Strengthening Vaccine Supply Chains:
A systems approach using HERMES
(Highly Extensible Resource for Modeling Event-Driven Supply Chains)

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Global Obesity Prevention Center

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PREVENTION CENTER

HERMES
HIGHLY EXTENSIBLE RESOURCE MODELING
EVENT-DRIVEN SUPPLY CHAINS

What is a system?

Transportation systems

Ecological systems

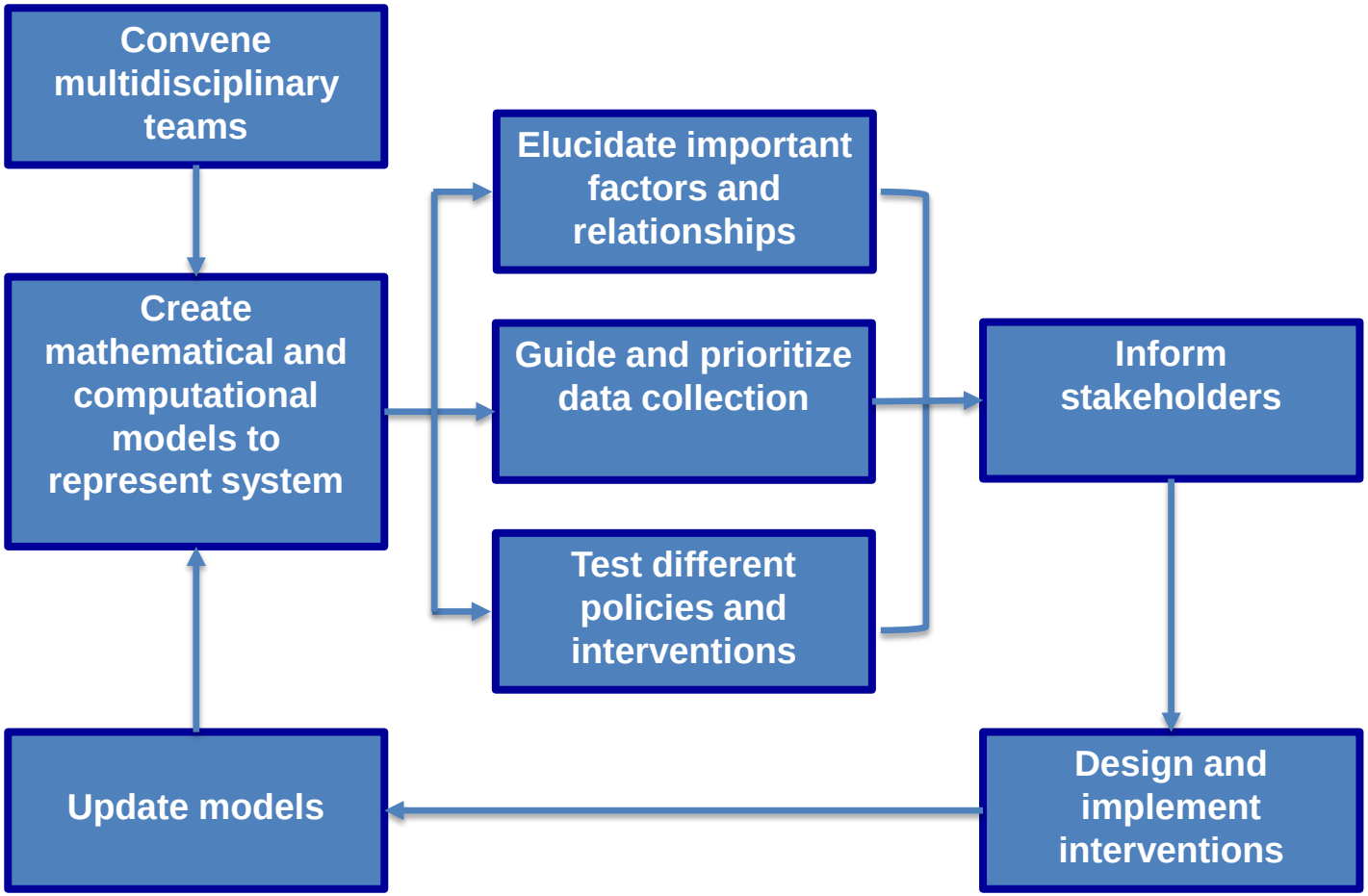
Manufacturing systems

Meteorological systems

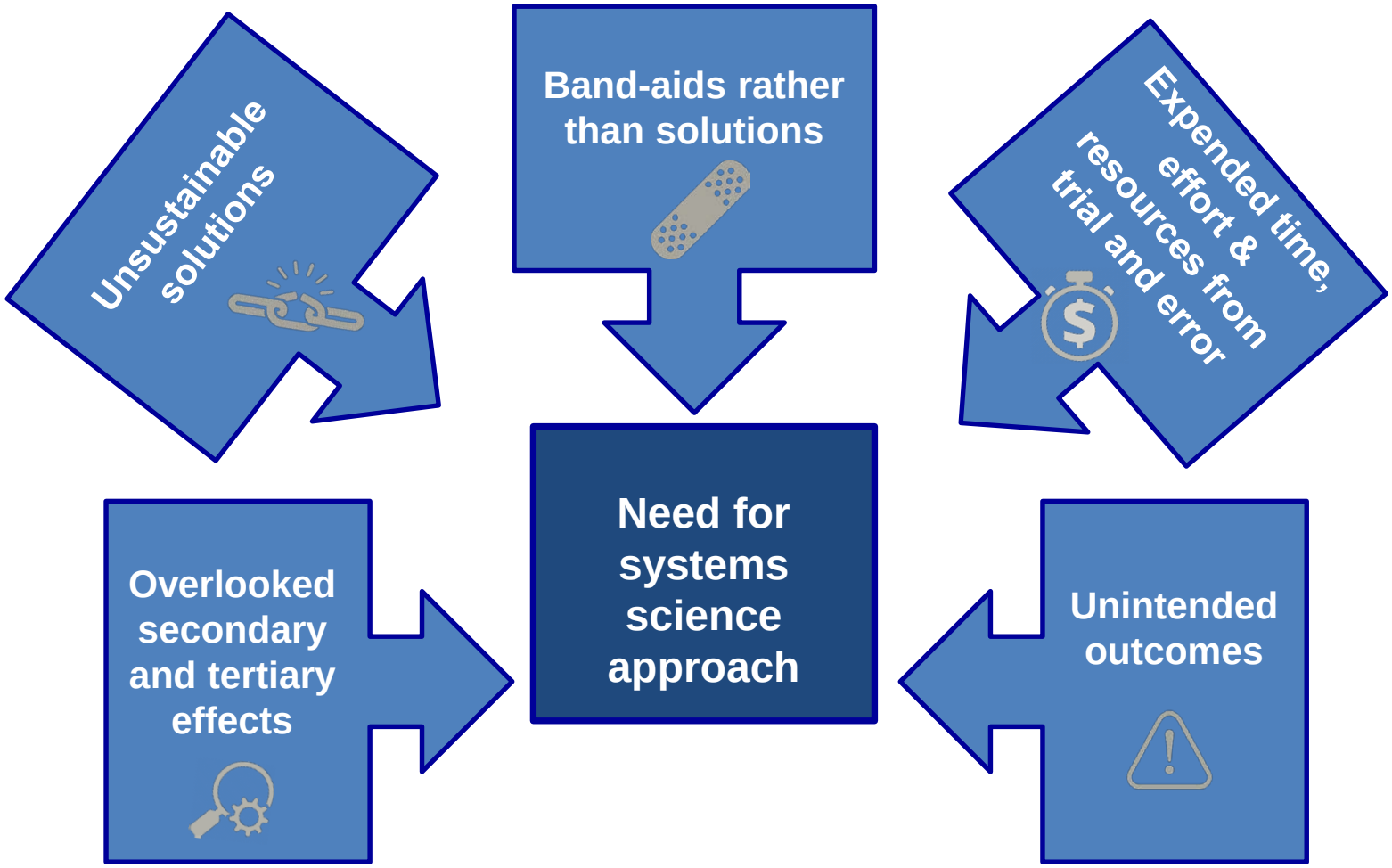
Financial systems

Aerospace systems

What is a systems approach?



