

	Deaths per 1000 livebirths					Number of under 5 deaths (thousands)	Annualised rate of change		
	Early neonatal (0-6 days)	Late neonatal (7-28 days)	Post to neonatal (29-364 days)	Childhood (1-4 years)	Under 5 (0-4 years)		1990-2000	2000-13	1990-13
(Table continued from previous page)									
Costa Rica	3.9 (3.5 to 4.5)	1.3 (1.2 to 1.4)	3.3 (2.9 to 3.7)	1.9 (1.5 to 2.5)	10.4 (9.5 to 11.5)	0.8 (0.7 to 0.8)	-3.3 (-2.2 to -4.5)	-2.9 (-1.9 to -3.9)	-3.1 (-2.5 to -3.6)
El Salvador	4.6 (3.7 to 5.5)	1.9 (1.7 to 2.1)	4.6 (3.6 to 5.7)	2.4 (1.9 to 3.1)	13.4 (12.2 to 14.8)	1.7 (1.6 to 1.9)	-5.9 (-4.8 to -7.0)	-6.2 (-5.2 to -7.2)	-6.1 (-5.6 to -6.6)
Guatemala	6.5 (5.9 to 7.3)	2.8 (2.6 to 3.0)	10.4 (8.8 to 12.2)	8.6 (6.9 to 10.7)	28.1 (25.5 to 30.9)	13.3 (12.1 to 14.7)	-4.0 (-3.0 to -4.9)	-4.6 (-3.7 to -5.5)	-4.3 (-3.9 to -4.8)
Honduras	9.2 (8.2 to 10.1)	2.6 (2.4 to 2.8)	6.3 (5.3 to 7.2)	5.3 (4.1 to 6.6)	23.1 (21.2 to 25.2)	4.8 (4.4 to 5.2)	-3.9 (-3.1 to -4.7)	-3.6 (-2.8 to -4.3)	-3.7 (-3.3 to -4.2)
Mexico	5.8 (5.1 to 6.6)	2.4 (2.2 to 2.6)	5.6 (4.8 to 6.6)	3.1 (2.3 to 3.8)	16.8 (15.3 to 18.6)	38.1 (34.7 to 42.0)	-4.6 (-3.6 to -5.7)	-3.6 (-2.6 to -4.5)	-4.0 (-3.5 to -4.5)
Nicaragua	8.9 (8.0 to 9.7)	2.7 (2.5 to 2.9)	8.7 (7.5 to 10.3)	4.1 (3.2 to 5.1)	24.1 (22.0 to 26.7)	3.3 (3.0 to 3.7)	-5.1 (-4.3 to -5.9)	-3.8 (-3.0 to -4.7)	-4.4 (-3.9 to -4.9)
Panama	5.9 (5.0 to 6.9)	2.2 (2.1 to 2.4)	4.4 (3.7 to 5.3)	6.2 (5.0 to 7.5)	18.7 (17.0 to 20.6)	1.4 (1.3 to 1.5)	-1.7 (-0.5 to -2.8)	-1.7 (-0.8 to -2.6)	-1.7 (-1.1 to -2.2)
Venezuela	4.7 (4.2 to 5.2)	1.8 (1.7 to 1.9)	4.0 (3.6 to 4.4)	2.9 (2.3 to 3.5)	13.3 (12.5 to 14.1)	8.0 (7.5 to 8.5)	-3.6 (-3.4 to -3.7)	-3.5 (-3.0 to -4.0)	-3.5 (-3.2 to -3.8)
Southern Latin America	4.8 (3.3 to 6.9)	1.7 (1.3 to 2.1)	4.0 (3.1 to 5.3)	1.8 (1.2 to 2.6)	12.3 (9.2 to 16.5)	12.2 (9.1 to 16.4)	-4.1 (-3.9 to -4.3)	-2.5 (-0.2 to -4.7)	-3.2 (-1.9 to -4.4)
Argentina	5.7 (4.0 to 8.0)	2.0 (1.6 to 2.4)	4.4 (3.6 to 5.7)	2.1 (1.4 to 3.1)	14.2 (10.8 to 18.5)	9.8 (7.5 to 12.8)	-3.9 (-3.6 to -4.1)	-2.5 (-0.3 to -4.5)	-3.1 (-1.9 to -4.2)
Chile	2.6 (1.7 to 3.8)	1.0 (0.8 to 1.4)	2.8 (1.8 to 4.0)	1.1 (0.6 to 1.7)	7.4 (5.1 to 10.8)	1.8 (1.3 to 2.6)	-5.8 (-5.4 to -6.2)	-2.9 (0.0 to -5.8)	-4.2 (-2.5 to -5.7)
Uruguay	3.6 (2.2 to 6.2)	1.8 (1.3 to 2.6)	4.3 (2.7 to 6.2)	1.3 (0.8 to 2.0)	10.9 (7.0 to 16.7)	0.5 (0.3 to 0.8)	-3.8 (-3.1 to -4.4)	-3.1 (0.3 to -6.4)	-3.4 (-1.4 to -5.2)
Tropical Latin America	7.5 (6.7 to 8.5)	2.6 (2.4 to 2.8)	6.1 (5.4 to 6.9)	2.0 (1.5 to 2.7)	18.1 (16.7 to 19.8)	57.4 (52.9 to 62.7)	-5.0 (-4.2 to -6.0)	-4.2 (-3.4 to -5.0)	-4.6 (-4.1 to -5.0)
Brazil	7.5 (6.6 to 8.4)	2.6 (2.4 to 2.7)	6.1 (5.4 to 6.9)	1.9 (1.3 to 2.7)	18.0 (16.6 to 19.7)	54.1 (49.8 to 59.0)	-5.1 (-4.3 to -6.0)	-4.3 (-3.5 to -5.1)	-4.6 (-4.2 to -5.1)
Paraguay	8.9 (7.9 to 9.9)	2.7 (2.6 to 2.9)	5.6 (4.8 to 6.6)	3.9 (2.9 to 5.2)	21.0 (19.3 to 22.9)	3.4 (3.1 to 3.7)	-2.6 (-1.7 to -3.5)	-2.5 (-1.7 to -3.3)	-2.6 (-2.1 to -3.0)
North Africa and Middle East	9.1 (8.5 to 9.8)	3.2 (3.0 to 3.4)	7.7 (7.0 to 8.6)	5.3 (4.7 to 6.0)	25.2 (23.4 to 27.1)	291.4 (271.2 to 313.9)	-4.6 (-4.2 to -5.0)	-4.6 (-4.0 to -5.1)	-4.6 (-4.2 to -4.9)
Algeria	10.0 (8.8 to 11.4)	2.9 (2.7 to 3.3)	7.0 (5.7 to 8.7)	4.5 (3.3 to 5.9)	24.3 (21.2 to 28.0)	22.9 (20.1 to 26.4)	-4.2 (-3.3 to -5.2)	-3.5 (-2.4 to -4.5)	-3.8 (-3.2 to -4.5)
Bahrain	2.5 (2.2 to 2.7)	1.3 (1.2 to 1.4)	2.2 (1.9 to 2.6)	0.9 (0.7 to 1.2)	6.9 (6.2 to 7.5)	0.1 (0.1 to 0.2)	-5.6 (-4.9 to -6.4)	-4.2 (-3.4 to -5.1)	-4.8 (-4.4 to -5.3)
Egypt	7.3 (6.4 to 8.2)	3.5 (3.3 to 3.8)	6.5 (5.4 to 7.8)	4.7 (3.6 to 6.0)	21.8 (19.6 to 24.3)	41.3 (37.2 to 46.1)	-6.5 (-5.9 to -7.0)	-5.4 (-4.5 to -6.2)	-5.8 (-5.3 to -6.3)
Iran	7.8 (6.5 to 9.2)	2.6 (2.3 to 2.8)	5.2 (4.3 to 6.4)	3.4 (2.5 to 4.6)	18.9 (16.4 to 21.9)	27.4 (23.7 to 31.8)	-6.0 (-5.1 to -6.9)	-6.3 (-5.2 to -7.3)	-6.2 (-5.5 to -6.8)
Iraq	11.3 (10.3 to 12.4)	3.3 (3.0 to 3.7)	8.8 (7.0 to 10.7)	5.7 (3.9 to 7.8)	28.8 (26.2 to 31.7)	29.9 (27.3 to 33.0)	-2.1 (-1.4 to -2.8)	-3.1 (-2.2 to -3.9)	-2.7 (-2.2 to -3.1)
Jordan	6.7 (5.8 to 7.6)	2.3 (2.1 to 2.4)	4.6 (3.8 to 5.4)	5.0 (3.9 to 6.1)	18.3 (16.7 to 20.2)	3.5 (3.2 to 3.9)	-2.3 (-1.6 to -2.9)	-2.9 (-2.1 to -3.6)	-2.6 (-2.2 to -3.1)
Kuwait	3.1 (2.8 to 3.5)	1.3 (1.3 to 1.4)	2.7 (2.4 to 3.1)	1.8 (1.4 to 2.2)	8.9 (8.2 to 9.6)	0.6 (0.6 to 0.6)	-3.5 (-3.0 to -4.1)	-2.7 (-2.1 to -3.4)	-3.1 (-2.7 to -3.5)
Lebanon	4.9 (4.1 to 5.9)	2.0 (1.7 to 2.3)	3.8 (3.1 to 4.5)	2.7 (1.9 to 3.8)	13.3 (11.7 to 15.2)	0.8 (0.7 to 0.9)	-6.1 (-5.0 to -7.1)	-3.9 (-2.7 to -4.8)	-4.8 (-4.2 to -5.4)
Libya	5.1 (4.1 to 6.2)	2.0 (1.7 to 2.2)	4.2 (3.3 to 5.2)	3.2 (2.4 to 4.1)	14.3 (12.5 to 16.6)	1.9 (1.6 to 2.1)	-4.5 (-3.3 to -5.5)	-4.5 (-3.4 to -5.5)	-4.5 (-3.8 to -5.2)
Morocco	10.5 (9.3 to 11.8)	4.1 (3.7 to 4.6)	7.4 (5.9 to 9.0)	4.5 (3.4 to 6.0)	26.3 (23.2 to 29.8)	19.4 (17.2 to 22.1)	-3.9 (-3.2 to -4.5)	-4.6 (-3.7 to -5.5)	-4.3 (-3.7 to -4.9)
Oman	2.7 (2.3 to 3.3)	1.3 (1.2 to 1.5)	2.6 (2.1 to 3.1)	2.0 (1.5 to 2.6)	8.5 (7.4 to 10.0)	0.6 (0.5 to 0.7)	-7.1 (-5.9 to -8.2)	-6.6 (-5.4 to -7.7)	-6.8 (-6.1 to -7.5)

