criticising the health system.

Furthermore, the mean scores for countries with less political and social freedom were higher at the 95 % confidence level. Three series measuring political and social freedom were obtained from two sources: from the Polity Project which had 0 to 10 scores for democracy and autocracy series [8] and from the Freedom House which had a civil liberties scores [9]. This difference could be attributed to the fact that people living in less liberal societies would be less confident about voicing criticisms than people in freer societies. The "freedom score" used in the adjustment regression was the factor score derived from factor analysis of the three data series obtained for about 150 countries. The factor score ranged from -5.613 for least free country to 4.694 for the most free country.

Table 1 shows the results from tests of the difference of mean scores for individual and country level characteristics described in the preceding two paragraphs.

Table 1: Results of Difference of Means Tests

	Mean Element Score	Number Observations	Degrees of Freedom	T-Statistic	P value for 2 Tailed Test
FREEDOM					
Free	5.6334	5328	13721	-7.104	0.000
Less free	5.8916	8393			
SEX					
Females (0)	5.6837	7118	13754	-6.114	0.000
Males (1)	5.9002	6636			
PLACE OF WORK					
Non-government Employees (0)	6.1308	5514			
Government Employees (1)	5.5593	8606	14118	-16.021	0.000

Process of Adjustment

The first step in the adjustment process was to create a database from the key informant records by stacking each of the responsiveness element scores underneath each other. This would create a single variable containing all the responsiveness scores captured by the survey. This variable would become the dependent variable in the adjustment regression. The total number of records in this new regression amounted to 11,425.

The second step was to select independent variables to regress against the variable consisting of concatenated elements. The selected independent variables were: the Human Development Indicator (United Nations Development Programme), total health expenditure per capita (purchasing power parity Dollars), the percentage of private health expenditure, the percentage of the population with reasonable geographic access (within one hour's travel of a health facility), the percentage of the population who were illiterate, the income Gini coefficient, the number of doctors per 10 000 population, and the number of nurses per 10 000 population.

The third step was to create a matrix of dummy variables for all the element and overall responsiveness scores. The product of this matrix and the matrix of independent variables created a new matrix of independent variables such that nested within the adjustment regression of 11,425 observations were 8 different regressions on the common set of exogenous variables indicated above.

Fourth, four exogenous variables were added to each record in the regression. These variables were the ones hypothesised to cause the same systematic, non-substantive variation in responsiveness across all element scores. These variables were a dummy for sex, a dummy variable for whether or not the respondent worked for the government, a continuous variable representing a score for the level of socio-political freedom in a country, and a continuous variable for age.

The number of exogenous variables in the panel data set was 60. The regression of these variables on the element scores generated an adjusted R-squared of 0.2033. Of the four variables hypothesised to be causing systematic, non-substantive variation across the element scores, only three had significant t-statistics. These were the sex dummy, the government dummy and the "freedom score". The coefficients, the t-statistics and the corresponding p-values are shown for all four of these variables in Table 2.

Table 2: Results from the Adjustment Regression (n=11,425)

	<i>Coefficient</i>	<i>T-Statistic</i>	<i>P value for 2-Tailed Test</i>
FREEDOM	-0.0947	-13.094	0.000
SEX (1 = male)	0.2541	6.976	0.000
PLACE OF WORK (1= government)	0.2517	7.037	0.000
AGE	0.0013	0.738	0.460

In making the adjustment to the element scores, the regression coefficients for the sex dummy, the government employment dummy and the freedom score were used. The adjustment standardised the populations to make the responsiveness scores comparable. The standard to which all the country's element scores were adjusted was to a population of respondents who lived in a totally free society, who did not work for the government and whose sex composition was 50 % female and 50 % male.

The results of this adjustment were to decrease the mean scores of countries that were characterised by less freedom, more male key informants and more government key informants. The impact of this adjustment can be illustrated by comparing the ranks of the scores prior to the adjustment and after the adjustment, as shown in Table 3. As seen in Table 3, there was no dramatic change in the ranking of surveyed countries. However, the face validity of the adjusted score rankings appears to be higher than of the unadjusted score rankings. In spite of the substantial work involved in deriving the formula for adjusting the scores, this aspect of work is still in its infancy. Some of the problems with this approach are highlighted in the discussion.

Table 3: Ranking of Overall Performance Before and After Adjustment For Non-Substantive Systematic Variations

BEFORE ADJUSTMENT			AFTER ADJUSTMENT		
Rank	Country Name	Score	Rank	Country Name	Score
1	United Arab Emirates	7.45	1	Cyprus	6.88
2	China	7.33	2	Mexico	6.71
3	Mexico	7.22	3	United Arab Emirates	6.33
4	Malaysia	7.05	4	Malaysia	6.32
5	Cyprus	7.05	5	China	6.29
6	Viet Nam	6.80	6	Thailand	6.23
7	Indonesia	6.56	7	Rep.of Korea	6.12
8	Philippines	6.54	8	Mongolia	5.79
9	Thailand	6.39	9	Philippines	5.75
10	Republic of Korea	6.30	10	Poland	5.73
11	Egypt	6.15	11	Viet Nam	5.70
12	Ecuador	6.07	12	Slovak Republic	5.51
13	Zimbabwe	6.00	13	Hungary	5.47
14	Slovakia	5.88	14	Indonesia	5.46
15	Senegal	5.81	15	South Africa	5.35
16	Chile	5.69	16	Ecuador	5.32
17	South Africa	5.57	17	Botswana	5.32
18	Botswana	5.56	18	Chile	5.19
19	Hungary	5.56	19	Egypt	5.06
20	Mongolia	5.48	20	Guatemala	4.97
21	Ghana	5.48	21	Senegal	4.96
22	Poland	5.47	22	Zimbabwe	4.94
23	Guatemala	5.31	23	Brazil	4.81
24	Brazil	5.15	24	Ghana	4.80
25	India	5.13	25	India	4.76
26	Peru	5.03	26	Trinidad and Tobago	4.73
27	Burkina Faso	4.97	27	Bolivia	4.58
28	Trinidad	4.94	28	Bulgaria	4.43
29	Bolivia	4.78	29	Georgia	4.33
30	Georgia	4.78	30	Peru	4.24
31	Uganda	4.72	31	Burkina Faso	4.18
32	Bulgaria	4.72	32	Sri Lanka	4.13
33	Sri Lanka	4.64	33	Bangladesh	4.07
34	Bangladesh	4.61	34	Nepal	3.83
35	Nepal	4.21	35	Uganda	3.74

(c) Regressions for Modelling Element Scores

The approach to estimating responsiveness scores for non-surveyed countries was to find regression models for each of the seven elements of responsiveness, with the highest explanatory power based on the data from the countries surveyed. As the regressions

were performed on country-level data, the dependent variables used in these regression models were the mean adjusted element scores for the surveyed countries¹.

Regressions were carried out using a number of variables including: life expectancy at birth, average years of schooling, primary and secondary education enrolment rates, doctors and nurses per 100 000, the percentage of paved roads, the Human Development Index, the percentage of people living in poverty, the percentage of people with no access to sanitation, females as a percentage of the labour force, population density, rural population density, public health expenditure per capita, total health expenditure per capita, private health expenditure per capita, the percentage of private health expenditure, the percentage of public health expenditure, the rate of unemployment, WHO and UNDP regional dummies, the income Gini coefficient, GDP per capita, GNP per capita, hospital beds per 1000 population, the percentage of people of 65 years and over, infant mortality rates for 1987 and 1997, happiness scores, the Gender Development Index, and the percentage of people with reasonable access to health services. All of the series were obtained for 1997. Where data on some of the series mentioned above were not available (in most cases for the small island economies), the missing data was estimated using a multiple imputations approach [10,11].

Several criteria were used in the selection of regression models for each of the elements. These criteria included whether the signs of the coefficient of explanatory variables could be rationally explained; whether the signs on the confidence intervals were stable (both positive or negative); whether the p-values for the t-statistics of the coefficients were significant; whether a reliable data series was available for all 191 WHO member countries and the results of Cox tests for non-nested regressions. Table 4 shows the results of the regression models finally selected for each of the elements of responsiveness. The results for other models that were considered but not used for the final estimation procedure are shown in Table 5.

The exogenous variables used in the final seven regression models used to predict out-of-sample were: GDP per capita (purchasing power parity US\$), health expenditure per capita (purchasing power parity US\$), the percentage of private sector health expenditure, the percentage of people with reasonable access (defined as residing within 1 hour's travel from a health facility), the average years of education and the percentage of people of and over 65 years old in the population. Information on per capita GDP and health expenditure were collated in WHO [12]. The percentage of private sector health expenditure was obtained from the National Health Accounts prepared by the WHO for the World health Report 2000 from numerous national income accounting records prepared by individual countries and UN agencies such as the World Bank and the IMF. The series for access was extracted from *United Nations Basic Social Services Statistics*[13]. Average years of education was another series developed by WHO staff [12]. The percentage of the population equal to and over 65 years old was obtained from the *UN Demographic and Population Statistics*.

¹ Although surveys were conducted in 35 countries, the India and China survey estimates were not used to estimate out-of-sample as their surveys took place in only one province within each country and were consequently not considered sufficiently representative. In the case of Mexico, Chile and Sri Lanka, the survey scores were not used in the final ranking because certain major events affecting the health system and taking place at the time of the survey seemed to have biased the results. For a detailed explanation of the problems with the survey scores for level of responsiveness for these countries, please refer to GPE Discussion Paper 21 (De Silva et al. 2000).

Table 4: The Best Regression Models for the Responsiveness Elements (n=33)

Element and Independent Variables (adjusted R-squared)	Trans-formation	Coefficients	P-values of T-statistics	95 % Confidence Interval: Lower Bound	95 % Confidence Interval: Upper Bound
DIGNITY (R ² =0.2127)	natural log				
Percentage of population equal to and over 65 years	natural log	-0.1393	0.0520	-0.2799	0.0014
Average years of schooling	natural log	0.2029	0.0180	0.0372	0.3686
Geographic access rate	natural log	0.0591	0.1730	-0.0384	0.2032
CONSTANT		0.8626	0.0130	0.1931	1.532
AUTONOMY (R ² =0.2063)	none				
Average years of schooling	natural log	0.6810	0.0300	0.0688	1.2932
Health expenditure per capita (PPP)	none	0.0005	0.3850	-0.0007	0.00188
CONSTANT		3.162	0.0000	2.1955	4.1285
CONFIDENTIALITY (R ² =0.3301)	none				
GDP per capita (PPP)	none	0.0001	0.0200	0.0000	0.0001
Average years of schooling	natural log	0.5918	0.0200	0.0077	1.1759
CONSTANT		4.5550	0.0000	3.1631	5.4969
PROMPT ATTENTION (R ² =0.6249)	natural log				
Geographic access rate	none	0.2129	0.0530	-0.0025	0.4283
Average years of schooling	natural log	0.1731	0.0030	0.06349	0.2827
GDP per capita (PPP)	none	0.0000	0.0050	0.0000	0.0000
CONSTANT		1.0329	0.0000	0.8472	1.2185
ACCESS TO SOCIAL SUPPORT SERVICES (R ² =0.2346)	none				
Health expenditure per capita (PPP)	none	0.0014	0.0220	0.000218	0.002634
Geographic access rate	none	0.7700	0.1820	-0.3822	1.9222
CONSTANT		5.6402	0.0000	4.7751	6.5053
QUALITY OF BASIC AMENITIES (R ² = 0.6035)	none				
GDP per capita (PPP)	natural log	1.2735	0.0000	0.8723	1.6747
Percentage of private health expenditure	none	2.2263	0.0130	0.5085	3.9441
CONSTANT		-6.8506	0.0000	-10.2324	-3.4688
CHOICE (R ² =0.4223)	none				
Health expenditure per capita (PPP)	none	0.0023	0.0006	0.001	0.0036
Geographic access rate	none	1.1067	0.0760	-0.1212	2.3347
CONSTANT		3.2653	0.0000	2.3434	4.1873

Explanations of the regressions models presented in Table 4 have been summarized in the following paragraphs.

For *dignity*: The old are likely to get treated with less dignity. The higher the percentage of old in the population, the more pressure there is on the health system and this may result in there being less time to treat people well. The higher the level of education, the more treatment is demanded and the more able the health system is to deliver better treatment. Better access means that there is less pressure on the health system, so people are treated better.

For *autonomy*: Increased human capital increases the ability to demand and exercise autonomy better. Increased health expenditure leads to higher staffing levels, so more time to allow patients to become involved in making decision about their care.

For *confidentiality*: Higher health expenditure means more private cubicles for consultations. Higher human capital in a population means that people have a greater ability to demand confidentiality from the health system.

