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Comparing GDP Health and Military Expenditure, Poverty and Child Mortality of 71 Countries from Different Regions

Colin Pritchard and Steven Keen

Additional information is available at the end of the chapter

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Abstract

Child mortality rates (CMR) indicate how a nation meets the needs of its children, so relative to their region, do some countries 'neglect' their children? Using William Penn (1693) statement 'It's a reproach to religion and government to suffer so much poverty and excess' to judge nations CMR from three world regions within the context of poverty, health and military gross domestic product (GDP) expenditure data. **West ($n = 21$):** USA, New Zealand and Canada are a reproach—Sweden, Japan Finland and Norway are commended. **Asia ($n = 17$):** Pakistan, Myanmar and India are a reproach. Singapore and Thailand commended. **Sub-Saharan Africa ($n = 33$):** Relative to their region, Madagascar and Namibia are commended. Twelve countries failed the United Nations (UN) target, including the relatively rich Nigeria and South Africa. Poverty and higher CMR are linked in all three regions. Relative poverty and military expenditures correlated in the West but not in the other regions. In the pursuit of social justice, societies need to be alerted to the extent of the impact of poverty on child mortality even though some countries will find this challenging.

Keywords: child mortality, poverty, health, military expenditure

1. Introduction

In terms of the well-being of children, there are profound implications in the United Nations Children's Fund (UNICEF)'s statement '*that in the last analysis child mortality rates are an indication of how well a nation meets the needs of its children*' [1]. Parents who relatively fail to meet the needs of their children can be described as 'neglecting'; can the same be said of nations?

Poverty is the context in which child mortality rates (CMR) have been analysed in this chapter. Therefore, this study assesses the relationship between poverty and CMR in 71 countries from three world regions, the West, Asia and Sub-Saharan Africa (SSA) and how successful they have been in reducing mortality rates over time relative and comparative to their region. There are, of course, many interrelated social policy factors that influence CMR reflecting differing political priorities so included is a comparison of health and military expenditure to reflect what in fiscal terms are competitive concerns [1–5].

Bringing together markedly different socio-economic regions has its problems, but it has been argued that in a globalised world the concept of developed and underdeveloped nations is redundant and countries should be seen along a continuum of socio-economic development [6]. This juxtaposition of three regions provides a comparative perspective of what is happening to children, in the context of poverty, within a regional perspective. Although the socio-political and economic make up of these regions varies considerably, all 71 countries under review are signatory to the United Nations millennium goals aspiration of reducing under-five CMR by 2% per annum [7, 8].

The importance of the poverty dimension originates from the seminal work of Wilkinson and Pickett who highlighted the significance of income inequality, a measure of relative poverty relevant to Western societies [4]. 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 ‘clinical’ studies [9–14]. International comparisons of CMR are problematic and more so when contrasting three world regions. However, as each nation is assessed, within its own region, against itself over time, it becomes its own control, enabling us to judge how successful it has been in reducing CMR relative to its region [12–15].

In analysing mortality rates, it is easy to forget the emotional impact of the death of a child. This is epitomised in the lament of the octogenarian Elizabeth Barraclough who said *‘I’ve lost a husband, mother and father, brothers and sisters but nothing, nothing is more bitter than losing a bairn’*. This would be true of any parent in any society in any region, so we also consider the impact that disproportionate levels of child mortality have upon societies. This is the first-ever known comparative study of societies’ responses to children in three world regions and draws upon a range of recent and new research specific to this chapter.

2. Method

There are inherent methodological problems with international comparisons of mortality but the following method has sought to minimise them, as utilised in a number of comparative international studies covering healthcare, suicide, child-abuse-related deaths, cancer and neurological disease [15–18]. Nonetheless, there can be limitations linked to the accuracy of mortality data in less industrialised nations [1, 8, 19].

2.1. Mortality data

Two types of mortality data have been used: confirmed and estimated figures. The World Health Organisation (WHO) provides *confirmed* annual deaths for babies (<1 year) and infants (1–4 years) in the 21 Western and five of 17 Asian countries [20]. From these figures, under-five

(0–4 years) child mortality rates (CMR) per million (pm) of population have been calculated. Since 1968, annual WHO mortality data were collected from member states though the data are invariably 4–5 years behind the year of publication. Whilst probably never entirely accurate, they are the most consistently reliable available international data for mortality [20].

UN Millennium Goals Indicators (UNMGI) and the UN Statistics Division provide *estimated* levels of child mortality from intra-country expert committees [8, 18] but have been criticised because of the discrepancies between them [21]. Inevitably, there are variations between WHO, UNICEF and United Nations Millennium Development Goals (UNMDG) data for the same years. For instance, a brief inspection of UNMGI data for the UK in 2010 gives a mortality estimate of 5.2 per thousand live births, equivalent to 5200 pm, but WHO data yield a confirmed rate of 4464 pm [20]. Although WHO rates are invariably lower than UNICEF-estimated data, UNICEF results are generally closer to WHO figures for the West and the industrialised Asian countries and therefore UNICEF data [8] have been used for societies without WHO information, as indicated in the tables.