(Table 3 continues on next page)

	Deaths per 1000 livebirths					Number of under 5 deaths (thousands)	Annualised rate of change		
	Early neonatal (0-6 days)	Late neonatal (7-28 days)	Post to neonatal (29-364 days)	Childhood (1-4 years)	Under 5 (0-4 years)		1990-2000	2000-13	1990-13
(Table continued from previous page)									
Palestine	8.0 (6.6 to 9.5)	2.5 (2.3 to 2.8)	5.3 (4.4 to 6.5)	3.9 (2.7 to 5.3)	19.6 (17.0 to 22.8)	2.6 (2.2 to 3.0)	-4.0 (-2.9 to -5.1)	-3.5 (-2.3 to -4.6)	-3.7 (-2.9 to -4.4)
Qatar	3.5 (2.9 to 4.3)	1.6 (1.4 to 1.8)	3.1 (2.6 to 3.7)	2.2 (1.6 to 2.9)	10.3 (9.0 to 12.0)	0.2 (0.2 to 0.3)	-3.5 (-2.3 to -4.8)	-3.1 (-2.1 to -4.1)	-3.3 (-2.5 to -4.0)
Saudi Arabia	4.3 (3.4 to 5.3)	1.8 (1.6 to 2.1)	3.5 (2.9 to 4.2)	2.5 (1.7 to 3.4)	12.0 (10.4 to 14.0)	6.8 (5.9 to 7.9)	-6.5 (-5.4 to -7.7)	-5.0 (-3.9 to -6.1)	-5.7 (-5.0 to -6.4)
Sudan	15.5 (14.0 to 17.4)	4.7 (4.1 to 5.4)	14.2 (11.6 to 17.2)	13.4 (9.9 to 17.1)	47.1 (41.6 to 53.4)	59.5 (52.7 to 67.5)	-3.1 (-2.2 to -4.1)	-4.1 (-3.1 to -5.0)	-3.6 (-3.1 to -4.2)
Syria	6.0 (5.2 to 6.8)	2.1 (2.0 to 2.2)	4.2 (3.4 to 5.1)	4.8 (3.7 to 5.9)	17.0 (15.8 to 18.3)	9.0 (8.4 to 9.7)	-6.5 (-5.6 to -7.5)	-2.1 (-1.2 to -2.8)	-4.0 (-3.6 to -4.4)
Tunisia	5.1 (4.3 to 5.9)	2.2 (1.9 to 2.4)	4.0 (3.4 to 4.6)	3.0 (2.2 to 3.8)	14.1 (12.6 to 15.9)	2.7 (2.4 to 3.0)	-5.7 (-4.8 to -6.5)	-5.2 (-4.3 to -6.1)	-5.4 (-4.9 to -6.0)
Turkey	7.3 (6.3 to 8.5)	2.5 (2.3 to 2.6)	5.4 (4.7 to 6.3)	2.3 (1.7 to 3.0)	17.4 (15.5 to 19.6)	22.0 (19.6 to 24.8)	-5.6 (-4.9 to -6.3)	-6.4 (-5.5 to -7.2)	-6.0 (-5.5 to -6.6)
United Arab Emirates	2.2 (1.9 to 2.5)	1.1 (1.0 to 1.3)	2.0 (1.6 to 2.5)	1.4 (1.0 to 2.0)	6.8 (6.0 to 7.6)	0.9 (0.8 to 1.0)	-5.5 (-4.2 to -6.9)	-4.6 (-3.4 to -5.7)	-5.0 (-4.3 to -5.8)
Yemen	15.3 (13.0 to 17.6)	5.7 (4.8 to 6.8)	20.7 (16.0 to 25.3)	9.6 (7.2 to 12.7)	50.4 (44.5 to 57.5)	38.0 (33.6 to 43.4)	-3.4 (-2.8 to -4.0)	-4.2 (-3.2 to -5.1)	-3.9 (-3.3 to -4.4)
High-income North America	2.9 (2.4 to 3.5)	0.7 (0.6 to 0.8)	1.9 (1.5 to 2.4)	1.1 (0.7 to 1.5)	6.5 (5.4 to 7.9)	30.1 (24.8 to 36.7)	-3.2 (-3.1 to -3.4)	-1.6 (-0.1 to -3.1)	-2.3 (-1.5 to -3.1)
Canada	2.5 (2.0 to 3.0)	0.6 (0.5 to 0.7)	1.5 (1.2 to 1.9)	0.9 (0.6 to 1.3)	5.4 (4.4 to 6.6)	2.1 (1.7 to 2.6)	-3.5 (-3.0 to -4.0)	-0.9 (0.7 to -2.4)	-2.1 (-1.2 to -2.9)
USA	2.9 (2.4 to 3.5)	0.7 (0.6 to 0.8)	1.9 (1.5 to 2.4)	1.1 (0.7 to 1.5)	6.6 (5.5 to 8.1)	28.0 (23.1 to 34.2)	-3.2 (-3.1 to -3.4)	-1.7 (-0.1 to -3.1)	-2.3 (-1.5 to -3.2)
Oceania	15.7 (12.3 to 19.9)	4.7 (3.0 to 7.3)	17.3 (10.1 to 26.9)	13.8 (6.9 to 25.8)	50.5 (32.6 to 76.5)	14.2 (9.2 to 21.4)	-1.1 (1.0 to -3.1)	-2.5 (1.0 to -5.1)	-1.9 (0.0 to -3.7)
Federated States of Micronesia	5.8 (3.0 to 10.1)	1.7 (1.1 to 2.2)	3.9 (2.4 to 6.3)	3.4 (1.9 to 5.6)	14.7 (8.9 to 23.5)	0.0 (0.0 to 0.1)	-5.9 (-2.9 to -8.8)	-4.7 (-1.7 to -7.5)	-5.2 (-3.1 to -7.2)
Fiji	12.1 (8.7 to 15.8)	2.9 (2.0 to 4.3)	9.5 (5.1 to 16.6)	8.6 (5.0 to 14.3)	32.7 (21.5 to 48.9)	0.6 (0.4 to 0.9)	-0.7 (1.9 to -3.3)	0.3 (3.4 to -2.4)	-0.1 (2.4 to -2.3)
Kiribati	16.5 (13.2 to 20.6)	4.9 (3.2 to 7.2)	18.1 (10.7 to 28.4)	13.7 (7.2 to 23.6)	52.2 (35.6 to 75.4)	0.1 (0.1 to 0.2)	-2.5 (-0.3 to -4.7)	-2.3 (0.6 to -5.0)	-2.4 (-0.6 to -4.1)
Marshall Islands	12.3 (8.2 to 16.5)	2.9 (2.0 to 5.1)	9.5 (4.9 to 18.2)	7.4 (3.8 to 14.4)	31.8 (19.2 to 51.8)	0.1 (0.0 to 0.1)	-1.5 (1.5 to -4.5)	-2.1 (1.1 to -5.3)	-1.9 (0.6 to -4.0)
Papua New Guinea	17.1 (13.6 to 21.7)	5.3 (3.3 to 8.3)	19.9 (11.5 to 30.6)	15.8 (7.5 to 30.5)	57.0 (36.7 to 86.4)	12.0 (7.7 to 18.1)	-1.4 (0.9 to -3.6)	-2.8 (-0.1 to -5.4)	-2.2 (-0.3 to -4.1)
Samoa	4.5 (2.3 to 8.7)	1.4 (0.9 to 2.1)	3.2 (1.8 to 5.2)	3.1 (1.7 to 5.5)	12.1 (6.9 to 20.4)	0.1 (0.0 to 0.1)	-3.1 (0.3 to -6.7)	-2.7 (1.1 to -6.1)	-2.9 (0.2 to -5.7)
Solomon Islands	9.0 (5.0 to 13.5)	2.2 (1.5 to 3.2)	5.8 (3.3 to 10.9)	5.0 (2.8 to 8.4)	21.8 (13.2 to 35.1)	0.4 (0.2 to 0.6)	-2.7 (0.2 to -5.6)	-3.1 (0.4 to -6.0)	-2.9 (-0.8 to -5.1)
Tonga	9.6 (5.2 to 14.4)	2.3 (1.6 to 3.6)	6.4 (3.3 to 12.9)	5.4 (2.8 to 10.0)	23.5 (13.5 to 39.3)	0.1 (0.0 to 0.1)	0.6 (4.0 to -2.7)	-1.9 (1.6 to -5.3)	-0.8 (1.5 to -3.1)
Vanuatu	13.0 (9.7 to 16.3)	3.2 (2.2 to 4.7)	10.6 (6.0 to 17.4)	8.1 (4.6 to 13.9)	34.5 (23.5 to 50.0)	0.2 (0.2 to 0.3)	0.3 (2.5 to -1.9)	-0.7 (2.3 to -3.7)	-0.3 (1.6 to -2.2)
Central sub-Saharan Africa	22.7 (20.0 to 25.8)	7.7 (6.5 to 9.1)	39.8 (32.6 to 48.6)	45.1 (33.7 to 60.0)	110.7 (93.0 to 130.9)	461.4 (386.8 to 547.7)	-0.7 (-0.2 to -1.2)	-3.0 (-1.6 to -4.3)	-2.0 (-1.2 to -2.8)
Angola	16.6 (14.0 to 19.7)	8.6 (6.9 to 10.5)	29.5 (21.3 to 39.6)	38.3 (26.4 to 54.4)	90.1 (72.2 to 109.9)	83.4 (67.2 to 101.5)	-2.0 (-1.0 to -2.8)	-4.1 (-2.4 to -5.8)	-3.2 (-2.3 to -4.2)
Central African Republic	29.6 (24.8 to 35.8)	11.6 (8.9 to 15.1)	50.3 (38.5 to 65.9)	53.4 (34.3 to 76.5)	137.7 (107.4 to 176.5)	21.5 (16.8 to 27.6)	-0.8 (0.1 to -1.7)	-1.4 (0.7 to -3.2)	-1.1 (0.0 to -2.2)
Congo	17.7 (15.5 to 19.9)	4.8 (4.0 to 5.6)	21.8 (16.7 to 26.9)	18.1 (12.3 to 24.5)	61.1 (51.8 to 69.9)	10.0 (8.5 to 11.5)	1.9 (2.6 to -1.0)	-4.6 (-3.4 to -6.0)	-1.8 (-1.2 to -2.6)
Democratic Republic of the Congo	24.7 (20.8 to 29.1)	7.5 (5.9 to 9.5)	44.2 (33.6 to 57.0)	49.3 (33.8 to 71.2)	120.3 (96.1 to 150.2)	340.4 (272.3 to 425.8)	-0.4 (0.2 to -1.1)	-2.8 (-1.0 to -4.5)	-1.7 (-0.7 to -2.7)