For *prompt attention*: Local access will lead to more prompt attention. Increased human capital leads to a greater demand for prompt attention because people understand the higher opportunity cost of time spent waiting. Higher income levels mean that the population is able to afford a greater number of health care providers and facilities, improving prompt attention.

For *social support services*: Better local access makes it easier for relatives to visit hospital patients. At low average levels of health expenditure, more expenditure means a better distribution of health facilities making it easier to visit relatives in hospital.

For *quality of basic amenities*: The higher the income level in a population, the more they are able to afford better equipped health care facilities. A higher private share in health expenditure will mean higher quality of basic amenities because private services tend to compete on "hotel services".

For *choice*: Higher expenditure means more staff and facilities and so greater choice. Better local access improves the choice people have.

The element scores (the dependent variables) were all approximately normally distributed, with social support networks being slightly right skewed and confidentiality being slightly left skewed. The models for elements with the highest explanatory power were those for prompt attention and quality of basic amenities. The adjusted R-squareds for these models were 0.63 and 0.60 respectively. These elements of health systems responsiveness were more strongly related to financial resources for which there were good proxy data series.

Data series for modelling the less resource dependent aspects of responsiveness (i.e., dignity, autonomy, confidentiality) were harder to find and the final models had low R-squareds: 0.21, 0.20 and 0.33 respectively. The regression model for access to social support networks was 0.23 and 0.42 for choice of care provider. All variables, except the percentage of old people in the population, varied in a positive direction with respect to the dependent variable.

In the models for the dignity and prompt attention elements, it was necessary to change the form of the dependent variable and sometimes the independent variables in order to obtain greater accuracy in out-of-sample prediction than that resulting from linear equations.

Table 5: Results from Other Regression Models for Estimating Responsiveness Elements (n=33)

Element and Independent Variables	Transformation	Coefficients	P-values of T-statistics	95 % Confidence Interval: Lower Bound	95 % Confidence Interval: Upper Bound
DIGNITY (R²=0.1882)					
Unemployment rate	natural log	-0.0758	0.0450	-0.1499	0.0018
Geographic access rate	square root	0.3165	0.0570	-0.0105	0.6436
CONSTANT		1.1669	0.0000	0.8543	1.4794
AUTONOMY (R²= 0.2063)					
Unemployment rate	natural log	-0.3605	0.0570	-0.7318	0.0109
Average years of schooling	natural log	0.6243	0.0180	0.1139	1.1346
CONSTANT		2.6194	0.0000	1.6076	3.6312
CONFIDENTIALITY (R²=0.3105)					
Unemployment rate	natural log	-0.2931	0.1850	-0.7305	0.1475
Health expenditure per capita (PPP)	natural log	0.4087	0.0170	0.0776	0.7399
CONSTANT		3.2622	0.0000	1.7976	4.7269
PROMPT ATTENTION (R²=0.5211)					
Geographic access rate	none	0.3367	0.0120	0.0797	0.5936
Health expenditure per capita (PPP)	none	0.0003	0.0450	0.0000	0.0005
Unemployment rate	none	-0.7248	0.0170	-1.3114	-0.1382
CONSTANT		1.3624	0.0000	1.1342	1.5907
ACCESS TO SOCIAL SUPPORT SERVICES (R²=0.2041)					
Percentage of population over 65 years	none	-3.0176	0.4300	-10.7186	4.6834
Health expenditure per capita (PPP)	none	0.0019	0.0030	0.0007	0.0031
CONSTANT		6.2906	0.0000	5.7790	6.8021
QUALITY OF BASIC AMENITIES (R²=0.5496)					
Nurses per 100 000 population	none	-3.5110	0.0010	-0.0047	0.0012
Health expenditure per capita (PPP)	none	4.7860	0.0000	0.0023	0.0056
Illiteracy rate	none	-2.0850	0.0460	-3.9650	-0.0380
CONSTANT		4.6783	0.0000	3.8075	5.5492
CHOICE (R²=0.4443)					
Percentage of private health expenditure	none	1.0712	0.1450	-0.3926	2.5350
Geographic access rate	none	1.3096	0.0330	0.1137	2.5055
Poverty rate	none	-3.7516	0.0010	-5.7362	-1.7669
CONSTANT		3.7126	0.0000	2.3554	5.0698

(d) Estimating Out-of-Sample Responsiveness Level Scores and Uncertainty Intervals

Using the regression models shown in Table 4 distributions of 1000 scores were generated for each element in each non-surveyed country. The distribution of 1000 scores for a particular element was modelled using the errors of the coefficients and the residual errors of the regression model. In other words, the distribution of 1000 scores captures both uncertainty in the relationships estimated and the unexplained variance in responsiveness.

The mean of the 1000 values was then taken as the point estimate for the level of the element for each non-surveyed country. The uncertainty intervals were calculated by taking 80 % uncertainty intervals for the 1000 observations generated for each country. Weights from the health system performance preference survey [3] were applied to each element and the resultant weighted element scores were summed to generate an overall responsiveness score for each country. The weights that were applied to the element scores are shown in Table 6 below.

Table 6: Weights for the Responsiveness Elements

<i>Elements</i>	<i>Weight</i>
Respect for Persons Elements	
Dignity	16.67%
Autonomy	16.67%
Confidentiality	16.67%
Client Orientation Elements	
Prompt Attention	20.00%
Quality of Basic Amenities	15.00%
Access to Social Support Networks	10.00%
Choice of Care Provider	5.00%

(e) Estimating Responsiveness Level Scores and Uncertainty Intervals for Surveyed Countries

For unsurveyed countries, the final responsiveness levelscores were calculated by summing the weighted means of all the elements. Taking an 80 % uncertainty intervals around the mean generated the uncertainty interval presented in Annex 6 to the 2000 World Health Report. For surveyed countries, uncertainty intervals were calculated by weighting and summing the 80 % uncertainty intervals created from the variances around the individual key informant responses for each element. The equation used to estimate the responsiveness level scores and range was as follows:

$$Y=0.1667 v_1 + 0.1667 v_2 + 0.1667 v_3 + 0.200 v_4 + 0.100 v_5 + 0.150 v_6 + 0.050 v_7$$

where *v*: element score (7 elements in total).

2.2. Distribution of Responsiveness

(a) Overview of Survey Data

Household surveys are likely to be the best means of collecting responsiveness data, particularly on distribution. A household survey instrument was piloted in 1999, and will be used for data collection in the future. Such an instrument would allow for the sampling of different socioeconomic and demographic groups and the comparison of responsiveness attainments across the different groups. In the interim, as there were no previous responsiveness distribution indicators available at an international level, the key informant surveys were used for data collection on responsiveness distribution [2]. Given the paucity of data available from these surveys, this index should be treated more as a qualitative categorisation of countries than as a quantitative exercise.

In the key informant instrument, Section C, relating to distribution posed the following question:

"Are there any specific social groups in your country who face worse health system performance with regard to any of the aspects of the health system listed above? Note that social group refers to any group within society, that differs from other groups due to demographic, economic or social characteristics, such as age, gender, education level, race, religion, income level, lifestyle, beliefs etc."

In sections A and B, the seven elements of responsiveness: dignity, autonomy, confidentiality, prompt attention, access to social support networks during care, quality of basic amenities and choice of care provider had been listed.

The respondents were expected to provide a list of groups they believed were discriminated against with regard to responsiveness. This approach was adopted to gain an understanding of which groups were adversely affected in the countries being studied. The question was left open-ended in order to elicit individual's opinion on inequality rather than to focus on known disadvantaged groups. This approach, for example, resulted in the citing of low caste groups in Nepal and individuals living in the civil war affected areas in Sri Lanka. The respondents were also asked what aspects of responsiveness were affected in the case of each disadvantaged group.

The objective of the exercise was to ascertain the total percentage of the population facing worse responsiveness levels than average, due to their belonging to the different disadvantaged social groups identified for a particular country. In estimating responsiveness inequality, the aim was to estimate a single number that represented the percentage of people disadvantaged, weighted by the severity of the perceived discrimination. The number of times the key informants cited a group as being disadvantaged is referred to as the key informant **intensity score**. This was considered to proxy the intensity of the problem in the country, on the grounds that the more common the discrimination, the greater the probability of citation. The respondents cited many different groups as being disadvantaged. These included the poor, the uneducated, rural populations, indigenous and tribal groups, ethnic minorities, women, children, the elderly, farmers, commercial sex workers, those afflicted with HIV/AIDS, drug users and homosexuals. In almost every country the poor were the most commonly cited disadvantaged group. Indigenous groups were cited in Guatemala, Mexico, Peru and

Bolivia; tribal groups in Botswana and India; and gypsies in Bulgaria, Hungary and Slovakia. About 75% of the countries surveyed reported rural populations to be disadvantaged. Bangladesh, Botswana and India in particular noted that the illiterate and those with low education levels were likely to be disadvantaged. With regard to gender, Bangladesh, Nepal, Uganda and Ecuador cited women as being discriminated against. The elderly were cited most frequently in Slovakia, Chile, Zimbabwe, Bangladesh, South Africa and Trinidad whereas children were commonly cited in Uganda, Bolivia, Ghana, Zimbabwe, Burkina Faso, Slovakia and Ecuador.

(b) Calculating Responsiveness Inequality Scores: survey countries

The information on disadvantaged groups relating to the surveyed countries was tabulated. Then the most commonly cited disadvantaged groups were selected. These included the poor, women and the elderly, and disadvantaged ethnic groups. In the case of the first three groups there was no ambiguity in categorising and collating numbers across countries. In the case of the last category, disadvantaged ethnic groups, there was a need to take a broader perspective. In most cases this category related to indigenous or tribal groups or ethnic minorities. In Nepal however it related to a division along caste lines, while in Sri Lanka the reference to 'individuals in civil war affected areas' led to focusing on the Tamil population living in the North and East, and the Sinhalese and Muslims living in border areas. In the case of South Africa only, the disadvantaged ethnic group referred to the majority, a residue from its past under apartheid.

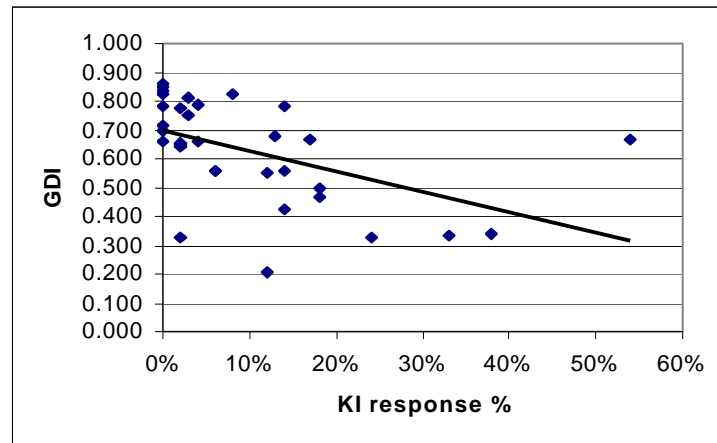
Two other groups that were cited frequently were the rural populations and the uneducated. In many developing countries these two groups coincide significantly with the poor. The responsiveness inequality score was calculated using the rural population alongside the other four factors, and again including both the rural population and the uneducated as separate disadvantaged groups. The resultant ranking of countries emerging from these three sets of figures were compared using Spearman's Rank Correlation. The results in each case were over 0.90 suggesting that no significant difference would result from omitting these two categories.

In cases where children were mentioned as a disadvantaged group, the word "child" was most often prefaced by the words poor or street, which suggests that this group was already accounted for by the category poor. Only in South Africa, Zimbabwe and Uganda were the disabled cited by over 10% of the respondents; in Bangladesh 12% of respondents cited commercial sex workers; and in Brazil 12% of key informants mentioned homosexuals as being a disadvantaged group. These categories were not taken into account. Some disadvantaged groups mentioned only in the context of one or two countries such as farmers in China and Burkina Faso, illegal migrants in Malaysia and Thailand and plantation workers in Sri Lanka were not considered explicitly in the calculations. The farmers and plantation workers are likely to be characterised by poverty and so are likely to have been included implicitly in the analysis.

The appropriateness of this approach to identifying the most commonly disadvantaged groups within a country depends on the avoidance of sample selection bias in the choice of key informants and the accuracy of their perceptions. In this context it was interesting to note that the numbers citing women as being disadvantaged was related to the

country's Gender Development Index published by the UNDP as shown by the regression line in the Figure 1 below.