As CMR varies on an annual basis, a 3-year baseline average (1988–1990) is contrasted with a 3-year index average (2008–2010) and a percentage of change calculated. As also indicated in the tables, WHO data for China were available until 1994, based upon a 10% sample of population (running into the tens of millions), but UNICEF data are used for 2008–2010. Index data for Canada and New Zealand is only available from 2007–2009 and Germany, Portugal and Spain have slightly later baseline years of 1990–1992 and is noted in the table.

2.2. Poverty data

There is a long-standing debate about definitions of poverty, crucially between ‘relative’ poverty in Western countries and ‘absolute’ poverty in the developing world [22–25]. Recently, the World Bank highlights that whilst 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 [26]. The Western concept of relative poverty is usually proportionate to national average income, so a family income 60% below the average is designated as in relative poverty [26–28].

For Western countries, a ratio of income inequality is used, that is, the gap between the top and bottom 20% of incomes used by Wilkinson & Pickett [4], alongside gross national income (GNI) data [29] as indicated in the tables. 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. As previously noted, income inequalities have been found to be associated with a wide range of poorer outcomes in education, crime, unemployment and health [2, 4, 30–33].

As no comparable income inequality data exist for Asian countries, GNI figures by purchasing power parity (PPP) have been used [34]. 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 [24, 25]. GNI is the total national income divided by 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 [29]. 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 under £18,000 p.a. indicating the mode income is far lower than the average [35].

Recent World Bank data has been published that includes 30 of the 33 SSA countries (Anglo, Congo (Kinshasa) and Somalia were not available) and so matching GNI data are reported for 2010 [28]. SSA data are available for 2015, but over 5 years, there was virtually no difference between the countries ranking, hence CMR and 2010 GNI are also correlated to explore any link between CMR and poverty.

2.3. Socio-economic, health and military expenditure

The different socio-economic backgrounds of these regions are recognised but to an extent both Asian and SSA societies from the former British Empire have faced similar postcolonial struggles [36]. Comparisons of countries since their independence *within*, not *between* regions, are therefore considered reasonable.

Although Angola, China, Nigeria, Somalia, South Africa and Yemen are considered developing countries, they are among the world's top 20 producers of minerals and oil [34]. It is also noted that 14 of the 33 SSA countries have endured serious civil conflict over the period under review.

An important policy priority context is what percentage countries spend of their national wealth (gross domestic product, GDP) on health and military. World Bank data are extrapolated as a percentage of GDP for health and military expenditure from which a military to health expenditure ratio is calculated [37]. This ratio reflects national priorities and is likely to be influenced by local/regional political history as regimes change over time and respond to their sense of threat from their regional perspective. This is exemplified by the long-standing tension between India and Pakistan, Greece and Turkey. Hence the military and health ratios can be seen as broad indicators of policy priorities.

2.4. Statistical analysis

Spearman rank order (Rho) correlations have been used to determine any association between regional CMR and poverty, that is, GNI, military and health data. Standard deviations (SD) of CMR in each of the regions have been calculated and 1 SD above or below the regional average is the measure used to assess whether a nation merits a *reproach*, using the words of William Penn (1693), or a *commendation*. 'It is a reproach to Government and Religion to Suffer such Poverty and Excess' [38]

3. Identifying countries of reproach and commendation

3.1. The West

Socio-economic data: **Table 1** lists Western socio-economic data. The USA has the widest income inequality, as their top 20% of salaries are 8.5 times that of the bottom 20% followed by Portugal (8 times) and the UK (7.2 times). The narrowest income inequalities are, apart from Japan (3.4 times), seen in European nations, for example, Finland (3.7 times), Norway (3.9 times) and Sweden (4 times). Switzerland has the highest GNI (\$47,100) followed by the USA (\$45,640), down to the lowest figures in Portugal (\$24,080) and Spain (\$31,490). Based upon 18 countries (owing to missing data from three countries), the Western GNI average is \$35,662 per person; the UK figure lies just above this at \$35,860 (see **Table 1**).

Health and military expenditure: **Table 1** also lists the West's health (GDPHE) and military expenditure (GDPME) as a percentage of total GDP.

Country	Income inequality	GNI \$ average per person	%GDPEH 2010–2013	% GDP military expenditure	Military:health ratio
1. USA	8.5	45,640	17.1	3.3	1:5.2
2. Portugal	8.0	24,080	10.2	1.9	1:5.4
3. UK	7.2	35,860	9.2	1.9	1:4.8
4. Australia	7.0	38510	9.0	2.0	1:4.5
5. New Zealand	6.8	n/a	10.0	1.2	1:8.3
6 Italy	6.7	31,870	9.3	1.3	1:7.2
7. Greece	6.2	28,800	9.6	2.6	1:3.7
8. Ireland	6.1	n/a	8.9	0.4	1:22.3
9. Switzerland	5.7	47,100	11.2	0.7	1:16.0
10. Canada	5.6	37,280	11.0	1.0	1:11.0
11. Spain	5.6	31,490	9.3	1.2	1:7.8
12. France	5.6	33,950	11.6	2.1	1:5.5
13. Netherlands	5.3	37,940	12.4	1.2	1:10.3
14. Germany	5.2	36,850	11.3	1.2	1:9.4
15. Austria	4.8	31,900	11.0	0.7	1:15.7
16. Belgium	4.5	36,610	10.8	0.9	1:12.0
17. Denmark	4.3	32678	10.9	1.2	1:9.1
18. Sweden	4.0	38,050	9.6	1.1	1:8.7
19. Norway	3.9	39,869	9.4	1.5	1:6.3
20. Finland	3.7	n/a	9.1	1.3	1:7.0
21. Japan	3.4	33,440	10.1	1.0	1:10.1
Mean average	5.6	35,662	10.5	1.4	1:7.5

n/a, not available.
Income inequality and high military expenditure $\text{Rho} = +0.4748$ $p < 0.025$.