Why do we need to take a systems approach?



Why focus on the supply chain?

Forbes

Are Vaccines Getting To Where They Need To Go?

Bruce Y. Lee, CONTRIBUTOR

I cover the intersection of business, health and public healt

Opinions expressed by Forbes Contributors are their own.

By Judith R. Kaufmann, Roger Miller, and James Cheyne

ANALYSIS & COMMENTARY

Vaccine Supply Chains Need To Be Better Funded And Strengthened, Or Lives Will Be At Risk

DOI: 10.1377/hlthaff.2011.0368
HEALTH AFFAIRS 30,
NO. 6 (2011): 1113–1121
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The People-to-People Health
Foundation, Inc.

Contents l

Vaccine

ELSEVIER

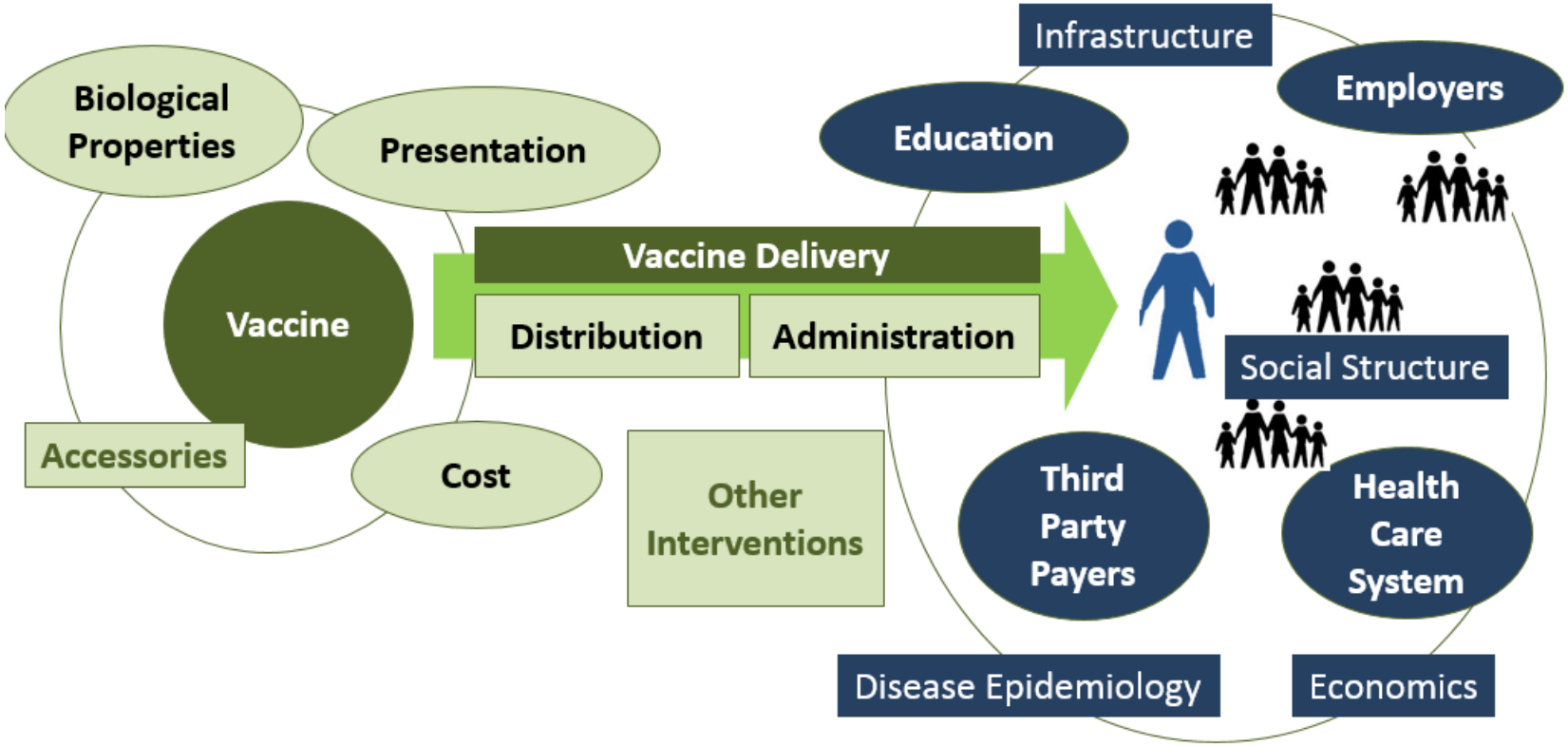
journal homepage: www.elsevier.com/locate/vaccine

