

## Page Proof Instructions and Queries

**Journal Title:** *Scandinavian Journal of Public Health*

**Article Number:** 675550

Greetings, and thank you for publishing with SAGE. We have prepared this page proof for your review. Please respond to each of the below queries by digitally marking this PDF using Adobe Reader (free at <https://get.adobe.com/reader>).

Please use *only* the circled tools to indicate your requests and responses, as edits via other tools/methods are not compatible with our software. To ask a question or request a formatting change (such as italics), please click the  tool and then choose “Text Callout.” To access the necessary tools, choose “Comment” from the right-side menu.



**As you are aware there is a \$100 charge per page for all pages over 5 pages. If your article is over 5pp in total extent, please provide your institute’s VAT number (if you are in the EU) so that our Finance department can send you the necessary invoice.**

No.	Query
	Please confirm that all author information, including names, affiliations, sequence, and contact details, is correct.
	Please review the entire document for typographical errors, mathematical errors, and any other necessary corrections; check headings, tables, and figures.
	Please ensure that you have obtained and enclosed all necessary permissions for the reproduction of art works (e.g. illustrations, photographs, charts, maps, other visual material, etc.) not owned by yourself. Please refer to your publishing agreement for further information.
	Please note that this proof represents your final opportunity to review your article prior to publication, so please do send all of your changes now.
	Please confirm that the Funding and Conflict of Interest statements are accurate.
1	Please note references have been re-numbered to include UNICEF reference as ref. 2. Please check very carefully and confirm that these are now all correct.
2	Would it be better to use ‘mean’ income in the following sentence and throughout the paper and tables rather ‘average’? ‘For example, the UK’s average income is £28,000, yet 60% of the population receive less than £18,000 per year, indicating the mode income is far lower than the average [21].’
3	Please confirm funding statement is now correct.
4	Please give web address for ref. 2.
5	Please note references have been re-numbered to include UNICEF ref. as ref. 2. Please check very carefully and confirm that these are now correct.
6	Please explain why some entries in Table I are in italic font.
7	Please explain why some entries in Table III are in italic font.

ORIGINAL ARTICLE

## Child mortality and poverty in three world regions (the West, Asia and Sub-Saharan Africa) 1988–2010: Evidence of relative intra-regional neglect?

COLIN PRITCHARD & STEVEN KEEN

Faculty of Health and Social Sciences, Bournemouth University, UK

### Abstract

**Aims:** Poverty kills children. This study assesses the relationship between poverty and child mortality rates (CMRs) in 71 societies from three world regions to determine whether some countries, relative to their region, neglect their children. **Methods:** Spearman rank order correlations were calculated to determine any association between the CMR and poverty data, including income inequality and gross national income. A current CMR one standard deviation (SD) above or below the regional average and a percentage change between 1988 and 2010 were used as the measures to assess the progress of nations. **Results:** There were positive significant correlations between higher CMRs and relative poverty measures in all three regions. In Western countries, the current CMRs in the USA, New Zealand and Canada were 1 SD below the Western mean. The narrowest income inequalities, apart from Japan, were seen in the Scandinavian nations alongside low CMRs. In Asia, the current CMRs in Pakistan, Myanmar and India were the highest in their region and were 1 SD below the regional mean. Alongside South Korea, these nations had the lowest percentage reductions in CMRs. In Sub-Saharan Africa, the current CMRs in Somalia, Burkina Faso, Sierra Leone, Chad, Democratic Republic of Congo and Angola were the highest in their region and were 1 SD below the regional mean. **Conclusions:** Those concerned with the pursuit of social justice need to alert their societies to the corrosive impact of poverty on child mortality. Progress in reducing CMRs provides an indication of how well nations are meeting the needs of their children. Further country-specific research is required to explain regional differences.

**Key Words:** *Child mortality, poverty, international comparisons*

### Introduction

‘Poverty and inequity kill children’ [1]. Poverty is therefore the context in which child mortality rates (CMRs) have been analysed in this study because, as UNICEF states, ‘in the last analysis CMR are an indication of how well a nation meets the needs of its children’ [2] **IAQ: 1**. This study assessed the relationship between poverty and CMR in 71 societies from three world regions – the West, Asia and Sub-Saharan Africa (SSA) – and how successful they have been in reducing CMRs over time, relative to and in comparison with their region.