(Table 3 continues on next page)

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	Early neonatal (0-6 days)	Late neonatal (7-28 days)	Post to neonatal (29-364 days)	Childhood (1-4 years)	Under 5 (0-4 years)		1990-2000	2000-13	1990-13
(Table continued from previous page)									
Equatorial Guinea	23.9 (19.7 to 28.2)	8.4 (6.3 to 11.3)	40.4 (28.4 to 54.5)	41.1 (26.0 to 63.8)	109.4 (82.5 to 142.6)	2.9 (2.2 to 3.8)	0.1 (1.6 to -1.1)	-3.4 (-0.8 to -5.6)	-1.9 (-0.6 to -3.2)
Gabon	19.1 (16.5 to 21.4)	3.9 (3.2 to 4.6)	20.7 (16.1 to 25.1)	17.9 (13.0 to 23.7)	60.4 (50.5 to 71.2)	3.2 (2.7 to 3.8)	-1.9 (-1.0 to -2.8)	-1.3 (-0.1 to -2.8)	-1.5 (-0.8 to -2.3)
Eastern sub-Saharan Africa	19.6 (18.5 to 20.8)	6.3 (5.8 to 6.8)	26.8 (24.4 to 29.3)	25.9 (22.8 to 29.5)	76.5 (71.0 to 82.6)	1005.0 (932.7 to 1085.4)	-2.4 (-2.2 to -2.6)	-4.4 (-3.8 to -5.0)	-3.5 (-3.2 to -3.9)
Burundi	19.4 (16.6 to 22.4)	7.2 (6.1 to 8.5)	28.5 (22.8 to 34.7)	36.4 (27.0 to 49.1)	88.7 (75.3 to 104.8)	39.1 (33.2 to 46.3)	0.2 (0.9 to -0.5)	-5.4 (-4.1 to -6.8)	-3.0 (-2.2 to -3.8)
Comoros	18.2 (14.8 to 22.3)	6.3 (4.5 to 9.2)	13.6 (8.7 to 20.4)	8.5 (5.4 to 13.3)	45.8 (33.2 to 63.1)	1.2 (0.9 to 1.6)	-3.8 (-1.9 to -5.7)	-4.7 (-2.0 to -7.0)	-4.3 (-2.9 to -5.6)
Djibouti	17.6 (15.1 to 21.0)	5.4 (4.0 to 7.1)	21.8 (15.1 to 29.7)	19.5 (12.3 to 30.9)	62.9 (47.3 to 82.1)	1.5 (1.1 to 2.0)	-0.9 (0.6 to -2.1)	-3.8 (-1.3 to -6.0)	-2.5 (-1.3 to -3.7)
Eritrea	15.9 (13.4 to 18.9)	4.1 (3.0 to 5.7)	16.9 (11.7 to 24.0)	22.6 (14.0 to 36.7)	58.2 (41.9 to 79.9)	13.3 (9.6 to 18.2)	-2.8 (-2.1 to -3.6)	-5.3 (-2.8 to -7.7)	-4.2 (-2.7 to -5.5)
Ethiopia	22.9 (20.0 to 26.1)	7.0 (5.8 to 8.4)	23.3 (18.3 to 28.9)	23.2 (16.7 to 32.6)	74.4 (62.7 to 88.4)	229.3 (193.4 to 273.0)	-3.5 (-2.9 to -4.1)	-5.1 (-3.8 to -6.5)	-4.4 (-3.6 to -5.2)
Kenya	17.5 (15.1 to 20.5)	4.4 (3.4 to 5.6)	21.1 (15.4 to 28.7)	16.6 (11.2 to 23.2)	58.3 (46.5 to 73.4)	89.5 (71.4 to 112.8)	0.1 (0.8 to -0.6)	-3.9 (-1.9 to -5.6)	-2.2 (-1.0 to -3.1)
Madagascar	14.6 (12.5 to 17.0)	5.3 (4.2 to 6.7)	21.6 (16.2 to 28.4)	18.3 (12.5 to 26.2)	58.5 (46.5 to 73.7)	45.7 (36.3 to 57.7)	-4.1 (-3.5 to -4.8)	-3.9 (-2.1 to -5.8)	-4.0 (-3.0 to -5.0)
Malawi	19.7 (16.9 to 22.1)	6.5 (5.5 to 7.4)	30.6 (24.7 to 36.5)	36.1 (26.8 to 46.9)	89.9 (76.5 to 103.4)	57.2 (48.7 to 65.9)	-3.1 (-2.6 to -3.7)	-4.8 (-3.5 to -5.9)	-4.0 (-3.4 to -4.7)
Mauritius	6.2 (5.2 to 7.4)	1.9 (1.7 to 2.1)	3.3 (2.9 to 3.8)	2.6 (2.0 to 3.3)	14.0 (12.2 to 16.0)	0.2 (0.2 to 0.2)	-2.3 (-1.6 to -3.1)	-1.7 (-0.6 to -2.8)	-2.0 (-1.4 to -2.6)
Seychelles	4.5 (3.6 to 5.5)	1.6 (1.4 to 1.9)	3.0 (2.5 to 3.6)	2.7 (1.9 to 3.7)	11.7 (10.1 to 13.7)	0.0 (0.0 to 0.0)	-2.8 (-1.0 to -4.5)	-0.9 (0.9 to -2.3)	-1.7 (-0.8 to -2.5)
Mozambique	21.0 (18.4 to 23.9)	6.8 (5.7 to 7.8)	33.5 (26.6 to 41.0)	30.1 (21.4 to 39.8)	88.4 (76.9 to 101.5)	87.9 (76.3 to 101.1)	-3.4 (-2.9 to -4.0)	-4.4 (-3.3 to -5.5)	-4.0 (-3.4 to -4.6)
Rwanda	17.6 (15.4 to 20.3)	5.4 (4.3 to 6.8)	21.6 (16.3 to 29.2)	19.5 (12.5 to 28.4)	62.6 (50.7 to 78.2)	25.7 (20.8 to 32.1)	-0.3 (0.2 to -1.0)	-7.2 (-5.4 to -8.8)	-4.2 (-3.2 to -5.1)
Somalia	23.8 (19.8 to 28.2)	10.0 (7.5 to 13.0)	39.2 (27.3 to 53.1)	45.5 (29.5 to 67.2)	113.7 (88.9 to 144.5)	51.3 (40.1 to 65.3)	-1.8 (-0.7 to -2.8)	-2.6 (-0.5 to -4.4)	-2.2 (-1.2 to -3.3)
South Sudan	23.0 (19.8 to 26.9)	9.0 (6.9 to 11.8)	36.9 (27.6 to 48.8)	41.1 (26.2 to 59.9)	105.9 (83.8 to 135.1)	41.8 (33.2 to 53.5)	-3.0 (-0.8 to -5.0)	-2.7 (-0.3 to -4.8)	-2.8 (-1.6 to -4.0)
Tanzania	18.0 (15.7 to 20.4)	5.8 (4.8 to 6.9)	30.2 (23.2 to 37.2)	24.6 (18.0 to 33.1)	76.5 (63.8 to 90.4)	145.2 (121.1 to 171.8)	-2.1 (-1.6 to -2.7)	-3.6 (-2.2 to -5.0)	-3.0 (-2.2 to -3.7)
Uganda	20.2 (17.6 to 22.7)	5.7 (4.9 to 6.6)	27.9 (22.4 to 33.1)	28.8 (21.7 to 37.0)	80.1 (69.4 to 93.1)	127.3 (110.3 to 147.9)	-1.7 (-1.2 to -2.3)	-4.2 (-2.9 to -5.3)	-3.1 (-2.4 to -3.7)
Zambia	15.2 (13.2 to 17.7)	6.9 (5.5 to 8.6)	29.5 (22.8 to 37.9)	31.2 (20.7 to 43.6)	80.5 (63.4 to 101.2)	48.7 (38.3 to 61.3)	-1.4 (-0.8 to -1.9)	-4.9 (-3.3 to -6.7)	-3.4 (-2.4 to -4.4)
Southern sub-Saharan Africa	13.8 (12.4 to 15.2)	4.2 (3.5 to 4.9)	17.5 (13.7 to 21.4)	12.3 (9.5 to 15.4)	46.9 (39.8 to 54.6)	83.2 (70.7 to 96.7)	1.3 (2.7 to -0.3)	-4.1 (-2.5 to -5.6)	-1.7 (-1.0 to -2.5)
Botswana	12.5 (10.1 to 14.8)	2.6 (2.0 to 3.7)	9.6 (6.3 to 15.1)	6.6 (3.9 to 10.5)	30.9 (22.4 to 41.9)	1.5 (1.1 to 2.0)	2.0 (3.3-0.7)	-6.0 (-3.1 to -8.4)	-2.5 (-1.2 to -4.0)
Lesotho	31.3 (26.3 to 37.2)	7.4 (5.8 to 9.7)	35.0 (26.9 to 47.6)	18.8 (12.5 to 27.0)	89.6 (71.3 to 113.8)	5.1 (4.0 to 6.5)	1.1 (2.0-0.1)	-1.1 (0.9 to -2.9)	-0.1 (1.0 to -1.2)
Namibia	14.0 (11.2-17.8)	2.5 (1.7 to 3.7)	9.4 (5.8 to 15.6)	9.2 (5.5 to 15.3)	34.7 (24.2 to 49.0)	2.1 (1.4 to 2.9)	-1.0 (0.0 to -1.7)	-4.8 (-2.0 to -7.4)	-3.1 (-1.6 to -4.6)
South Africa	11.4 (9.5 to 13.3)	3.2 (2.5 to 4.2)	14.7 (9.2 to 20.3)	8.2 (5.3 to 12.2)	37.0 (27.8 to 47.8)	40.6 (30.6 to 52.6)	1.4 (3.6 to -1.0)	-6.1 (-3.6 to -8.5)	-2.8 (-1.6 to -4.1)
Swaziland	16.8 (14.4 to 19.9)	5.0 (3.9 to 6.4)	34.5 (26.1 to 45.0)	20.1 (13.0 to 28.4)	74.4 (58.1 to 96.0)	2.8 (2.1 to 3.5)	2.9 (3.8-2.1)	-2.4 (-0.4 to -4.3)	-0.1 (1.2 to -1.2)
Zimbabwe	17.7 (15.4 to 20.8)	6.5 (5.3 to 8.1)	23.3 (18.5 to 30.6)	23.1 (16.0 to 31.0)	69.0 (56.3 to 84.7)	30.3 (24.7 to 37.2)	1.0 (1.6-0.3)	-0.6 (1.0 to -2.3)	0.1 (0.9 to -0.7)

