

Estimated global resources needed to attain universal coverage of maternal and newborn health services

Benjamin Johns,^a Kristjana Sigurbjörnsdóttir,^b Helga Fogstad,^c Jelka Zupan,^d Matthews Mathai^d & Tessa Tan-Torres Edejer^e

Objective To estimate the amount of additional resources needed to scale up maternal and newborn health services within the context of the Millennium Development Goals, and to inform countries, donors and multilateral agencies about the resources needed to achieve these goals.

Methods A costing model based on WHO's clinical guidelines was used to estimate the incremental resource needs for maternal and newborn health care in 75 countries. The model estimated the costs for care during pregnancy, childbirth, the neonatal period and the postpartum period, as well as the costs for postpartum family planning and counselling, abortion and post-abortion care; programme-level costs were also estimated. An ingredients-based approach, with financial costs for the years 2006 to 2015 as the output, allowed estimates to be made of country-specific and year-specific populations, unit costs and scale-up rates. Two scenarios using different scale-up rates were used (moderate and rapid).

Findings The results show that a minimum yearly average increase in resources of US\$ 3.9 billion is needed, although annual costs increase over the time period of the model. When more rapid rates of scale-up are assumed, this minimum figure may be as high as US\$ 5.6 billion per year. The 10-year estimated incremental costs range from US\$ 39.3 billion for a moderate scale-up scenario to US\$ 55.7 billion for the rapid scale-up scenario.

Conclusion These projections of future financial costs may be used as a starting point for mobilizing global resources. Countries will have to further refine these estimates, but these figures may serve as goals towards which donors can direct their plans. Further research is needed to measure the costs of health system reforms, such as recruiting, training and retaining a sufficient number of personnel.

Bulletin of the World Health Organization 2007;85:256-263.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

An estimated 15% of pregnant women in developing countries experience pregnancy-related complications, 7% require care at centres with surgical capacity (referral care) and 2% to 3% require surgical care.¹ Nearly 530 000 women die from pregnancy complications annually.² Furthermore, each year an estimated 4 million babies die within the first 4 weeks of life, around three-quarters during the first week of life.¹ Deaths among neonates account for almost 40% of deaths occurring among children aged < 5 years and for more than half of all deaths among infants.^{3,4} An additional

3.3 million babies are stillborn, a quarter of them dying during birth.

In developing countries, interventions that are known to be effective in lowering maternal and perinatal mortality and morbidity are not universally provided. These interventions can be delivered by skilled health personnel providing care during pregnancy, childbirth and the postpartum and postnatal periods; health-care personnel may also provide early detection and management of complications that occur during pregnancy, birth and the postpartum period. However, in the countries included in this analysis, only about 43% of births

take place in health facilities where there are skilled health personnel.^{5,6} The skill levels of these personnel vary, and only a fraction of mothers and babies have access to a full range of maternal and neonatal health interventions. Thus, scale up of these interventions must occur on two fronts: the quality and range of health services for mothers and neonates must be improved, and access to skilled birth attendants must be increased.

Scaling-up the coverage of maternal and newborn health care provided by skilled personnel is expected to have a considerable impact on achieving the

^a World Health Organization, 9F Bina Mulia – I Bldg, Jl Rasuna Said Kav. 10, Kuningan Jakarta 12950, Indonesia. Correspondence to Benjamin Johns (e-mail: johnsb@who.or.id).

^b HIV/AIDS Practice Team, UNDP Regional Centre, Colombo, Sri Lanka.

^c Global Health and AIDS Department, Norwegian Agency for Development Cooperation, Oslo, Norway.

^d Department of Making Pregnancy Safer, WHO, Geneva, Switzerland.

^e Department of Health Systems Financing, WHO, Geneva, Switzerland.

doi: 10.2471/BLT.06.032037

(Submitted: 28 March 2006 – Final revised version received: 5 October 2006 – Accepted: 11 October 2006)

Millennium Development Goals, specifically goal 5 (which aims to improve the health of mothers), large parts of goal 4 (which focuses on reducing child mortality) and parts of goal 6 (which seeks to combat AIDS, malaria and other diseases). For these goals to be achieved, countries, donors and multi-lateral agencies must mobilize resources. To determine the resources needed, it is necessary to estimate the cost of scaling-up to universal coverage.

This paper presents the methods used to construct a model and the results of two scenarios used in the model to estimate the financial costs of expanding the coverage of skilled maternal and newborn health care at facilities. The two scenarios reflect uncertainty around the speed and scope of future scale-up rates. Both scenarios assume that resources supporting current maternal and newborn health-care programmes will remain available; thus, they include only costs additional to current resource use.

The cost projections are based on country-specific and year-specific estimates for 75 low- and middle-income countries. The costing includes clinical interventions critical to improving health outcomes during pregnancy for mothers and neonates, and it is not limited to interventions that save lives. It includes the provision of information, advice and counselling to help women and their families with home care, birth planning and emergency preparedness as well as community support for women with special needs. It assumes that existing primary- and secondary-level health-care services deliver maternal and newborn health services. The cost estimates include the investments needed to strengthen the health system infrastructure and human resources as well as the costs of the management and support needed to ensure that high-quality care is provided, that there is a demand for these health services and that they are accessible.

Methods

To estimate financial needs until 2015 of expanding the coverage of maternal and newborn care provided by skilled personnel, we selected countries for the analysis; derived country-specific estimates and projections of pregnancies, births and abortions; selected the activities to be scaled up; estimated scale-

up scenarios; and calculated country-specific unit costs (for additional information, see http://www.who.int/whr/2005/td_two_en.pdf).

The cost of tetanus toxoid immunization was estimated using a costing model developed by WHO's Department of Immunization, Vaccines and Biologicals. The costs of intermittent preventive therapy for malaria and the distribution of insecticide-treated bed-nets were estimated using the model developed by Roll Back Malaria and WHO. The methods and data sources for these models are similar to those of the maternal and newborn health model that we developed. Prevention of mother-to-child transmission of HIV was not included in this model; it was included in a parallel costing exercise.⁷

Countries

Countries were selected in parallel with a costing exercise for child health interventions⁷ and included those ranked highest in terms of both rates and gross numbers of maternal deaths, neonatal deaths and children's deaths. Additional countries were added to ensure that all WHO regions were represented; this resulted in a list of 75 countries (this list is available on request from the corresponding author). Together, these countries account for more than 75% of the world's population and almost 86% of births (more than an estimated 122 million births in 2006, rising to more than 137 million in 2015). These countries also represent approximately 97% of maternal deaths, 93% of fetal and neonatal deaths, and 94% of deaths occurring among children aged < 5 years.

