Vaccine 32 (2014) 4097–4103

Contents lists available at ScienceDirect

Vaccine

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

The benefits of redesigning Benin's vaccine supply chain

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ARTICLE INFO

Article history:
Received 15 January 2014
Received in revised form 21 April 2014
Accepted 23 April 2014
Available online 9 May 2014

Keywords:
Benin
Vaccine
Supply chain
Computational modeling

ABSTRACT

Introduction: New vaccine introductions have put strains on vaccine supply chains around the world. While increasing storage and transportation may be the most straightforward options, it is also important to consider what financial and operational benefits can be incurred. In 2012, suboptimal vaccine coverage and impending vaccine introductions prompted the Republic of Benin's Ministry of Health (MOH) to explore ways to improve their vaccine supply chain.
Methods: Working alongside the Beninese MOH, we utilized our computational model, HERMES, to explore the impact on cost and vaccine availability of three possible options: (1) consolidating the Commune level to a Health Zone level, (2) removing the Commune level completely, and (3) removing the Commune level and expanding to 12 Department Stores. We also analyzed the impact of adding shipping loops during delivery.
Results: At baseline, new vaccine introductions without any changes to the current system increased the logistics cost per dose ($0.23 to $0.26) and dropped the vaccine availability to 71%. While implementing the Commune level removal scenario had the same capital costs as implementing the Health Zone scenario, the Health Zone scenario had lower operating costs. This increased to an overall cost savings of $504,255 when implementing shipping loops.
Discussion: The best redesign option proved to be the synergistic approach of converting to the Health Zone design and using shipping loops (serving ten Health Posts/loop). While a transition to either redesign or only adding shipping loops was beneficial, implementing a redesign option and shipping loops can yield both lower capital expenditures and operating costs.

1. Introduction

Impending new vaccine introductions (NVIs) are prompting many low and middle income countries to examine whether their vaccine supply chains (i.e., the series of steps and components required to get vaccines from the national storage location to the population) are currently getting vaccines to their populations in a timely manner and can handle the added volume of new vaccines. In 2012, the Republic of Benin's Ministry of Health (MOH) was interested in determining how they could improve their vaccine supply chain. A December 2008 external review of Benin's Expanded Program on Immunization (EPI) found high maternal and infant mortality (397/100,000; 67/1000, respectively) [1] and that at least 15% of children are not currently receiving the complete set of recommended vaccinations, as measured by estimated DTP (diphtheria tetanus pertussis) third dose coverage [2]. The introduction of PCV13 (pneumococcal conjugate) vaccine in 2010 strained the current system (nearly tripling the volume of

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http://dx.doi.org/10.1016/j.vaccine.2014.04.090