Table 1. Western countries: Income inequality and gross national income (GNI) by purchasing power parity (PPP) & average 2010–2013 GDP expenditure on health (GDPEH) and GDP military expenditure (sources World Bank): A military: health ratio [Source: World Bank, [37].

The average health expenditure in the West is 10.5% of GDP; therefore, out of every \$100 of a nation's wealth, \$10.50 is, on average, spent on health. Figures range from 17.1% in the USA and 11.6% in France down to 9% in Australia and 8.9% in Ireland. The average military expenditure in the West is 1.4% of GDP. Figures range from 3.3% in the USA followed by Greece at 2.6%, down to 0.7% in Austria and 0.4% in Ireland.

Military: Health ratios are narrowest in Australia 1:4.5, the UK 1:1.4.8 and the USA 1:5.2, the West's average being 1:7.5; ratios are widest in Ireland 1:22.3, Switzerland 1:16.0 and the Netherlands 1:10.3; reflecting different political priorities, which according to Nye Bevan is the essence of politics (Foot, 1978)

Child-mortality-rates: **Table 2** shows the top-six highest CMR (0–4 years) are from English-speaking nations led by the USA at 1503 per million (pm), New Zealand at 1308 pm, Canada at 1189 pm, UK at 1113 pm, Australia at 1030 pm and Ireland at 947 pm. Nations with the lowest CMR, apart from Japan at 663 pm, are from Europe: Sweden at 624 pm, Finland at 632 pm and Norway at 691 pm.

Country by CMR rank (latest years)	CMR baseline pm (1988–1990) [20]	CMR index pm (2008–2010 unless stated) [20]	% of change
1. USA	2420	1503	–38 [#]
2. New Zealand (2007–2009)	2361	1308	–45
3. Canada (2007–2009)	1740	1189	–32 [#]
4. UK	1929	1113	–42
5. Australia	1886	1030	–45
6. Ireland	1659	947	–43
7. Switzerland	1783	944	–47
8. Austria	1944	939	–52
9. Netherlands	1729	906	–48
10. Belgium	2013	886	–56
11. France	1740	876	–50
12. Germany	1611	838	–48
13. Italy	1895	822	–57
14. Spain	1790	820	–54
15. Denmark	1993	813	–59
16. Greece	2039	792	–61
17. Portugal	3019	782	–74
18. Norway	2005	691	–64
19. Japan	1218	663	–46
20. Finland	1463	632	–57
21. Sweden	1520	624	–59
Mean average	1893	910	–51

1 SD = 216 pm.

[#]Failed to meet Millennium target of reducing CMR by 2% p.a. (UN [39, 7]).

Table 2. West child mortality rates (0–4 years) per million (pm) and % of change (1988–1990 v 2008–2010) [Source WHO, [40]].

The USA, New Zealand and Canada merit a relative *reproach* as their CMR are 1 SD above the Western mean; Canada and the USA also failed to meet the UN millennium target of reducing CMR by 2% per annum. Conversely Sweden, Finland, Japan and Norway merit a *commendation* as their CMR is 1 SD below the Western mean. Portugal and Greece previously had the highest CMR but, at the index years, achieved the largest reductions (74%) over the period. Eleven other countries had falls in their CMR of 50% or more; the UK's rate fell by 42%, lower than the average Western reduction of 51% over the period.

CMR—poverty, health and military associations: There is a positive significant correlation between higher CMR and GNI ($Rho = +0.6416$; $p < 0.005$) confirming that at national levels there is an association between relative poverty and child mortality. Whilst there was no significant correlation between CMR and health and military expenditures, there was a significant correlation between higher military expenditure and worse relative poverty as measured by income inequality ($Rho = +0.4758$; $p < 0.025$).

3.2. ASIA

Socio-economic data: **Table 3** shows Singapore's and Hong Kong's GNI at \$49780 and \$44540, respectively; they hold the second and fifth highest GNI figures within the three regions, well above the average of the industrialised Asian countries at \$38,750 and the West's average of \$35,662. Conversely, GNI in non-industrialised Asian countries runs from \$1180 in Nepal, to \$1559 in Bangladesh and \$6890 in China. So, the Western GNI average, based upon the US dollar's PPP, is nearly eight times higher than the non-industrialised Asian country average of \$4460.