Maternal and newborn health services

Clinical interventions to be included were selected based on proven effectiveness in improving the health outcomes of mothers and neonates, and whether they could feasibly be implemented in resource-poor settings. For example, "screening all pregnant women for blood group isoimmunization" and "postpartum administration of anti-D immunoglobulin" are included only for countries classified as having strong health systems using the classification described below. Interventions that require advanced technology, such as assisted ventilation for neonates, and

services that require tertiary-level health care are not included. The interventions, and their required technologies, were obtained from WHO's clinical guidelines.⁸⁻¹⁰

Table 1 (available at <http://www.who.int/bulletin>) presents the interventions used in the model as well as the necessary inputs and the number of times the intervention is used during pregnancy, birth and the postnatal period.

In this model, health facilities provide all services. The primary level of the health-care system administers preventive and diagnostic assessment and treatment from the start of pregnancy until the end of the postpartum period (6 weeks) for the mother and the neonatal period (first 28 days of life) for the infant. This includes four antenatal visits, care during childbirth and the immediate postpartum period for mother and newborn, and one postpartum visit. Pre-referral care is also included when needed. In areas where certain diseases, such as malaria, are endemic, preventive care is included. In this model, the secondary level of health care (to which patients are referred from the primary level) includes the provision of emergency care. Referral includes services for managing complications in a hospital with a laboratory, surgical facilities and blood transfusion facilities. It also includes the cost of transport and a maternal stay in hospital in order to breastfeed a preterm infant.

In addition to an early postpartum visit, the model also includes a late postpartum visit for counselling on family planning. These services include contraception; the usage rates and types of contraception are based on current patterns in each country. The treatment of post-abortion complications is included for all countries. Abortion care is included in countries where it is currently legal.

In addition to implementing the clinical interventions described above, countries' abilities at the programme levels (national, provincial and district administration levels, directly above patient care) may need upgrading to support scale-up. These costs include providing training for additional health-care providers, such as midwives and doctors, to ensure coverage of services. The areas of activity included in programme-level support are shown in Table 2.

Table 2. Programme-level activities and costing assumptions

Category	Activities	Costs included ^a	Major assumptions
Programme management	Developing and assessing policy, regulations and strategic and operational plans for programmes	PD; MC; TC; CD; SS; S	Applies to all countries; some costs not fully allocated to maternal health SS in countries classed as HSC-1, HSC-2 and HSC-3 only
Supervision of staff related to maternal and newborn health care, services and programmes	Includes districts, referral facilities and first-level facilities	PD; TC	Applies to all countries, some costs not fully allocated to maternal health
Infrastructure upgrading and maintenance	Upgrading and maintaining existing hospitals; upgrading health centres to birthing centres and building maternity waiting homes	NC; E; M	Applies only to countries classed as HSC-1, HSC-2 and HSC-3
Transport and telecommunication	Acquiring, running and maintaining vehicles and telecommunications systems to transport patients, for staff supervision and for training and outreach services	E; M	Applies to all countries, some costs not fully allocated to maternal health; some costs apply only to countries classed as HSC-1, HSC-2 and HSC-3
Health education	Mobilizing the community to raise awareness of maternal and newborn health-related issues using mass media (radio, TV) and printed material (posters, fliers)	CD; TC; P; SS; S	Applies to all countries, scaled by HSC index
Advocacy	Developing advocacy strategy and advocacy materials; implementing advocacy activities	PD; MC; TC; P; SS; S	Applies to all countries; some costs not fully allocated to maternal health
Monitoring and evaluation	Establishing or integrating maternal and newborn health services into monitoring and evaluation frameworks and designs; conducting community surveys (such as the Demographic and Health Survey) and conducting facility-based surveys	SS; S; PD; TC; MC; CD; surveys scaled by population in need and past observed costs	Applies to all countries; some costs not fully allocated to maternal health; some activities limited to countries where currently not done or those classed as HSC-1, HSC-2 and HSC-3
Human resources development	Increasing training capacity and number of new skilled birth attendants (mostly midwives) needed to scale up to target coverage levels, accounting for attrition; upgrading of pre-service training for midwifery, obstetric and neonatal care; reviewing training materials; establishing refresher training courses; and establishing in-service training programmes	PD; TC; MC; CD; S; pre-service training scaled according to past observed costs	Country-specific estimates of new staff needed; need for other activities scaled by HSC

CD, consultant days; E, equipment; HSC, health system constraint; M, maintenance; MC, meeting costs; NC, new construction; P, products; PD, per diems; S, supplies; SS, staff salaries; TC, travel costs.

^a All categories except supplies, equipment and products are not considered fully tradable goods and are adjusted to country-specific prices.

Deriving country-specific estimates and projections

Country-specific mid-range (or medium variant) projections from the United Nations Development Programme were used to calculate total population (interpolated to yearly estimates using MORTPACK, the United Nations demographic software package), crude birth rate¹¹ and maternal mortality.² The number of pregnancies not resulting in birth was taken from Demographic and Health Surveys (DHS) for the latest year available until 2004;⁶ regional averages from the Global Burden of Disease study were used for countries for which data were lacking.¹² The number of pregnancies was estimated using the projected number of live births for each country

adjusted for maternal mortality and pregnancies not resulting in birth.