(Table 3 continues on next page)

	Deaths per 1000 livebirths					Number of under 5 deaths (thousands)	Annualised rate of change		
	Early neonatal (0-6 days)	Late neonatal (7-28 days)	Post to neonatal (29-364 days)	Childhood (1-4 years)	Under 5 (0-4 years)		1990-2000	2000-13	1990-13
(Table continued from previous page)									
Western sub-Saharan Africa	25.7 (23.7 to 27.7)	8.7 (8.1 to 9.3)	32.4 (29.2 to 35.8)	52.3 (45.7 to 59.6)	114.3 (106.8 to 122.1)	1645.9 (1537.4 to 1758.6)	-1.3 (-1.1 to -1.6)	-3.1 (-2.6 to -3.6)	-2.3 (-2.0 to -2.6)
Benin	18.1 (16.0 to 20.3)	3.6 (3.2 to 4.1)	18.9 (15.8 to 22.2)	20.8 (16.1 to 26.7)	60.1 (54.1 to 67.1)	22.3 (20.0 to 24.9)	-3.1 (-2.6 to -3.6)	-5.9 (-4.9 to -6.8)	-4.7 (-4.1 to -5.1)
Burkina Faso	20.2 (17.5 to 23.1)	8.7 (7.8 to 9.9)	32.3 (26.9 to 38.6)	46.6 (36.7 to 57.0)	104.0 (93.0 to 116.6)	70.6 (63.1 to 79.4)	-1.3 (-0.8 to -1.9)	-4.3 (-3.4 to -5.2)	-3.0 (-2.5 to -3.5)
Cameroon	25.1 (22.5 to 28.4)	7.5 (6.8 to 8.5)	30.3 (25.9 to 35.5)	41.8 (33.5 to 52.5)	100.9 (91.9 to 113.9)	82.5 (75.1 to 93.2)	0.3 (0.9 to -0.2)	-2.5 (-1.5 to -3.4)	-1.3 (-0.7 to -1.7)
Cape Verde	9.1 (7.5 to 10.7)	2.4 (2.2 to 2.8)	7.3 (5.7 to 9.7)	5.5 (4.1 to 7.2)	24.1 (20.0 to 29.2)	0.2 (0.2 to 0.3)	-2.4 (-1.0 to -3.8)	-4.8 (-3.0 to -6.4)	-3.8 (-2.9 to -4.6)
Chad	29.6 (25.2 to 34.5)	12.1 (10.0 to 14.6)	46.3 (34.9 to 59.9)	66.5 (47.9 to 84.6)	146.5 (128.2 to 170.3)	84.5 (74.0 to 98.5)	-0.7 (-0.1 to -1.3)	-2.0 (-0.7 to -3.1)	-1.4 (-0.8 to -2.0)
Côte d'Ivoire	27.0 (24.0 to 30.1)	9.4 (8.4 to 10.7)	31.9 (27.0 to 38.0)	31.3 (24.8 to 40.5)	96.0 (86.7 to 108.9)	70.2 (63.3 to 79.5)	-0.8 (-0.2 to -1.4)	-3.0 (-1.9 to -3.8)	-2.0 (-1.4 to -2.5)
Ghana	21.9 (19.1 to 24.8)	5.9 (5.1 to 6.8)	18.3 (14.9 to 22.1)	27.2 (21.5 to 34.2)	71.4 (62.4 to 82.3)	56.6 (49.4 to 65.2)	-1.8 (-1.3 to -2.3)	-2.8 (-1.7 to -3.8)	-2.3 (-1.7 to -2.9)
Guinea	26.1 (22.9 to 29.2)	8.6 (7.8 to 9.5)	33.6 (28.0 to 38.9)	44.6 (35.8 to 53.6)	108.6 (99.6 to 117.7)	46.3 (42.4 to 50.3)	-2.8 (-2.3 to -3.4)	-3.6 (-2.9 to -4.3)	-3.3 (-2.9 to -3.7)
Guinea-Bissau	30.0 (25.2 to 35.5)	12.3 (10.0 to 14.9)	47.6 (36.4 to 60.6)	71.2 (52.3 to 92.2)	152.5 (130.6 to 177.4)	9.6 (8.2 to 11.2)	-1.3 (-0.3 to -2.5)	-1.9 (-0.3 to -3.2)	-1.6 (-0.8 to -2.4)
Liberia	20.4 (18.2 to 22.8)	5.9 (5.0 to 7.0)	32.6 (26.9 to 39.6)	20.8 (15.0 to 27.8)	77.5 (66.2 to 91.4)	11.6 (9.9 to 13.7)	-3.4 (-2.8 to -4.0)	-5.6 (-4.3 to -6.9)	-4.6 (-3.9 to -5.3)
Mali	31.4 (26.0 to 36.9)	11.5 (9.6 to 13.9)	38.8 (30.4 to 48.6)	75.0 (58.5 to 96.3)	148.8 (126.4 to 176.0)	104.2 (88.5 to 123.0)	-1.5 (-1.0 to -2.0)	-3.0 (-1.7 to -4.3)	-2.4 (-1.7 to -3.1)
Mauritania	26.8 (23.5 to 30.7)	6.7 (5.5 to 8.1)	16.0 (12.6 to 20.4)	21.6 (15.7 to 28.5)	69.3 (58.4 to 82.5)	9.1 (7.7 to 10.8)	-0.7 (0.2 to -1.6)	-2.7 (-1.2 to -4.0)	-1.8 (-1.0 to -2.6)
Niger	17.7 (15.1 to 20.5)	8.3 (7.4 to 9.2)	31.3 (25.6 to 37.6)	62.6 (51.6 to 75.5)	115.4 (104.9 to 127.4)	97.8 (88.7 to 108.1)	-2.9 (-2.4 to -3.4)	-5.1 (-4.3 to -5.9)	-4.1 (-3.7 to -4.6)
Nigeria	27.9 (23.9 to 31.7)	9.2 (8.1 to 10.4)	34.8 (28.6 to 41.1)	62.0 (49.8 to 76.1)	128.0 (114.3 to 142.0)	892.6 (796.1 to 991.6)	-1.2 (-0.7 to -1.7)	-2.8 (-1.9 to -3.8)	-2.1 (-1.6 to -2.6)
São Tomé and Príncipe	15.2 (13.3 to 17.0)	3.2 (2.7 to 4.0)	11.7 (8.7 to 15.3)	11.2 (8.1 to 15.2)	40.7 (34.5 to 48.2)	0.3 (0.2 to 0.3)	-2.4 (-1.5 to -3.3)	-4.8 (-3.4 to -6.1)	-3.8 (-3.0 to -4.5)
Senegal	18.0 (15.9 to 20.1)	5.6 (5.0 to 6.3)	14.8 (12.3 to 17.7)	22.4 (17.6 to 27.7)	59.5 (53.4 to 66.8)	31.1 (27.9 to 35.0)	-1.5 (-1.0 to -2.0)	-5.7 (-4.9 to -6.6)	-3.9 (-3.4 to -4.4)
Sierra Leone	27.7 (24.1 to 31.4)	9.8 (8.5 to 11.4)	48.9 (40.2 to 58.7)	46.4 (34.3 to 60.0)	126.8 (111.6 to 144.3)	28.1 (24.7 to 32.0)	-1.4 (-0.9 to -2.0)	-3.5 (-2.5 to -4.5)	-2.6 (-2.0 to -3.2)
The Gambia	20.6 (18.1 to 23.7)	6.1 (5.0 to 7.6)	23.4 (17.9 to 29.9)	26.5 (17.9 to 36.1)	74.6 (62.2 to 90.0)	5.7 (4.8 to 6.9)	-2.6 (-1.4 to -3.7)	-4.0 (-2.5 to -5.5)	-3.4 (-2.5 to -4.2)
Togo	25.2 (22.0 to 28.6)	6.1 (5.1 to 7.4)	26.2 (21.0 to 32.1)	38.4 (27.8 to 50.2)	92.8 (77.5 to 111.8)	22.6 (18.9 to 27.2)	-1.6 (-0.8 to -2.4)	-2.3 (-0.6 to -3.7)	-2.0 (-1.2 to -2.7)