Health and military expenditure: The average expenditure on health as a percentage of GDP is 7.4% for industrialised and 4.4% for non-industrialised Asian countries (see **Table 3**). Figures range from 10.5% in Japan, followed by 7.5% in Cambodia, 6% in Nepal and Vietnam, down to 3.1% in Indonesia, 2.8% in Pakistan and 1.8% in Myanmar.

The average expenditure on the military is 2.6% for Asian countries. Figures range from 3.6% in Pakistan, followed by 3.4% in Myanmar and 3.2% in Singapore, down to 1% in Japan and 0.9% in Indonesia. The narrowest military to health ratios are in Myanmar (1:0.5) and Pakistan (1:08), as they spent more on their military than health expenditure.

Child mortality rates: Pakistan has the highest CMR of *non-industrialised* Asian nations at 87,000 pm and alongside Myanmar and India merit a *reproach* as their CMR are 1 SD above the regional non-industrialised mean (see **Table 4**).

China's (WHO) data from 1994, based upon urban and rural 10% samples, averaged CMR of 9394 pm. Yet, UNICEF data estimate a total mortality rate of 48,000 pm in 1990 reducing by 62% to 18,000 pm by 2010. CMR in Thailand is 1 SD below the non-industrialised Asian mean of 39,000 pm and merits a *commendation* alongside Singapore. Sri Lanka and China narrowly missed a *commendation* with current CMR of 17,000 and 18,000 pm respectively. Malaysia, with CMR *estimated* at 6000 pm, achieved a remarkable 67% reduction over the period. CMR in non-industrialised Asian countries are more than 40 times higher than the Western average. All industrialised Asian countries' CMR are lower than the Western average (910 pm) with

remarkable lows of 522 pm in Singapore and 663 pm in Japan [20]. South Korea is likely to have suffered from the problem of diminishing returns [41] and also merits a *reproach* because its rate of 842 pm is above 1 SD above the industrialised mean; it also failed to meet the UN target.

Country and GNI rank	\$ GNI average per person	GDPEH % 2014	% GDP military	Health:military ratio
1. Singapore	49,780	4.6	3.2	1:1.4
2. Hong Kong	44,540	n/a	n/a	n/a
3. Japan	33,440	10.5	1.0	1:10.5
4. Korea South	27,240	7.2	2.6	1:2.8
Industrialised average	38,750	7.4	2.7	1:2.7
5. Malaysia	13,710	4.0	1.5	1:2.7
6. Thailand	7640	4.6	1.5	1:3.1
7. China	6890	5.6	n/a	n/a
8. Sri Lanka	4720	3.2	2.2	1:1.5
9. Indonesia	3720	3.1	0.9	1:3.4
10. Philippines	3540	4.4	1.3	1:3.4
11. India	3280	4.0	2.4	1:1.7
12. Vietnam	2790	6.0	2.4	1:2.5
13. Pakistan 27	2680	2.8	3.6	1:0.8
14. Cambodia	1820	7.5	n/a	n/a
15. Bangladesh	1550	3.7	n/a	n/a
16. Nepal	1180	6.0	1.5	1:4.0
17. Myanmar	n/a	1.8	3.4	1:0.5
Non-industrialised average	4460	4.4	2.5	1:1.8
n/a, not available.				

Table 3. Asian countries: gross national income (GNI) by purchasing power parity (PPP) and % GDP expenditure on health (GDPEH) % GDP military (source World Bank) and health to military ratio [Source World Bank [37]] .

CMR—poverty, health and military associations: The correlation between CMR and GNI is highly statistically significant ($Rho = +0.9323$; $p < 0.001$) again confirming the statistical link between relative poverty and child mortality. There is no correlation between CMR and military and health expenditures. However, mention must be made about Myanmar and Pakistan, whose disproportionate high military to health expenditure proved to be the biggest distortion of all 71 countries reviewed.

Country by CMR Rank	CMR baseline pm (1988–1990)	CMR index pm (2008–2010)	% of change
Non-industrialised			
1. Pakistan	124,000	87,000	–30 [#]
2. Myanmar	112,000	66,000	–41
3. India	115,000	63,000	–45
4. Cambodia	121,000	51,000	–58
5. Nepal	141,000	50,000	–64
6. Bangladesh	143,000	48,000	–66
7. Indonesia	85,000	35,000	–59
8. Philippines	59,000	29,000	–51
9. Vietnam	51,000	23,000	–55
10. China (WHO 1994)	9390	n/a	n/a
10. China	48,000	18,000	–62
11. Sri Lanka	32,000	17,000	–47
12. Thailand	32,000	13,000	–59
13. Malaysia	18,000	6000	–67
Average	88,000	39,000	–56
Industrialised			
14. Korea South 2007–2009 (WHO)	1220	840	–31 [#]
15. Hong Kong (WHO)	1550	808	–48
16. Japan (WHO)	1218	663	–46
17. Singapore (WHO)	1598	552	–67
Industrialised average	1397	715	–49
Non-industrialised 1 SD = 23,000 pm. Industrialised 1 SD = 116 pm. n/a, Not available. [#] Failed to meet Millennium target of reducing CMR by 2% p.a. (UN [39, 7]).			