Data on the incidence of induced abortion and abortion care services were incomplete or unavailable for all countries. Thus, in countries where abortion is legal, the number of abortions was derived from the regional estimates from the Global Burden of Disease study of the ratio of abortions to live births; in countries where abortion is not legal, regional estimates of the ratio of unsafe abortions to live births was used.¹² We assumed that 3% of legal abortions had complications requiring medical care;¹³ we assumed that 33–50% of unsafe abortions had complications requiring medical treatment and that 23–35% of these required hospitalization, depend-

ing on the Global Burden of Disease region.¹⁴

Estimating country-specific scale-up

Using estimates of current coverage and international goals, two scenarios were established to reflect movement towards providing universal access to maternal and newborn health care. Using experiences from developing countries that have 95% coverage, WHO experts' opinions were used to draw a moderate scale-up scenario: this estimated that coverage across countries will average 73% in 2015. An alternative scenario, the rapid scale-up scenario, was developed using the assumption that all countries would achieve 95% coverage by 2015.

The first step in developing the scale-up scenarios was to establish a health-system constraint index to reflect the strength of the countries' health systems in relation to service requirements for maternal and newborn health care. The indicator "percentage of births attended by skilled health personnel in a health facility" was determined to be the most suitable baseline indicator for the ability to scale up, and countries were divided into four categories based on this indicator. (These categories were denoted HSC-1 to HSC-4, with HSC-1 having the greatest constraints on scaling-up.) Using separate growth rates for the four health-system constraint categories, scale up patterns and targets for 2015 were determined. The scenarios are not meant to be prescriptive; they are for estimation purposes only.

Calculating country-specific costs for the activities

The population in need of a specified intervention was multiplied by the unit price of that activity. The median price reported by the organization Management Sciences for Health was used for medicines,¹⁵ and publicly available medical supply catalogues were used for the prices of supplies and equipment. The prices for these goods were adjusted to account for insurance during shipment and freight. The prices for visits to health centres and hospital outpatient departments, inpatient stays,^{16,17} salaries, per diems, media costs and construction costs^{16,18} were derived from WHO's Choosing Interventions that are Cost Effective (WHO-CHOICE) studies. The prices for laboratory procedures, referrals to hospital and medical procedures were modelled using country-specific prices and ingredients lists for the disposable inputs necessary to complete procedures.^{16,18–20} These unit prices included compensation for health workers at current pay rates. All unit prices are presented with a 3% annual inflation rate. The second column in Table 1 (available at <http://www.who.int/bulletin>) and the third column in Table 2 list the type of price category used in each activity.

Attempts were made to derive country-specific rates for diseases and conditions. However, data are scant, so default assumptions were based on regional rates from the Global Burden of Disease study and WHO experts' experiences and opinions. The final column

Table 3. Interactive effect of an intervention on the need for additional services

Activity	Area of decrease
Syphilis screening and treatment during pregnancy	Incidence of newborns requiring treatment for syphilis ²¹
Maternal immunization with tetanus toxoid	Incidence of tetanus infection among neonates ²²
Antibiotics for pre-labour rupture of membranes	Delay in delivery and reduction in neonatal morbidity including infections ²³
Treatment of bacterial vaginosis	Incidence of pre-labour rupture of membranes and low birth weight ²⁴
Active management of third stage of labour	Incidence of postpartum haemorrhage ²⁵
External cephalic version	Need for caesarean section ²⁶

in Table 1 (available at <http://www.who.int/bulletin>) lists the number of times each intervention is carried out for an individual woman going through pregnancy, childbirth and the postpartum period.

In addition to current rates, the interaction of scaling-up maternal and newborn health-care activities on the incidence of other conditions is considered (Table 3).

The best proxy for the coverage of skilled care during birth and the postpartum, newborn and postnatal periods was the percentage of births delivered at a facility (this is to reflect the need for improvements in quality; for additional information, see http://www.who.int/whr/2005/td_two_en.pdf). Current coverage for tetanus vaccination was derived from databases at WHO's Department of Immunization, Vaccine and Biologicals, while data from DHS surveys or regional estimates are used for bednets and intermittent preventive therapy. Information on access to abortion in countries where it is legal was derived from country-specific data and country experts; information on access to hospital care after unsafe abortion was based on experts' opinions.

The quantities needed for the programme section of the costs were derived from interviews with experts at WHO. If an activity was judged to cover a wider area than maternal and newborn health care, only a percentage of the costs were allocated to maternal and newborn health care. Additionally, to control for varying needs, we adjusted the level of investments and activities based on the health system constraint index. The last column in Table 2 shows the general assumptions used.

Findings

The estimated costs for 2006–2015 are summarized in Table 4. Over the 10-year period, the estimated cost ranges from US\$ 39.3 billion for the moderate scale-up scenario to US\$ 55.7 billion for the rapid scale-up scenario. The average cost per capita per year is US\$ 0.73 for the moderate scale-up scenario and US\$ 1.03 for rapid scale-up, with an average additional cost of US\$ 1.17–1.82 per capita in 2015 when full coverage is achieved. The WHO region requiring the most additional resources is South-East Asia, reflecting the large population in need of services there; the region with the highest cost per capita is the Eastern Mediterranean, reflecting relatively high labour costs. The countries with the lowest health system constraint ranking, mostly in Africa, are projected to need US\$ 0.35–0.38 of additional resources per inhabitant in 2006; with increased coverage, this amount is estimated to rise to US\$ 2.17–4.19 per inhabitant in 2015. Countries in category HSC-1 are projected to represent 11% of the total population for the year 2015, but they represent 18–21% of costs. Countries in the HSC-2 category represent 14% of the population and 17–21% of costs; countries in HSC-3 have 9% of the population and 9–10% of costs; and countries in HSC-4 account for 65% of the population but only 49–56% of costs.

A comparison with the current general government health expenditure per country reveals that the investments required are equivalent to a weighted average increase in this expenditure of 3% in 2006, rising to 20–34% by 2015 (see WHO's data at <http://www.who.int/nha>).