Figure 1: Gender Development Index and Key Informant Intensity Scores



The magnitudes of disadvantaged population groups were determined using different sources. The number demarcating the poor is the percentage of the population under the poverty line, based on the World Bank figures. The series for the percentage of females and the population over 65 years were both extracted from the *UN Demographic and Population Statistics* [13]. In each case they referred to the year 1997. Information relating to the disadvantaged ethnic groups was obtained from the CIA Fact book [14], with the focal person being consulted regarding the appropriate figure in the cases of Nepal and Sri Lanka.

The responsiveness inequality score was first calculated for each country using the following equation. All variables are in percentage terms.

$$RIS_{df} = 1 - [(1 - KII_P \cdot P_P)(1 - KII_W \cdot P_W)(1 - KII_O \cdot P_O)(1 - KII_{DE} \cdot P_{DE})]$$

where:

- RIS_{df} : Responsiveness Inequality Score
- KII_P : Key informant intensity on poverty
- KII_W : Key informant intensity on women
- KII_O : Key informant intensity on old persons
- KII_{DE} : Key informant intensity on disadvantaged ethnic groups
- P_P : Population under the poverty line
- P_W : Proportion of women in the population
- P_O : Proportion of persons aged over 65 in the population
- P_{DE} : Proportion of a population identified as a 'disadvantaged' ethnic group in the population.

A high probability exists of overlap between identified categories. In particular, development literature suggests that the elderly, women and ethnic minorities are often over-represented among the poor. Given the differences in life expectancy among men and women, the elderly are also likely to be disproportionately female. To adjust for

overlaps, given the limitations of available data, two options existed: firstly to consider the categories to be totally mutually exclusive in being characterised as disadvantaged (independent probability of inclusion, RIS_{if}) or, secondly, to consider the categories to be totally over-lapping (RIS_{if}). Reality lies in between these two extremes and so for the current purpose the mid point between these extremes was chosen in calculating the responsiveness inequality scores. This was done by taking the average of RIS_{if} and RIS_{if} , where the latter is defined as:

$$RIS_{if} = KII_P + P_P.$$

Tests using Spearman's rank correlation coefficient suggest that whether we consider merely the poor or consider all four disadvantaged groups as being mutually independent this does not affect the ranking by responsiveness inequality scores of the survey countries significantly. This is due mainly to the poor being cited by a much larger number of the respondents in each country, than cite the other three categories. The responsiveness inequality scores and the data used in calculating these scores are presented in Appendix 1.

(c) Estimating Responsiveness Inequality Scores for Non-Survey Countries

Choice of Explanatory Variables

In selecting explanatory variables to predict responsiveness inequality scores across the 191 countries, two issues had to be considered: firstly the appropriateness of choosing a particular variable to proxy for responsiveness inequality; secondly the existence of this data, in an internationally comparable form, for a large number of countries.

The following variables were considered: percentage of females in the labour force, percentage of population with access to safe water, percentage of the population with access to sanitation, percentage poor, percentage unemployed, percentage illiterate, percentage of paved roads, the gender development index, rural population density and percentage with access to local health care. The percentage of females in the labour force and the Gender Development Index could proxy for treatment of women per se, as economic independence often coincides with social standing. The percentage of the population below the poverty line and the percentage unemployed are direct measures of the level of poverty in an economy while the percentage illiterate and the percentage who lack of access to safe water and sanitation often characterise the poor. Marginalized ethnic and tribal groups often live in remote areas where access to local health care is poor. Rural population density and the percentage of paved roads attempt to capture obstacles to accessing services.

Multiple data sources were considered. The unemployment statistics were not comparable internationally, particularly since some countries only reported the official unemployment rate as assessed from registration at unemployment centres, so this variable was omitted. Data on some of the series mentioned above were not available for a few countries, in most cases the small island economies. The missing data was estimated using a multiple imputations approach [10,11]. In addition to the variables mentioned above, data on the following variables were also included in order to enhance the estimation process: dependency rate, total fertility rate, percentage of the labour force

in agriculture, gender development index, female activity rate and the percentage of urban population

Combining the percentage of the population under the poverty line with the figures for access to safe water and sanitation led to problems of multicollinearity. Based on appropriateness of sign, t-statistics and adjusted R-squareds, it was determined that the percentage under the poverty line and the percentage with access to health care services locally were to be the two explanatory variables included. While the inclusion of rural population density and the percentage of paved roads in a country improved the R-squareds, their inclusion made the regressions less stable. As the main objective of this exercise was to estimate responsiveness inequality scores for the non-survey WHO member countries stability of coefficients was important. The coefficients and diagnostic statistics are shown for the model that was finally selected. The fact that only two explanatory variables were adopted made the forecasting less sensitive and resulted in a large number of countries having the same responsiveness inequality index, and hence the same rank. Table 7 summarises the regression results.

Table 7: Results From The Responsiveness Distribution Regression (n=33)

Elements and Independent Variables	Co-efficients	P-values of T-statistics	95 % Confidence Interval: Lower Bound	95 % Confidence Interval: Upper Bound	Model Adjusted R-Squared
DISTRIBUTION					0.7615
Percentage below the poverty line	0.5620	0.0000	0.4323	0.6918	
Geographic access rate	-0.4617	0.0410	-0.9039	-0.1952	
CONSTANT	-1.3940	0.0000	-1.8459	-0.9421	

Estimation

The regression was run as a double log function. Linear regression would not have been appropriate in this case as the dependent variable has a censored sample ranging from zero to one. If a linear equation was adopted under such conditions some of the forecast values were likely to be negative scores.

The regression equations were run a thousand times, using the flexible parameter approach where the β 's were allowed to vary, within a normal distribution. In order to simulate the parameters a point estimate and the variance-covariance matrix of the estimates were used [14]. This resulted in a thousand estimated responsiveness inequality distribution values for each country, of which the mean value was taken.

Annex Table 6 of the World Health Report provides information on responsiveness equality indices, which are one minus the responsiveness inequality scores. This convention was adopted, as the calculation of the composite index, combining the attainments on all five goals, necessitated the data series to be similarly oriented, as in

being ranked in descending order. The higher the responsiveness equality index the more equal the country is with regard to responsiveness.

Calculation of Uncertainty Intervals

Uncertainty intervals are provided for all the responsiveness inequality scores. These uncertainty intervals indicate the range of error that could exist with regard to the estimates. The narrower the uncertainty interval the more confident one can be about the estimate. The uncertainty intervals were also converted in line with the change of focus from responsiveness inequality to equality indices.

Uncertainty in the estimation process occurs from two sources. Firstly there is estimation uncertainty that arises from not knowing the parameters perfectly, which is an unavoidable consequence of having a limited number of observations. The second form of variability, known as fundamental uncertainty, is represented by the stochastic component, where factors that influence the dependent variable are not included in the explanatory variables [15]. Both these phenomena need to be taken into account. In the case of the non-survey countries, using the distribution of 1000 estimates, the 10th and 90th percentile values were taken as defining the uncertainty interval.

In the case of the survey countries there was no distribution of estimates to consider as the responsiveness inequality scores were generated not through regression but from a formulae. Therefore the Monte Carlo technique described elsewhere [16], was used. This technique allows for the distribution of the observations to be specified by the probability of events rather than the mean and variance of a series. For example if 35 key informants out of 50 in a country mention the poor, the random draw of responsiveness inequality scores in determining the distribution was carried out using the probability of citation (35/50). Having generated a distribution of key informant citation probabilities that were weighted by the percentage in each disadvantaged group the 10th and 90th percentile values were taken as defining the uncertainty interval.

3. Results

3.1. Ranking of Scores: level and distribution

A complete list of rankings, scores and uncertainty intervals for both level and distribution of responsiveness can be found in Annex 6 of the 2000 World Health Report, as well as in Appendices 2 and 3 at the end of this report. Appendix 2 provides the information by ranking while the latter groups the countries by region.

Figure 2 shows the distribution of bands of responsiveness level scores on a map of the world. The blue shades represent countries that achieved the highest responsiveness level scores, while the orange and red shades represent countries attaining lower responsiveness level scores. The countries in the middle ranges are in shades of green.

The top 10 best performing countries with respect to level of responsiveness were the United States of America, Switzerland, Luxembourg, Denmark, Germany, Japan, Canada, Norway, Netherlands and Sweden. Amongst the countries with the lowest scores were Chad, Central African Republic, Guinea-Bissau, Nepal, Eritrea, Mali,

Uganda, Mozambique, Niger and Somalia. There were more countries from Europe in the top quartile than from any other WHO region. The SEARO region only had one country, Thailand, in the top quartile, while the AFRO region had no countries in the top quartile.

The best performing countries with respect to the distribution of responsiveness were the United Arab Emirates and Bulgaria. Due to the lack in sensitivity of the distribution of responsiveness indicator, a further 36 countries had the same score and the same tied rank. On the bottom end of the scale, the countries with the lowest distributionscores were Bangladesh, Ecuador, Cameroon, Niger, Chad, Sierra Leone, Mali, Angola, Yemen, Somalia and Central African Republic. Most countriesat the lower end were from the AFRO region. The EURO region was the only region withno countries falling into the bottom quartile of countries ranked by distribution.

The correlation between responsiveness level and distribution scores is high ($r=0.7705$). While the correlation is high across the whole range of level scores (0.77), it is higher for countries in the bottom half of the rankings where the correlation coefficient was 0.71 versus 0.65 in the upper half of the rankings. The correlation and graphing of the level and distribution country rankings is similarly high. The correlation coefficient for a correlation of ranks is 0.89. This relationship is evident inFigure 3, which defines an upward sloping trend for the points demarcating the level and distribution of responsiveness ranks. This indicates that in general higher levels of responsiveness are associated with better distributions of responsiveness. A striking outlier in this picture is the case of Bulgaria, which achieves a low rank for the level of responsiveness goalbut a high rank for the equality of responsiveness. Also shown in Figure 3 are the rank uncertainty bands for both the level and distribution of ranks. The level of responsiveness uncertainty bands extend vertically below and above these points, while the distribution of responsiveness uncertainty bands extend horizontally.

Figure 2: Map of the Level of Responsiveness in Different Countries

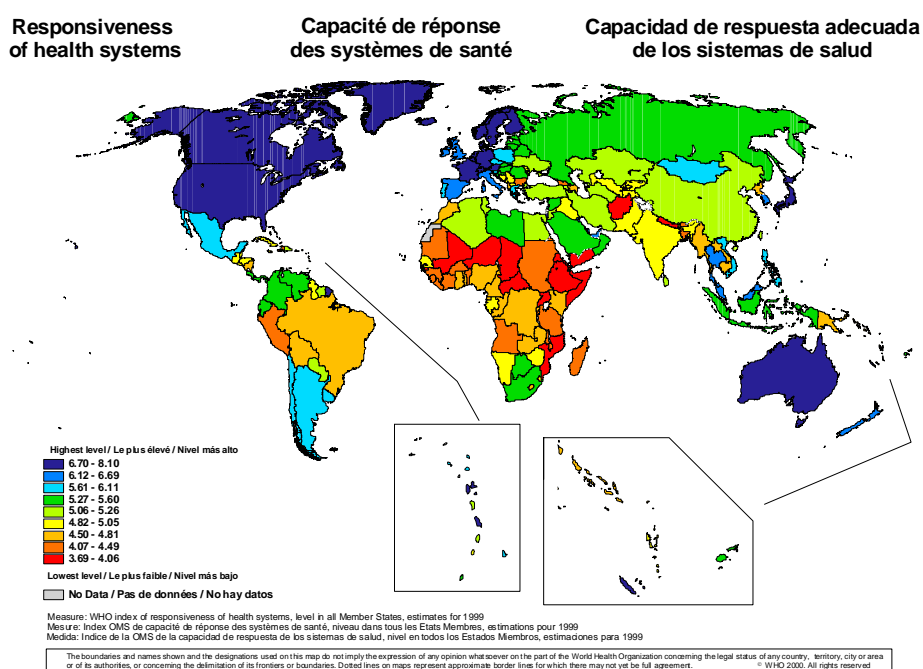
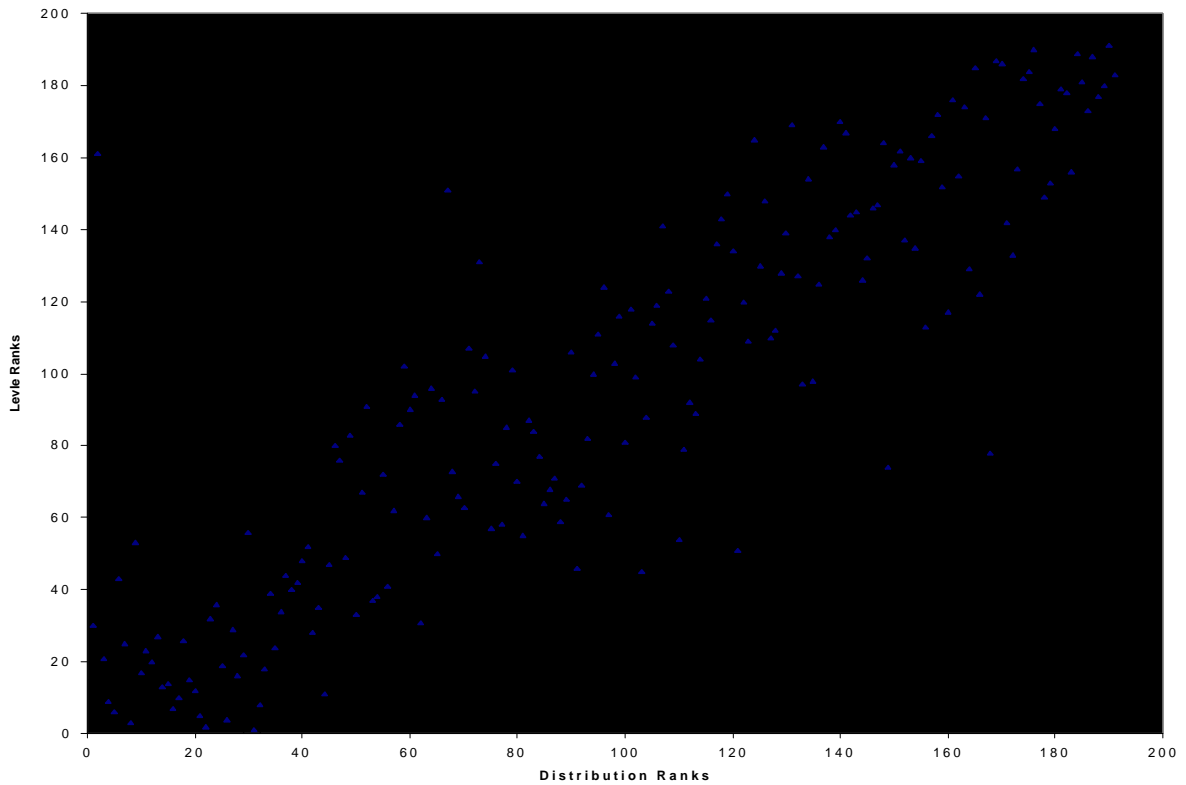