It is unusual to examine regions with markedly different socio-economic circumstances. The previous

concept of developed and under-developed nations is now redundant in our ‘globalized’ world because countries can be placed along a continuum of socio-economic development [3]. This juxtaposition of three regions provides a comparative perspective of what is happening to children, in the context of poverty, from a regional perspective. Although the socio-political and economic make-up of these regions varies considerably, all the countries reviewed here have signed up to the United Nations’ aspiration of reducing the CMR of under-5s by 2% per annum [4].

The importance of the poverty dimension originates from the seminal work of Wilkinson and Pickett

---

Correspondence: Steven Keen, National Centre for Post-Qualifying Social Work and Professional Practice, Bournemouth University, Bournemouth BH1 3LT, UK. E-mail: skeen@bournemouth.ac.uk

(Accepted 21 September 2016)

© Author(s) 2016

Reprints and permissions: [sagepub.co.uk/journalsPermissions.nav](http://sagepub.co.uk/journalsPermissions.nav)

DOI: 10.1177/1403494816675550

[sjp.sagepub.com](http://sjp.sagepub.com)



[5], who highlighted the significance of income inequality, a measure of relative poverty relevant to Western societies. Income inequality is linked with a range of negative outcomes, such as poorer employment, education, crime, housing and health outcomes, as detailed in numerous Western studies [6–8]. CMRs are also influenced by a range of political, economic, social and educational policies [1,9,10]. International comparisons of CMRs are notoriously difficult to conduct, especially when contrasting three world regions. However, as each nation is assessed against itself over time, it becomes its own control within its regional context, to judge how successful it has been in reducing CMRs [11]. Although there has been a great deal of research examining progress in reducing CMRs [12,13], this is the first known comparative study examining the poverty link across three world regions.

## Methods

### *Mortality data*

Two types of mortality data were used: confirmed and estimated figures. The World Health Organization (WHO) [14] provides confirmed annual deaths for babies (<1 year) and infants (1–4 years) in the 21 Western and five of the 17 Asian countries studied here. CMRs for under-5s (0–4 years) per million of population were calculated from these figures. Since 1968, annual WHO mortality data have been collected from member states, although the data are invariably 4–5 years behind the year of publication.

UNICEF [15] and UN Millennium Goals Indicators (MGIs) [16] provide estimated levels of child mortality from intra-country expert committees, but have been criticized because of the discrepancies between them [17]. There are inevitably variations between the WHO, UNICEF and UN MGI data for the same years. For instance, a brief inspection of the UN MGI data for the UK in 2010 gives a mortality estimate of 5.2 per 1000 live births, equivalent to 5200 per million, but WHO data yield a confirmed rate of 4464 per million. Although the WHO rates are invariably lower than the UNICEF and UN MGI estimated data, the UNICEF results are generally closer to the WHO figures for the West and the industrialized Asian countries. Therefore the UNICEF data have been used for societies without WHO information, as indicated in the tables. As CMRs vary on an annual basis, a 3-year baseline average (1988–1990) was contrasted with a 3-year index average (2008–2010) and the percentage change was calculated. WHO data for China were available until 1994, based on a 10% sample of population (running into the tens of millions), but UNICEF data were used for 2008–2010. Index data

for Canada and New Zealand were only available from 2007 to 2009 and Germany's slightly later baseline years of 1990–1992 follow its reunification.

### *Poverty data*

There is a long-standing debate about definitions of poverty, crucially between 'relative' poverty in Western countries and 'absolute' poverty in the lower income world [18]. The World Bank [19] highlights that although there is no internationally agreed definition of poverty, in effect each country determines a 'relevant welfare measure' juxtaposed against a selected poverty line for that country to report poverty in relation to its total population. The Western concept of relative poverty is usually proportional to the national average income, so a family income 60% below the average is designated as relative poverty [19].

For Western countries, a ratio of income inequality is used, i.e. the gap between the top and bottom 20% of income [5]. The benefit of using this ratio is that it is country-specific, thereby reflecting the relative positions of poorer families within that society, but avoiding the blurring of average incomes.