Table 4. Industrial and non-industrialised Asian countries CMR (0–4 years) per million (pm) and % of change (1988–1990 v 2008–2010) [Sources WHO [40]].

3.3. Sub-Saharan Africa

Socio-economic data: GNI data are available from World Bank [29] for 30 of the 33 SSA countries, as shown in **Table 5**. Gabon (\$16,350), Botswana (\$15,110) and South Africa (\$12,350) hold the highest GNI figures in this region. The Democratic Republic of Congo, Liberia and Malawi and Niger have the lowest figures ranging from \$630 to \$880. Bearing in mind these figures denote average

income per person, this means that a considerable proportion of SSA populations must be living in *absolute poverty* on less than \$1 or \$2 per day [25]. Although the SSA GNI average of \$3,833 is similar to the non-industrialised Asian countries average of \$4,460, the Western (\$35,662) and industrialised Asian (\$38,750) averages are around 10 times higher.

Health and military expenditure: No data were available for six SSA countries (see **Table 5**). The average expenditure on health as a percentage of GDP is 6.6%, well below the West's figure (10.5%) but above Asia's average (4.6%). There are marked variations led by Lesotho at 11.5%, Rwanda 11.1% and Liberia 10%, down to 5% in Zambia, 4.2% in Madagascar and 3.6% in Chad.

The average military expenditure in SSA countries is 1.5% of GDP. Again, there are marked variations ranging from 4.8% in Namibia and 3.5% in the Democratic Republic of Congo to 0.5% in Ghana and 0.4% in Nigeria. The average military to health ratio is 1:4.4. The narrowest is a 1:1 ratio in the Democratic Republic of Congo; Lesotho has the highest ratio of 1:16.

Child mortality rates: **Table 6** lists CMR for SSA nations. Only South Africa has WHO [20] data; UNICEF estimates are used for the remaining countries. Highest CMR are in Somalia at 188,000 pm, followed by Burkina Faso 176,000 pm, Sierra Leone 174,000 pm, Chad 173,000 pm, Democratic Republic of Congo 170,000 pm and 161,000 pm in Angola. These six countries are classed as a relative *reproach* as their figures are 1 SD above the regional mean; they also failed to meet the UN millennium goal target of reducing CMR by 2% per annum. Somalia, Zimbabwe and South Africa increased their rates over the period.

Countries with the lowest regional CMR include Namibia at 40,000 pm, Botswana at 48,000 pm and Madagascar at 62,000 pm, all of whom are 1 SD below the mean meriting a relative *commendation*. Botswana's commendation is tempered by the fact that they had a 19% reduction in CMR over the period thereby failing to achieve the UN target of a 2% reduction per annum and with a GNI by PPP figure four times the regional mean.

The average reduction in CMR was 33% and 16 SSA countries reduced their CMR by more than 35%; 12 achieving the millennium goal. Therefore, 21 (including South Africa) SSA countries failed to meet the UN target of a 2% reduction in CMR per annum, though five countries came close with falls of more than 30%. Fourteen SSA countries have been in civil conflict situations in the last 20 years; paradoxically Ethiopia, Liberia, Madagascar, Rwanda and Yemen managed to reduce their CMR by more than 40% over the review period. Compared to Nigeria who had the sixth highest income and equal seventh highest CMR, surely meriting a reproach.

Out of the 33 SSA counties, 21 (including South Africa) failed to meet the UN target of a 2% per annum reduction in CMR, although 5 came close with falls of more than 30%.

Perhaps the biggest surprise relates to figures from South Africa. Under the apartheid regime in 1990, WHO data yielded CMR of 6431 pm, but this might be a serious underestimation as child mortality in rural areas could have gone unreported. The first available WHO data for the post-apartheid regime (2002–2004) records a rate of 10,410 pm, equivalent to a 62% increase. Taking only post-apartheid WHO data, the latest index years 2007–2009 figure of 11,245 pm points to a rise in 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 fell to 9158 pm.

This variation is also reflected in the UN Statistics Division data where for the baseline years (1988–1990) CMR is estimated at 61,000 pm, 59,600 pm and 58,500 pm, respectively, averaging 59,700 pm. For the years 2008–2010, CMR estimates went from 69,300 pm, down to 53,200 pm and 47,500 pm, averaging 56,700 pm—a 5% reduction, yet well below the millennium target.