Table 4. Estimated cost of maternal and newborn health-care interventions, 2006–2015

Scenario and WHO region	Additional costs for year 2015 (billions of US\$)	Percentage of total costs for year 2015	Percentage of population for year 2015	Average cost per capita per year 2006–2015 (US\$)	Total incremental cost, 2006–2015 (billions of US\$)
Rapid scale-up scenario (all countries)	9.5	100	100	1.03	55.7
Africa	2.5	26	16	1.58	13.2
Americas	0.5	5	8	0.81	3.3
Eastern Mediterranean	1.9	20	9	2.05	9.8
European	0.2	2	2	1.02	1.3
South-East Asia	3.4	36	34	1.12	20.5
Western Pacific	0.9	9	31	0.44	7.6
Moderate scale-up scenario (all countries)	6.2	100	100	0.73	39.3
Africa	1.5	24	16	1.07	8.9
Americas	0.5	8	8	0.74	3.0
Eastern Mediterranean	1.0	16	9	1.20	5.7
European	0.2	3	2	1.05	1.3
South-East Asia	2.0	32	34	0.66	12.0
Western Pacific	1.0	16	31	0.48	8.2

Fig. 1 shows the breakdown of total costs during the 10 years for both scale-up scenarios. Overall, the primary-care level comprises 29% of costs for moderate scale-up and 30% for rapid scale-up, with referral care accounting for 44% of costs in the moderate scale-up scenario and 47% in the rapid scale-up scenario. The remaining 27% in the moderate scale-up scenario and 23% in the rapid scale-up cover programme development and investments in health infrastructure. The costs of direct care – which include essential medicines, procedures (including some staff time) and commodities – account for 38% of total costs for moderate scale-up and 41% for rapid scale-up; 35% of the costs of moderate scale-up and 36% of rapid scale-up consist of non-traded goods such as salaries and utilities. The yearly health infrastructure costs double between 2006 and 2015 in the moderate scale-up scenario but the share of the total drops from 30% to 7%.

Fig. 2 (available at <http://www.who.int/bulletin>) shows the breakdown of the 10-year costs by scenario and service type. Care during childbirth is the largest cost category. Antenatal care and programme costs each represent about a quarter of total costs; the other broad service types represent 5% or less.

Discussion

These results are intended to be a rough estimate to aid countries, donors and

multilateral agencies in determining the amount of resources needed to scale up maternal and newborn health services and to start taking steps to increase resource availability. Although the estimates are built country by country, they are intended to provide a global price tag. The results show that the financial effort needed for such a scale-up in 75 countries represents a modest investment of around US\$ 0.73–1.03 per person per year. Countries such as Malaysia, Sri Lanka and Thailand have demonstrated that reducing maternal and neonatal mortality is achievable at this cost, given appropriate management, budget priorities and training.¹

Within the results presented here, some of the costs may be counted in other estimates of need for scaling-up priority health interventions. For example, our modelling found that in 2015, 2–3% of costs may be attributable to the treatment and prevention of malaria and 1.5–2.5% to the provision of vaccines. (The methods used to cost these two interventions are slightly different from those used for the core maternal and newborn health model; vaccine estimates, for example, include the cost of campaigns.)

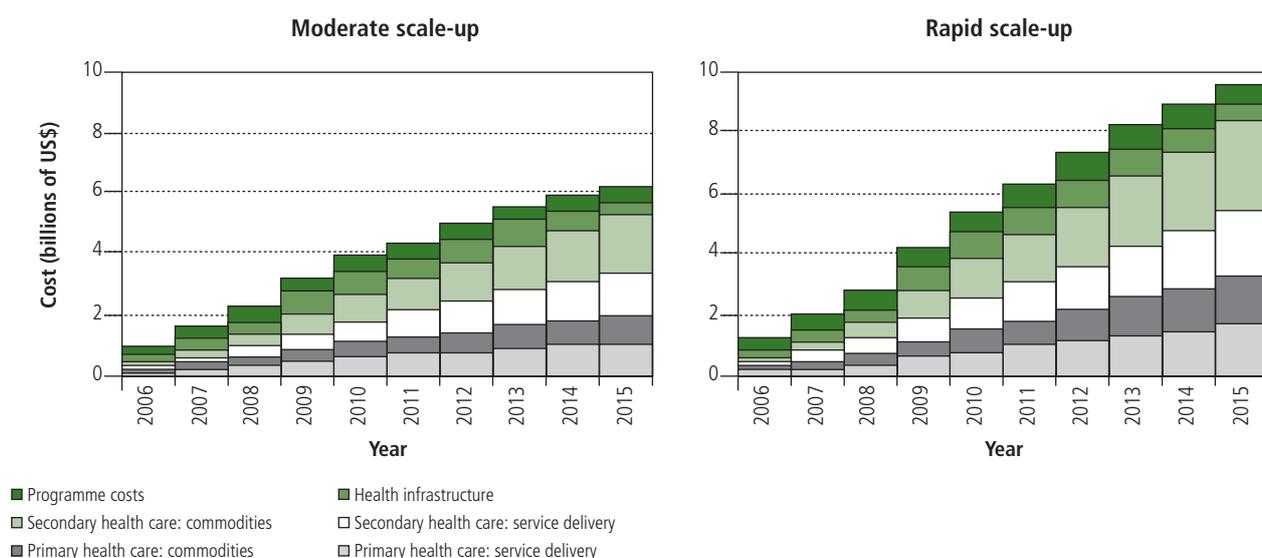
For some programme costs, only a percentage of the total need was allocated to maternal and newborn health services; this was based on the assumption that the scale-up of these services would be possible only in the context of an overall strengthening of the health-

care system. However, most of the costs are specific to pregnancy and childbirth, so resources specifically allocated for to maternal and newborn health are needed. It will take considerable effort for countries with weak health-care systems to upgrade their capacities to reach the desired coverage levels, and fuller assessments of necessary resources are needed.

Some costs not normally borne by health systems, such as the costs of transportation needed to access care, are not included in this analysis. Certain services included in the WHO recommended list of maternal and newborn health interventions are estimated under different disease categories and are not included in this exercise. The most significant example is HIV testing and preventing mother-to-child transmission of HIV. Additionally, the model does not incorporate the impact of developments that do not fall directly under the purview of maternal and newborn health services – such as improvements in the education of girls and women – on the incidence of diseases or conditions.