Figure 3: Rank Intervals for the Level and Distribution of Responsiveness



3.2. Responsiveness and Other Goals

Table 8 compares responsiveness goal attainment with attainment in the other goals. Correlations of responsiveness scores with the attainment scores for the other goals are high for both level and distribution of responsiveness, except in the case of fair financing where the correlation coefficient is less than 0.40 in both cases. Correlation of both the

Table 8: Responsiveness Goal Attainment Compared with Other Goals: correlation coefficients for scores (n=191)

	<i>Responsiveness Level</i>	<i>Responsiveness Distribution</i>	<i>Fair Financing</i>	<i>Health Equality</i>	<i>DALES</i>	<i>Composite Index</i>
Responsiveness Level	1					
Responsiveness Distribution	0.7705	1				
Fair Financing	0.3451	0.3204	1			
Health Equality	0.7761	0.7104	0.276	1		
DALES	0.7627	0.7819	0.2812	0.812	1	
Composite Index	0.8646	0.8313	0.4431	0.9405	0.9204	1

level and distribution responsiveness scores with the Composite Index, which measures overall attainment in all 5 health systems goals is high ($r=0.86$, $r=0.83$). Table 9 shows the correlation coefficients for the ranks for the different goals as well as the overall attainment composite index. The rank correlation coefficients are higher than the score correlation coefficients in all cases except between health equality and the composite index.

Table 9: Responsiveness Goal Attainment Compared with Other Goals: correlation coefficients for ranks (n=191)

	<i>Responsiveness Level</i>	<i>Responsiveness Distribution</i>	<i>Fair Financing</i>	<i>Health Equality</i>	<i>DALES</i>	<i>Composite Index</i>
Responsiveness Level	1					
Responsiveness Distribution	0.8882	1				
Fair Financing	0.4649	0.4701	1			
Health Equality	0.7727	0.7747	0.3395	1		
DALES	0.8039	0.8105	0.4399	0.8369	1	
Composite Index	0.8829	0.8829	0.4930	0.9389	0.9348	1

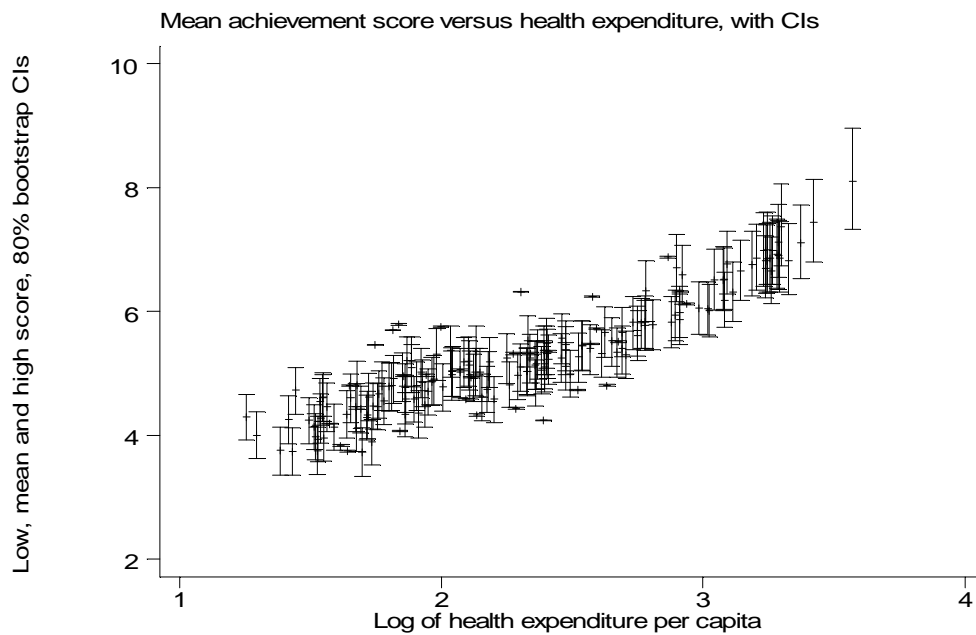
4. Discussion

The first part of the discussion focuses on the salient points emerging from the results presented above. As this is a new area of work, a significant portion of the discussion is devoted to an evaluation of the methodology used in the estimation of responsiveness level and distribution scores. This performs the dual function of qualifying the preceding discussion of the results as well as leading into a brief discussion of the next phase of the work on the area of responsiveness. A detailed discussion of WHO's work in this area is available elsewhere[16].

4.1. How Much Does Health Expenditure Matter?

Figure 4 shows the level of responsiveness scores graphed against the log of average health expenditure per capita. Overall, the level of responsiveness is higher in countries with higher health expenditure per capita. However, for any given level of health expenditure per capita, different responsiveness outcomes are attainable. Some countries with health expenditure that is two to three times greater attained the same level of responsiveness.

Figure 4: Level of Responsiveness Scores and Average Health Expenditure Per Capita



On the whole, the countries performing well with respect to the level of responsiveness are countries spending a lot on health care. The high correlation between a country's health expenditure per capita and responsiveness ($r=0.90$) can be explained by two factors. Firstly, the nature of several of the responsiveness elements are such that they are expenditure dependent. The achievement of high scores for several of the "client orientation" elements of responsiveness, e.g., quality of basic amenities or prompt attention, may require higher levels of expenditure on health services infrastructure [2]. Unsurprisingly, the WHO regions containing countries spending more on health care have higher regional average scores for the level and distribution of responsiveness. From high to low the regions were: EURO, WPRO, AMRO, EMRO, SEARO and AFRO. Secondly, the regression models used to estimate scores for the non-surveyed countries relied to a large extent on the variable health expenditure per capita, even in the case of less resource elements, e.g., *confidentiality*, because of the unavailability of other series correlated with these elements. It is therefore likely that the resultant ranking of countries *overstates* the interdependence of health expenditure and good performance with respect to the average level of responsiveness.

While similar associations are observed with respect to responsiveness distribution, the distribution of responsiveness is less strongly associated with GDP and health expenditure per capita as evidenced by the weaker correlation coefficients ($r=0.61$ and 0.53). The positive and relatively significant correlation scores are however understandable when one considers that the responsiveness of health systems might be directed towards certain sub groups of the population, e.g., the more wealthy, the majority ethnic group etc. The achievement of an equal distribution of responsiveness across a population is however clearly determined by factors other than the level of income or health expenditure in a

society. Some of these other factors might be the homogeneity of a population and social solidarity.

4.2. Relationships Between Goals

Just as the pre-existence of high levels of income and health expenditure in a country do not guarantee good performance with respect to the level and, especially, the distribution of responsiveness, the achievement of success in one of the responsiveness goals does not automatically imply success in the other. There were several cases of countries that had low responsiveness scores but more equal distributions of responsiveness across their populations. Sri Lanka, Bulgaria and Egypt are some examples of countries that achieved this outcome (there were 11 in total). There were an equal number of countries for which the converse was true (there were 11 in total): they had achieved relatively high average responsiveness (above the median score for all 191 countries) but it was distributed unequally across the population (e.g., Armenia, Chile, South Africa).

While higher responsiveness of health systems seems to be associated with higher levels and more equal distributions of health, it is only weakly associated with greater equity in financing. The health system's achievements with respect to health status may be more directly related to areas of service provision, which might affect responsiveness in the same direction. For example, having prompt access to health care might improve health outcomes, as well as meet people's legitimate expectations regarding how the health system should value their time by not keeping them waiting.

4.3. Critique of Methodology Used for Estimating Responsiveness

Obvious constraints to the measurement of responsiveness were the newness of both the concept and the instrument, and the use of key informant surveys rather than the preferred household surveys. In spite of these hurdles, the instrument, the construct of responsiveness with its seven elements, seems to have fared reasonably well with regards to certain criterion. It performed well under exploratory factor analysis, where the data divided almost perfectly into the conceptualised seven elements [1,2]. On the whole, much of the results would also pass the test of empirical validity.

The relatively small number of countries surveyed also made the estimation exercise difficult. The strengths of the list of countries selected were that it covered all WHO regions, with wide spread in GDP per capita (ranging from \$890 to \$20,000 (purchasing power parity Dollars), and divergent health systems.

(a) Level of Responsiveness

The assumptions underlying the adjustment process are another area of the methodology that can be criticised. It was assumed that there was a systematic variation common to all element scores, introduced by factors measured by the variables: sex, place of work and socio-political "freedom". If the effect of these factors differed for different elements, then this assumption would be incorrect. Furthermore, it was assumed that all of the systematic variation was non-substantive and therefore it did not measure any real difference in responsiveness. Were the first of the two assumptions incorrect, the

direction of the adjustment error would be hard to foretell. If the variations were stronger with elements which were given larger weights, the adjustment would have underestimated the difference resulting from the presence of these factors. The opposite would apply for elements with smaller weights. If the second assumption were incorrect, it is easier to predict the direction of the error: the adjustment process would over-estimate the required change. The score adjustment process was also hampered by the lack of data and evidence of how various national and individual characteristics affect the reporting of responsiveness performance. In the future we will need to gain a better understanding of relationship between gender, place of work, general wellbeing, happiness, national and cultural characteristics, political freedom and reporting on responsiveness. The range of quantitative cross-national research so far in this field is fairly small.

Within the context of the process of estimating out-of-sample there were also several constraints. The prediction of the respect of persons elements, and the social support networks element was difficult because of the lack of data series explaining or correlated with these element scores. Reliable data series for all 191 countries were even difficult to obtain for more conventional indicators, like nurses or doctors per 100 000 population. Consequently, the regressions for the respect of persons elements, collectively constituting 50 % of the overall score, had low explanatory power, increasing the uncertainty intervals.

(b) Distribution of Responsiveness

There are several obvious weaknesses in the approach taken to measuring responsiveness distribution. Firstly, the distribution is not the distribution of the level of responsiveness, but another measure constructed from data from a different part of the questionnaire. This approach was used because there was no other way to estimate distributions from key informant surveys. Such a shortcoming could be avoided in the future through the use of household survey data.

Secondly, using the number of times a disadvantaged group was mentioned by key informants as a proxy for the intensity of discrimination was weak. Nevertheless, this type of indicator seemed to measure some constructs satisfactorily, as evidenced by the close fit of the regression between these scores and the Gender Development Index for example. A third weakness of this approach was the lack of data on the actual distribution of disadvantaged groups within a population, taking into account the possible overlap between the identified groups. This necessitated the compromise of taking 50 % of the score generated from assuming complete overlap of the four disadvantaged groups, and 50 % of the score generated from assuming total mutual independence of inclusion.

