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improvements in safe water, sanitation, and indoor air quality, will also impact on child health. A major challenge in the achievement of millennium development goal 4 will be to find a sustainable intersectoral solution to reducing malnutrition in children and to tackle the root causes of poverty, lack of education, and sex inequality.

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- 1 Bryce J, Boschi-Pinto C, Shibuya K, Black RE. WHO estimates of the causes of death in children. *Lancet* 2005;365:1147-52.
- 2 Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? *Lancet* 2003;361:2226-34.
- 3 World Health Organization. *The world health report 2002: reducing risks, promoting healthy life*. Geneva: WHO, 2002.
- 4 Evans DB, Adam T, Tan-Torres Edejer T, Lim SS, Cassels A, Evans TG, et al. Achieving the millennium development goals for health: Time to reassess strategies for improving health in developing countries? *BMJ* 2005;331:1133-6.
- 5 Murray CJ, Evans DB, Acharya A, Baltussen RM. Development of WHO guidelines on generalized cost-effectiveness analysis. *Health Econ* 2000;9:235-51.
- 6 World Health Organization. *Making choices in health: WHO guide to cost-effectiveness analysis*. Geneva: WHO, 2003.
- 7 Evans DB, Tan-Torres Edejer T, Adam T, Lim SS, for the WHO-CHOICE Millennium Development Goals Team. Achieving the millennium development goals for health: Methods to assess the costs and health effects of interventions for improving health in developing countries. *BMJ* 2005;331:1137-40.
- 8 Murray CJL, Lopez AD. *Global health statistics: a compendium of incidence, prevalence and mortality estimates for over 200 conditions*. Cambridge, MA: Harvard University Press, 1996.
- 9 Perry R, Halsey N. The clinical significance of measles: a review. *J Infect Dis* 2004;189:S4-16.
- 10 Fishman S, Caulfield L, de Onis M, Blossner M, Hyder A, Mullany L, et al. Chapter 2. Childhood and maternal undernutrition. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. *Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors, Vol 1*. Geneva: WHO, 2004.
- 11 Rice A, West K, Fishman S, Black R. Chapter 4. Vitamin A deficiency. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. *Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors, Vol 1*. Geneva: WHO, 2004.
- 12 Caulfield L, Black R. Chapter 5. Zinc deficiency. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. *Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors*. Geneva: WHO, 2004.
- 13 Horton S. *Unit costs, cost-effectiveness, and financing of nutrition interventions*. Population and Human Resources Department, Washington, DC: World Bank, 1992. WPS-952.
- 14 Pegurri E, Fox-Rushby JA, Damian W. The effects and costs of expanding the coverage of immunisation services in developing countries: a systematic literature review. *Vaccine* 2005;23:1624-35.

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How does progress towards the child mortality millennium development goal affect inequalities between the poorest and least poor? Analysis of Demographic and Health Survey data

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The millennium development goals (MDGs) have been widely accepted as a framework for improving health and welfare worldwide. Child mortality is one of the most crucial and avoidable global health concerns. In many low income countries, 10-20% of children die before reaching 5 years (compared with, for example, 0.7% in England and Wales). The child mortality MDG (to reduce the under 5 mortality rate by two thirds between 1990 and 2015) is formulated as a national average. The *World Health Report 2003* posed an important question: how does progress towards the MDGs affect equity? We investigated this by examining, across a range of settings, how inequality in the under 5 mortality of the poorest and least poor changes as progress is made towards the MDG.