Table 3: Early neonatal, late neonatal, postneonatal, childhood, and under-5 mortality rate and under-5 deaths in 2013, and annualised rates of change in mortality rates for 1990-2000, 2000-2013, and 1990-2013 for 188 countries and 21 Global Burden of Disease regions

Since 2000 in sub-Saharan Africa, child mortality has decreased fastest where it increased in the 1990s (probably because of the HIV epidemic) and then subsequently fell with the scale-up of prevention of mother-to-child transmission and ART.⁴⁷⁻⁵² Bangladesh has maintained a consistently higher rate of change of around -4.7% to -5.5% since 1990, slightly higher than in neighbouring India (-3.0% to -4.3%), although the pace of child mortality change in India has improved during the past 13 years, reaching -4.5% from 2012 to 2013. Timor-Leste had one of the fastest rates of change

(-7.9% per year) since 2000. Nine countries accounted for two-thirds of the global decrease of 3.1 million child deaths in 2013 compared with 2000 (in order of magnitude): India, China, Ethiopia, Bangladesh, Indonesia, Pakistan, Brazil, Afghanistan, and Nigeria (table 3).

Table 4 shows results for the four regression model specifications that assessed the broad determinants of change in under-5 mortality. These models account for a very large share of the recorded variation in under-5 mortality; R^2 values ranged from 0.85 to 0.97.

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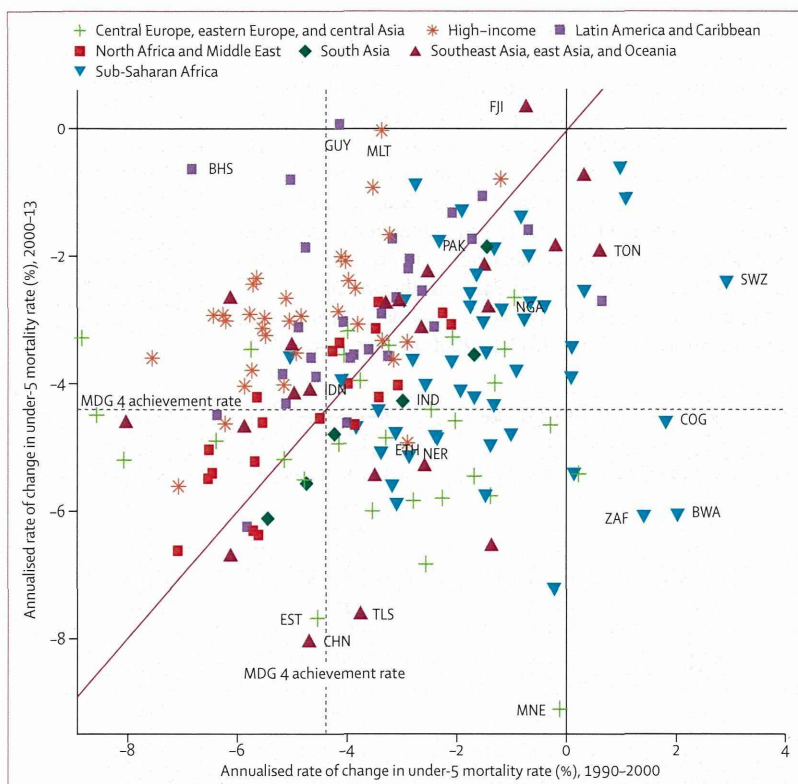


Figure 3: Global annualised rate of change in under-5 mortality rate (%) from 1990–2000, and 2000–13 Solid line shows the equivalence line between the two periods. Dashed lines show the Millennium Development Goal 4 target rate of 4.4% per year. We excluded North Korea from the figure because of substantially higher rates of change that distort the scales in the figure. CHN=China. EST=Estonia. IDN=Indonesia. GUY=Guyana. ETH=Ethiopia. TLS=Timor-Leste. IND=India. NER=Niger. PAK=Pakistan. NGA=Nigeria. MNE=Montenegro. ZAF=South Africa. COG=Congo. TON=Tonga. SWZ=Swaziland. BWA=Botswana. BHS=The Bahamas. MLT=Malta. FJI=Fiji.

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For the mixed effects regression model, the effect of a 10% increase in income per person corresponded with a 1.6% decrease in under-5 mortality rates. A 1 year increase in maternal education corresponded with an 8.5% decrease in under-5 mortality rate. Therefore, our findings confirm and quantify the findings of other researchers that show that improved levels of maternal education in low-income and middle-income countries have a far greater effect on reduction of child mortality than do any other intervention.^{28–32} The year fixed effects for each super-region that captured the secular trend unobserved by income, maternal education, or HIV were essentially linear for all regions, although the slope and level of these regional time trends were quite heterogeneous across regions (data not shown). The average annual change explained by the secular trend was –2.3% overall, ranging from –0.4% to –5.4% across regions.

We estimated the contribution of changes in income, education, birth numbers, secular trend, HIV, and other (unobserved) factors to changes in the number of child deaths in each country, comparing 1990 with 2013. Worldwide, higher numbers of births contributed

	Coefficient	SE	95% CI
Lagged distributed income (logarithmic scale)			
Mixed effects regression	–0.16‡	0.007	–0.18 to –0.15
Within-between regression*	–0.15‡	0.013	–0.17 to –0.12
Generalised linear model	–0.15‡	0.007	–0.17 to –0.14
Within-between regression†	–0.15‡	0.008	–0.17 to –0.14
Maternal education			
Mixed effects regression	–0.08‡	0.004	–0.09 to –0.08
Within-between regression*	–0.09‡	0.009	–0.11 to –0.07
Generalised linear model	–0.08‡	0.004	–0.09 to –0.07
Within-between regression†	–0.08‡	0.004	–0.09 to –0.07
Crude death rate from HIV			
Mixed effects regression	92.42‡	4.137	84.31 to 100.52
Within-between regression*	56.42‡	4.323	47.95 to 64.90
Generalised linear model	91.26‡	4.098	83.22 to 99.29
Within-between regression†	91.26‡	4.156	83.13 to 99.38

Combined GBD super-region and year fixed effects, and country level random effects, when included, not shown here. *Within-between estimator with AR(1) autocorrelation specification. †Within-between estimator without AR(1) autocorrelation specification. ‡Significant at 0.001 level.

Table 4: Regression models for the log of the under-5 mortality rate for different model specifications for 188 countries 1970–2013

to 1.42 million (95% UI 1.41 million–1.44 million) more child deaths in 2013 compared with in 1990. Similarly, the HIV/AIDS epidemic has resulted in a 32 400 (29 600–35 200) increase in under-5 deaths from 1990 to 2013 (table 5). Conversely, increased income, especially after 2000, led to 902 100 (821 100–983 300) fewer deaths in 2013, whereas improved maternal education led to 2.2 million (2.0 million–2.4 million) fewer deaths. The secular trend, which we posit to likely represent technological changes and their diffusion, accounted for 4.2 million (3.5 million–4.8 million) fewer deaths in 2013 than in 1990. Changes in other factors not accounted for in this simple model led to an increase of 57 800 (–55 900–66 700) deaths in 2013 compared with 1990.

Figure 4 provides the results of the Shapley decomposition of changes in under-5 deaths for the seven GBD super-regions. We noted the largest decrease in the number of under-5 deaths in south Asia where the secular shift contributed the most, followed by maternal education, and then income. Other factors actually led to an increase in the number of child deaths—ie, south Asia has had less progress than expected in reduction of child deaths because of unobserved other factors. Child deaths in southeast Asia, east Asia, and Oceania have also decreased, with most factors except HIV making important contributions to observed changes (figure 4). In sub-Saharan Africa, increasing birth numbers in the absence of other change would have led to an increase in under-5 deaths. The main contributors to lower child mortality were secular factors and maternal education. Table 5 shows more detail on the Shapley decomposition

of changes in the number of under-5 deaths for the 21 GBD regions.

To quantify the potential contribution of global and national action after the Millennium Declaration on trends in under-5 mortality, figure 5 shows which countries had a much faster rate of decline than expected. Expected trends are based on recorded income per person, maternal education, secular trends, and HIV child death rates in the absence of intervention (ie, what would happen without the global effort in scaling up ART and prevention of mother-to-child transmission). 14 countries in sub-Saharan Africa (Burundi, Benin, Burkina Faso, Congo, Ethiopia,

Guinea, Liberia, Mozambique, Niger, Rwanda, Senegal, Sao Tome and Principe, South Africa, and Zambia) had faster than expected decreases (figure 5). Child mortality decreased faster than predicted in Asia and Europe (China, Estonia, Cambodia, Laos, Lithuania, Maldives, Montenegro, North Korea, and Timor-Leste) and in seven countries in Latin America (Bolivia, Brazil, Guatemala, Nicaragua, Peru, El Salvador, and Venezuela). Countries with slower than expected decreases include five in Africa and four in Central Asia, and Pakistan (figure 5).