Gross national income (GNI) by purchasing power parity (PPP) data [20] have also been used for all three regions, particularly as no comparable income inequality data exist for Asian or SSA countries. PPP is the estimated value of the local currency converted into US dollars sufficient to obtain basic foodstuffs, but does not demonstrate the income gaps that exist in that society. Absolute poverty relates to an individual surviving on \$1–2 a day [21]. GNI is the total national income divided by the total population, adjusted for PPP, and so provides a global indication of parity of income to show relative gaps between the West and other regions. The problem of an average income figure is that it obscures variations between groups. For example, the UK's average income is £28,000, yet 60% of the population receive less than £18,000 per year, indicating the mode income is far lower than the average [21]. **IAQ: 2**

Data have been published [20] that included 30 of the 33 SSA countries and so matching GNI data are reported for 2010. SSA data were available for 2015, but over the five years there was virtually no difference between countries' rankings, hence the CMRs and the 2010 GNIs were correlated to explore any link between CMR and poverty.

### *Socio-economic issues*

The different socio-economic backgrounds of these regions are recognized, but to a certain extent both Asian and SSA societies from the former British

Table I. Child mortality rates, income inequality and gross national income in Western countries by purchasing power parity. **TAQ: 6**

Country in order of CMR rank	CMR baseline per million (1988–1990) [14]	CMR index per million (2008–2010 unless stated otherwise) [14]	Change (%)	Income inequality [5]	Lowest GNI by PPP rank [20]
1. USA	2420	1503	–38 <sup>a</sup>	8.5	17 \$45,640
2. New Zealand (2007–2009)	2361	1308	–45	6.8	NA
3. Canada (2007–2009)	1740	1189	–32 <sup>a</sup>	5.6	12 \$37,280
4. UK	1929	1113	–42	7.2	9 \$35,860
5. Australia	1886	1030	–45	7.0	15 \$38,510
6. Ireland	1659	947	–43	6.1	NA
7. Switzerland	1783	944	–47	5.7	18 \$47,100
8. Austria	1944	939	–52	4.8	5 \$31,900
9. Netherlands	1729	906	–48	5.3	13 \$37,940
10. Belgium	2013	886	–56	4.5	10 \$36,610
11. France	1740	876	–50	5.6	8 \$33,950
12. Germany	1611	838	–48	5.2	11 \$36,850
13. Italy	1895	822	–57	6.7	4 \$31,870
14. Spain	1790	820	–54	5.6	3 \$31,490
15. Denmark	1993	813	–59	4.3	6 \$32,678
16. Greece	2039	792	–61	6.2	2 \$28,880
17. Portugal	3019	782	–74	8	1 \$24,080
18. Norway	2005	691	–64	3.9	16 \$39,869
19. Japan	1218	663	–46	3.4	7 \$33,440
20. Finland	1463	632	–57	3.7	NA
21. Sweden	1520	624	–59	4.0	14 \$38,050
Average	1893	910	–51		\$35,662

CMR: child mortality rate; GNI: gross national income; NA: not available; PPP: purchasing power parity.

<sup>1</sup>SD = 216 per million.

<sup>a</sup>Failed to meet millennium target of reducing CMR by 2% per annum [4].

Empire have faced similar post-colonial struggles [23]. Comparisons of countries since their independence within, not between, regions is therefore considered reasonable. Although Angola, China, Nigeria, Somalia, South Africa and Yemen are considered as developing countries, they among the world's top 20 producers of minerals and oil. It must also be noted that 14 of the 33 SSA countries have endured serious civil conflicts over the period under review.

### Statistical analysis

Spearman rank order (Rho) correlations were used to determine any statistical association between regional CMRs and poverty, i.e. the GNI data. The standard deviation (SD) value of the CMR in each of the regions was calculated. CMR 1 SD above or below the regional average and a percentage change between the baseline and index years were used to assess a nation's progress.

## Results

### The West

*Socio-economic data.* Table I lists the socio-economic data for Western countries. The USA has the widest income inequality, with the top 20% of salaries 8.5

times those of the bottom 20%, followed by Portugal and the UK. The narrowest income inequalities are, apart from Japan (3.4 times), seen in the Scandinavian nations of Finland, Norway and Sweden. Switzerland has the highest GNI (\$47,100), followed by the USA, down to the lowest figures in Portugal and Spain. Based on 18 countries (owing to missing data from three countries) the average Western GNI is \$35,662 per person; the UK figure lies just above this at \$35,860.