Editorial

No product, no program: The critical role of supply chains in closing the immunization gap ☆

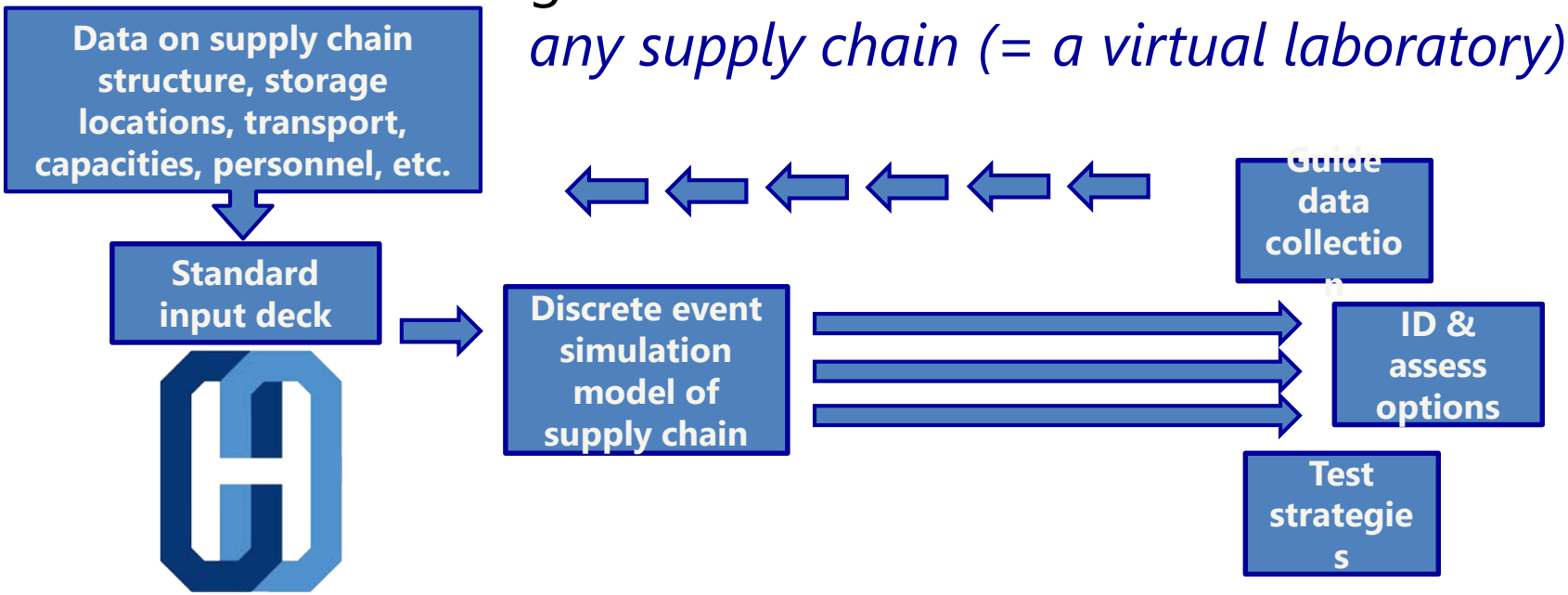
CrossMark

Vaccine delivery is a complex system



HERMES is a systems modeling tool for decision support

Create a *freely available* and *user-friendly software tool* for decision makers to generate an *interactive simulation model of any supply chain (= a virtual laboratory)*.



Example topics HERMES has addressed

- **Introducing new vaccines and technology**
  e.g. vaccines, storage, vehicles
- **Altering characteristics of vaccines and other technologies**