SSA country	GNI by PPP \$average P-P	% GDP on health	% GDP military ⁴	Military: health ratio
1 Gabon	16,350	3.8	1.2	1:3.2
2. Botswana	15,110	5.4	2.8	1:1.9
3. South Africa	12,350	8.9	1.1	1:8.1
4. Namibia	9380	7.7	4.8	1:1.6
5.. Swaziland	7450	8.4	1.8	1:4.7
6. Nigeria C	5380	3.9	0.4	1:9.8
7. Ghana C	3850	5.4	0.5	1:10.8
8. Sudan C	3810	6.5	2.1	1:3.1
9. Yemen C	3650	5.4	n/a	n/a
10. Zambia	3580	5.0	1.7	1:2.9
11. Lesotho	3280	11.5	0.7	1:16.4
12. Cote d' Ivory C	2890	5.7	1.5	1:3.8
13. Kenya	2820	4.5	1.5	1:3.0
14. Cameroon	2780	5.1	1.0	1:5.1
15. Senegal	2,210	4.2	1.6	1:2.6
16. Sierra Leone C	2210	11.8	0.8	1:14.8
17. Chad C	1980	3.6	2.0	1:1.8
18. Uganda	1680	9.8	1.3	1:7.5
19. Zimbabwe	1610	n/a	2.7	n/a
20. Gambia	1600	6.0	0.8 [#]	1:7.5
21. Burkina Faso	1560	6.4	2.2 [#]	1:2.9
22. Rwanda C	1,540	11.1	1.2	1:9.3
23. Madagascar C	1370	4.2	0.6	1:7.0
24. Ethiopia C	1370	5.1	0.7	1:7.3
25. Guinea	1140	4.7	n/a	n/a
26. Mozambique	1060	6.8	1.0	1:6.8
27. Niger	880	6.5	n/a	n/a
28. Malawi	760	n/a	0.7	n/a
29. Liberia C	710	10.0	0.7	1:14.3

SSA country	GNI by PPP \$average P-P	% GDP on health	% GDP military ⁴	Military: health ratio
30. Dem Republic Congo	630	3.5	3.5	1:1.0
31. Tanzania	n/a	7.3	1.1	1:6.6
32. Angola	n/a	n/a	n/a	n/a
33. Somalia	n/a	n/a	n/a	n/a
SSA average	3833	6.6	1.5	1:4.4

n/a, Not available.
[#]Military expenditure from 2000.
 C, Civil conflict over the period.

Table 5. Sub-Saharan African countries: gross national income (GNI) by purchasing power parity (PPP) and health and military expenditure on health (GDPEH) 2014 [Source World Bank [37]] [#]indicates 2000 military GDP.

SSA country	CMR Baseline pm	CMR index pm	% of change	Lowest GNI: rank
1. Somalia C	180,000	188,000	+4 #	n/a
2. Burkina Faso	205,000	176,000	-14 #	10
3. Sierra Leone C	276,000	174,000	-37 #	15=
4. Chad C	207,000	173,000	-16 #	14
5. Dem Republic Congo C	181,000	170,000	-6 #	1
6. Angola C	243,000	161,000	-34 #	n/a
7. Nigeria C	213,000	143,000	-33 #	25
8. Niger	311,000	143,000	-54	4
9. Cameroon	137,000	136,000	-1 #	17
10. Mozambique	219,000	135,000	-38 #	5
11. Guinea	229,000	130,000	-43	6
12. Cote d' Ivory C	151,000	123,000	-19 #	19
13. Zambia	183,000	111,000	-39 #	21
14. Ethiopia C	184,000	106,000	-42	7=
15. Sudan C	125,000	103,000	-18 #	23
16. Liberia C	227,000	103,000	-55	2
17. Uganda	175,000	99,000	-43	13
18. Gambia	165,000	98,000	-41	11
19. Congo (Kinshasa) C	116,000	93,000	-20 #	n/a
20. Malawi	222,000	92,000	-59	3
21. Rwanda C	163,000	91,000	-44	9
22. Lesotho	89,000	85,000	-4 #	20

SSA country	CMR Baseline pm	CMR index pm	% of change	Lowest GNI: rank
23. Kenya	99,000	85,000	-14 #	18
24. Zimbabwe	78,000	80,000	+3 #	12
25. Swaziland	96,000	78,000	-19 #	26
26. Yemen C	128,000	77,000	-46	22
27. Senegal	139,000	75,000	-46	15=
28. Ghana C	122,000	74,000	-39 #	24
29. Gabon	93,000	74,000	-20 #	30
30. Madagascar C	159,000	62,000	-61	7=
31. Botswana	59,000	48,000	-19 #	26
32. Namibia	73,000	40,000	-45	27
33. South Africa (WHO 2002–2004–2007–2009)	10,410	11,245	+8 #	28
Averages: SSA (excluding S. Africa)	164,000	110,000	-33 #	
Non-industrialised Asia	88,000	39,000	-56	
Industrialised Asia	1397	715	-49	
Western	1893	910	-52	

Highest CMR and lowest GNI Rho= +0.5132 $p = 0.005$.

1 SD 39,000 pm.

n/a, Not available.

#Failed to meet Millennium target of reducing CMR by 2% p.a. (UN [39, 7]).

C, Civil conflict over the period.

No GNI rank for Anglo, Congo (Kinshaha) and Somalia.

Table 6. Sub-Saharan Africa CMR (0–4 years) per million (pm), % of change (1988–1990 v 2008–2010) and lowest GNI rank.

CMR—poverty, health and military associations: The rank order of the lowest GNI with the highest child mortality rates was significantly and positively correlated ($Rho = +0.5204$; $p = 0.005$), thus across the three regions, there are positive and significant statistical associations with CMR and ‘poverty’ however defined, reflecting the truism that poverty, even relative poverty, is linked to the deaths of children throughout the world.