*CMR.* Table I also shows that the top six highest CMRs (0–4 years) are from English-speaking nations, led by the USA at 1503 per million. Nations with the lowest CMRs, apart from Japan at 663 per million, are again from Scandinavia. Current CMRs in the USA, New Zealand and Canada are 1 SD above the Western mean. Canada and the USA, with the lowest percentage reductions in CMRs of the region, also failed to meet the UN millennium target of reducing CMRs by 2% per annum. Conversely, the current CMRs in Sweden, Finland, Japan and Norway are 1 SD below the regional mean. Portugal and Greece had the highest CMRs during the baseline years and achieved the largest reductions (74%) over the period. Eleven other countries had decreases in their CMRs of 50% or more. The UK's rate fell by 42%,

Table II. Child mortality rates and gross national income by purchasing power parity in industrialized and non-industrialized Asian countries.

Country by CMR rank	CMR baseline per million (1988–1990, unless stated otherwise) [15, unless stated otherwise]	CMR index per million (2008–2010, unless stated otherwise) [15, unless stated otherwise]	Change (%)	Lowest GNI by PPP rank [20]
<b>Non-industrialized countries</b>				
1. Pakistan	124,000	87,000	–30 <sup>a</sup>	4 \$2,680
2. Myanmar	112,000	66,000	–41	NA
3. India	115,000	63,000	–45	6 \$3280
4. Cambodia	121,000	51,000	–58	3 \$1820
5. Nepal	141,000	50,000	–64	1 \$1180
6. Bangladesh	143,000	48,000	–66	2 \$1550
7. Indonesia	85,000	35,000	–59	8 \$3720
8. Philippines	59,000	29,000	–51	7 \$3540
9. Vietnam	51,000	23,000	–55	5 \$2790
10. China (1994) [14]	9390	NA	NA	10 \$6890
10. China	48,000	18,000	–62	10 \$6890
11. Sri Lanka	32,000	17,000	–47	9 \$4720
12. Thailand	32,000	13,000	–59	11 \$7640
13. Malaysia	18,000	6000	–67	12 \$13,710
Non-industrialized average	88,000	39,000	–56	\$4460
<b>Industrialized countries</b>				
14. South Korea (2007–2009) [14]	1220	840	–31 <sup>a</sup>	13 \$27,240
15. Hong Kong [14]	1550	808	–48	15 \$44,540
16. Japan [14]	1218	663	–46	14 \$33,440
17. Singapore [14]	1598	552	–67	16 \$49,780
Industrialized average	1397	715	–49	\$38,750

CMR: child mortality rate; GNI: gross national income; NA: not available; PPP: purchasing power parity.

Non-industrialized 1 SD = 23,000 per million; industrialized 1 SD = 116 per million.

<sup>a</sup>Failed to meet millennium target of reducing CMR by 2% per annum [4].

lower than the average Western reduction of 51% over the period.

*CMR–poverty association.* There was a positive significant correlation between higher CMRs and GNI ( $Rho=+0.6416$ ,  $p<0.005$ ) confirming that there is a strong association between relative poverty and child mortality at national levels.

#### Asia

*Socio-economic data.* Table II shows that the GNIs in Singapore and Hong Kong are \$49,780 and \$44,540, respectively; they have the second and fifth highest GNIs within the three regions, well above the average of the industrialized Asian countries at \$38,750 and the West's average of \$35,662. The GNI in non-industrialized Asian countries ranges from \$1180 in Nepal to \$13,710 in Malaysia. The average Western GNI is therefore nearly eight times higher than the non-industrialized Asian country average of \$4460.

*CMR.* Pakistan has the highest CMR of the non-industrialized Asian nations at 87,000 per million and, alongside Myanmar and India, has a current

CMR 1 SD above the non-industrialized regional mean (Table II). China's (WHO) data from 1994, based on urban and rural 10% samples, averaged a CMR of 9394 per million. The UNICEF data [15] estimated a total mortality rate of 48,000 per million in 1990, reducing by 62% to 18,000 per million by 2010. Thailand's current CMR is 1 SD below the regional mean; Sri Lanka and China narrowly missed this measure with CMRs of 17,000 and 18,000 per million, respectively. Malaysia, with a CMR estimated at 6000 per million, achieved a remarkable 67% reduction over the period. The CMRs in non-industrialized Asian countries are more than 40 times higher than the Western average. The CMRs of all industrialized Asian countries are lower than the Western average (910 per million), with lows of 522 per million in Singapore and 663 per million in Japan. South Korea is likely to have suffered from the problem of diminishing returns [24] because its rate of 842 per million is >1 SD above the industrialized mean. South Korea, alongside Pakistan, also failed to meet the UN millennium target.