  e.g. vaccine vial size, vaccine thermostability, cold device capacity
- **Changing configuration and operations of the supply chain**
  e.g. storage, shipping frequency, personnel, ordering policy
- **Differing conditions/circumstances**
  e.g. power outages, delays, inclement weather, limited access
- **Investing or allocating resources**
  e.g. adding refrigerators vs. increasing transport frequency
- **Optimizing vaccine delivery**
  e.g. minimize cost, cost per outcome, maximize immunizations

Making vaccines thermostable

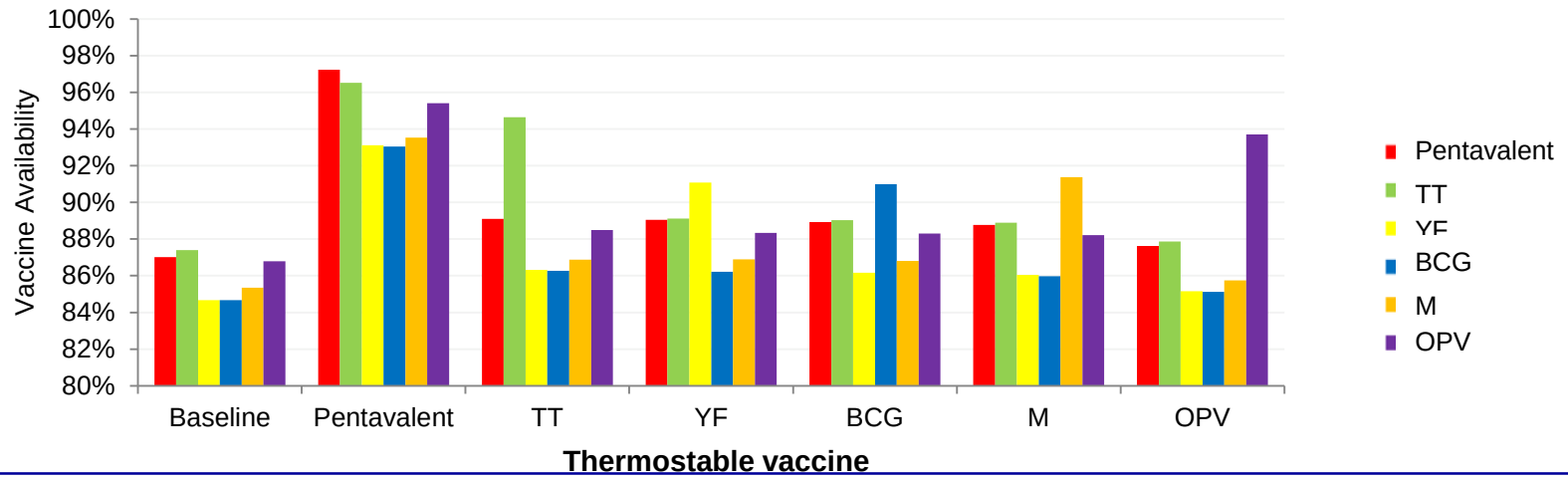
Contents lists available at SciVerse ScienceDirect