When looking at SSA nations, those with the highest GNI figures such as Cameroon and Nigeria, against expectations, had higher CMR, whilst poorer countries such as Madagascar and Zimbabwe had lower CMR, suggesting major differences in policy in these societies in relation to child health. To explain this more fully would require country-specific research. Remembering that GNI is adjusted for PPP in comparative terms, we in the West probably cannot conceive what such low levels of effective income mean for these societies. Again, perhaps counter intuitively, there was no correlation between the health, military expenditures and CMR.

4. 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 [8, 20]. The biggest data inconsistency, however, concern South Africa, for example, UN-estimated data that far exceeded WHO rates were available. Self-evidently, we are not in a position to state which figures are the most reliable; WHO data appear to hold a greater degree of internal consistency as, for example, UN rates compared to WHO data when available always show WHO rates as lower. The marked increases, based upon South Africa's 1990 WHO figure of 6431 pm, raise the question of the accuracy of earlier pre-1994 apartheid regime figures. It *may* be that the former regime would have been less likely to include rural Black deaths. This in part *might* account for some of their rises though there have been increases in treatment-resistant TB and HIV/AIDS deaths in the country, which may have contributed to real rises in CMR [42–44]. Conversely, the increases could be due to more accurate reporting systems yet only country-specific research could confirm this. Another limitation is that 14 of the SSA countries faced civil conflict during the period, which is very likely to have affected those countries ability to meet the UN millennium goal, although five of these countries, for example, Liberia and Ethiopia, did meet the target.

These limitations mean that these results cannot be definitive. Rather, they are indicative of changes found in other studies of non-Western societies such as Islamic, Latin American and former Warsaw Pact countries related to suicide and child-abuse-related deaths, where data accuracy has been found to be problematic because of cultural and political taboos [15–17]. Nonetheless, despite these limitations, this first-ever comparative study of societies' response to children in three world regions provides significant indicators of those meriting a relative regional *reproach* or *commendation*. More importantly, these results provide a baseline for future comparative studies and how well or otherwise these societies are meeting the needs of their children.

4.1. The West

Most Western governments can be congratulated on the impressive reduction in mortality rates, but the *USA, New Zealand and Canada* are classed as a *reproach* for having CMR 1 SD above the regional mean. Are these countries relatively neglecting the needs of their children? As far as the UK is concerned, it had the fourth highest CMR of the 21 countries alongside the third highest income inequality figure; it has been found that British children, in regard to poverty and health expenditure, are significantly disadvantaged compared to other Western societies [13, 45]. The fact that the six highest CMR occurred in English-speaking countries suggests that, despite major reductions, there are cultural factors influencing CMR. Are English-speaking societies less child-focused than other Western nations?

Relative poverty and higher CMR are significantly correlated, which is seen in the fact that the five Western countries with the highest CMR occupied the six widest income inequalities positions. Conversely, countries with the narrowest income inequalities have the lowest

CMR, that is, Sweden, Finland, Japan and Norway, meriting their *commendation*, as well as Greece and Portugal, who had the biggest CMR reduction in the region.

4.2. Asia

There is a very strong correlation between CMR and relative poverty in Asian countries. Whilst Hong Kong and Singapore have lower CMR than the West's average, seven non-industrialised Asian countries had impressive reductions (more than 40%) in their CMR. Singapore and Thailand with their relatively high GNI figures and CMR 1 SD below the mean merit a *commendation*. However, Pakistan, India and Myanmar are a relative *reproach*.

4.3. Sub-Saharan Africa

Even acknowledging the incredible poverty of Africa compared with much of Asia and the West, the levels of CMR are overwhelming. Averaging 3.1% of all under-fives dying, surely this is a continent of hidden and silent sorrows. However, 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 [28] yet all failed the UN challenge. Against expectations, some relatively richer countries, for example, Nigeria have higher CMR, whilst lower income countries such as Madagascar have lower figures. Further country-specific research is required to explain these apparent anomalies.

4.4. Governments

What also has to be recognised is that globally *the rich are getting richer*. Inequality continues to widen in such countries as the UK [46] and according to Credit Suisse, 0.7% of the world's population has increased its wealth holding to 44% of global wealth and 8.6% of the world's population now own 85% of the world's wealth [47]. The authors of this Credit Suisse Report argue that rapid increases in income inequality often lead to economic recession and in view of the current global economic situation, this gives further impetus to consider not only the current situation of children, but if these inequalities continue what will the outcome be? Therefore, when we see evidence of the social consequences of not achieving the UN goal of reducing child mortality, with its statistical link to poverty in Western, Asian and African societies, we should speak out. The UN millennium aspiration is essentially a campaign for social justice and we need to highlight the very corrosive effect of poverty and its impact upon children in *every continent*, for to be respectably silent is surely not an option. Hence, we have an obligation to hold our individual societies and governments to account, especially to those societies who merited a *reproach*.

When exploring the percentage of GDP on military expenditure, it was significant that the higher military expenditure in the West was statistically linked with worse income inequality, but not in the other regions. However, when considering the comparison of health and military expenditure ratios in Asia and Africa, we are ill-equipped to comment, in part because of unavailable data and the various countries perceived security threats. However, we recall the valedictory address of President Eisenhower, America's top general and commander-in-chief of the Allied war in Europe, who warned of the inherent socio-economic-political dangers of the 'military industrial complex'.