Increasing scale-up targets from an average of 73% coverage to 95% coverage (a 27% increase) results in around a 42% increase in total costs. There is considerable uncertainty about these results, including the uncertainty inherent in demographic projections and the impact of scaled-up family planning programmes on reducing numbers of pregnancies. It was necessary to use

Fig. 1. Distribution of incremental costs by delivery point and type, by scenario, 2006–2015



assumption-based estimates owing to variability in treatment protocols and the current quality of services, unreliable data on service utilization and a lack of accurate measures of the incidence and prevalence of maternal and newborn health conditions. This level of uncertainty precluded a formal analysis of uncertainty. Additionally, establishing goals is an uncertain process not only in terms of identifying an achievable target, but also in terms of the pace of scale-up. Thus, the results of this analysis should be regarded as projections of the order of magnitude, and they can be validated only by costing exercises conducted in specific individual countries.

Antenatal care and childbirth care constitute the majority of costs; in these categories, the cost of human resources represents about half of the total costs. The cost of human resources was derived using current levels of remuneration; in many countries these are likely to be insufficient to recruit, retain and deploy enough health workers. The Eastern Mediterranean Region, for example, has relatively high labour costs. This is reflected in the outcomes, despite the common perception that countries in this region have adequate human resources when compared with other regions. Meanwhile, the African Region needs relatively high levels of investment in health infrastructure; this, together with low levels of current coverage, helps account for that region's higher costs.

These results represent only the share of labour attributable to providing maternal and newborn health services; in many countries any attempt to reform human resources may involve reforming the entire health labour sector or the entire civil service. The entire cost of reforms targeting human resources is not captured here, but the success of reforms in this area will predict the success of scaling-up maternal and newborn care in many countries. Thus we suggest that our projections are a low-end estimate. If the costs of recruiting and retaining staff are, on average, double what is currently paid for wages, then we calculate that costs will increase by roughly a third. However, not all countries face a severe crisis in human resources, and the salary increases needed are uncertain.

Finally, attainment of the Millennium Development Goals demands a reliable and comparable method for estimating resource needs. More robust country-specific information and costing of scaling-up these health services is needed to better inform national decisions about the resources needed. Achieving the Millennium Development Goals may also require reform of health-care systems to allow greater access for the poor; for example, health financing systems may need to be reformed in order to allow the poor to access care. Because the costs of these reforms are unknown, they are uncaptured in this analysis. Such information should be systematically collected in conjunction

with efforts to scale-up maternal and newborn health services. ■

Acknowledgements

The authors would like to acknowledge Luc de Bernis, Rita Kabra, Della Sherratt, Annie Portela, Juliana Yartey, Ornella Lincetto, Zoë Matthews and other members of the Making Pregnancy Safer team at WHO for their guidance and technical input in relation to the maternal and newborn health interventions. Special thanks go to Dr Monir Islam, director of the Making Pregnancy Safer Department. Jane Cottingham, Elisabeth Aahman and Iqbal Shah provided technical expertise and data for this analysis; the Child and Adolescent Health team jointly worked in allocating shared costs between the two programmes, notably, Karin Stenberg and Robert Scherpbier. Data, methods and calculations from Lara Wolfson and the Roll Back Malaria costing team were used in the calculations of tetanus vaccinations and the costs of intermittent preventive care and insecticide-treated bednets. The authors acknowledge guidance from David Evans, Taghreed Adam and other members of WHO's Health System Financing team. Finally, the background for this study was motivated by the *World health report 2005: making every mother and child count*, and by Wim Van Lerberghe, its editor-in-chief.

Competing interests: None declared.

Résumé

Estimation des ressources nécessaires à l'échelle mondiale pour atteindre une couverture universelle par les services de santé maternelle et néonatale

Objectif Estimer les moyens supplémentaires nécessaires pour la mise à l'échelle des services de santé maternelle et néonatale dans le cadre des objectifs du Millénaire pour le développement et informer les pays, les donateurs et les agences multilatérales des ressources requises pour atteindre ces objectifs.

Méthodes Un modèle d'évaluation des coûts s'appuyant sur les Directives cliniques de l'OMS a permis d'estimer les besoins financiers supplémentaires pour délivrer les soins de santé maternelle et néonatale prévus dans 75 pays. Ce modèle a évalué les coûts des soins dispensés pendant la grossesse, l'accouchement, la période néonatale et la période postpartum, ainsi que ceux des services de planification familiale et de conseil et ceux liés à un éventuel avortement et à la période post-avortement. Les coûts programmatiques ont également été estimés. En appliquant une approche par composants et en considérant comme des extrants les coûts financiers pour les années 2006 à 2015, on a obtenu une estimation des coûts unitaires et des coefficients de mise à l'échelle par pays et par année/habitant. Deux scénarios de mise à l'échelle (rythme modéré ou rapide), utilisant des coefficients de mise à l'échelle différents, ont été utilisés.

Résultats Les résultats indiquent qu'en moyenne, une augmentation des ressources de US \$ 3,9 milliard par an au minimum est nécessaire, sans compter l'augmentation annuelle des coûts sur la période prise en compte par le modèle. Si l'on suppose une mise à l'échelle plus rapide, cette augmentation minimale des ressources peut atteindre US \$ 5,6 milliard par an. Sur 10 ans, on estime que les coûts supplémentaires représenteront de US \$ 39,3 milliard, pour un scénario à vitesse moyenne, à US \$ 55,7 milliard pour un scénario prévoyant une mise à l'échelle rapide.

Conclusion Ces projections de coûts financiers sont utilisables comme point de départ pour mobiliser les ressources au niveau mondial. Les pays auront ensuite à affiner ces estimations, mais elles pourront servir d'objectifs aux donateurs pour la définition des grandes lignes de leurs plans. Des études plus poussées sont nécessaires pour évaluer les coûts des réformes à apporter aux systèmes de santé, telles que : recrutement, formation et recyclage de personnel en effectif suffisant.

Resumen

Estimación de los recursos mundiales necesarios para lograr la cobertura universal de servicios de salud de la madre y del recién nacido

Objetivo Estimar la cantidad de recursos adicionales necesarios para expandir los servicios de salud de la madre y del recién nacido en el contexto de los Objetivos de Desarrollo del Milenio, e informar a los países, donantes y organismos multilaterales sobre los recursos necesarios para alcanzar esas metas.