Vaccine

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

The impact of making vaccines thermostable in Niger's vaccine supply chain

Bruce Y. Lee[a,*], Brigid E. Cakouros[a], Tina-Marie Assi[a], Diana L. Connor[a], Joel Welling[b], Souleymane Kone[c], Ali Djibo[d], Angela R. Wateska[a], Lionel Pierre[e], Shawn T. Brown[b,f]



Evaluating solar refrigerators

Contents lists available at ScienceDirect

Vaccine

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

When are solar refrigerators less costly than on-grid refrigerators: A simulation modeling study ☆

Leila A. Haidari [a,b], Shawn T. Brown [a,b], Patrick Wedlock [a,c], Diana L. Connor [a,c], Marie Spiker [a,c], Bruce Y. Lee [a,c,*]

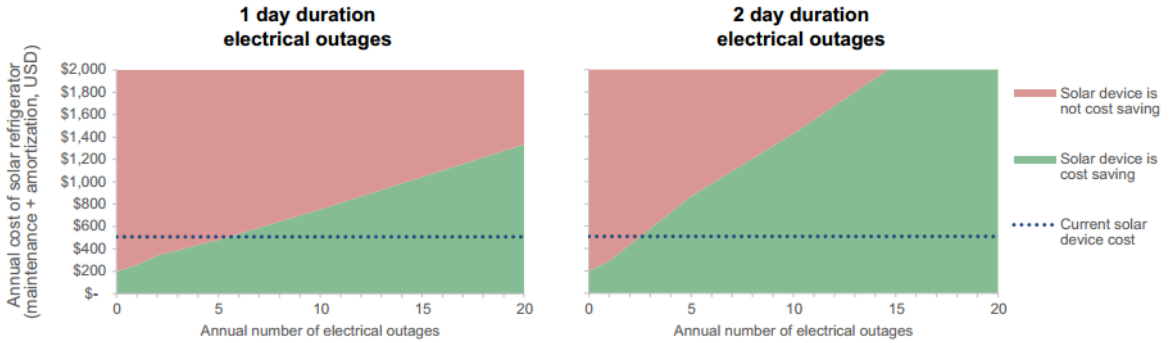


Fig. 2. Conditions under which solar powered refrigerators can provide savings over electric refrigerators at health facilities. The maximum annual cost for each solar device (including amortization and maintenance) that can provide savings over electric mains-powered refrigerators in total cost per dose administered at the health facility level is shown when electrical outages of varying frequency and duration occur at all health facilities. Results assume the electric refrigerator holdover time exceeds the duration of the outage.

Redesigning the system

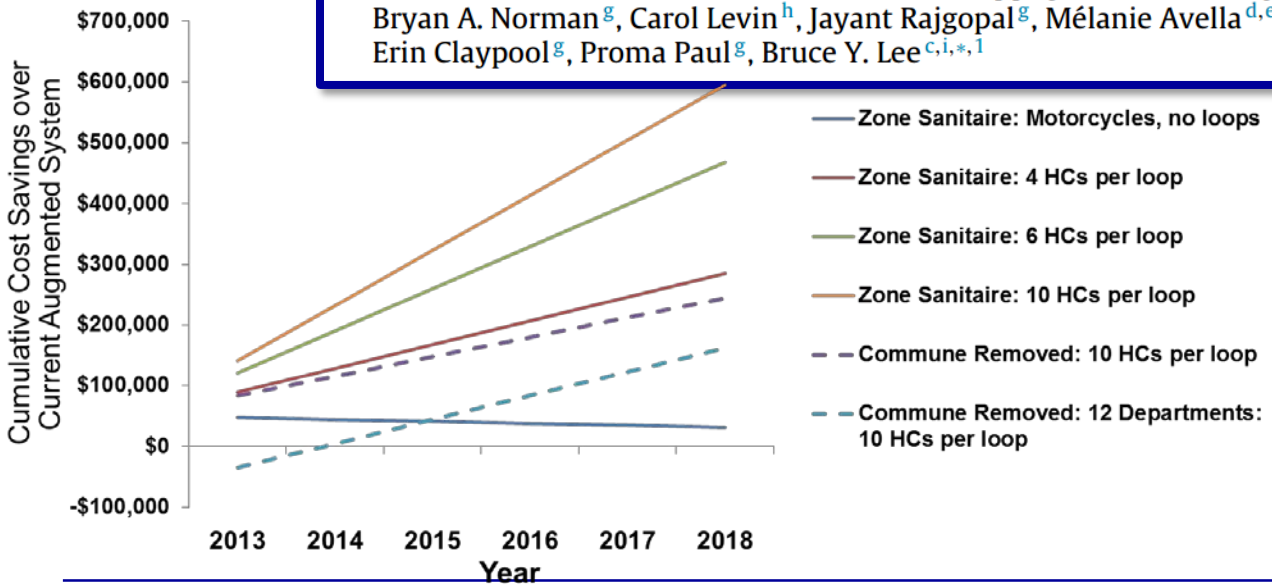
Contents lists available at ScienceDirect