*We have been compelled to create a permanent armaments industry of vast proportions.....
We annually spend on military security more than the net income of all United States corporations.*

This conjunction of an immense military establishment and a large arms industry is new in the American experience. The total influence -- economic, political, even spiritual -- is felt in every city, every State house, every office of the Federal government. We recognize the imperative need for this development. [But]

In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist. [48] [Our preposition].

When discussing CMR, in one sense, using rates distances us, but rates are statistics, numbers are real children. One practical feature must be the accumulative societal impact of high child mortality as bereavement itself is damaging to family health [49, 50]. Losing a child must be one of the worst and bitter tragedies for any parent in whatever world region and should be a focus of future research. So what do these rates mean in terms of relative excess' deaths of children? The USA and UK, who claim to be the mature and greatest democracies, have somewhat distorted political priorities, not only warned of by President Eisenhower, but former Chief of Staff General Colin Powell, who complained the US military was out of tilt and distorting the US economy [51]. Yet the US and the UK have the higher military to health expenditure ratios, reflecting their priorities. Does this influence the conjugation that if the UK and USA had the same current CMR of Portugal, who had been the highest Western country in 1989–1991, then there would be 850 fewer dead children in Britain and 13,591 fewer American grieving parents, more than four times the worst ever terrorist atrocity. Indeed, both countries' CMR substantially exceeded that of Hong Kong, Singapore and South Korea. It might be argued that for every bullet, plane and tank manufactured, potentially it is taking the sustenance from children in need, not only in the West but also in the other two regions.

One excuse for SSA is they only have imperfect or new democracies, which we do not accept as apartheid ended 26 years ago and forthcoming research over a similar period of the former Warsaw Pact countries, shows that eight of them now have lower CMR than the USA, so with such considerable improvement, we should have greater expectations for post-apartheid Africa.

In all three regions, there seem to be questionable priorities: countries with narrow ratios, narrower than the average, such as Greece, Australia, UK and the USA, all less than 1:5.5, should be challenged as to the rationale in relation to their CMR. In Asia, except Japan, they have a far 'worse' health to military ratio, averaging 1:2.3. Again, surely this should raise questions as to their priorities—especially Myanmar and Pakistan, who spend more on military than on health and who have the highest CMR in Asia. In view of India's economic success, their ratio of 1:1.7 in part may be a reaction to their neighbour's military expenditure, but again should be challenged.

Finally, on the 'government' side of Penn's dictum, Sub-Sahara-Africa military: health ratios vary considerably, averaging 1:4.4. However, for 12 of the 27 SSA countries for whom we have data are below the 'average' and in view of CMR toll is of itself a reproach. For in the last analysis, every gun, tank and plane manufactured is competing for feeding and providing adequate healthcare for their children. This is reported with great sadness, but we must never

be afraid to report what we find even if it can inadvertently be re-framed as racist, as politicians over the centuries have used patriotism as the last refuge for the political scoundrel.

4.5. Religion

William Penn (1693) condemned both government and religion [38], however. Christianity and Islam, the main religions in the West, Asia and Africa, hold strong socially positive messages about the care of children. Both condemn child neglect and abuse in the strongest terms. For example, Jesus of Nazareth, also revered in Islam, denounces those who actively or passively neglect and abuse children:

but whosoever shall hurteth one of my little ones, it were better for him that a millstone were hanged about his neck and that he were cast into the depth of the sea (Matthew 18.v 6).

From the Qur' an, there are clear obligations concerning how to treat and give priority to children, for example; '*He who treats the orphan with harshness and does not encourage feeding the poor so woe be to such praying ones, who are unmindful of their prayers!*' (Chapter 107 Al-Maum: 2-5). Those who ignore the poverty issue related to children are particularly condemned:

Nay but you do not honour the orphan Nor do you urge one another to feed the poor and love wealth with exceeding love (Chapter 89 Al-Fajr: 17, 18).

Therefore, these two faiths come together to reinforce Penn's (1693) message that '*it is a reproach to religion and government to suffer so much poverty and excess*'.

5. Implications

The professions and those academics in universities concerned with children should not be afraid to highlight the United Nations declaration of the Rights of Children. At times of limited resources for services and research, some organisations may be afraid of their staff appearing 'political' or to offend powerful vested interests. Yet the inherent independence of the professional and academic ethos means we have a responsibility to 'tell it as it is' based upon the best available evidence. Therefore, whilst some countries can be commended for the progress they have made, these results should be a spur to the other to match the best or better in their regions. Here is evidence that is a challenge to all societies to honour its obligation to children in the constant pursuit of social justice, especially those societies of *reproach* who need to hear the silent sorrows of bereaved parents who have no voice.

Author details

Colin Pritchard* and Steven Keen

*Address all correspondence to: cpritchard@bournemouth.ac.uk

National Centre for Post-Qualifying Social Work & Professional Practice, Faculty of Health & Social Sciences, Bournemouth University, Royal London Senior Lecturer House, Christchurch Road, Bournemouth, UK

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