Vaccine xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Commentary

Achieving a "Grand Convergence" in global health by 2035

Adel Mahmoud

Department of Molecular Biology and The Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ 085444, USA

ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Convergence
Vaccines
Global health
Universal health

ABSTRACT

Historical evidence demonstrates the validity of the concept "Grand Convergence". The Lancet commission identified the major challenges facing low and lower middle income countries including the unfinished agenda, non-communicable diseases and injuries and an approach to funding and achieving these objectives along with progress towards universal health care. The role of vaccines is summarized as a major approach to accomplish a Grand Convergence in a generation.

1. Introduction

In 1993, the World Bank's World Development Report was a landmark in the annals of Global Health in recent decades [1]. The report presented a comprehensive evidence that health expenditure is an investment for the future. It leads to improvements in health for the population and economic prosperity. In addition, the report indicated that these investments in health of the population are needed to implement effective interventions for the major Global Health Challenges.

Twenty years later, the Lancet Commission was formed under the leadership of Larry Summers and Dean Jamison. Both have been instrumental in developing the 1993 document from the World Bank. The Lancet Commission set its working plan to re-examine the validity of the concepts around investing in health and to propose an investment framework for low and middle income countries which is needed for tackling multiple health challenges. The Commission accomplished its targets by proposing a road map to achieving remarkable gains in global health through a "Grand Convergence". The Commission's report was published in the Lancet by the end of 2013 entitled "Global Health 2035: a world converging within a generation" [2]. The overall purpose of this presentation is to summarize the specific challenges and messages identified by the Commission and its strategic directions. Then we will focus specifically on what is expected to be achieved by currently available vaccines and those that are urgently needed to be discovered and developed to achieve "Grand Convergence" [3].

2. Two centuries of divergence then!

The concept of convergence is deeply rooted in economic sciences. It is sometimes called "catching up", indicating that the economy of less developed counties tend to grow quicker than mature economies. This theoretical framework of events is supported in the past two centuries are roots in the theory of economic growth [4]. While some may not agree, the Commission took this principle to analyze progress in global health over the past two centuries and to project future directions. From the illustrative example in Fig. 1, it is appreciated that divergence was developing between the rich and poor as it applies to indicator health statistics. Using under 5 mortality, China and Sweden data diverged over one and half century then the gap began to shrink over the past 60 years achieving supporting evidence for the concept of convergence. Similar profiles can be ascertained by data from the 4 "C" countries China, Cuba, Costa Rica, and Chile. If this trend continues and a tremendous effort is mounted to expand its geographic reach, global health could be at the cusp of an historical achievement in 2035.

3. Global health challenges

The commission identified 3 domains to illustrate what the global community is facing in approaching convergence.

First: The unfinished agenda. This applies to the high rates of avoidable infections and child and maternal death.
Second: Emerging agenda. This is an outcome of demographic and other changes, reflecting of the increasing importance of non-communicable diseases and injuries.
Third: Cost estimates: The commission undertook a detailed analysis of the global economic dynamics and how the convergence agenda may be funded.

The Commission then undertook a modeling analysis to estimate the scale up and investments needed for achieving

E-mail address: amahmoud@princeton.edu

http://dx.doi.org/10.1016/j.vaccine.2016.10.085
0264-410X/

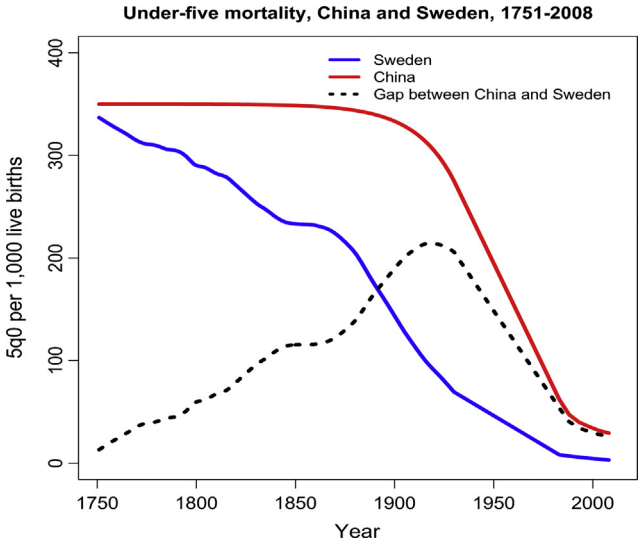

Fig. 1. Example of a "high-performing" country overcoming "divergence" in health" Although starting rates of childhood mortality in Sweden and China were comparable in the mid-18th century, Sweden was more successful than China in reducing its level of childhood mortality over time. By the early 20th century, the divergence in child mortality outcomes between the two countries was striking. However, over the next century China's child mortality rate fell sharply and converged on the Swedish rate, primarily due to China's scale up of effective health interventions and strengthening of health systems. *Source:* Boyle et al. [6] and [4].

convergence. This included date from 34 low-income countries and 48 lower middle-income nations.