Figure 6 shows possible global trends in under-5 mortality from 2013 to 2030 on the basis of the

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	Fertility	Maternal education	HIV/AIDS	Income	Unexplained	Secular trend	Total
Global	1423.6 (1412.9 to 1436.2)	-2223.8 (-2402.7 to -2040.4)	32.4 (29.6 to 35.2)	-902.1 (-983.3 to -821.1)	57.8 (-555.9 to 662.7)	-4170.4 (-4789 to -3495.9)	-5782.5 (-5834.6 to -5746.9)
High-income	-2.3 (-2.3 to -2.3)	-1.6 (-1.8 to -1.5)	0 (0 to 0)	-0.9 (-1 to -0.8)	0.6 (0 to 1.3)	-5.3 (-6 to -4.6)	-9.5 (-9.6 to -9.5)
Asia Pacific							
Central Asia	-6.2 (-6.3 to -6)	-19.8 (-21.5 to -18.3)	0 (0 to 0)	-2.7 (-3 to -2.4)	30.2 (22.5 to 38.7)	-67.3 (-75.9 to -59.8)	-65.7 (-66.4 to -65.2)
East Asia	-242.1 (-242.9 to -241.4)	-195.4 (-211.1 to -180.3)	0.3 (0.3 to 0.3)	-211.9 (-230.7 to -192.8)	-316.4 (-368.1 to -262.1)	-292.2 (-347.7 to -237.9)	-1257.7 (-1259.2 to -1256.4)
South Asia	-78.5 (-82.5 to -75.6)	-826.2 (-900.1 to -752)	-7.9 (-8.6 to -7.2)	-405.1 (-447.9 to -366.3)	492.2 (-38.6 to 1046)	-1608.0 (-2153.1 to -1081.3)	-2433.5 (-2485.7 to -2398.3)
Southeast Asia	-19.7 (-19.8 to -19.6)	-142.3 (-153.9 to -131.3)	0.6 (0.5 to 0.6)	-73.6 (-80.3 to -67)	-65.0 (-107.4 to -23)	-229.8 (-275.1 to -185.8)	-529.8 (-531.4 to -528.7)
Australasia	0.4 (0.4 to 0.4)	-0.3 (-0.4 to -0.3)	0 (0 to 0)	-0.2 (-0.2 to -0.2)	0.1 (-0.1 to 0.3)	-1.4 (-1.6 to -1.2)	-1.4 (-1.4 to -1.4)
Caribbean	-1.2 (-1.2 to -1.2)	-12.5 (-13.5 to -11.5)	-1.6 (-1.8 to -1.5)	-0.5 (-0.6 to -0.5)	0.7 (-2.4 to 3.9)	-16.5 (-19.7 to -13.2)	-31.7 (-31.8 to -31.6)
Central Europe	-7.1 (-7.2 to -7.1)	-3.5 (-3.8 to -3.2)	0 (0 to 0)	-1.4 (-1.5 to -1.2)	-2.5 (-4 to -0.9)	-13.4 (-15 to -12)	-27.9 (-28.1 to -27.8)
Eastern Europe	-9.8 (-9.9 to -9.6)	-7.1 (-7.7 to -6.6)	0 (0 to 0)	-0.6 (-0.6 to -0.5)	2.9 (-0.5 to 6.4)	-29.8 (-33.5 to -26.6)	-44.5 (-44.8 to -44.2)
Western Europe	0.3 (0.3 to 0.3)	-5.3 (-5.7 to -4.9)	0 (0 to 0)	-1.7 (-1.9 to -1.6)	-1.0 (-2.9 to 1.1)	-16.8 (-19 to -14.8)	-24.6 (-24.6 to -24.5)
Andean	0.5 (0.5 to 0.5)	-16.4 (-17.7 to -15.1)	0 (0 to 0)	-3.8 (-4.1 to -3.4)	-14.6 (-18.8 to -10.3)	-23.2 (-27.6 to -18.6)	-57.5 (-57.6 to -57.5)
Latin America							
Central	0.8 (0.8 to 0.8)	-35.4 (-38.3 to -32.7)	-0.1 (-0.2 to -0.1)	-6.5 (-7.1 to -5.9)	-25.1 (-35.4 to -14.7)	-56.2 (-66.9 to -45)	-122.7 (-122.9 to -122.5)
Latin America							
Southern	-1.2 (-1.2 to -1.2)	-4.4 (-4.8 to -4.1)	0 (0 to 0)	-1.9 (-2.1 to -1.8)	3.5 (2 to 5)	-11.2 (-12.7 to -9.8)	-15.2 (-15.3 to -15.1)
Latin America							
Tropical	-19.4 (-19.4 to -19.4)	-31 (-33.5 to -28.6)	-0.2 (-0.2 to -0.2)	-5.2 (-5.7 to -4.7)	-34.3 (-42.2 to -26.1)	-44.2 (-52.5 to -35.5)	-134.2 (-134.4 to -134.2)
Latin America							
North Africa and Middle East	57.2 (56.1 to 58.5)	-139.7 (-150.9 to -128.3)	0.3 (0.3 to 0.3)	-37.1 (-40.6 to -33.8)	-27 (-72.6 to 17.7)	-321.9 (-368.3 to -276.2)	-468.1 (-469.4 to -467.3)
High-income	1.8 (1.8 to 1.9)	-2 (-2.2 to -1.9)	-0.1 (-0.1 to -0.1)	-2.3 (-2.5 to -2.1)	7.2 (4.4 to 10.3)	-23.4 (-26.6 to -20.5)	-18.8 (-18.9 to -18.8)
North America							
Oceania	5 (4.9 to 5.1)	-4.1 (-4.4 to -3.7)	0 (0 to 0)	-0.7 (-0.8 to -0.6)	4.2 (3 to 5.5)	-6.6 (-7.9 to -5.3)	-2.1 (-2.1 to -2.1)
Central	245.1 (243.6 to 246.9)	-99.5 (-107.6 to -91.5)	3.6 (3.3 to 3.9)	31.6 (28.7 to 34.4)	30.9 (-0.6 to 62.5)	-183.1 (-214.1 to -151.5)	28.6 (27.5 to 29.9)
sub-Saharan Africa							
Eastern	561 (559.2 to 563.6)	-240.9 (-260.5 to -221.7)	-5.9 (-6.4 to -5.4)	-78.7 (-85.8 to -71.5)	-219.2 (-297.9 to -138.5)	-490.3 (-571.3 to -407)	-474.1 (-474.6 to -473.2)
sub-Saharan Africa							
Southern	5.6 (5.5 to 5.7)	-30 (-32.5 to -27.6)	2.5 (2.3 to 2.8)	-1.2 (-1.3 to -1.1)	28 (21.4 to 34.9)	-38.5 (-45.2 to -31.8)	-33.6 (-33.8 to -33.4)
sub-Saharan Africa							
Western	933.4 (927.4 to 940.8)	-406.2 (-439.5 to -373.5)	40.9 (37.5 to 44.6)	-97.5 (-106.1 to -88.5)	162.3 (47.5 to 281.2)	-691.3 (-808.8 to -572.2)	-58.4 (-60.8 to -55.2)
sub-Saharan Africa							

Table 5: Shapley decomposition analysis of the change in the number of under-5 deaths (thousands) related to changes in income per person, maternal education, HIV child death rate, births, secular trends, and unexplained factors, 2013 versus 1990, worldwide and in the 21 GBD regions

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four scenarios for change in child mortality rate. Even under the most ambitious scenario for reduction of child mortality, the number of child deaths worldwide in 2030 would still be about 2·4 million, roughly 4 million

less than the present number, but still substantial. If the present rates of change continue, 3·8 million children could be expected to die in 2030. These scenarios assume the UN Population Division forecasts of fertility; faster

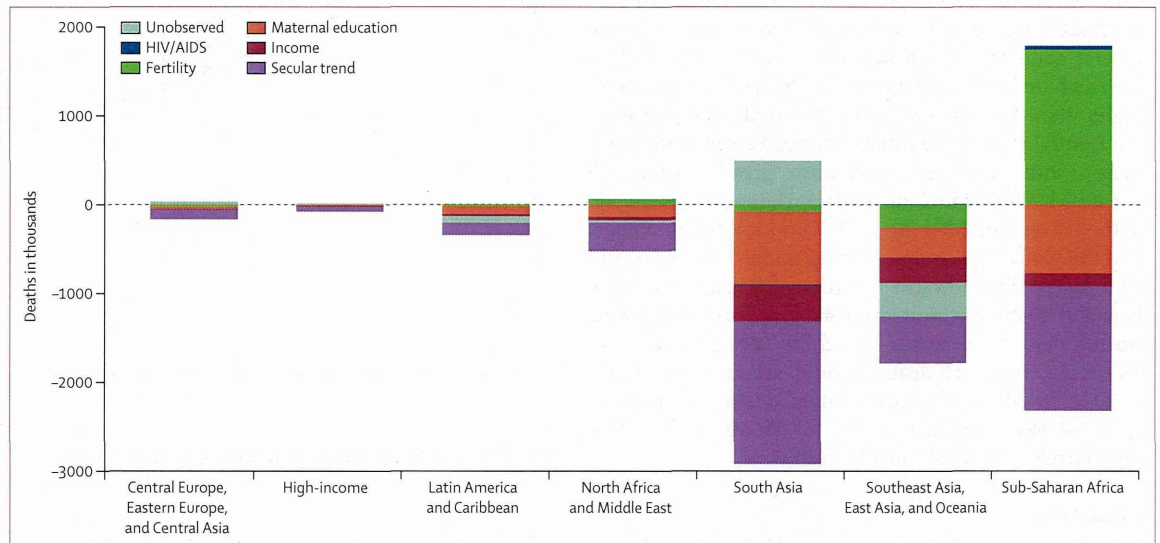


Figure 4: Change in the number of deaths comparing 2013 with 1990
Change due to income per person, maternal education, HIV child death rate, shift in secular trend, births, and unexplained factors for seven Global Burden of Disease super-regions.

