



**COST OF SCALING UP THE HEALTH WORKFORCE IN LIBERIA,
SIERRA LEONE, AND GUINEA AMID THE EBOLA EPIDEMIC**

Frontline Health Workers Coalition Analysis - March 2015

Introduction

The Ebola virus epidemic in West Africa has brought renewed attention to the need to increase investments in frontline health workers and the systems that support them. The World Health Organization (WHO) reports that as of February 18, 2015, 830 health workers have been infected with the Ebola virus and 488 have died caring for the more than 22,000 people confirmed or suspected to be infected with the virus.¹

Nearly all these lives have been lost in three countries – Liberia, Sierra Leone, and Guinea. Each of these three countries had less than three doctors, nurses, and midwives per 10,000 people before the Ebola epidemic took hold, far less than the 22.8 per 10,000 people that the WHO identifies as the minimum needed to deliver basic health services.²

With this in mind, the Frontline Health Workers Coalition – an alliance of 40 United States-based organizations working together to urge greater and more strategic investment in frontline health workers – supported the following independent analysis by Eric Friedman of the O’Neill Institute for National and Global Health Law at the Georgetown University Law Center of existing costing and workforce data. The findings from this analysis further

inform the FHWC’s recommendations to increase investment to help build a resilient and sustainable health workforce in Liberia, Sierra Leone, and Guinea.³

The analysis estimates the potential core investments that would need to be made to approximately double the number of doctors, nurses, midwives, and other skilled health workers in the three countries over the next five years. In addition, it estimates the potential costs of implementing community health worker programs in Guinea, Liberia, and Sierra Leone based on the recommendations of the 2013 Technical Task Force of the Earth Institute of Columbia University. Five-year and year-by-year costing information are provided, along with the assumptions and data underlying these calculations. Assumptions made in the analysis are detailed below.

Where possible, the estimates are based on officially reported country data. It should be noted, however, that health workforce data in the three countries are often many years old and sometimes absent.

The costed components are compensation – including allowances to encourage retention and rural retention incentives – for new health workers, retention

payments to existing health workers, training new health workers, and the community health worker program. These components have been shown to be the most effective incentives for retaining health workers and increasing their productivity. The costs for a community health worker program, which would be extremely valuable and cost effective for helping to restore essential health services, are broken out separately and by country.

Several costs that a comprehensive health workforce program should include – such as health worker safety, leadership and management, human resources information systems, and broader health system investments – are not included. Some of these, however, are part of the community health worker program.

Acknowledgements



This costing analysis was issued on behalf of the Frontline Health Workers Coalition, an alliance of United States-based organizations working together to urge for greater and more strategic U.S. investment in frontline health workers in developing countries as a cost-effective way to save lives and foster a healthier, safe and more prosperous world. This costing analysis does not necessarily represent the views of any individual Coalition member or donor.

The Coalition would like to thank Eric A. Friedman (J.D.) of the O’Neill Institute for National and Global Health Law at Georgetown Law Center, who administered the research, calculations, and writing of this costing analysis.

Prior to joining the O’Neill Institute, Mr. Friedman was a Senior Global Health Policy Advisor at Physicians for Human Rights, focusing on health systems, global health workforce shortages and HIV/AIDS. He has also been a Board member for the Global Health Workforce Alliance, an international partnership hosted by the World Health Organization, and served as a chair for the Health Workforce Advocacy Initiative. This

costing analysis could not have been completed without his invaluable expertise.

We would also like to thank Frontline Health Workers Coalition members for providing insightful and constructive feedback for this report.

Estimated Costs of Doubling the Health Workforce in Liberia, Sierra Leone, and Guinea

FIVE-YEAR HEALTH WORKFORCE INVESTMENT BREAKDOWN

The total costs of doubling the health workforce and adding a comprehensive community health worker program in the three countries over the next five years,* with the assumptions and data used, comes to **\$573,416,399** with the annual breakdown:

Year 1: \$106,296,003
 Year 2: \$107,356,643
 Year 3: \$111,053,891
 Year 4: \$115,287,311
 Year 5: \$133,422,551
Total: \$573,416,399

Overall, the estimated cost for each country is:

Liberia: \$105,848,310
 Sierra Leone: \$129,528,359
 Guinea: \$338,039,730

The differences across countries come from considerable differences in the size and composition of the existing health workforces of these countries, amplified when the existing workforces are the basis of the calculations.