Métodos Se empleó un modelo de cálculo de costos basado en las directrices clínicas de la OMS a fin de estimar las necesidades progresivas de recursos para asegurar la atención de salud de la madre y del recién nacido en 75 países. El modelo calculó los costos de la atención correspondiente al embarazo, el parto, el periodo neonatal y el periodo posparto, así como los costos de la planificación familiar y el consejo tras el parto, y la atención de aborto y posaborto; también se estimaron los costos de programas. El uso de un método basado en componentes, con costos financieros para los años 2006-2015 como resultado, permitió hacer estimaciones para poblaciones, costos unitarios y ritmos de expansión en países específicos y años específicos. Se usaron dos escenarios con diferentes ritmos de expansión (moderado y rápido).

Resultados Los resultados muestran que se requiere un incremento medio anual mínimo de los recursos del orden de US\$ 3900 millones, aunque los costos anuales aumentan a lo largo del periodo considerado en el modelo. Si se asumen ritmos más rápidos de expansión, esa cifra mínima puede llegar a ser de US\$ 5600 millones anuales. Los costos adicionales estimados a 10 años varían entre US\$ 39 300 millones para un escenario de expansión moderada y US\$ 55 700 millones para el escenario de expansión rápida.

Conclusión Estas proyecciones de los futuros costos financieros pueden servir de punto de partida para movilizar recursos mundiales. Los países tendrán que seguir refinando estas estimaciones, pero las cifras pueden ser utilizadas por los donantes como metas para orientar sus planes. Es necesario realizar nuevas investigaciones para medir los costos de las reformas de los sistemas de salud, como las relacionadas con la contratación, formación y conservación de personal en número suficiente.

ملخص

تقدير الموارد العالمية اللازمة للوصول إلى التغطية الشاملة بالخدمات الصحية للأمهات والأطفال حديثي الولادة

المتراكمة اللازمة لرعاية صحة الأمهات والأطفال حديثي الولادة في 75 بلداً. وقد عمد النموذج إلى تقدير تكاليف الرعاية أثناء الحمل، والولادة، وفترة الوليد، وفترة ما بعد الولادة، فضلاً عن التكاليف اللازمة لتنظيم الأسرة عقب الولادة، وللتوعية، والإجهاض، وتقديم الرعاية عقب الإجهاض. كما قُدرت التكاليف على مستوى البرنامج. وقد ساعد الأسلوب المستند على المكونات، واحتساب التكاليف المالية للسنوات من عام 2006 إلى 2015 كمخرجات

الغرض: تقدير مبلغ الموارد الإضافية اللازمة للتهوض بالخدمات الصحية المقدمة للأمهات والأطفال حديثي الولادة في سياق المرامي الإنمائية للألفية، وإبلاغ البلدان والجهات المانحة والوكالات المتعددة الأطراف بالموارد اللازمة لإحراز هذه المرامي.

الطريقة: لقد تم استخدام نموذج تقدير التكاليف بناء على الدلائل الإرشادية السريرية لمنظمة الصحة العالمية، وذلك لتقدير مدى الاحتياج للموارد

مليار دولار أمريكي في حالة سيناريو معدل النهوض المتوسط، و55.7 مليار دولار أمريكي في حالة سيناريو معدل النهوض السريع. **الخصيلة:** إن هذه التوقعات للتكاليف المالية في المستقبل قد تمثل نقطة البداية لاستجلاب وحشد الموارد العالمية. وبطبيعة الحال تحتاج البلدان إلى إجراء المزيد من التطوير لهذه التقديرات، وإن كانت هذه الأرقام تمثل مرامياً تصبو الجهات المانحة إلى بلوغها وتوجيه خططهم إليها. وهناك حاجة إلى إجراء المزيد من البحوث لقياس تكاليف إصلاحات النظام الصحي مثل التعيين والتدريب واستبقاء عدد كاف من العاملين.

للبرنامج، على إعداد التقديرات الخاصة بالسكان لكل بلد على حدة ولكل سنة على حدة، وكذا تكاليف الوحدة، ومعدلات النهوض. وتم الاعتماد على سيناريوهين باستخدام معدلين مختلفين للنهوض (السريع والمتوسط). **الموجودات:** أظهرت النتائج الحاجة إلى زيادة المتوسط السنوي للموارد لنحو 3.9 مليار دولار أمريكي على الأقل، وذلك رغم زيادة التكاليف السنوية على مدى الفترة الزمنية للنموذج. وفي حالة افتراض معدلات نهوض أسرع، فقد نحتاج إلى زيادة الحد الأدنى ليصل إلى نحو 5.6 مليار دولار أمريكي سنوياً. ومن ثم فإن التكاليف التراكمية المقدره لعشر سنوات تتراوح ما بين 39.3