A final criticism is that the use of only two explanatory variables in estimating responsiveness inequality scores for the non-surveyed countries reduced the sensitivity of the measure. For instance it did not result in any variation in the scores of many of the high-income countries, causing these countries to be jointly ranked 3-38.

4.4. Future Work

Elsewhere, WHO's approach to improving the measurement of responsiveness is described in detail [17]. The description includes a detailed discussion of the WHO strategy for improving responsiveness measurement in the future. Without wishing to repeat everything in this paper, some of the salient points it raises are outlined here.

The main approach to improving the measurement of the level and distribution of responsiveness will be to switch from using key informant surveys to household surveys. A key feature of the measurement strategy will be to ensure that it is affordable and to this end, the use of postal household surveys is being tested. Part of the strategy is also the strengthening of the data set by increasing the number of countries surveyed. In order to survey the maximum number of countries possible, some key informant surveys will still need to be used. A calibration exercise, whereby different instruments are used in the same country, will be done in several countries to measure differences caused by survey modes. Another new initiative will be the attempt to validate household survey results through using facility surveys.

For the 2001 World Health Report, the measurement of responsiveness distribution will change from the current measure, which is based on identifying vulnerable groups, to one that is based on measuring total inequality in a population, as is currently being developed for health [18]. For this approach, reports on differences in responsiveness will be used in countries where household surveys will be run. For measurement of inequality in those countries where it will not be possible to run household surveys, an improved model of the vulnerable group approach combined with the total inequality estimates will be developed.

The organisation of health systems, as reflected in the different ways in which health system functions are carried out, are likely to have a strong bearing on responsiveness level and distribution. Different forms of insurance and provider incentives in particular are likely to be of importance in this regard. It is therefore extremely important, from a policy formulation perspective, to link current responsiveness attainments at country level with health system functions.

Finally, the current focus of the health system responsiveness work has been on measuring the responsiveness of health care services. The responsiveness of other parts of health systems serving the population, such as public health services and health promotion will also need to be evaluated in the future.

References

1. **De Silva A.** *A framework for measuring responsiveness.* Geneva, World Health Organisation, Global Programme on Evidence for Health Policy, 1999 (unpublished paper).
2. **De Silva A & Valentine N.** Measuring responsiveness: results of a key informants survey in 35 countries. *GPE Discussion Paper No. 21.* Geneva, WHO, 2000.
3. **Gakidou EE, Frenk J & Murray CJL.** Measuring preferences on health system performance assessment. *GPE Discussion Paper No. 20.* Geneva, WHO, 2000.
4. **Iburg KM, Murray CJL & Saloman J.** An Approach to determine the population's expectations for health. Validity of selfreported, physician-assessed and observed health status. *Unpublished.*
5. **European Commission.** *Citizens and health systems: main results from a Eurobarometer survey.* Luxembourg, Directorate-General for Employment, Industrial Relations and Social Affairs: health, 1998.
6. **Diener E & Suh EM.** "National Differences in Subjective Well-Being". In: *Well-Being: the foundation of Hedonic Psychology.* Kahneman D, Diener E & Schwarz N (eds). Russel Sage Foundations, New York, 1999.
7. **Kaplan SH.** Satisfaction surveys: does the information make a difference. *Clinical Performance and Quality Healthcare*, 4: 216-217 (1996).
8. **Gurr TR & Jagers K.** *Polity98 Project.* Inter-University Consortium for Political and Social Research & the University of Colorado. [Http://www.bsos.umd.edu/cidcm/polity/index.htm](http://www.bsos.umd.edu/cidcm/polity/index.htm).
9. **Freedom House.** [Http://www.freedomhouse.org/](http://www.freedomhouse.org/).
10. **Honaker J, Joseph A, King G, Scheve K & Naunihal S.** *Amelia: a program for missing data (Windows version ,)* Harvard University, Cambridge, MA, 1999. [Http://GKing.Harvard.edu](http://GKing.Harvard.edu).
11. **King G, Honaker J, Joseph A & Scheve K.** *List-wise deletion is evil: what to do about missing data in political science .* Paper presented at the Annual Meeting of the American Political Science Association, Boston, 1998.
12. **Evans DE, Bendib L, Tandon A, Lauer J, Ebener S, Hutubessy R, Asasa Y & Murray CJL.** Estimates of income per capita, literacy, educational attainment, absolute poverty, and income gini coefficients for the World Health Report 2000. *GPE Discussion Paper No. 7.* Geneva, WHO, 2000.
13. **United National Development Programme (UNDP).** *Human development report [CD-ROM].* UNDP, New York, 1999.

14. **CIA Factbook.** [Http://www.odci.gov/cia/publications/factbook/](http://www.odci.gov/cia/publications/factbook/)
15. **King G, Tomz M & Wittenberg J.** Making the most of statistical analyses: improving interpretation and presentation. *American Journal of Political Science.* 44 (2): 341-355 (2000).
16. **Evans D, Tandon A, Murray CJL & Lauer J.** *The comparative efficiency of national health systems in producing health: an analysis of 191 countries.* Geneva, World Health Organisation, 2000 (Global Programme on Evidence for Health Policy Discussion Paper No. 29).
17. **Darby C, Valentine N & Murray CJL.** WHO strategy on measuring responsiveness. *GPE Discussion Paper No. 23.* Geneva, WHO, 2000.
18. **Gakidou EE, Murray CJL & Frenk J.** *A framework for measuring health inequality* Geneva, World Health Organization, 1999 (Global Programme on Evidence for Health Policy Discussion Paper No. 5)

Appendices

Appendix 1: Calculation of Responsiveness Distribution Scores for

No	Country	Key informant intensity Poor	WHO % in poverty (less than \$1)	Key informant intensity Women	% of Women	Key informant intensity old	% 65 and over	Key informant intensity disadvantaged pop. groups
1	Bangladesh	66%	29.30%	38%	49.4%	24%	3.20%	0%
2	Bolivia	52%	8.40%	14%	50.3%	18%	3.90%	72%
3	Botswana	26%	33.30%	2%	51.0%	16%	2.40%	14%
4	Brazil (33)	55%	7.50%	3%	50.5%	15%	4.90%	15%
5	Bulgaria	10%	0.50%	0%	51.2%	0%	15.10%	26%
6	Burkina Faso	31%	56.60%	12%	50.6%	2%	2.60%	0%
7	Chile	80%	4.20%	14%	50.5%	36%	6.80%	28%
8	China	27%	15.30%	2%	48.4%	8%	6.40%	0%
9	Cyprus	10%	0.00%	0%	50.1%	16%	11.30%	0%
10	Ecuador (24)	75%	20.20%	54%	49.8%	25%	4.50%	25%
11	Egypt	20%	3.10%	6%	49.1%	0%	4.00%	0%
12	Georgia	60%	21.60%	0%	52.3%	30%	12.00%	0%
13	Ghana	26%	42.80%	18%	50.3%	16%	3.10%	0%
14	Guatemala	16%	26.90%	12%	49.6%	18%	3.40%	58%
15	Hungary	40%	0.50%	0%	52.1%	16%	14.30%	32%
16	India (AP)	40%	28.70%	14%	48.4%	14%	4.70%	28%
17	Indonesia	22%	15.20%	2%	50.1%	2%	4.50%	0%
18	Malaysia	22%	0.70%	4%	49.3%	16%	4.00%	32%
19	Mexico	20%	17.90%	2%	50.5%	4%	4.40%	35%
20	Mongolia	26%	21.70%	4%	49.9%	2%	3.80%	0%
21	Nepal	44%	33.80%	24%	49.4%	4%	3.60%	20%
22	Peru (35)	49%	10.30%	17%	50.3%	11%	4.50%	51%

No	Country	Key informant intensity Poor	WHO % in poverty (less than \$1)	Key informant intensity Women	% of Women	Key informant intensity old	% 65 and over	Key informant intensity disadvantaged pop. groups
23	Philippines	26%	0.90%	0%	49.6%	10%	3.50%	30%
24	Poland	36%	5.40%	0%	51.3%	18%	11.40%	8%
25	Senegal	38%	21.20%	2%	50.1%	4%	2.50%	0%
26	Slovakia	18%	1.00%	0%	51.2%	44%	11.00%	12%
27	South Africa	44%	8.30%	13%	51.9%	24%	3.50%	25%
28	South Korea	46%	1.00%	0%	49.6%	12%	6.00%	0%
29	Sri Lanka	54%	6.60%	0%	49.1%	0%	6.30%	32%
30	Thailand	37%	1.00%	3%	50.0%	0%	5.30%	17%
31	Trinidad	52%	12.40%	8%	50.1%	26%	6.40%	0%
33	Uganda	39%	32.50%	33%	50.2%	19%	2.20%	6%
32	United Arab Emirates	24%	0.00%	0%	33.6%	0%	2.00%	0%
34	Vietnam	62%	15.10%	6%	51.1%	4%	5.10%	24%
35	Zimbabwe	49%	31.60%	18%	50.4%	23%	2.80%	14%

Appendix 2:

Responsiveness of health systems, level and distribution in all Member estimates for 1999

Rank	Low Rank	High Rank	Member State	Index	Uncertainty interval	Rank	Member
1	1 -	1	United States of America	8.10	7.32 - 8.96	1	United Arab Emi
2	2 -	3	Switzerland	7.44	6.79 - 8.13	2	Bulgaria
3	2 -	4	Luxembourg	7.37	6.73 - 8.06	3-38	Argentina
4	4 -	6	Denmark	7.12	6.55 - 7.73	3-38	Australia
5	4 -	8	Germany	7.10	6.52 - 7.72	3-38	Austria
6	6 -	9	Japan	7.00	6.43 - 7.61	3-38	Bahamas
7-8	6 -	9	Canada	6.98	6.44 - 7.54	3-38	Bahrain
7-8	6 -	12	Norway	6.98	6.40 - 7.60	3-38	Barbados
9	9 -	12	Netherlands	6.92	6.38 - 7.49	3-38	Belgium
10	10 -	15	Sweden	6.90	6.35 - 7.47	3-38	Brunei Darrusala
11	2 -	28	Cyprus	6.88	6.76 - 7.00	3-38	Canada
12-13	10 -	16	Australia	6.86	6.34 - 7.40	3-38	Denmark
12-13	11 -	18	Austria	6.86	6.31 - 7.45	3-38	Finland
14	11 -	18	Monaco	6.85	6.32 - 7.44	3-38	France
15	12 -	17	Iceland	6.84	6.31 - 7.42	3-38	Germany
16-17	14 -	20	Belgium	6.82	6.29 - 7.39	3-38	Greece
16-17	11 -	22	France	6.82	6.27 - 7.42	3-38	Iceland
18	12 -	21	Bahamas	6.77	6.28 - 7.29	3-38	Ireland
19	17 -	21.5	Finland	6.76	6.26 - 7.29	3-38	Israel
20-21	18 -	24	Israel	6.70	6.22 - 7.22	3-38	Italy
20-21	11 -	26	Singapore	6.70	6.16 - 7.25	3-38	Japan
22-23	19 -	28	Italy	6.65	6.13 - 7.20	3-38	Kuwait

22-23	20 -	25 New Zealand	6.65	6.18 - 7.15	3-38 Luxembourg
24	20 -	28 Brunei Darussalam	6.59	6.11 - 7.07	3-38 Malta
25	25 -	30 Ireland	6.52	6.03 - 7.02	3-38 Mauritius
26-27	22 -	31 Qatar	6.51	6.02 - 7.00	3-38 Monaco
26-27	23 -	31 United Kingdom	6.51	6.01 - 7.05	3-38 Netherlands
28	26 -	32 Andorra	6.44	5.97 - 6.93	3-38 New Zealand
29	27 -	35 Kuwait	6.34	5.84 - 6.82	3-38 Norway
30	16 -	38 United Arab Emirates	6.33	6.24 - 6.41	3-38 Qatar
31	15 -	37 Malaysia	6.32	6.21 - 6.42	3-38 Saint Kitts and N
32	29 -	34 San Marino	6.30	5.84 - 6.79	3-38 San Marino
33	22 -	42 Thailand	6.23	6.11 - 6.35	3-38 Singapore
34	30 -	37 Spain	6.18	5.74 - 6.63	3-38 Spain
35	27 -	47 Republic of Korea	6.12	5.99 - 6.24	3-38 Sweden
36	32 -	41 Greece	6.05	5.63 - 6.48	3-38 Switzerland
37	33 -	41 Slovenia	6.04	5.62 - 6.48	3-38 United Kingdom
38	34 -	43 Portugal	6.00	5.58 - 6.44	3-38 United States of
39	35 -	43 Barbados	5.98	5.57 - 6.41	39-42 Andorra
40	37 -	45 Argentina	5.93	5.53 - 6.34	39-42 Antigua and Barb
41	39 -	49 Uruguay	5.87	5.47 - 6.28	39-42 Nauru
42	40 -	52 Nauru	5.83	5.41 - 6.25	39-42 Palau
43-44	40 -	52 Bahrain	5.82	5.38 - 6.24	43 Republic of Kore
43-44	41 -	52 Malta	5.82	5.42 - 6.24	44 Cyprus
45	42 -	51 Chile	5.81	5.41 - 6.21	45-47 Belarus
46	35 -	62 Mongolia	5.79	5.67 - 5.92	45-47 Czech Republic
47-48	44 -	53 Antigua and Barbuda	5.78	5.37 - 6.17	45-47 Lithuania
47-48	42 -	54 Czech Republic	5.78	5.38 - 6.19	48 Philippines