*As is further explained in the analysis, the number of doctors is increased and on its way to doubling, but not yet doubled due to assumed training lag-time.



Photo Credit: International Medical Corps/ Stuart Sia

Data and Related Assumptions

Health workforce numbers

The existing health workforce data are as follows and represent the categories used in the costing and training calculations. The community health worker data are not included here because the community health worker program was calculated separately. Some categories of health workers – such as cleaners, drivers, and security guards – are not included in this analysis, but increased financing for all frontline health workers is necessary for a robust health workforce.

The most recently available data vary significantly by country, with Liberia's latest data in 2011, Sierra Leone's in 2008, and Guinea's in 2005. This lack of recent

health workforce data points to the need for investment in better and more current human resources for health information systems.

Liberia⁴

Doctors: 90
 Nurses: 1,393
 Midwives: 412**
 Other skilled health workers: 3,451
 Management/support health workers: 50

Sierra Leone⁵

Doctors: 136
 Nurses/midwives: 1,017
 Other skilled health workers: 293
 Management/support health workers: 23

Guinea⁶

Doctors: 940
 Nurses/midwives: 4,408

Other skilled health workers: 548
 Management/support health workers: 470

Compensation

No single source of salary information was available, so actual figures and estimates were pieced together from news reports and assumptions. Particular country-specific assumptions are below. Salaries for doctors and nurses are based on country-specific data or, in the case of Guinea, Liberian salaries. Lacking country specific data for other skilled health workers and managers, it was assumed that their salaries were the same as nurses in the country.

**The nurse/midwife differentiation was available only for Liberia. Accordingly, calculations conflated nurses and midwives, the nurse/midwife proportion was used in calculating training costs, as nurses required three years of training but midwives only two years.

The training and tasks of skilled health workers varies considerably with professional, highly skilled workers such as pharmacists, as well as health workers such as laboratory technicians who receive less training. To simplify the calculations, these skilled health workers were grouped together.

Data from a 2008 *Lancet* article show that in 2004, while pharmacists and laboratory scientists had salaries approaching those of doctors, other cadres – including clinical officers, lab technicians, and pharmacy technicians – had salaries very similar to nurses.⁷ These lower level cadres of health workers are more numerous in Liberia, Sierra Leone, and Guinea than pharmacists and lab scientists. Liberia, for example, had six public-sector pharmacists and only two pharmacy technicians in 2006 but 126 full-time lab techs in the public sector along with 135 lab assistants.⁸

Liberia

Doctors: \$500/month⁹
Nurses/midwives: \$250/month¹⁰
Other skilled health workers and managers: \$250/month

Sierra Leone

Doctors: \$600/month¹¹
Nurses/midwives: \$55/month¹²
Other skilled health workers and managers: \$55/month

Guinea

No data were found for health worker salaries in Guinea. The more reasonable Liberian health worker salaries were used to calculate costs for Guinea because

of the unusually large disparity in pay between doctors and nurses, as well as extraordinarily low salaries for nurses in Sierra Leone.

Doctors: \$500/month
Nurses/midwives: \$250/month
Other skilled health workers and managers: \$250/month

Training cost and length

Liberia's human resources for health plan was the only one to provide detailed information on the cost of training. It, like Sierra Leone's plan, specified length of training. Accordingly, the information on health worker training for all three countries was based on Liberia's 2007-2011 human resources for health plan.¹³ All three countries are similarly placed on the economic ladder; they are low-income countries with similar gross national income (GNI) per capita.* Thus, it is reasonable to expect that costs of investments will be similar across these countries.

Liberia's plan was published in 2007, and it was assumed that the dollar figures were in 2006 U.S. dollars. Accordingly, training costs were increased by a multiplier of 1.20, an adjustment for inflation, which was 17% from 2006 to 2014 using the U.S. consumer price index.¹⁴ Had the higher inflation levels in Liberia, Sierra Leone, and Guinea been used, the training costs would have been higher than those calculated here.** The figures below are the data directly from the plan, without the inflation adjustment used in the calculations.