*CMR–poverty association.* The correlation between CMR and GNI is highly statistically significant ( $Rho+0.9323$ ,  $p<0.001$ ) again confirming a very

strong association between relative poverty and child mortality.

### *Sub-Saharan Africa*

*Socio-economic data.* GNI data [20] are available for 30 of the 33 SSA countries (Table III). Gabon, Botswana and South Africa have the highest GNI in this region. The Democratic Republic of Congo, Liberia, Malawi and Niger have the lowest figures, ranging from \$630 to \$880. Bearing in mind these figures denote the average income per person, this means that a considerable proportion of the SSA populations must be living in absolute poverty on less than \$1 or \$2 per day [19]. Although the SSA GNI average of \$3833 is similar to the average of non-industrialized Asian countries of \$4460, the Western (\$35,662) and industrialized Asian (\$38,750) averages are around 10 times higher.

*CMR.* Table III also lists the CMRs for SSA nations. Only South Africa has WHO data [14]; UNICEF [15] estimates were used for the remaining countries. The highest CMRs were in Somalia at 188,000 per million, followed by Burkina Faso, Sierra Leone, Chad, Democratic Republic of Congo and Angola. Figures from these six countries are all 1 SD above the regional mean; they also failed to meet the UN millennium target. Countries with the lowest current CMRs include South Africa, Namibia, Botswana and Madagascar, where the CMRs are 1 SD below the regional mean. South Africa, Somalia and Zimbabwe increased their rates over the study period; Botswana did not meet the UN millennium target.

The average reduction in CMR was 33% and 16 SSA countries reduced their CMR by >35%, 12 achieving the UN target of a 2% reduction in CMR per annum. Although 21 (including South Africa) SSA countries did not meet this target, five countries came close, with decreases of >30%. Fourteen SSA countries have been in civil conflict situations over the last 20 years; paradoxically, Ethiopia, Liberia, Madagascar, Rwanda and Yemen managed to nevertheless reduce their CMR by >40% over the review period.

Perhaps the biggest surprise relates to figures from South Africa. Under the apartheid regime in 1990, WHO [14] data yield CMRs of 6431 per million; this might be a serious underestimation as child mortality in rural areas could have been unreported. The first available WHO data for the post-apartheid regime (2002–2004) records a rate of 10,410 per million, equivalent to a 62% increase. Taking only post-apartheid WHO data, the latest index years 2007–2009 figure of 11,245 per million points to an increase in

the CMR of 8% over 7 years. However, South Africa's annual figures vary widely from year to year – for example, in 2009 the WHO reported rate decreased to 9158 per million.

*CMR–poverty association.* The rank order of GNI and CMR were significantly and positively correlated ( $\text{Rho}=+0.5131, p=0.005$ ). When looking at the SSA nations, those with higher GNI figures, such as Cameroon and Nigeria, had higher CMRs against expectations, whereas poorer countries, such as Madagascar and Zimbabwe, had lower CMRs, suggesting major differences in policy in these societies in relation to child health. To explain these differences more fully would require country-specific research.

## **Discussion**

### *Limitations*

The biggest limitation of this study relates to the necessity of using two different datasets – confirmed WHO data and UNICEF estimates of CMR – with the inevitable acknowledged inconsistencies [17]. The largest inconsistency in data, however, was in South Africa, with the UN data [16] (a CMR of 61,600 per million for 2008–2010) far exceeding the WHO rates. Although we are not in a position to state which figures are the more reliable, the WHO data appear to hold a greater degree of internal consistency because the UN MGI rates compared with the WHO data generally show that the WHO rates are lower. The marked increases, based on South Africa's 1990 WHO figure of 6431 per million, raises the question of the accuracy of earlier pre-1994 apartheid regime figures. It may be that the former regime was less likely to include the deaths of the rural Black population. Increases in treatment-resistant tuberculosis and HIV/AIDS deaths in the country [25] may also have contributed to real increases in the CMR. Another limitation is that 14 of the SSA countries faced civil conflict during the study period, which is likely to have affected the ability of these countries to meet the UN millennium goals, although five, including Liberia and Ethiopia, did meet the target.