Rank	Low Rank	High Rank	High Rank	Index	Uncertainty interval	Rank	Men
49	36 -	67	Philippines	5.75	5.64 - 5.87	49	Oman
50	37 -	70	Poland	5.73	5.61 - 5.85	50-52	Algeria
51	39 -	73	Viet Nam	5.70	5.59 - 5.81	50-52	Saudi Arabi
52	47 -	58	Palau	5.69	5.27 - 6.09	50-52	Thailand
53-54	48 -	59	Mexico	5.66	5.25 - 6.07	53-57	Jordan
53-54	48 -	59	Saint Kitts and Nevis	5.66	5.26 - 6.06	53-57	Latvia
55	50 -	61	Lebanon	5.61	5.20 - 6.01	53-57	Portugal
56	52 -	63	Mauritius	5.57	5.15 - 5.96	53-57	Slovenia
57-58	53 -	65	Fiji	5.53	5.10 - 5.93	53-57	Uruguay
57-58	53 -	66	Libyan Arab Jamahiriya	5.53	5.10 - 5.93	58	Hungary
59	54 -	66	Panama	5.52	5.11 - 5.90	59	Egypt
60	45 -	90	Slovakia	5.51	5.37 - 5.66	60-61	Kazakhstan
61	55 -	69	Tonga	5.49	5.07 - 5.89	60-61	Tunisia
62	47 -	95	Hungary	5.47	5.36 - 5.59	62	Malaysia
63-64	58 -	71	Grenada	5.46	5.04 - 5.85	63-64	Slovakia
63-64	48 -	97	Indonesia	5.46	5.35 - 5.57	63-64	Ukraine
65	58 -	71	Cook Islands	5.45	5.05 - 5.85	65	Poland
66	58 -	72.5	Estonia	5.44	5.04 - 5.84	66	Turkey
67	59 -	82	Saudi Arabia	5.40	4.97 - 5.78	67-68	Morocco
68	63 -	76	Costa Rica	5.39	4.99 - 5.77	67-68	Romania
69-72	64 -	79	Latvia	5.37	4.97 - 5.77	69	Estonia
69-72	64 -	79	Russian Federation	5.37	4.97 - 5.76	70	Indonesia
69-72	63 -	81.5	Syrian Arab Republic	5.37	4.94 - 5.76	71	Uzbekistan
69-72	64 -	79	Venezuela, Bolivarian Republic of	5.37	4.98 - 5.75	72	Dominican R
73-74	65 -	82	Romania	5.35	4.96 - 5.76	73-74	Fiji
73-74	54 -	111.5	South Africa	5.35	5.21 - 5.49	73-74	Jamaica
Rank	Low Rank	High Rank	Member State	Index	Uncertainty interval	Rank	M
75	65 -	85	Seychelles	5.34	4.94 - 5.73	75	Seychelles

76-79	69	-	85 Belarus	5.32	4.92 - 5.72	76 Libyan Arab	
76-79	56	-	115.5 Botswana	5.32	5.15 - 5.49	77-78 Dominica	
76-79	69	-	85 Croatia	5.32	4.93 - 5.71	77-78 Sri Lanka	
76-79	56	-	116 Ecuador	5.32	5.15 - 5.49	79-81 Lebanon	
80-81	71	-	86 Lithuania	5.31	4.90 - 5.71	79-81 Suriname	
80-81	65	-	92 Samoa	5.31	4.88 - 5.72	79-81 Syrian Arab	
82	71	-	87 Colombia	5.30	4.92 - 5.68	82 Saint Lucia	
83	69	-	96 Oman	5.27	4.85 - 5.65	83 Croatia	
84-86	78	-	90 Dominica	5.25	4.86 - 5.64	84-85 Brazil	
84-86	74	-	92 Jordan	5.25	4.83 - 5.63	84-85 Grenada	
84-86	77	-	91 Saint Lucia	5.25	4.84 - 5.63	86-87 Costa Rica	
87	78	-	92 Suriname	5.23	4.82 - 5.62	86-87 Russian Fe	
88-89	80	-	97 China	5.20	4.79 - 5.58	88 Panama	
88-89	79	-	99 Turkmenistan	5.20	4.78 - 5.59	89 Cook Island	
90-91	83	-	98 Algeria	5.19	4.77 - 5.57	90 Belize	
90-91	82	-	97 Kazakhstan	5.19	4.80 - 5.58	91 Mongolia	
92	82	-	100 Armenia	5.18	4.77 - 5.57	92 Venezuela,	
93	85	-	104 Turkey	5.16	4.74 - 5.53	93-94 Colombia	
94	87.5	-	101 Tunisia	5.15	4.75 - 5.52	93-94 Iran, Islamic	
95	88	-	103 Dominican Republic	5.14	4.74 - 5.51	95 The former Macedonia	
96	86	-	109 Ukraine	5.13	4.72 - 5.52	96 Kyrgyzstan	
97	88	-	109 Paraguay	5.12	4.74 - 5.50	97 Tonga	
98-99	92	-	106 Maldives	5.11	4.69 - 5.49	98-100 Cuba	
98-99	81.5	-	115 Marshall Islands	5.11	4.70 - 5.52	98-100 Saint Vince	
Rank	Low Rank	High Rank	Member State	Index	Uncertainty interval	Rank	M
100	93	-	107 Iran, Islamic Republic of	5.10	4.71 - 5.48	98-100 Samoa	
101	95	-	109 Sri Lanka	5.08	4.69 - 5.47	101-102 Gabon	
102	68	-	137 Egypt	5.06	4.94 - 5.17	101-102 Maldives	
103-104	98	-	117 Iraq	5.05	4.63 - 5.43	103 Chile	
103-104	100	-	111 Saint Vincent and the Grenadines	5.05	4.66 - 5.43	104 Senegal	
105-107	100	-	118 Belize	5.03	4.63 - 5.40	105-106 China	

105-107	101	-	116 Jamaica	5.03	4.65 - 5.41	105-106 Guyana		
105-107	100	-	117 Uzbekistan	5.03	4.62 - 5.42	107 Republic of		
108-110	100	-	119 Bosnia and Herzegovina	5.02	4.64 - 5.40	108-109 Mexico		
108-110	98	-	123 India	5.02	4.61 - 5.41	108-109 Trinidad and		
108-110	101	-	119 Swaziland	5.02	4.61 - 5.40	110 Swaziland		
111	99	-	120 The former Yugoslav Republic of Macedonia	5.01	4.62 - 5.40	111-112 Armenia		
112	102	-	122 Micronesia, Federated States of	5.00	4.60 - 5.38	111-112 Botswana		
113	104	-	123 Namibia	4.99	4.62 - 5.37	113 Turkmenist		
114	109	-	122 Guyana	4.98	4.58 - 5.36	114 Iraq		
115-117	105	-	126 Cuba	4.97	4.57 - 5.36	115 Pakistan		
115-117	77	-	144 Guatemala	4.97	4.81 - 5.12	116 Yugoslavia		
115-117	105.5	-	124 Yugoslavia	4.97	4.59 - 5.36	117 Albania		
118-119	106	-	129 Gabon	4.96	4.57 - 5.32	118 Equatorial C		
118-119	78	-	145 Senegal	4.96	4.83 - 5.09	119 Papua New		
120-121	107	-	129 Kiribati	4.95	4.54 - 5.35	120 Solomon Isl		
120-121	108	-	128 Pakistan	4.95	4.54 - 5.32	121 Viet Nam		
122	80	-	147.5 Zimbabwe	4.94	4.82 - 5.05	122 Kiribati		
123	113	-	129 Republic of Moldova	4.92	4.54 - 5.30	123 Mauritania		
124	116	-	129 Kyrgyzstan	4.91	4.51 - 5.29	124 Bosnia and		
125	113	-	132 Tajikistan	4.90	4.49 - 5.29	125 Azerbaijan		
Rank	Low Rank		High Rank	Member State	Index	Uncertainty interval	Rank	M
126	116.5	-	136 Niue	4.87	4.48 - 5.25	126 Sao Tome e		
127	122	-	134 Vanuatu	4.85	4.46 - 5.22	127 India		
128	119	-	136 El Salvador	4.84	4.47 - 5.22	128-129 El Salvador		
129	122	-	138 Honduras	4.82	4.45 - 5.19	128-129 Micronesia,		
130-131	124	-	139 Azerbaijan	4.81	4.43 - 5.19	130-131 Democratic Korea		
130-131	93	-	156 Brazil	4.81	4.68 - 4.94	130-131 Guinea		
132-135	92	-	156 Ghana	4.80	4.69 - 4.92	132 Vanuatu		
132-135	124	-	141 Solomon Islands	4.80	4.40 - 5.18	133 Paraguay		
132-135	125	-	142 Tuvalu	4.80	4.40 - 5.18	134-135 Cape Verde		
132-135	124	-	140 Zambia	4.80	4.40 - 5.18	134-135 Marshall Isl		

136	125	-	141 Albania	4.79	4.39 - 5.17	136 Tajikistan	
137-138	125	-	144 Cambodia	4.77	4.37 - 5.15	137-138 Bhutan	
137-138	125	-	144 Congo	4.77	4.39 - 5.15	137-138 Cambodia	
139	128	-	144 Democratic People's Republic of Korea	4.76	4.36 - 5.14	139 Nicaragua	
140	132	-	142 Nicaragua	4.75	4.36 - 5.11	140 Djibouti	
141	103	-	161 Trinidad and Tobago	4.73	4.60 - 4.86	141 Georgia	
142	132	-	146 Democratic Republic of the Congo	4.72	4.34 - 5.10	142 Kenya	
143	134	-	147 Equatorial Guinea	4.71	4.33 - 5.07	143-144 Lao People's	
144	138	-	149 Kenya	4.67	4.28 - 5.05	143-144 Rwanda	
145-147	138	-	159 Lao People's Democratic Republic	4.62	4.23 - 5.00	145 Niue	
145-147	141	-	153 Lesotho	4.62	4.23 - 4.99	146 Ghana	
145-147	139	-	155 Rwanda	4.62	4.22 - 5.01	147 South Africa	
148	141	-	155 Sao Tome and Principe	4.61	4.21 - 4.99	148-149 Lesotho	
149	143	-	154 Nigeria	4.60	4.22 - 4.98	148-149 Sudan	
Rank	Low Rank	High Rank	Member State	Index	Uncertainty interval	Rank	M
150	142	-	157 Papua New Guinea	4.59	4.18 - 4.96	150 United Rept	
151-153	121	-	169 Bolivia	4.58	4.46 - 4.70	151 Congo	
151-153	142	-	156 Morocco	4.58	4.20 - 4.94	152 Malawi	
151-153	144	-	155 Myanmar	4.58	4.21 - 4.95	153-155 Comoros	
154	146	-	158 Cape Verde	4.56	4.17 - 4.92	153-155 Côte d'Ivoire	
155	149	-	158 Togo	4.54	4.16 - 4.91	153-155 Tuvalu	
156	147	-	164 Cameroon	4.50	4.13 - 4.87	156 Namibia	
157-160	153	-	164 Comoros	4.46	4.06 - 4.83	157 Gambia	
157-160	154	-	163 Côte d'Ivoire	4.46	4.08 - 4.83	158 Myanmar	
157-160	153.5	-	163 Haiti	4.46	4.10 - 4.84	159 Guatemala	
157-160	152	-	164 United Republic of Tanzania	4.46	4.06 - 4.84	160 Benin	
161	135	-	174 Bulgaria	4.43	4.30 - 4.57	161 Peru	
162	157	-	166 Malawi	4.42	4.03 - 4.80	162 Togo	
163	159	-	170 Bhutan	4.35	3.96 - 4.72	163 Honduras	
164	160.5	-	171 Sudan	4.34	3.96 - 4.71	164 Burkina Fas	