The training costs in Liberia's human resources for health plan were:

Doctors: \$5,000/student/year (5 years)

Nurses: \$2,500 total (3 years)
Midwives: \$1,500 total (2 years)
Pharmacists: \$4,500/year (4 years)
Pharmacy technicians: \$3,000/year (3 years)
Physician assistants: \$2,500/year (3 years)
Social workers: \$600/year (3 year)
Laboratory technician: \$700/year (3 years)
Radiography personnel: \$700/year (2 years)
Environmental health officers: \$700/year (2 years)

As explained in the section on calculations, based on Liberia's staffing targets an average cost for the other skilled health worker category was calculated to be \$4,629, or \$5,555 including inflation.

Community health worker program

Because the community health worker program depends on the size of the rural population, it was necessary to have the overall populations of each country and the proportion of the population that is rural.

Liberia¹⁵

Population: 4,092,000
Proportion of population rural: 51.8%
Rural population: 2,112,000

Sierra Leone¹⁶

Population: 5,754,000
Proportion of population rural: 60.8%
Rural population: 3,498,000

Guinea¹⁷

Population: 11,474,000
Proportion of population rural: 64.6%
Rural population: 7,412,000

*In 2013, Guinea's per capita GNI was \$460, Liberia's was \$410, and Sierra Leone's was \$660. World Bank, "GNI per capita Atlas method (current US\$)," <http://data.worldbank.org/indicator/NY.GNP.PCAP.CD>, accessed January 18, 2015.

**Using IMF data from the World Bank's World Development Indicators database, five-year training costs for the three countries would total approximately \$74.5 million more than those included in the present calculations.

Costs: Compensation for New and Existing Health Workers



International Medical Corps/ Stuart Sia

It was assumed that by the end of the five-year period, the number of nurses/midwives, other skilled health workers and managers all doubled. Given the training lag time, this seemed an unrealistic assumption for doctors. With five years of training, even if medical schools could accommodate an immediate doubling of the number of medical students, they would not enter the workforce until year 6, beyond this estimate.

Therefore, two assumptions were made for doctors that affected their number. One was that their numbers could increase over the five-year period due to reduced attrition for medical school. Their attrition levels are particularly high – for example, 62.5% between 1998 and 2002 in Sierra Leone.¹⁸ It also was assumed that by improving medical school retention, the number of doctors would increase by 5% each year beginning with year two – i.e., preventing dropout during year 1 of the five-year initiative, and entering the

workforce in year 2 – thus reaching a 20% increase in doctor numbers by the end of the five years.

In addition, to further increase their numbers, it was assumed that improved retention would increase their numbers by 5% every year beginning at the beginning of the five-year initiative, thus further increasing the number of doctors by 25%. While attrition is a problem for other cadres of health workers as well, it is particularly high for doctors.¹⁹ In all, therefore, the number of doctors under these calculations increased by 45% over the five-year period.

Compensation

Assumptions for Existing Health Workers

Salaries: Total salary costs are based on doubling all skilled cadres (including

management), with the exception of doctors. For doctors, a gradual increase in their number, up to 45% by year 5, was assumed, as explained above.

Since most of the nurse/midwife cadres are nurses with three years of training, it was assumed that half would enter the workforce in year 4, and the other half in year 5.

For other skilled health workers and managers, whose training generally lasts two or three years, a phased entrance into the health workforce was assumed, with one-third entering in year 3, one-third entering in year 4, and the final third entering in year 5.

Retention investment: For all clinical health workers – excluding managers, as there is no evidence that retention of managers is a significant problem – a 1.20 multiplier was used to account for allowances to increase compensation

and thus improve retention, along with in-service training. Since allowances and other financial compensation aimed at improving retention might vary significantly depending on a country's strategy, this seemed to be a reasonable and conservative estimate.

Rural retention: A rural retention investment of 50% base salary was used for half of the health workers, except managers, for whom a 20% of base salary investment was used – there is less research on rural retention issues for managers, but presumably like other health workers they prefer urban areas, so a

lower but still significant retention investment was assumed. The 50% (20% for managers) of salary per health worker investment was applied to half of health workers. This was based on the fact that Liberia, Sierra Leone, and Guinea have more than half of their populations living in rural areas.

Assumptions for Existing Health Workers

Retention of existing health workers: To ensure equal compensation and to promote their retention, the investment required

to help retain existing health workers was calculated separately. As with new health workers, an additional 20% of their salary cost was calculated. Though not included, given the hazards of Ebola and heroics of non-clinical health workers such as ambulance drivers and cleaners, it could be appropriate to provide hazard allowances to non-clinical health workers as well. As those allowances are not included here, this estimate of added compensation for current health workers is conservative.