References

1. *The world health report 2005: make every mother and child count*. Geneva: WHO; 2005.
2. *Maternal mortality in 2000: estimates developed by WHO, UNICEF and UNFPA*. Geneva: WHO; 2004.
3. *Perinatal mortality: a listing of available information*. Geneva: WHO; 1996 (WHO/FRH/MSM/96.7).
4. *State of the world's newborns: a report from saving newborn lives*. Washington: Save the Children Fund; 2004. pp. 1-28.
5. *Global monitoring and evaluation*. Geneva: WHO; 2004.
6. Demographic and Health Surveys. *STATcompiler*, 2004. Available from http://www.measuredhs.com/statcompiler/start.cfm?action=new_table&user_id=155356&usertabid=170332&CFID=139536&CFTOKEN=83650943
7. Stenberg K, Johns B, Scherpier R, Tan-Torres Edejer T. A financial road map to scaling up essential child health interventions in 75 countries. *Bull World Health Organ* 85;4:305-314.
8. *Pregnancy, childbirth, postpartum and newborn care: a guide for essential practice*. Geneva: WHO; 2003. Available from <http://www.who.int/reproductive-health/publications/pcpnc/index.html>
9. *Managing complications in pregnancy and childbirth: a guide for midwives and doctors*. Geneva: WHO; 2000. Available from <http://www.who.int/reproductive-health/impac/index.html>
10. *Managing newborn problems: a guide for doctors, nurses, and midwives*. Geneva: WHO; 2003. Available from <http://www.who.int/reproductive-health/publications/mnp/index.html>
11. United Nations Population Division. *World population prospects: the 2002 revision*, 2004. Available from <http://www.un.org/esa/population/publications/wpp2002/wpp2002annextables.PDF>
12. Murray CJL, Lopez AD. *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020*. Cambridge: Harvard University Press; 1996.
13. Thonneau P, Fougeyrollas B, Ducot B, Boubilley D, Dif J, Lalande M et al. Complications of abortion performed under local anesthesia. *Eur J Obstet Gynecol Reprod Biol* 1998;81:59-63. doi: 10.1016/S0301-2115(98)00147-X
14. *Unsafe abortion: global and regional estimates of incidence of mortality due to unsafe abortion with a listing of available country data*, 3rd edition. Geneva: WHO; 2004. Available from http://www.who.int/reproductive-health/publications/MSM_97_16/MSM_97_16_table_of_contents_en.html
15. Management Sciences for Health. *International drug price indicator guide*, 2004. Available from <http://erc.msh.org/dmpguide/>
16. Mulligan J, Fox-Rushby JA, Adam T, Johns B, Mills A. *Unit costs of health care inputs in low and middle income regions*. Washington, DC: World Bank; 2005. Disease Control Priorities Project Working Paper No. 9. Available from <http://www.dcp2.org/file/24/wp9.pdf>
17. Adam T, Evans DB, Murray CJL. Econometric estimation of country-specific hospital costs. *Cost Eff Resour Alloc* [online journal] 2003;1:3. Available from: <http://www.resource-allocation.com/content/1/1/3> doi: 10.1186/1478-7547-1-3
18. Johns B, Adam T, Evans DB. Enhancing the comparability of costing methods: cross-country variability in the prices of non-traded inputs to health programmes. *Cost Eff Resour Alloc* [online journal] 2006;4:8. Available from: <http://www.resource-allocation.com/content/4/1/8> doi: 10.1186/1478-7547-4-8
19. *Essential technology package software*. Tygerberg: WHO Collaborating Centre for Essential Technologies in Health; 2004.
20. UNFPA, World Health Organization. *Essential drugs and other commodities for reproductive health services*. Geneva: UNDP, WHO; 2003.
21. *Antenatal syphilis screening in the UK: a systematic review and national options appraisal with recommendations*. London: Public Health Laboratory Service Syphilis Working Group; 1998.
22. Maral I, Cirak M, Aksakal FN, Baykan Z, Kayikcioglu F, Bumin MA. Tetanus immunization in pregnant women: serum levels of antitetanus antibodies at time of delivery. *Eur J Epidemiol* 2001;17:661-5. doi: 10.1023/A:1015507402480
23. Kenyon S, Boulvain M, Neilson J. Antibiotics for preterm rupture of membranes. *Cochrane Database of Systematic Reviews*. 2003;2:CD001058.
24. McDonald H, Brocklehurst P, Parsons J. Antibiotics for treating bacterial vaginosis in pregnancy. *Cochrane Database of Systematic Reviews* 2005;1: CD000262. doi: 10.1002/14651858.CD000262.pub2
25. Prendiville WJ, Elbourne D, McDonald S. Active versus expectant management in the third stage of labour. *Cochrane Database of Systematic Reviews* 2000; 3:CD000007.
26. Hofmeyr GK, Kulier R. Interventions to help external cephalic version for breech presentation at term. *Cochrane Database of Systematic Reviews* 2004;1:CD000184.

Table 1. Activities included in costing for maternal and newborn health services

Intervention or activity ^a	Cost category and assumptions ^b	No. per completed pregnancy or delivery
Routine antenatal care		
Assessment of maternal and fetal well-being	HCV	4
Information and counselling	HCV	4
Recording and reporting	HCV	4
Screening for hypertensive disorders of pregnancy (pre-eclampsia)	HCV; T	4
Screening for anaemia	HCV; S	4
Prevention of anaemia	HCV; D	4
Specialist care for pregnant women with diabetes	T	0.04
Syphilis testing	HCV; T; S	1
Tetanus toxoid immunization	HCV; D; S	2
Situational antenatal care (in endemic areas, depending on epidemiological situation)		
Treatment of hookworm infection	HCV; D	1
Intermittent preventive therapy for malaria	D	2
Insecticide-treated bednets	S	1
Additional and pre-referral antenatal care (early detection and management of diseases or conditions)		
Treatment of severe hypertension in pregnancy	HCV; D; S	0.05
Treatment of moderate anaemia	HCV; D	0.1–0.6 ^c
Treatment of syphilis	HCV; D; S	0.00004– 0.0023 ^c
Treatment of bacterial vaginosis or trichomoniasis infection	HCV; D	0.06
Treatment of vaginal candida infection	HCV; D	0.075
Treatment of gonorrhoea	HCV; D; S	0.0024–0.028 ^c
Treatment of chlamydia	HCV; D	0.0024–0.028 ^c
Treatment of lower urinary tract infection	HCV; D; S	0.055
Treatment of upper urinary tract infection	HCV; T	0.02
Treatment of severe illnesses or complications during pregnancy		
Treatment of severe pre-eclampsia	R; HBD; D; T; S	0.0019–0.011 ^c
Treatment of eclampsia	HBD; D; S	0.00019–0.0011 ^c
Treatment of severe anaemia	R; HBD; D; BT; S	0.02–0.0.5 ^c
Treatment of upper urinary tract infection	HBD; D; T; S	0.02
Routine childbirth care		
Initial assessment and recognition of delivery complications	DV	1
Surveillance and regular monitoring of labour and delivery	DV; T	1
Social support throughout labour and delivery	DV	1
Prevention and control of infections	DV; S	1
Assistance during childbirth	DV; MP	1
Active management of the third stage of labour	DV; D	1
Care and support of the mother	DV	1
Treatment of complications during childbirth		
Ultrasound	MP	0.125
Promote fetal maturation before preterm delivery	D; S	0.10
Management of pre-labour rupture of membranes or infection	D	0.06
Management of antepartum haemorrhage	R; HBD; D; S	0.022
Caesarean section	HBD; MP	0.0011
Blood transfusion	BT; S	0.00726
Management of puerperal sepsis	HOV; D; S	0.08
Management of shock	MP; D; S	0.0216
Blood transfusion	R; HBD; BT; S	0.008
Laparotomy and hysterectomy	AHBD; MP	0.00004
Management of obstructed labour	R; HBD; D; S	0.05
Forceps delivery	MP; D; S	0.0025
Caesarean section	AHBD; MP; BT; S	0.045
Uterine repair or hysterectomy	AHBD; MP; BT; S	0.001

(Table 1, cont.)