Participants, methods, and results

Using published data¹ we examined changes in inequalities in under 5 mortality within 22 low and lower middle income countries (11 in Africa, five in Latin America or the Caribbean, and six in Asia) each with two Demographic and Health Surveys between 1991 and 2001 (www.measuredhs.com). These countries encompass high and lower mortality situations, varied sociodemographic conditions, and in 2000 they accounted for 27% of the world's population. Under 5 mortality was estimated, using standard methods, from

information on births in the 10 years preceding the survey derived from birth histories collected from women of reproductive ages. Socioeconomic position was described using an index of household wealth calculated from information on ownership of household assets (for example, a radio), housing characteristics (for example, floor materials), drinking water source, toilet facilities, and availability of electricity. The method is described elsewhere.² Households, ranked by wealth index, were split into five groups each containing 20% of individuals and representing the poorest up to the least poor quintiles of the population. Under 5 mortality rates (deaths under age 5 per 1000 live births) were calculated for each quintile and the rate ratio (ratio of mortality in poorest and least poor quintiles) used to describe relative inequality. Inequality was considered to have increased or decreased over time if the rate ratio changed by at least $\pm 10\%$.

National under 5 mortality rates vary between 30 and 250 deaths per 1000 live births (table). In all surveys mortality is higher in the poorest as compared with the least poor quintile. Most rate ratios lie within the range 1.5 to 3.0 and almost all the 95% confidence intervals exclude 1.0. Thirteen countries had statisti-

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Trend in level and inequalities in under 5 mortality in 22 low and lower middle income countries

	Overall under 5 mortality		Poorest to least poor inequality in under 5 mortality	
	Level of under 5 mortality per 1000 live births (95% CI)	% change in level of under 5 mortality*	Rate ratio† (95% CI)	Change in rate ratio‡
Countries with declining under 5 mortality§				
Bangladesh 1996-7	127.8 (120.3 to 135.3)	-13.9	1.86 (1.48 to 2.33)	—
Bangladesh 2000	110.0 (103.4 to 116.6)		1.93 (1.60 to 2.32)	
Benin 1996	183.9 (172.9 to 194.9)	-11.5	1.89 (1.56 to 2.30)	Increase
Benin 2001	162.7 (153.2 to 172.2)		2.13 (1.71 to 2.65)	