These limitations, alongside the criticism that measuring a nation's progress using a crude measure of 1 SD above or below the regional average does not acknowledge country-specific strategies nor uneven starting points, mean that these results cannot be definitive. Rather they are indicative of changes found in other studies of non-Western societies, where the accuracy of data is problematic [11,26]. Despite these limitations, this study does provide a

Table III. Child mortality rates and gross national income by purchasing power parity in Sub-Saharan Africa countries. **TAQ: 7**

Country by CMR rank	CMR baseline per million (1988–1990, unless stated otherwise) [15, unless stated otherwise]	CMR index per million (2008–2010, unless stated otherwise) [15, unless stated]	Change (%)	Lowest GNI by PPP rank [20]
1. Somalia C	180,000	188,000	+4 <sup>a</sup>	NA
2. Burkina Faso	205,000	176,000	-14 <sup>a</sup>	10 \$1560
3. Sierra Leone C	276,000	174,000	-37 <sup>a</sup>	15= \$2210
4. Chad C	207,000	173,000	-16 <sup>a</sup>	14 \$1980
5. Democratic Republic of Congo C	181,000	170,000	-6 <sup>a</sup>	1 \$630
6. Angola C	243,000	161,000	-34 <sup>a</sup>	NA
7. = Nigeria C	213,000	143,000	-33 <sup>a</sup>	25 \$5380
8. = Niger	311,000	143,000	-54	4 \$880
9. Cameroon	137,000	136,000	-1 <sup>a</sup>	17 \$2780
10. Mozambique	219,000	135,000	-38 <sup>a</sup>	5 \$1060
11. Guinea	229,000	130,000	-43	6 \$1140
12. Cote d'Ivoire C	151,000	123,000	-19 <sup>a</sup>	19 \$2890
13. Zambia	183,000	111,000	-39 <sup>a</sup>	21 \$3580
14. Ethiopia C	184,000	106,000	-42	7= \$1370
15.= Sudan C	125,000	103,000	-18 <sup>a</sup>	23 \$3810
15.= Liberia C	227,000	103,000	-55	2 \$710
17. Uganda	175,000	99,000	-43	13 \$1680
18. Gambia	165,000	98,000	-41	11 \$1600
19. Congo (Kinshasa) C	116,000	93,000	-20 <sup>a</sup>	NA
20. Malawi	222,000	92,000	-59	3 \$760
21. Rwanda C	163,000	91,000	-44	9 \$1540
22. = Lesotho	89,000	85,000	-4 <sup>a</sup>	20 \$3280
22. = Kenya	99,000	85,000	-14 <sup>a</sup>	18 \$2820
24. Zimbabwe	78,000	80,000	+3 <sup>a</sup>	12 \$1610
25. Swaziland	96,000	78,000	-19 <sup>a</sup>	26 \$7450
26. Yemen C	128,000	77,000	-46	22 \$3650
27. Senegal	139,000	75,000	-46	15= \$2210
28.= Ghana C	122,000	74,000	-39 <sup>a</sup>	24 \$3850
28.= Gabon	93,000	74,000	-20 <sup>a</sup>	30 \$16,350
30. Madagascar C	159,000	62,000	-61	7= \$1370
31. Botswana	59,000	48,000	-19 <sup>a</sup>	26 \$15,110
32. Namibia	73,000	40,000	-45	27 \$9380
33. South Africa (2002–2004, 2007–2009) [14]	10,410	11,245	+8 <sup>a</sup>	28 \$12,350
Average	164,000 (excl. South Africa)	110,000 (excl. South Africa)	-33 <sup>a</sup>	\$3833
Non-industrialized Asia	88,000	39,000	-56	\$4460
Industrialized Asia	1397	715	-49	\$38,750
Western countries	1893	910	-52	\$35,662

C: civil conflict during the study period; CMR: child mortality rate; GNI: gross national income; NA: not available; PPP: purchasing power parity.

<sup>1</sup>SD = 39,000 per million.

<sup>a</sup>Failed to meet millennium target of reducing CMR by 2% per annum [4].

baseline for how well societies are meeting the needs of their children, relative and in comparison to their region, as each nation has been assessed against itself over time using a percentage of change.