165-167	163	-	170	Gambia	4.33	3.95 - 4.70	165	Uganda
165-167	144	-	178	Georgia	4.33	4.18 - 4.48	166-167	Nepal
165-167	160	-	170	Mauritania	4.33	3.97 - 4.69	166-167	Zimbabwe
168-169	165	-	173	Guinea	4.29	3.92 - 4.64	168	Burundi
168-169	163	-	173	Madagascar	4.29	3.92 - 4.65	169-170	Democratic
170	162	-	175	Djibouti	4.28	3.87 - 4.66	169-170	Eritrea
171	166	-	175	Burundi	4.25	3.86 - 4.64	171	Zambia
172	152	-	181	Peru	4.24	4.12 - 4.36	172-173	Afghanistan
173	166	-	175	Sierra Leone	4.23	3.86 - 4.61	172-173	Haiti
174	156	-	183	Burkina Faso	4.18	4.06 - 4.31	174	Guinea-Biss
175-176	171	-	178	Benin	4.14	3.75 - 4.50	175	Mozambique
Rank	Low Rank		High Rank	Member State	Index	Uncertainty interval	Rank	M
175-176	171	-	178	Liberia	4.14	3.77 - 4.50	176	Liberia
177	173	-	179	Angola	4.10	3.74 - 4.46	177	Nigeria
178	163	-	188	Bangladesh	4.07	3.94 - 4.20	178	Bolivia
179	176	-	182	Ethiopia	4.00	3.62 - 4.38	179-180	Ethiopia
180	176	-	184	Yemen	3.98	3.61 - 4.35	179-180	Madagascar
181-182	177	-	185	Afghanistan	3.96	3.57 - 4.33	181	Bangladesh
181-182	178	-	184	Chad	3.96	3.59 - 4.31	182	Ecuador
183	178	-	185	Central African Republic	3.94	3.57 - 4.30	183	Cameroon
184	180	-	186	Guinea-Bissau	3.89	3.52 - 4.26	184	Niger
185	175	-	190	Nepal	3.83	3.69 - 3.98	185	Chad
186	184	-	190	Eritrea	3.75	3.36 - 4.13	186	Sierra Leon
187-188	185	-	189	Mali	3.74	3.36 - 4.13	187	Mali
187-188	179	-	191	Uganda	3.74	3.61 - 3.87	188	Angola
189-190	186	-	190	Mozambique	3.73	3.34 - 4.12	189	Yemen
189-190	185	-	190	Niger	3.73	3.35 - 4.12	190	Somalia
191	187	-	191	Somalia	3.69	3.31 - 4.07	191	Central Afric

Appendix 3: Responsiveness of health systems, level and distribution in all Member States by Region (1999)

LEVEL				DISTRIBUTION			
Rank	Member State	Index	Uncertainty interval	Rank	Member State	Index	Uncertainty interval
AFRO				AFRO			
56	Mauritius	5.57	5.15 - 5.96	3-38	Mauritius	0.995	0.992 - 0.997
73-74	South Africa	5.35	5.21 - 5.49	50-52	Algeria	0.982	0.977 - 0.985
75	Seychelles	5.34	4.94 - 5.73	75	Seychelles	0.955	0.948 - 0.961
76-79	Botswana	5.32	5.15 - 5.49	101-102	Gabon	0.919	0.909 - 0.928
90-91	Algeria	5.19	4.77 - 5.57	104	Senegal	0.914	0.889 - 0.928
108-110	Swaziland	5.02	4.61 - 5.40	110	Swaziland	0.908	0.897 - 0.918
113	Namibia	4.99	4.62 - 5.37	111-112	Botswana	0.905	0.877-0.932
118-119	Senegal	4.96	4.83 - 5.09	118	Equatorial Guinea	0.892	0.877 - 0.906
118-119	Gabon	4.96	4.57 - 5.32	123	Mauritania	0.882	0.840 - 0.919
122	Zimbabwe	4.94	4.82 - 5.05	126	Sao Tome and Principe	0.877	0.857 - 0.895
132-135	Zambia	4.80	4.40 - 5.18	130-131	Guinea	0.873	0.842 - 0.902
132-135	Ghana	4.80	4.69 - 4.92	134-135	Cape Verde	0.866	0.847 - 0.882
137-138	Congo	4.77	4.39 - 5.15	142	Kenya	0.852	0.830 - 0.871
142	Democratic Republic of the Congo	4.72	4.34 - 5.10	143-144	Rwanda	0.850	0.824 - 0.875
143	Equatorial Guinea	4.71	4.33 - 5.07	146	Ghana	0.847	0.811 - 0.882
144	Kenya	4.67	4.28 - 5.05	147	South Africa	0.844	0.811 - 0.869
145-147	Rwanda	4.62	4.22 - 5.01	148-149	Lesotho	0.842	0.818 - 0.863
145-147	Lesotho	4.62	4.23 - 4.99	150	United Republic of Tanzania	0.836	0.808 - 0.862
148	Sao Tome and Principe	4.61	4.21 - 4.99	151	Congo	0.834	0.780 - 0.881
149	Nigeria	4.60	4.22 - 4.98	152	Malawi	0.831	0.804 - 0.855
154	Cape Verde	4.56	4.17 - 4.92	153-155	Comoros	0.830	0.801 - 0.856
155	Togo	4.54	4.16 - 4.91	153-155	Côte d'Ivoire	0.830	0.804 - 0.857
156	Cameroon	4.50	4.13 - 4.87	156	Namibia	0.828	0.802 - 0.854
157-160	United Republic of Tanzania	4.46	4.06 - 4.84	157	Gambia	0.825	0.797 - 0.850
157-160	Côte d'Ivoire	4.46	4.08 - 4.83	160	Benin	0.811	0.776 - 0.843
157-160	Comoros	4.46	4.06 - 4.83	162	Togo	0.803	0.771 - 0.835
162	Malawi	4.42	4.03 - 4.80	164	Burkina Faso	0.799	0.751 - 0.847
165-167	Mauritania	4.33	3.97 - 4.69	165	Uganda	0.796	0.751 - 0.818
165-167	Gambia	4.33	3.95 - 4.70	166-167	Zimbabwe	0.792	0.747 - 0.814
168-169	Madagascar	4.29	3.92 - 4.65	168	Burundi	0.790	0.750 - 0.825
168-169	Guinea	4.29	3.92 - 4.64	169-170	Democratic Republic of the Congo	0.783	0.743 - 0.817
171	Burundi	4.25	3.86 - 4.64	169-170	Eritrea	0.783	0.743 - 0.822
173	Sierra Leone	4.23	3.86 - 4.61	171	Zambia	0.781	0.739 - 0.816
174	Burkina Faso	4.18	4.06 - 4.31	174	Guinea-Bissau	0.762	0.703 - 0.818
175-176	Liberia	4.14	3.77 - 4.50	175	Mozambique	0.758	0.703 - 0.810
175-176	Benin	4.14	3.75 - 4.50	176	Liberia	0.753	0.680 - 0.822
177	Angola	4.10	3.74 - 4.46	177	Nigeria	0.746	0.696 - 0.792
179	Ethiopia	4.00	3.62 - 4.38	179-180	Ethiopia	0.733	0.665 - 0.797
181-182	Chad	3.96	3.59 - 4.31	179-180	Madagascar	0.733	0.665 - 0.798
183	Central African Republic	3.94	3.57 - 4.30	183	Cameroon	0.710	0.564 - 0.827
184	Guinea-Bissau	3.89	3.52 - 4.26	184	Niger	0.690	0.591 - 0.781
186	Eritrea	3.75	3.36 - 4.13	185	Chad	0.688	0.573 - 0.792
187-188	Mali	3.74	3.36 - 4.13	186	Sierra Leone	0.686	0.595 - 0.771
187-188	Uganda	3.74	3.61 - 3.87	187	Mali	0.685	0.601 - 0.763
189-190	Niger	3.73	3.35 - 4.12	188	Angola	0.683	0.549 - 0.797
189-190	Mozambique	3.73	3.34 - 4.12	191	Central African Republic	0.414	0.006 - 0.733

LEVEL				DISTRIBUTION			
Rank	Member State	Index	Uncertainty interval	Rank	Member State	Index	Uncertainty interval
AMRO				AMRO			
1	United States of America	8.10	7.32 - 8.96	3-38	Argentina	0.995	0.992 - 0.997
7-8	Canada	6.98	6.44 - 7.54	3-38	Bahamas	0.995	0.992 - 0.997
18	Bahamas	6.77	6.28 - 7.29	3-38	Barbados	0.995	0.993 - 0.997
39	Barbados	5.98	5.57 - 6.41	3-38	Canada	0.995	0.993 - 0.997
40	Argentina	5.93	5.53 - 6.34	3-38	Saint Kitts and Nevis	0.995	0.993 - 0.997
41	Uruguay	5.87	5.47 - 6.28	3-38	United States of America	0.995	0.993 - 0.997
45	Chile	5.81	5.41 - 6.21	39-42	Antigua and Barbuda	0.994	0.992 - 0.996
47-48	Antigua and Barbuda	5.78	5.37 - 6.17	53-57	Uruguay	0.981	0.977 - 0.985
53-54	Saint Kitts and Nevis	5.66	5.26 - 6.06	72	Dominican Republic	0.959	0.952 - 0.966
53-54	Mexico	5.66	5.25 - 6.07	73-74	Jamaica	0.956	0.950 - 0.962
59	Panama	5.52	5.11 - 5.90	77-78	Dominica	0.949	0.942 - 0.955
63-64	Grenada	5.46	5.04 - 5.85	79-81	Suriname	0.947	0.940 - 0.953
68	Costa Rica	5.39	4.99 - 5.77	82	Saint Lucia	0.946	0.938 - 0.953
69-72	Venezuela, Bolivarian Republic of	5.37	4.98 - 5.75	84-85	Brazil	0.944	0.942 - 0.968
76-79	Ecuador	5.32	5.15 - 5.49	84-85	Grenada	0.944	0.937 - 0.951
82	Colombia	5.30	4.92 - 5.68	86-87	Costa Rica	0.943	0.936 - 0.950
84-86	Saint Lucia	5.25	4.84 - 5.63	88	Panama	0.939	0.932 - 0.946
84-86	Dominica	5.25	4.86 - 5.64	90	Belize	0.937	0.929 - 0.944
87	Suriname	5.23	4.82 - 5.62	92	Venezuela, Bolivarian Republic of	0.933	0.925 - 0.941
95	Dominican Republic	5.14	4.74 - 5.51	93-94	Colombia	0.931	0.923 - 0.939
97	Paraguay	5.12	4.74 - 5.50	98-100	Cuba	0.920	0.909 - 0.930
103-104	Saint Vincent and the Grenadines	5.05	4.66 - 5.43	98-100	Saint Vincent and the Grenadines	0.920	0.911 - 0.929
105-107	Jamaica	5.03	4.65 - 5.41	103	Chile	0.918	0.902 - 0.933
105-107	Belize	5.03	4.63 - 5.40	105-106	Guyana	0.911	0.900 - 0.921
114	Guyana	4.98	4.58 - 5.36	108-109	Mexico	0.909	0.888 - 0.924
115-117	Guatemala	4.97	4.81 - 5.12	108-109	Trinidad and Tobago	0.909	0.894 - 0.925
115-117	Cuba	4.97	4.57 - 5.36	128-129	El Salvador	0.874	0.854 - 0.892
128	El Salvador	4.84	4.47 - 5.22	133	Paraguay	0.871	0.848 - 0.892
129	Honduras	4.82	4.45 - 5.19	139	Nicaragua	0.860	0.840 - 0.878
130-131	Brazil	4.81	4.68 - 4.94	159	Guatemala	0.812	0.787 - 0.837
140	Nicaragua	4.75	4.36 - 5.11	161	Peru	0.808	0.793 - 0.850
141	Trinidad and Tobago	4.73	4.60 - 4.86	163	Honduras	0.800	0.757 - 0.841
151-153	Bolivia	4.58	4.46 - 4.70	172-173	Haiti	0.776	0.726 - 0.823
157-160	Haiti	4.46	4.10 - 4.84	178	Bolivia	0.745	0.723 - 0.768
172	Peru	4.24	4.12 - 4.36	182	Ecuador	0.723	0.709 - 0.821
EMRO				EMRO			
11	Cyprus	6.88	6.76 - 7.00	1	United Arab Emirates	1.000	1.000 - 1.000
26-27	Qatar	6.51	6.02 - 7.00	3-38	Bahrain	0.995	0.992 - 0.997
29	Kuwait	6.34	5.84 - 6.82	3-38	Kuwait	0.995	0.993 - 0.997
30	United Arab Emirates	6.33	6.24 - 6.41	3-38	Qatar	0.995	0.993 - 0.997
43-44	Bahrain	5.82	5.38 - 6.24	44	Cyprus	0.991	0.988 - 0.994
55	Lebanon	5.61	5.20 - 6.01	49	Oman	0.983	0.979 - 0.987
57-58	Libyan Arab Jamahiriya	5.53	5.10 - 5.93	50-52	Saudi Arabia	0.982	0.978 - 0.986
67	Saudi Arabia	5.40	4.97 - 5.78	53-57	Jordan	0.981	0.976 - 0.985
69-72	Syrian Arab Republic	5.37	4.94 - 5.76	59	Egypt	0.979	0.968 - 0.988
84-86	Oman	5.27	4.85 - 5.65	60-61	Tunisia	0.976	0.971 - 0.981
84-86	Jordan	5.25	4.83 - 5.63	67-68	Morocco	0.967	0.960 - 0.973
94	Tunisia	5.15	4.75 - 5.52	76	Libyan Arab Jamahiriya	0.953	0.947 - 0.960
100	Iran, Islamic Republic of	5.10	4.71 - 5.48	79-81	Lebanon	0.947	0.940 - 0.954
102	Egypt	5.06	4.94 - 5.17	79-81	Syrian Arab Republic	0.947	0.940 - 0.954