Colombia 1995	37.4 (33.0 to 41.8)	-25.1	2.21 (1.46 to 3.34)	Decrease
Colombia 2000	28.0 (24.2 to 31.8)		1.94 (1.23 to 3.03)	
Egypt 1995	95.9 (89.4 to 102.4)	-27.8	3.76 (3.01 to 4.71)	Decrease
Egypt 2000	69.2 (64.6 to 73.8)		2.91 (2.36 to 3.57)	
Ghana 1993	132.8 (121.2 to 144.4)	-16.9	2.08 (1.60 to 2.71)	Increase
Ghana 1998	110.4 (100.8 to 120.0)		2.66 (1.86 to 3.81)	
Guatemala 1995	79.2 (73.5 to 84.9)	-18.4	2.35 (1.57 to 3.53)	Decrease
Guatemala 1998-9	64.6 (56.6 to 72.6)		1.97 (0.74 to 5.30)	
India 1992-3	118.8 (115.5 to 122.1)	-14.7	2.85 (2.61 to 3.11)	—
India 1998-9	101.3 (94.1 to 108.5)		3.11 (2.25 to 4.28)	
Malawi 1992	239.7 (226.6 to 252.8)	-15.4	1.47 (1.23 to 1.75)	—
Malawi 2000	202.7 (194.6 to 210.8)		1.55 (1.34 to 1.78)	
Namibia 1992	91.8 (82.7 to 100.9)	-34.4	1.46 (1.09 to 1.95)	Increase
Namibia 2000	60.2 (51.4 to 69.0)		1.76 (1.03 to 3.02)	
Nepal 1996	139.2 (130.2 to 148.2)	-22.1	1.89 (1.54 to 2.31)	—
Nepal 2001	108.4 (100.5 to 116.3)		1.92 (1.52 to 2.42)	
Nicaragua 1997-8	56.0 (51.4 to 60.6)	-20.4	2.32 (1.69 to 3.18)	Increase
Nicaragua 2001	44.6 (40.5 to 48.7)		3.35 (2.13 to 5.27)	
Turkey 1993	80.5 (72.2 to 88.8)	-25.8	4.60 (3.14 to 6.75)	Decrease
Turkey 1998	59.7 (51.8 to 67.6)		2.61 (1.59 to 4.27)	
Zambia 1996	192.1 (182.8 to 201.4)	-12.6	1.57 (1.34 to 1.83)	Increase
Zambia 2001-2	167.9 (158.3 to 177.5)		2.07 (1.68 to 2.57)	
Remaining countries				
Cameroon 1991	144.0 (128.1 to 159.9)	+1.6	2.46 (1.88 to 3.21)	—
Cameroon 1998	146.3 (132.3 to 160.3)		2.29 (1.80 to 2.92)	
Haiti 1994-5	140.6 (127.9 to 153.3)	-2.1	1.55 (1.17 to 2.04)	—
Haiti 2000	137.7 (127.0 to 148.4)		1.51 (1.17 to 1.94)	
Kazakhstan 1995	47.9 (38.0 to 57.8)	+31.5	1.21 (0.62 to 2.35)	Increase
Kazakhstan 1999	63.0 (52.0 to 74.0)		1.83 (1.13 to 2.97)	
Mali 1995-6	252.2 (241.4 to 263.0)	-5.6	1.76 (1.56 to 2.00)	—
Mali 2001	238.2 (227.5 to 248.9)		1.67 (1.46 to 1.92)	
Peru 1996	68.4 (64.0 to 72.8)	-11.7	4.98 (3.73 to 6.65)	—
Peru 2000	60.4 (56.4 to 64.4)		5.26 (3.46 to 7.99)	
Tanzania 1996	144.8 (134.7 to 154.9)	+11.3	1.44 (1.20 to 1.73)	Decrease
Tanzania 1999	161.1 (143.9 to 178.3)		1.18 (0.92 to 1.52)	
Uganda 1995	156.2 (145.5 to 166.9)	+0.2	1.69 (1.42 to 2.02)	—
Uganda 2000-1	156.5 (146.1 to 166.9)		1.80 (1.50 to 2.16)	
Vietnam 1997	45.9 (38.0 to 53.8)	-28.3	2.75 (1.71 to 4.44)	Increase
Vietnam 2000	32.9 (25.4 to 40.4)		3.35 (1.35 to 8.31)	
Zimbabwe 1994	75.9 (68.6 to 83.2)	+19.0	1.50 (1.09 to 2.08)	—
Zimbabwe 1999	90.3 (79.6 to 101.0)		1.60 (1.13 to 2.27)	