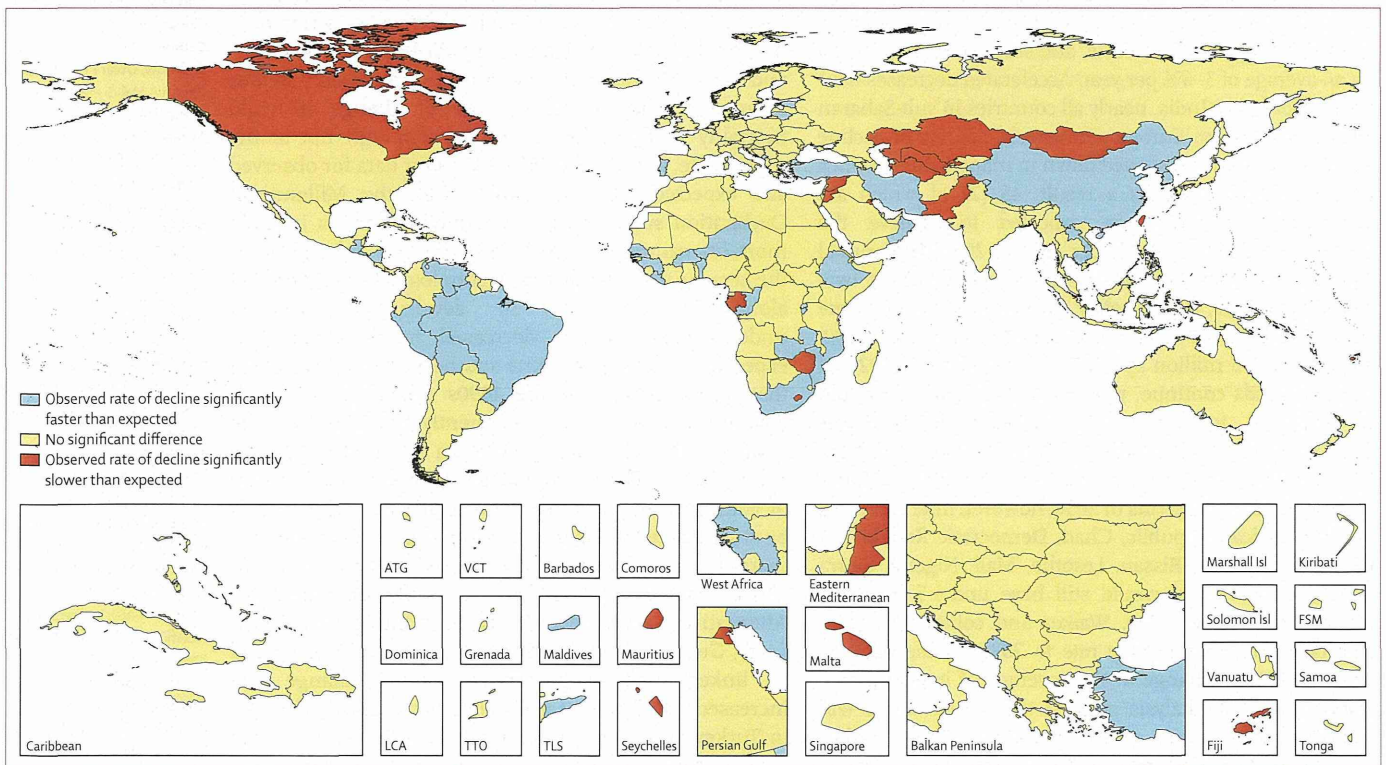


Figure 5: Countries with statistically significant differences between the observed rate of decline in under-5 mortality between 2000 and 2013, compared with the expected rate of decline on the basis of income, education, shift in secular trend, and HIV death rates in the absence of intervention
ATG=Antigua and Barbuda. LCA=Saint Lucia. VCT=Saint Vincent and the Grenadines. TTO=Trinidad and Tobago. TLS=Timor-Leste. FSM=Federated States of Micronesia.

rates of fertility decrease than projected by the UN, which might be achieved through scale-up of family planning services, are not factored into these scenarios, but would lead to fewer deaths. Figure 7 shows the expected level of child mortality worldwide in 2030 if rates of change continue as presently recorded. Under this scenario, several countries would still be expected to have high levels of under-5 mortality in 2030. Under-5 mortality higher than 100 per 1000 livebirths would still prevail in the Central African Republic, Guinea-Bissau, and Chad; those with expected mortality greater than 70 per 1000 livebirths include Nigeria, Democratic Republic of the Congo, and Mali (figure 7). Our projections suggest that the global age composition of under-5 deaths would continue to shift towards a younger structure. In 2013, neonatal deaths accounted for 41.6% of under-5 deaths worldwide. If decreases in child mortality do not accelerate, neonatal deaths would account for 44.9% in 2030, by which time postneonatal deaths and those at ages 1–4 years would account, for 28.1% and 26.9%, respectively, of under-5 deaths worldwide.

Discussion

The dominant global health focus on improvement of child survival in the past four decades has been extremely successful, although more remains to be done. Child mortality levels decreased, on average, by 2.6% per year from 1970 to 1985, then slowed down for a decade until 1997, began to accelerate, and since 2005, have fallen by an average of 3.6% per year. Accelerated decreases have been recorded in India, nearly all countries in sub-Saharan Africa, and eastern Europe. Conversely, the rate of decline in child mortality has slowed down in many Latin America countries (appendix). As a result, 45 (27 of which are developing) countries are expected to achieve the MDG 4 target rate of 4.4% per year by 2015. The annual number of under-5 deaths has decreased by about two-thirds since 1970, falling below 7 million for the first time in 2010 and, on the basis of patterns of change since 2000, should reach 5 million by 2021, and 4 million by 2028. If present trends continue, more than 120 countries would be expected to have child mortality levels lower than 20 per 1000 livebirths in 2030. By our projection, 19 countries will have under-5 mortality higher than 50 per 1000 livebirths in 2030; however, nine countries (Central African Republic, Chad, Democratic Republic of the Congo, Guinea-Bissau, Lesotho, Mali, Nigeria, Sierra Leone, and Somalia) would still have under-5 mortality higher than 70 per 1000. Walker and colleagues⁵³ have projected under-5 mortality rate to 2035 on the basis of observed rate of change in the coverage of interventions. Data from their analysis suggest that 37 countries will probably still have child mortality rates higher than 50 per 1000 livebirths in 2035 if country level trends in coverage continue unchanged.

Our analysis confirms the findings of previous studies that showed that most countries will not achieve the

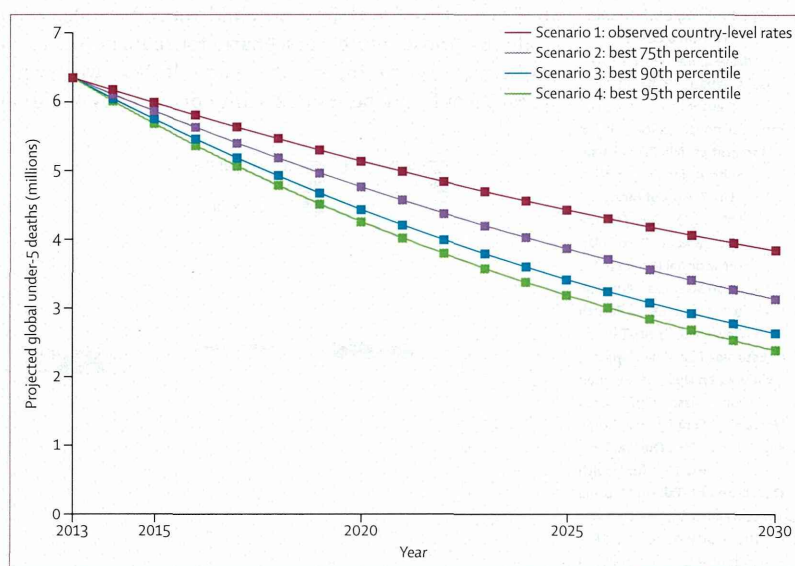


Figure 6: Projected global under-5 deaths for four scenarios, 2013–30
Scenarios have been defined by the distribution of observed rates of change 2000 to 2013.

MDG 4 target. In our view, this should not be the only standard by which country progress is measured. In fact, many countries have made huge strides since the declaration of the MDG goals, including Laos, Cambodia, Rwanda, Vietnam, and Ethiopia. All five countries have been included by The Partnership for Maternal, Newborn and Child Health in its success factor analysis.⁵⁴ By our estimation, the annualised rate of change in child mortality in these five countries, although not at the MDG4 rate, are about 4.0%–4.3%. Our data for observed and expected rates of change since the Millennium Declaration suggest that accelerated decreases in child mortality cannot be explained by income, education, or the secular trend (including technological interventions) alone. In fact, in 30 developing countries, under-5 mortality has decreased much faster than expected, including in some southern African countries that had increases in the 1990s related to the HIV epidemic and that have subsequently benefited from the scale-up of ART and prevention of mother-to-child transmission. The commendable progress in this group of countries, which exceeds expectations, might largely be attributable to global action after the MDGs that led to increased funding for HIV control programmes. In Niger, this action has been carefully documented.⁵¹ Alternatively, accelerated decreases in Cambodia, Timor-Leste, Guatemala, and El Salvador after the MDGs could be linked both to government policy change and increased development assistance for health.⁵⁵ Changes in Turkey and China, both of which have received little development assistance per person, are more likely to be related to national policy change and health-system strengthening.^{56–59} Rudan and colleagues⁵⁸ have documented the rapid fall in child mortality in China and