4. Recommendations

Four key messages were defined by the work of the Commission which helped shaping its recommendations.

1. A "Grand Convergence" in health is achievable within our lifetime.
2. Fiscal policies should be used for curbing non-communicable diseases and injuries.
3. And finally, progressive pathways (i.e. universal health coverage) are philosophically an effective way to achieve better health and financial protection for the served population.
4. The returns from investing in health are extremely impressive.

To accomplish these goals, the work of the Commission identified the overall targets that can help shaping global efforts. These include "16-8-4" objectives, based on what the UK health metrics were in 1980. The aim is to reduce under 5 mortality per 1000 live birth to 16, TB mortality to 8 per 100,000 population and reduce annual AIDS death per 100,000 population to 4.

These clearly identifiable metrics may be accomplished through focused work on 3 steps.

Step 1. Rapid scale up of life-saving interventions. These include vaccines maternal, newborn and child health as well as targeting HIV, TB, Malaria and neglected tropical diseases. An example of the goals of rapid scale up of life-saving intervention and possible trajectory in is shown in Fig. 2 [5].

5. Vaccines in the convergence model

Vaccines have been and still are the key strategy and tools for prevention and control of many infectious diseases. Table 1 summarizes the most recent estimate of vaccine coverage globally and what is expected of efforts to expand the umbrella

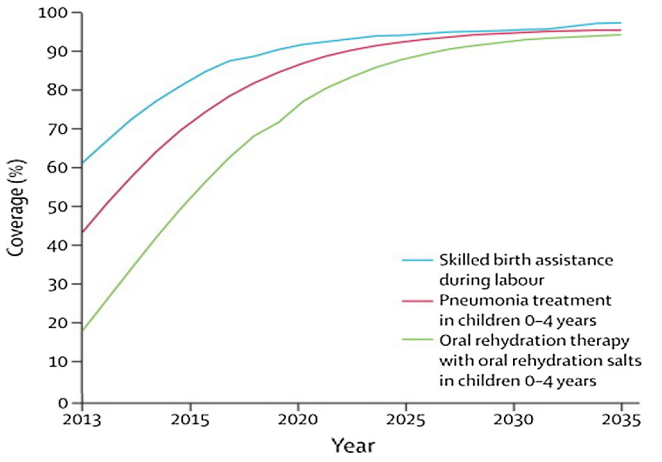

Fig. 2. Rapid scale-up of life-saving interventions. Source: Study Group for the Global Investment Framework for Women's Children's Health. *Advancing social and economic development by investing in women's and children's health: a new Global Investment Framework*. Nov 2013.

Table 1
Scale-up of vaccines in the convergence model.

	Current coverage %	2035 coverage %
Tetanus toxoid vaccine (pregnant women)	74.27	93·04
Rotavirus vaccine	5.52	90·66
Measles vaccine	79.45	99·94
DTP vaccine	80.62	99·94
Hib vaccine	62.46	91·52
Polio vaccine	81.20	81·57
BCG vaccine	87.59	87·89
Pneumococcal vaccine	4.85	88·80

Table 2
Important or Game-Changing Vaccines: Summary of recommended efforts to discover and develop needed vaccines that will contribute to "Grand Convergence". *Likely to be available before 2020: Please put this in the table as you did with likely to be available before 2030.*

	Vaccines
Important	Efficacious malaria vaccine; heat-stable vaccines Self-injected vaccines
Likely to be available before 2030	
Important	Combined diarrhea vaccines (rotavirus, *E. coli*, typhoid, shigella)
Game-changing	HIV vaccine, TB vaccine, universal flu vaccine

Table 3
Impact and cost of convergence.

Low-income countries	Lower middle-income countries
Annual deaths averted from 2035 onwards	
4.5 million	5.8 million
Approximate incremental cost per year, 2016–2035	
$25 billion	$45 billion
Proportion of costs devoted to structural investments in health system	
60–70%	30–40%
Proportion of health gap closed by existing tools (rest closed by R&D)	
2/3	4/5

Please cite this article in press as: Mahmoud A. Achieving a "Grand Convergence" in global health by 2035. Vaccine (2016), http://dx.doi.org/10.1016/j.vaccine.2016.10.085