5-YEAR HEALTH WORKER COMPENSATION COSTS: LIBERIA, SIERRA LEONE, GUINEA

Liberia

New health workers

Total compensation by year of doctors, nurses/midwives, other skilled health workers, and managers, with 20% retention allowances above base salary (except for managers) plus 50% rural retention allowance (except 20% for managers) for half of the new health workers for each cadre:

Year 1: \$45,000
 Year 2: \$135,000
 Year 3: \$1,260,300
 Year 4: \$6,363,300
 Year 5: \$11,369,700

Total = \$19,173,300

Retention of existing health workers

Doctors: \$108,000 per year
 Nurses/midwives: \$1,083,000 per year
 Other clinical skilled health workers: \$405,600 per year
 Management: \$30,000 per year

Total = \$1,626,600 per year, and \$8,133,000 over five years

Sierra Leone

New health workers

Total compensation by year of doctors, nurses/midwives, other skilled health workers, and managers, with 20% retention allowances above base salary (except for managers) plus 50% rural retention allowance (except 20% for managers) for half of the new health workers for each cadre:

Year 1: \$74,800
 Year 2: \$224,640
 Year 3: \$569,988
 Year 4: \$1,891,908
 Year 5: \$3,208,248

Total = \$5,969,584

Retention of existing health workers

Doctors: \$195,840 per year
 Nurses/midwives: \$268,488 per year
 Other clinical skilled health workers: \$77,352 per year
 Management: \$6,072 per year

Total = \$547,752 per year, and \$2,738,760 over five years

Guinea

New health workers

Total compensation by year of doctors, nurses/midwives, other skilled health workers, and managers, with 20% retention allowances above base salary (except for managers) plus 50% rural retention allowance (except 20% for managers) for half of the new health workers for each cadre:

Year 1: \$410,400
 Year 2: \$1,231,200
 Year 3: \$3,457,800
 Year 4: \$15,266,700
 Year 5: \$27,079,200

Total = \$47,445,300

Retention of existing health workers

Doctors: \$1,128,000 per year
 Nurses/midwives: \$2,644,800 per year
 Other clinical skilled health workers: \$328,800 per year
 Management: \$282,000 per year

Total = \$4,383,600 per year, and \$21,918,000 over five years

Costs: Training Doctors, Nurses/Midwives, and Other Skilled Health Workers



International Medical Corps/ Stuart Sia

Training

For the training of new doctors, it was assumed that new medical students would be phased in over the five-year period. This meant that, for training cost purposes, over the five-year period the average medical student will have completed three years. Accordingly, the analysis assumed a cost of \$15,000 for each medical student, which became \$18,000 adjusted for inflation as explained above.

Further, as explained, it was assumed that 20% of new physicians trained would come through reduced medical student attrition. Accordingly, the number of the entirely new medical students was calculated at only 80% of the total number of new doctors needed to double the health workforce.

There would be some costs associated with

retaining medical students who would otherwise drop out. Lacking any basis for these costs, a placeholder of \$2,000 per retained medical student was used.

For the training of new nurse/midwives, Liberia's proportion of nurses to midwives (1,393 to 412) and training costs (\$2,500 and \$1,500, respectively) was used to calculate the average cost of training a nurse/midwife in Liberia, weighted for the proportion of nurses and midwives. This came out to \$2,272, or \$2,726 adjusted for inflation as explained above.

A similar method was used to calculate training costs of other skilled clinical health workers. Lacking current numbers, the training costs of each of the other skilled health workers that Liberia's plan covered were added up and divided by the total number of these positions based on the staffing requirements in Liberia's 2007-

2011 human resources for health plan,²⁰ to come up with an average cost of these skilled health workers, weighted for the proportion of each of the cadres. This came out to \$4,629, or \$5,555 adjusted for inflation as explained above.

For simplicity, given the varied lengths and different assumptions across cadres, in calculating costs the average annual training costs for each of the five years was used. As a result, costs in earlier years were slightly overstated and costs in later years understated, but the five-year total is correct.

These calculations do not include additional costs of expanding pre-service training capacity to accommodate the higher number of health professional students, such as costs of additional tutors or expanding the physical capacity or number of health training institutions.