#### *The West, Asia and Sub-Saharan Africa*

Most Western governments have demonstrated substantial reductions in CMRs [12], yet the USA, New Zealand and Canada have CMRs 1 SD above their

regional mean. The fact that the six highest CMRs occurred in English-speaking countries suggests that, despite major reductions, there are cultural factors influencing CMRs. Perhaps English-speaking societies are less child-focused than other Western countries, in particular the Scandinavian nations [1,11].

Relative poverty and higher CMRs are significantly correlated. The five Western countries with the highest CMRs occupy the six widest income inequality positions. Conversely, countries with the

narrowest income inequalities have the lowest CMRs, i.e. Sweden, Finland, Japan and Norway. Detailed country-specific research is required to explain these findings, although there are likely to be differences between health systems policy and practice and the social determinants of health [1].

There are also strong correlations between CMRs and relative poverty in Asian and SSA countries. Hong Kong and Singapore have lower CMRs than the Western average and seven non-industrialized Asian countries had impressive reductions of >40% in their CMR [12]. Yet the levels of SSA CMRs, like those in Pakistan, Myanmar and India, are overwhelming. Averaging 3.1% of all under-5s mortality, the African continent is one of hidden and silent sorrows. It is noted that some SSA countries, such as Nigeria, Angola and South Africa, are among the top 20 oil-producing and mineral-supplying nations, yet all failed the UN millennium challenge. Against expectations, some relatively richer countries, e.g. Nigeria, have higher CMRs, while lower income countries such as Madagascar have lower mortality figures. Again, further country-specific research is required to explain these anomalies.

### Implications

One feature must be the accumulative impact in societies of high child mortality as bereavement itself is damaging to family health [27]. Losing a baby must be one of the worst and most bitter tragedies for any parent in whatever world region and should be a focus of future research.

Globally, the rich are getting richer. Inequality continues to widen as 0.7% of the world's population has now increased its global wealth holding to 44%; 8.6% of the world's population now own 85% of the world's wealth [28]. Rapid increases in income inequality often lead to economic recession [28]. This gives further impetus to consider not only the current situation of children, but also what the outcome will be if these inequalities continue. We need to highlight the corrosive effect of poverty and its impact on children in every continent and hold our individual societies and governments to account. Together with the UN Convention on the Rights of the Child [29], they issue a challenge to all societies to honour their obligation to children in the constant pursuit of social justice, especially those societies that need to hear the silent sorrows of bereaved parents who have no voice.

### Conflicts of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article. This research was funded by National Centre for Post-Qualifying Social Work and Professional Practice, Bournemouth University.