LEVEL				DISTRIBUTION			
Rank	Member State	Index	Uncertainty interval	Rank	Member State	Index	Uncertainty interval
103-104	Iraq	5.05	4.63 - 5.43	93-94	Iran, Islamic Republic of	0.931	0.923 - 0.939
120-121	Pakistan	4.95	4.54 - 5.32	114	Iraq	0.898	0.883 - 0.912
151-153	Morocco	4.58	4.20 - 4.94	115	Pakistan	0.897	0.883 - 0.909
164	Sudan	4.34	3.96 - 4.71	140	Djibouti	0.858	0.834 - 0.880
170	Djibouti	4.28	3.87 - 4.66	148-149	Sudan	0.842	0.818 - 0.863
180	Yemen	3.98	3.61 - 4.35	172-173	Afghanistan	0.776	0.729 - 0.819
181-182	Afghanistan	3.96	3.57 - 4.33	189	Yemen	0.673	0.489 - 0.820
191	Somalia	3.69	3.31 - 4.07	190	Somalia	0.621	0.440 - 0.772
EURO				EURO			
2	Switzerland	7.44	6.79 - 8.13	2	Bulgaria	0.996	0.994 - 0.997
3	Luxembourg	7.37	6.73 - 8.06	3-38	Austria	0.995	0.993 - 0.997
4	Denmark	7.12	6.55 - 7.73	3-38	Belgium	0.995	0.993 - 0.997
5	Germany	7.10	6.52 - 7.72	3-38	Denmark	0.995	0.993 - 0.997
7-8	Norway	6.98	6.40 - 7.60	3-38	Finland	0.995	0.993 - 0.997
9	Netherlands	6.92	6.38 - 7.49	3-38	France	0.995	0.993 - 0.997
10	Sweden	6.90	6.35 - 7.47	3-38	Germany	0.995	0.993 - 0.997
12-13	Austria	6.86	6.31 - 7.45	3-38	Greece	0.995	0.993 - 0.997
14	Monaco	6.85	6.32 - 7.44	3-38	Iceland	0.995	0.993 - 0.997
15	Iceland	6.84	6.31 - 7.42	3-38	Ireland	0.995	0.993 - 0.997
16-17	France	6.82	6.27 - 7.42	3-38	Israel	0.995	0.993 - 0.997
16-17	Belgium	6.82	6.29 - 7.39	3-38	Italy	0.995	0.993 - 0.997
19	Finland	6.76	6.26 - 7.29	3-38	Luxembourg	0.995	0.993 - 0.997
20-21	Israel	6.70	6.22 - 7.22	3-38	Malta	0.995	0.993 - 0.997
22-23	Italy	6.65	6.13 - 7.20	3-38	Monaco	0.995	0.993 - 0.997
25	Ireland	6.52	6.03 - 7.02	3-38	Netherlands	0.995	0.993 - 0.997
26-27	United Kingdom	6.51	6.01 - 7.05	3-38	Norway	0.995	0.993 - 0.997
28	Andorra	6.44	5.97 - 6.93	3-38	San Marino	0.995	0.993 - 0.997
32	San Marino	6.30	5.84 - 6.79	3-38	Spain	0.995	0.992 - 0.997
34	Spain	6.18	5.74 - 6.63	3-38	Sweden	0.995	0.993 - 0.997
36	Greece	6.05	5.63 - 6.48	3-38	Switzerland	0.995	0.993 - 0.997
37	Slovenia	6.04	5.62 - 6.48	3-38	United Kingdom	0.995	0.993 - 0.997
38	Portugal	6.00	5.58 - 6.44	39-42	Andorra	0.994	0.992 - 0.996
43-44	Malta	5.82	5.42 - 6.24	45-47	Belarus	0.987	0.984 - 0.990
47-48	Czech Republic	5.78	5.38 - 6.19	45-47	Czech Republic	0.987	0.984 - 0.990
50	Poland	5.73	5.61 - 5.85	45-47	Lithuania	0.987	0.984 - 0.990
60	Slovakia	5.51	5.37 - 5.66	53-57	Latvia	0.981	0.977 - 0.985
62	Hungary	5.47	5.36 - 5.59	53-57	Portugal	0.981	0.977 - 0.985
66	Estonia	5.44	5.04 - 5.84	53-57	Slovenia	0.981	0.977 - 0.985
69-72	Russian Federation	5.37	4.97 - 5.76	58	Hungary	0.980	0.976 - 0.985
69-72	Latvia	5.37	4.97 - 5.77	60-61	Kazakhstan	0.976	0.972 - 0.981
73-74	Romania	5.35	4.96 - 5.76	63-64	Slovakia	0.973	0.968 - 0.978
76-79	Belarus	5.32	4.92 - 5.72	63-64	Ukraine	0.973	0.968 - 0.978
76-79	Croatia	5.32	4.93 - 5.71	65	Poland	0.970	0.964 - 0.976
80-81	Lithuania	5.31	4.90 - 5.71	66	Turkey	0.969	0.964 - 0.974
88-89	Turkmenistan	5.20	4.78 - 5.59	67-68	Romania	0.967	0.961 - 0.972
90-91	Kazakhstan	5.19	4.80 - 5.58	69	Estonia	0.963	0.957 - 0.968
92	Armenia	5.18	4.77 - 5.57	71	Uzbekistan	0.960	0.953 - 0.965
93	Turkey	5.16	4.74 - 5.53	83	Croatia	0.945	0.939 - 0.952
96	Ukraine	5.13	4.72 - 5.52	86-87	Russian Federation	0.943	0.936 - 0.950
105-107	Uzbekistan	5.03	4.62 - 5.42	95	The former Yugoslav Republic of Macedonia	0.926	0.915 - 0.935
108-110	Bosnia and Herzegovina	5.02	4.64 - 5.40	96	Kyrgyzstan	0.925	0.915 - 0.933
111	The former Yugoslav Republic of Macedonia	5.01	4.62 - 5.40	107	Republic of Moldova	0.910	0.899 - 0.919

LEVEL				DISTRIBUTION			
Rank	Member State	Index	Uncertainty interval	Rank	Member State	Index	Uncertainty interval
115-117	Yugoslavia	4.97	4.59 - 5.36	111-112	Armenia	0.905	0.891 - 0.917
123	Republic of Moldova	4.92	4.54 - 5.30	113	Turkmenistan	0.899	0.886 - 0.912
124	Kyrgyzstan	4.91	4.51 - 5.29	116	Yugoslavia	0.895	0.882 - 0.907
125	Tajikistan	4.90	4.49 - 5.29	117	Albania	0.894	0.878 - 0.910
130-131	Azerbaijan	4.81	4.43 - 5.19	124	Bosnia and Herzegovina	0.881	0.866 - 0.895
136	Albania	4.79	4.39 - 5.17	125	Azerbaijan	0.878	0.863 - 0.893
161	Bulgaria	4.43	4.30 - 4.57	136	Tajikistan	0.864	0.845 - 0.881
165-167	Georgia	4.33	4.18 - 4.48	141	Georgia	0.855	0.835 - 0.874
SEARO				SEARO			
33	Thailand	6.23	6.11 - 6.35	50-52	Thailand	0.982	0.973 - 0.990
63-64	Indonesia	5.46	5.35 - 5.57	70	Indonesia	0.961	0.948 - 0.973
98-99	Maldives	5.11	4.69 - 5.49	77-78	Sri Lanka	0.949	0.941-0.956
101	Sri Lanka	5.08	4.69 - 5.47	101-102	Maldives	0.919	0.909 - 0.928
108-110	India	5.02	4.61 - 5.41	127	India	0.876	0.856 - 0.895
139	Democratic People's Republic of Korea	4.76	4.36 - 5.14	130-131	Democratic Peoples' Republic of Korea	0.873	0.852 - 0.892
151-153	Myanmar	4.58	4.21 - 4.95	137-138	Bhutan	0.861	0.840 - 0.881
163	Bhutan	4.35	3.96 - 4.72	158	Myanmar	0.822	0.785 - 0.856
178	Bangladesh	4.07	3.94 - 4.20	166-167	Nepal	0.792	0.757 - 0.825
185	Nepal	3.83	3.69 - 3.98	181	Bangladesh	0.728	0.699 - 0.756
WPRO				WPRO			
6	Japan	7.00	6.43 - 7.61	3-38	Australia	0.995	0.993 - 0.997
12-13	Australia	6.86	6.34 - 7.40	3-38	Brunei Darussalam	0.995	0.993 - 0.997
20-21	Singapore	6.70	6.16 - 7.25	3-38	Japan	0.995	0.993 - 0.997
22-23	New Zealand	6.65	6.18 - 7.15	3-38	New Zealand	0.995	0.993 - 0.997
24	Brunei Darussalam	6.59	6.11 - 7.07	3-38	Singapore	0.995	0.993 - 0.997
31	Malaysia	6.32	6.21 - 6.42	39-42	Nauru	0.994	0.992 - 0.996
35	Republic of Korea	6.12	5.99 - 6.24	39-42	Palau	0.994	0.992 - 0.996
42	Nauru	5.83	5.41 - 6.25	43	Republic of Korea	0.992	0.990 - 0.994
46	Mongolia	5.79	5.67 - 5.92	48	Philippines	0.986	0.982 - 0.987
49	Philippines	5.75	5.64 - 5.87	62	Malaysia	0.975	0.965 - 0.983
51	Viet Nam	5.70	5.59 - 5.81	73-74	Fiji	0.956	0.950 - 0.962
52	Palau	5.69	5.27 - 6.09	89	Cook Islands	0.938	0.929 - 0.946
57-58	Fiji	5.53	5.10 - 5.93	91	Mongolia	0.934	0.916 - 0.952
61	Tonga	5.49	5.07 - 5.89	97	Tonga	0.921	0.910 - 0.932
65	Cook Islands	5.45	5.05 - 5.85	98-100	Samoa	0.920	0.908 - 0.930
80-81	Samoa	5.31	4.88 - 5.72	105-106	China	0.911	0.899 - 0.922
88-89	China	5.20	4.79 - 5.58	119	Papua New Guinea	0.891	0.875 - 0.906
98-99	Marshall Islands	5.11	4.70 - 5.52	120	Solomon Islands	0.890	0.875 - 0.903
112	Micronesia, Federated States of	5.00	4.60 - 5.38	121	Viet Nam	0.884	0.870 - 0.900
120-121	Kiribati	4.95	4.54 - 5.35	122	Kiribati	0.883	0.864 - 0.901
126	Niue	4.87	4.48 - 5.25	128-129	Micronesia, Federated States of	0.874	0.858 - 0.889
127	Vanuatu	4.85	4.46 - 5.22	132	Vanuatu	0.872	0.854 - 0.887
132-135	Solomon Islands	4.80	4.40 - 5.18	134-135	Marshall Islands	0.866	0.848 - 0.882
132-135	Tuvalu	4.80	4.40 - 5.18	137-138	Cambodia	0.861	0.836 - 0.884
137-138	Cambodia	4.77	4.37 - 5.15	143-144	Lao People's Democratic Republic	0.850	0.778 - 0.912
145-147	Lao People's Democratic Republic	4.62	4.23 - 5.00	145	Niue	0.848	0.824 - 0.871
150	Papua New Guinea	4.59	4.18 - 4.96	153-155	Tuvalu	0.830	0.804 - 0.856