Liberia

Doctors (90): \$1,332,000
Nurses/midwives (1,805): \$4,920,430
Other skilled health workers (676):
\$3,755,180

Total training costs: \$10,007,610
Average annual training costs: \$2,001,522

Sierra Leone

Doctors (136): \$2,000,000
Nurses/midwives (1,017): \$3,017,682
Other skilled health workers (293):
\$1,627,615

Total training costs: \$6,645,297
Average annual training costs: \$1,329,059

Guinea

Doctors (940): \$13,912,000
Nurses/midwives (4,408): \$12,016,208
Other clinical skilled health workers
(548): \$3,044,140

Total training costs: \$28,972,348
Average annual training costs: \$5,794,470

Costs: Community Health Worker Program

The community health worker program costs were based entirely on the assumptions and calculations of the prominent proposal developed by the Technical Task Force convened by the Earth Institute at Columbia University.²¹ The costs that this program covered for each new community health worker included compensation, training, communications, and medicines and other supplies, as well as innovative additions such as mHealth tools. Significantly, the program also assumed one community health worker manager for every 30 new community health workers. The program would have one community health worker for every 650 rural inhabitants in Africa.

The Technical Task Force calculated the total cost per community health worker in the program to be \$3,584, or \$6.56 per capita for each person covered by the program.

These estimates have since been updated to be \$3,750 per community health worker, or \$6.86 per capita for each person covered by the program. More precise per capita costs are provided by country. These include \$6.90 per person served for the first three years for Guinea, falling to \$5.82 per capita thereafter; for Liberia, \$6.91 per capita

initially followed by \$5.86 after the first three years; for Sierra Leone, \$6.96 per capita falling to \$5.88 per capita. This assumes that community health workers would be trained to reach the one per 650 rural residents ratio after three years, with the training reflecting in the higher initial costs.

The ongoing costs incorporate training additional community health workers to account for population growth, as well as refresher courses for existing community health workers.²² The cost, therefore, is the respective per capita cost – the initial number for the first three years, and the lower cost for the final two of the five-year costing estimate, multiplied by the number of rural residents – assuming that all would be covered by the program.

Using the rural proportion data above, the annual costs of the program would be:

Liberia: \$14,593,920 per year (1-3) and \$12,376,320 per year (4-5); total \$68,534,400

Sierra Leone: \$24,346,080 per year (1-3) and \$20,568,240 per year (4-5); total \$114,174,720

Guinea: \$51,142,800 per year (1-3) and \$43,137,840 per year (4-5); total \$239,704,080

Total: \$90,082,800 per year (1-3) and \$76,082,400 per year (4-5), or \$422,413,200 over five years

These numbers are high in comparison to the other health workforce costs (i.e., salary and compensation costs for other health workers) because the community health worker program assumes far better coverage of the population than doubling other cadres, which still leaves immense deficits, unlike the community health worker program, which would achieve desired coverage levels. Also, as most training is in-service, the community health worker program would begin in year 1.

It was therefore assumed that all the accompanying investments, such as compensation and management, would be required during the first year. Other cadres do not reach full levels until year 5 – not even by year 5 in the case of doctors. Further, the community health worker program includes programmatic costs, such as supplies, that are not included in the calculations for other health workers.

Summary & Recommendations

The Frontline Health Workers Coalition recommends that the U.S. Government and its partners address the public health emergency resulting for the Ebola virus epidemic in Liberia, Sierra Leone, and Guinea by investing in the training, retention, and support of frontline health workers.

Based on the assumptions, data and calculations in this paper, the overall cost of doubling the health workforce over five years in Liberia, Sierra Leone, and Guinea, and expanded coverage via a community health worker program comes to approximately \$573.4 million, or less than \$115 million per year on average.

It should be noted that the estimates for this costing analysis were not asked for and are not those of the governments of Liberia, Sierra Leone, or Guinea – and any investments made to increase the capacity of the local frontline health workforce in these three countries should be made in close partnership and coordination with the governments of each country.

A strong commitment by the United States and other donors could help assist the three countries most heavily affected by the Ebola crisis to not only build resilient workforces and systems capable of ending the Ebola epidemic but also to restore essential health services and build capacity

to respond to future health threats.

End Notes

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End Notes

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