**[AQ: 3]**

### References

- [1] Wolfe I, Donkin A, Marmot M, et al. UK child survival in a European context: recommendations for a national Countdown Collaboration. *Arch Dis Child* 2015;100:907–914.
- [2] UNICEF. *Child deaths by injury in rich nations*. (2001, accessed 25 July 2016). **[AQ: 4][AQ: 5]**
- [3] Rosling H. *Worldwide child mortality down to 1 in 20*, <http://www.gapminder.org/factpod/worldwide-child-mortality-down-to-1-in-20/> (2014, accessed 25 July 2016).
- [4] United Nations. *United Nations Millennium Goals*. Geneva: United Nations, 2000.
- [5] Wilkinson R and Pickett K. *The Spirit Level*. London: Allen, 2009.
- [6] Pritchard C and Wallace S. Comparing UK and other Western countries' health expenditure, relative poverty and child mortality: are British children doubly disadvantaged? *Child Soc* 2015;29:462–72.
- [7] Freemantle N, Wood J, Griffin C, et al. What factors predict differences in infant and perinatal mortality in primary care trusts in England? A prognostic model. *BMJ* 2009;339:287–92.
- [8] Hanf M, Nacher M, Guihenneuc C, et al. Global determinants of mortality in under 5's: 10 year worldwide longitudinal study. *BMJ* 2014;347:f6427.
- [9] Ponnambalam L, Samavedham L, Lee HR, et al. Understanding the socio-economic heterogeneity in healthcare in US countries: the effect of population density, education and poverty on H1N1 pandemic mortality. *Epidemiol Infect* 2012;140:803–12.
- [10] House JS, Schoeni RF and Pollack H. *The health effects of social and economic policy*. Washington DC: National Poverty Centre, 2009.
- [11] Pritchard C, Williams R and Wallace MS. Child mortality and poverty in the Western nations 1980–2010: are English-speaking-countries' children disadvantaged? *Childhood* 2015;22:138–44.
- [12] You D, Hug L, Eidemyr S, et al. Global, regional and national levels and trends in under 5 mortality between 1990 and 2015, with scenario based projections to 2030: a systematic analysis by the UN Inter-agency Group for Child Mortality Estimation. *Lancet* 2015;386:2275–86.
- [13] Rajaratnam JK, Marcus J, Flaxman A, et al. Neonatal, post-natal, childhood, and under-5 mortality for 187 countries, 1970–2010: a systematic analysis of progress towards Millennium Development Goal 4. *Lancet* 2010;9730:1988–2008.
- [14] World Health Organization. *World health statistics*, [www.who.int/gho/publications/world\\_health\\_statistics/2012/en/](http://www.who.int/gho/publications/world_health_statistics/2012/en/) (2012, accessed 25 July 2016).
- [15] UNICEF. *Levels and trends of child mortality: Report 2011*, [www.unicef.org/media/files/Child\\_Mortality\\_Report\\_2011\\_Final.pdf](http://www.unicef.org/media/files/Child_Mortality_Report_2011_Final.pdf) (2011, accessed 25 July 2016).
- [16] United Nations Statistics Division. Millennium development goals indicators, <http://mdgs.un.org/unsd/mdg/data.aspx> (2016, accessed 25 July 2016).
- [17] United Nations Children's Fund. *Levels and trends in child mortality report 2015. Estimates developed by the UN Inter-agency Group for Child Mortality Estimation*, [www.child-mortality.org/files\\_v20/download/IGME%20report%20](http://www.child-mortality.org/files_v20/download/IGME%20report%20)

- 2015%20child%20mortality%20final.pdf (2015, accessed 25 July 2016).
- [18] Laderichi CR, Saith R and Stewart F. Does it matter that we do not agree on definitions of poverty? A comparison of 4 approaches. *Oxford Development Studies* 2003;31:253–74.
- [19] World Bank. *Measuring Poverty*, <http://go.worldbank.org/MJO6SB4JQ0> (2016, accessed 25 July 2016).
- [20] World Bank. GNI per capita, PPP, <http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD> (2016, accessed 25 July 2016).
- [21] USDHHS. The HHS Poverty Guidelines. One version of the U.S. Federal Poverty Measure, <https://aspe.hhs.gov/2009-hhs-poverty-guidelines> (2009, accessed 25 July 2016).
- [22] Office of National Statistics. Annual survey of hours and earnings, [www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2015provisionalresults](http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2015provisionalresults) (2015, accessed 25 July 2016).
- [23] Kwarteng K. *Ghosts of Empire*. London: Bloomsbury, 2011.
- [24] Murphy K and Topel R. Diminishing returns. The costs and benefits of improving health. *Perspect Biol Med* 2003;46(suppl 3):108–28.
- [25] Mudenda V, Lucas S, Shibema A, et al. Tuberculosis and tuberculosis/HIV/AIDS associated mortality in Africa: the urgent need to expand and invest in routine and research autopsies. *J Infect Dis* 2012;15(s2):340–6.
- [26] Pritchard C and Mirza S. Under-fives child mortality and child-abuse-related-deaths in the former USSR: Is there an under-reporting of abuse-related deaths? *Child Abuse Rev* 2016;25:218–29.
- [27] Rostila M, Saarela J and Kawachi I. Mortality in parents following the death of a child: A nationwide follow-up study from Sweden. *J Epidemiol Community Health* 2012;66:927–33.
- [28] Davies J, Lluberas R and Shorrocks A. *Global wealth report 2014*, [http://economics.uwo.ca/people/davies\\_docs/credit-suisse-global-wealth-report-2014.pdf](http://economics.uwo.ca/people/davies_docs/credit-suisse-global-wealth-report-2014.pdf) (2014, accessed 25 July 2016).
- [29] United Nations General Assembly. *Convention on the rights of the child*, [www.cirp.org/library/ethics/UN-convention/](http://www.cirp.org/library/ethics/UN-convention/) (1989, accessed 25 July 2016).