Intervention or activity ^a	Cost category and assumptions ^b	No. per completed pregnancy or delivery
Management of prolonged labour	HBD; D; S	0.1
Vacuum extraction	MP; D; S	0.015
Forceps delivery	MP; D; S	0.015
Caesarean section	AHBD; MP	0.07
Management of fetal distress		0.08
Forceps delivery	MP; D; S	0.010125
Caesarean section	AHBD; MP	0.05625
Vacuum extraction	MP; D; S	0.010125
Episiotomy	MP; D; S	0.125
Avoiding breech presentation at birth (with external cephalic version)	MP; D; S	0.04
Vaginal breech delivery	D; S	0.03
Craniotomy or embryotomy	MP; D; S	0.005
Management of postpartum haemorrhage	D; S	0.05
Additional supplies	S	0.0125
Treatment of bleeding lasting > 24 hours	D; S	0.0075
Refer to hospital	R; HBD	0.0125
Manual removal of placenta	D; S	0.01
Repair of vaginal or perineal tear	D; S	0.005
Repair of cervical tears	D; S	0.005
Blood transfusion	AHBD; BT; D; S	0.0125
Hysterectomy	AHBD; MP	0.00125
Management of perineal infection	HBD; D; S	0.0125
Repair of vaginal or perineal tear	HBD; D; S	0.1
Repair of cervical tear	HBD; S	0.02
Symphysiotomy	D; MP	0.001
Special intervention or activities (considered for HSC-4 countries only)		
Screening all pregnant women for blood group isoimmunization	T	1
Postpartum administration of anti-D immunoglobulin to rhesus-negative women with a rhesus-positive fetus	D; S	0.08
Routine postpartum care in the maternity ward		
Examination of the mother	RPC	1
Information and counselling	RPC	1
Recording and reporting	RPC; S	1
Administration of iron and folate supplements	RPC; D	1
Administration of vitamin A supplements	RPC; D	0.15
Postpartum care follow-up visit		
Postpartum examination of the mother	HCV	1
Information and counselling on home care, care seeking	HCV	1
Counselling on family planning methods	HCV	1
Management of mastitis	HCV; D	0.05
Management of postpartum depression	HCV	0.12
Postpartum counselling on family planning		
Counselling on family planning methods	HCV	1
Voluntary tubal ligation (female sterilization)	HBD; MP; D; S	0–0.023 ^d
Intrauterine device	HCV; S	0–0.64 ^d
Combined oral contraceptives	HCV; D	0.01–0.46 ^d
Combined injectables	HCV; D; S	0–0.31 ^d
Intervention or activity	Cost category and assumptions ^b	No. per abortion
Safe abortions		
Management of abortion complications	HBD; D; S	0.028 where legal; 0.23–0.35 ^c where illegal
Manual vacuum aspiration or dilatation and curettage	MP	0.143 of above
Manual vacuum aspiration	HOP; MP; D; S	0.90 where legal

(Table 1, cont.)

Intervention or activity	Cost category and assumptions ^b	No. per abortion
Dilatation and curettage	HOP; MP; D; S	0.10 where legal
Laparotomy	HBD; MP; D; S	0.3 of those receiving MP
Post-abortion care and counselling	HCV	0.143 where legal; 0.23–0.35 ^c where illegal
Intervention or activity	Cost category and assumptions ^b	No. per neonate
Routine newborn care		
Immediate postnatal care	S	1
Breastfeeding support	S	1
Resuscitation	HBD; S	0.04
Small baby care and kangaroo mother care	HBD; S	0.025
Care for minor problems	HCV; D	0.073
Presumptive sepsis care	HCV; D; S	0.015
Eye prophylaxis	D	1
Presumptive treatment for syphilis	D; S	Percentage of neonates with condition ^c
Pre-referral care for seriously ill neonate	D; S	0.07
Postnatal care		
Postnatal visit care	HCV	1
Follow-up visit	HCV	0.138
Sick baby visit	HCV; D; S	0.11
Maternal stay for baby care	HBD	0.13
Special newborn care		
Special general care for seriously ill neonate	HBD; D; S	0.07
Very small baby care and kangaroo mother care	(Covered above)	0.034
Sepsis management	T; D; S	0.042
Management of convulsions	D; S	0.022
Management of breathing difficulty	S	0.04
Management of severe jaundice	S	0.009
Management of severe hypothermia	AHBD	0.023
Management of congenital syphilis	D; MP; S	Percentage of neonates with condition ^c
Management of neonatal tetanus	D; S	0.001
Supporting breastfeeding (maternal stay for baby care)	AHBD	0.064

AHBD, hospital bed-days in addition to those already received; BT, blood transfusion; D, drugs; DV, proportion of visits for the delivery of the child; HBD, hospital bed-days; HCV, proportion of health centre visits; HOP, health centre outpatient visit; HOV, hospital outpatient visit; MP, medical procedure (these may contain costs for medicines; for example, the category hysterectomy contains costs for anaesthesia); R, referral to hospital; RPC, proportion of routine postpartum care time; S, medical supplies or materials; T, tests or laboratory procedures.

^a These interventions have been recommended by WHO as result of systematic reviews and consensus consultations and are described in the IMPAC series (WHO, unpublished document, 2004).^{8–10}

^b All categories except drugs and medical supplies or materials are not considered fully tradable goods and are adjusted to country-specific prices.

^c Based on regional estimates from the Global Burden of Disease survey.¹²

^d Percentage of women based on country's current usage.

Fig. 2. Distribution of incremental costs by major activity category, by scenario, 2006–2015