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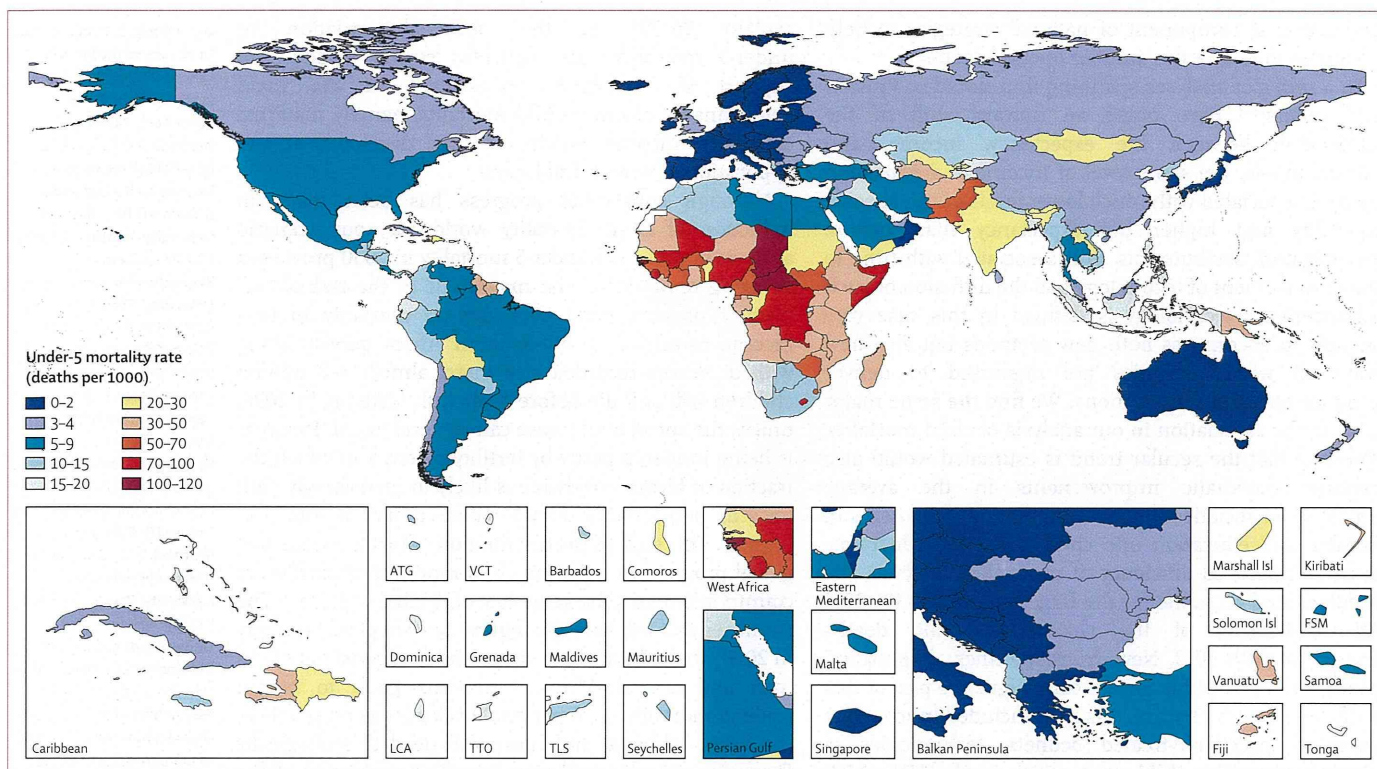


Figure 7: Projected under-5 mortality rate in 2030, on the basis of the observed rate of change for each country, 2000–13
 ATG=Antigua and Barbuda. LCA=Saint Lucia. VCT=Saint Vincent and the Grenadines. TTO=Trinidad and Tobago. TLS=Timor-Leste. FSM=Federated States of Micronesia.

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findings of analyses by Feng and colleagues⁵⁹ have shown the important role that socioeconomic and health system determinants have had in the reduction of child mortality in China.

The reasons underlying these faster than expected decreases in child mortality are undoubtedly multifactorial and complex, and deserve further study, but prominent among them is surely the introduction of national policies that promote development and increased access to essential child-care services among the worst off and increased investments in health and related sectors. The MDG declaration and subsequent political momentum might have affected the health-investment landscape, stimulating a more effective and comprehensive response by bilateral donors, the Global Alliance for Vaccines and Immunisation (GAVI), the US President's Emergency Plan for AIDS Relief (PEPFAR), The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), the World Bank, and other development partners to ensure the more widespread dissemination of new technologies and the remarkable progress against HIV. The attention that has been paid to achievement of the MDGs more broadly, and not merely those directly concerned with health, has undoubtedly helped with progress in reduction of child mortality by improvement of broader development indicators such as education, income, and the

environment, all of which are likely to lead to improved child survival. By contrast, 17 countries had rates of change in under-5 mortality much slower than expected. A more detailed case study analysis of these countries compared with those with faster than expected decreases could provide further insights into bottlenecks and circumstances that hinder progress.

Our analysis of long-term trends in child mortality provides some insight into the comparative contribution of different factors. Worldwide, income growth between 1990 and 2013 accounted for about 15·6% (95% UI 14·2–16·9) of the change in the number of child deaths. Although correlated (correlation coefficient 0·72) with income, maternal education had a much larger effect on decreases in child mortality (38·5% [35·5–41·2]) than did income, a finding that is consistent with previous research, but provides a quantitative assessment of just how important mothers' education is in the reduction of child mortality.^{31,60–65} These findings reinforce the continued importance of investments in primary and secondary schooling for girls in particular. Continued high total fertility rates, especially in western sub-Saharan Africa, have led to increased numbers of births, which, all other things being equal, has led to nearly 1 million more child deaths in 2013 than in 1990. Therefore, the renewed focus on contraceptive programmes for low-income countries^{66–68} is very timely

and a crucial component of national strategies to help countries to reduce the number of child deaths.

In a series of analyses spanning four decades, Preston and others^{32,69} have noted an upward shift of the association between life expectancy, income, and education—ie, the same level of income and education today is associated with much lower levels of age-specific mortality and higher life expectancy than before. Investigators attribute this shift associated with time to the advancement of technology and the diffusion of such advancement; technology is defined in this case very broadly to encompass both new methods but also new ways in which societies are organised to deliver programmes and interventions. We find the same major shift in the association in our analysis of child mortality. The way that the secular trend is estimated would also capture systematic improvements in the average efficiency of societies' ability to convert improvements in income and education into child mortality reductions, such as improved efficiency of production. Overall, the secular trend accounts for the largest share (72·1% 95% UI 60·8–82·1) of the change in child deaths from 1990 with 2013. New drugs, vaccines, diagnostics, procedures, and public health campaigns are part of this shift. In the past 23 years, this shift included innovations such as insecticide-treated bednets, technologies to prevent mother-to-child transmission of HIV, ART, rotavirus vaccine,^{70,71} pneumococcal⁷² and other vaccines, and many other life-saving technologies. The dominant role of new technologies and more efficient ways of diffusing them in poor countries emphasises the importance of continued innovation in drugs, vaccines, public health programmes, and the delivery of health care for continued declines in under-5 mortality. Our assessment of the comparative role of health technologies in bringing about the massive decreases in child mortality in the past few decades provides indirect evidence for donors, researchers, and countries alike of the crucial effect that these investments have had.

The variation in child mortality around the income and education curve at a given moment in time has been interpreted as variation in country performance in the production of better child health,^{31,73,74} a component of which might be related to health systems. In our study, we controlled for time invariant differences between countries that might be related to the environment or other fixed attributes. We noted unobserved factors beyond income, maternal education, time, HIV, birth and time-invariant country factors accounted for only about –1·0% (95% UI –9·5 to 11·5) of the global change in under-5 mortality between 1990 and 2013. Although other factors quantitatively have a much greater role in reductions in child deaths since 1990 than do the unobserved factors, understanding the local policy factors associated with this unobserved change could provide important insights and opportunities for shared learning. Nevertheless, the fact that our model can

explain 96·7% of the observed variation in under-5 mortality rates provides strong evidence to support the continued investment in the main determinants of lower child mortality, namely maternal education, income growth, and the development and application of new technologies.

Although substantial progress has been made in reduction of child mortality worldwide, our scenario analysis of projected under-5 mortality in 2030 provides a sobering reminder of the magnitude of the task ahead. Even if present, rapid decreases in mortality in low-income countries of sub-Saharan Africa persist, along with decreases recorded elsewhere, almost 3·8 million children will still die before their fifth birthday in 2030, unless the speed of decrease can be accelerated. Progress is being hindered partly by fertility patterns in which the fraction of births worldwide is likely to increasingly shift towards sub-Saharan Africa where mortality rates are highest. This shift in the distribution of births means that global progress in reducing child mortality, even if every country maintains the same rate of decline, will slow. The countries that will have the highest rates of child mortality in 2030, on the basis of present trends are concentrated in west and central Africa. Ambitious goals to reduce under-5 mortality to 20 per 1000 livebirths as proposed by the USA, Ethiopia, and India will need to strategically focus on countries in these regions.¹ Anticipation of the pace of these decreases suggests that donors might want to prioritise funding for some countries on the basis of their probable future under-5 mortality. Conversely, the pace of child mortality decrease in some countries (eg, India) is accelerating, such that by 2030, according to our base scenario, India will have an under-5 mortality rate lower than 25 per 1000 livebirths.

During the past 6 years, many studies have been done of country levels and trends in child mortality.^{1,13,14,75–83} Worldwide, the UN and the GBD estimates of the number of child deaths have largely converged. The appendix shows estimates from UNICEF and independent academic studies, including the GBD 2010 and this analysis. In their latest iteration, the UN Inter-agency Group for Child Mortality Estimation (IGME)⁸⁴ changed their methods, which resulted in increased mortality estimates for 1990, which has substantially changed some of the estimates of annualised rates of decrease. The UN has estimated that high-income countries such as Spain are under-reporting child deaths, although no direct evidence of under-reporting exists. Overall, the association between their estimates of the annualised rate of change from 1990 to 2007, published in 2012, and 2013, is 0·93.^{83,85} Likewise, the GBD effort has changed some methods such that the association of the annualised rate of change for the same period is 0·87 between GBD iterations. However, the uncertainty intervals on annualised rates of change between 2000 and 2010, generated as part of the GBD collaboration seem to be

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