*Between the earlier and later survey.

†Ratio of mortality in the poorest and least poor fifths.

‡Rate ratio increase or decrease of at least 10%.

§Statistically significant decline.

cally significant declines in overall under 5 mortality between surveys. Despite this, in only four of the 13 countries did the rate ratios decrease; five saw increasing rate ratios. None of the changes over time in the rate ratios were statistically significant.

Comment

We confirm that there are large and persistent inequalities in under 5 mortality within many low and lower middle income countries and show that improvements in national under 5 mortality, in line with the MDG, do not necessarily bring about decreasing inequalities in mortality between the poor-

est and least poor in society. Indeed, such society-wide improvements seem as likely to be accompanied by increasing as decreasing inequalities. This finding indicates the importance of monitoring under 5 mortality among different socioeconomic groups. It also argues for reformulating the child mortality MDG to incorporate an equity dimension and thus provide an impetus to adopt policies that tackle health inequalities.

For most countries considered here the Demographic and Health Surveys give the only nationally representative data on child mortality and are thus widely used for that purpose. However, as shown by the width of the confidence intervals in our analysis, these

What is already known on this topic

Progress is being made in some low and lower middle income countries towards achieving the millennium development goal on under 5 mortality

What this study adds

National improvements in under 5 mortality, in line with the millennium development goal, are as likely to be accompanied by increasing as decreasing inequalities in child mortality within countries; adding an equity dimension to this goal would give an impetus to adopting policies that tackle health inequalities

data allow us to give only indicative results rather than make statistically robust assessments of trends in inequality in under 5 mortality. This points to a need to strengthen health information systems for equity purposes.³

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- 1 Gwatkin DR, Rutstein S, Johnson K, Suliman EA, Wagstaff A. *Initial country-level differences about socio-economic differences in health, nutrition, and population*. 2nd ed. Washington, DC: World Bank, 2003.
- 2 Gwatkin D, Rutstein S, Johnson K, Pande R, Wagstaff A. *Socio-economic differences in health, nutrition, and population*. Washington, DC: World Bank, 2000.
- 3 Bambas Nolen L, Braveman P, Dachs JNW, Delgado I, Gakidou E, Moser K, et al. Strengthening health information systems to address health equity challenges. *Bull World Health Organ* 2005;83:597-603. (Accepted 13 October 2005)

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Corrections and clarifications

Influenza pandemics and avian flu

We introduced an important editorial error in this Clinical Review by Douglas Fleming at proof stage (*BMJ* 2005;331:1066-9, 5 Nov). While rephrasing a sentence, we inadvertently omitted the word "not." So in the box titled "Learning point: Example 4" the penultimate sentence should read: "Pregnancy is not a contraindication for vaccination." In the full text (HTML) version of this article on bmj.com, an electronic glitch resulted in an additional error: part of the main article appeared with the text of the same learning point box. All these errors have been corrected in the online versions of the article on bmj.com.

Rethinking breast screening—again

A confusion in the original text of this Personal View by Cornelia J Baines led to a change of intended meaning during the editorial process (*BMJ* 2005;331:1031, 29 Oct). In the third paragraph from the end, the sentence starting, "The reductions in breast cancer mortality..." should read: "Methodologically sound trials have found that the reduction in breast cancer mortality that can be attributed to screening does not even remotely approach 50%."

A memorable patient

A ship too far

We saw the look of despair in his eyes as his trolley was wheeled out of the anaesthetic room. After a long wait, the news had come from the intensive care unit that his operation had to be postponed because, as often happens, no bed was available. Unfortunately, the last bed had been claimed for a patient who had taken an overdose. We trainees, too, had our reasons to be disappointed at the postponement, since this was to be the first laparoscopic radical gastrectomy for distal gastric malignancy performed in our hospital. However, the patient's look as he was wheeled past us suggested much deeper feelings than mere disappointment.

We met him later on the ward. He was an extraordinary man whose wartime experiences fascinated us. "It was 60 years ago, and I was in the RAF," he began. "On Friday 13 January 1944, after being evacuated from Singapore, our ship was torpedoed by a Japanese submarine. We tried to make a raft out of hatches, but when we got it into the water it rolled over, and so we hung onto it, half submerged in the deep sea. It was 18 hours later when an Australian ship spotted us and started collecting the scattered crew members from the ocean. It appeared that hope and a second chance at life was sailing towards us, but then suddenly it changed its direction and started sailing away. 'Oh Lord, no. You

show us mercy and then take it away.' Then, when all seemed lost, the ship changed its direction and started coming back. We were rescued. I was told later by one of the ship's crew that if they had sailed head on towards us we would have drowned with the water turbulence, and so the ship had to make a deviation and approach us from the side. You know, doctors, later that day I tasted the best tomato soup that I ever had in my life."

He said, "Today that feeling of life ebbing away came back and I relived the experience as I was being sent back from theatre. I have cancer, and I felt as though my salvation, my operation, like the ship, had abandoned me. The postponement of my operation brought about feelings that were identical to those I had 60 years ago when, after 18 hours in the water, the ship came for us and then turned back."

The old man spoke from his heart, and we thought about how often we never take time to think about what goes on inside the minds of our patients. We had failed to appreciate how a casual postponement could equate to a struggle to survive while starving, cold, and weary in the dark waters of adversity.

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