Vaccine

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

The benefits of redesigning Benin's vaccine supply chain

Shawn T. Brown[a], Benjamin Schreiber[b], Brigid E. Cakouros[c,1], Angela R. Wateska[c,1], Hamadou M. Dicko[d,e], Diana L. Connor[c,1], Philippe Jaillard[d,e], Mercy Mvundura[f], Bryan A. Norman[g], Carol Levin[h], Jayant Rajgopal[g], Mélanie Avella[d,e], Caroline Lebrun[d,e], Erin Claypool[g], Proma Paul[g], Bruce Y. Lee[c,i,*,1]



Assessing alternative transport

The Next New Frontier For Drones: Saving Lives

Bruce Y. Lee, CONTRIBUTOR

I cover the intersection of business, health and

Opinions expressed by Forbes Contributors are their own.

Forbes

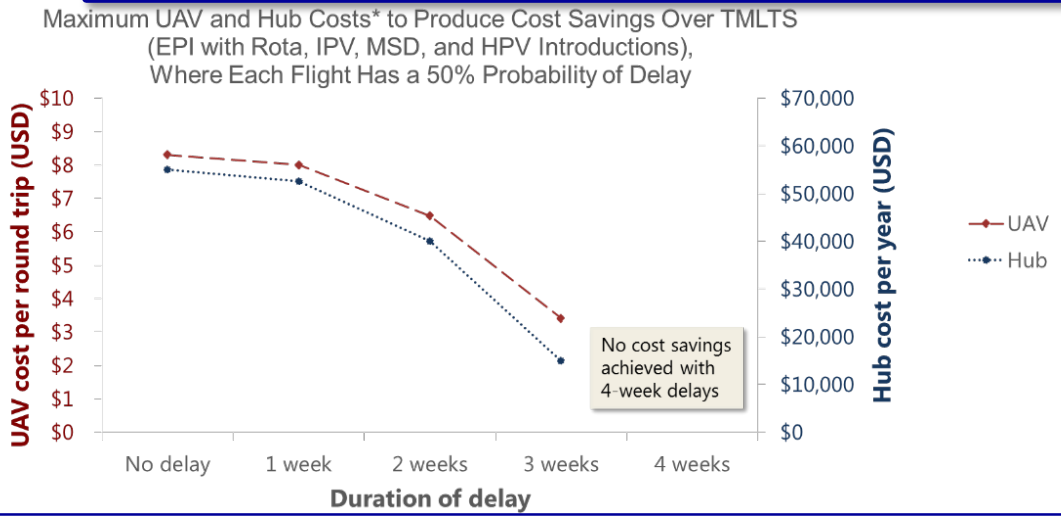
Contents lists available at ScienceDirect

Vaccine

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

The economic and operational value of using drones to transport vaccines

Leila A. Haidari [a,b], Shawn T. Brown [a,b], Marie Ferguson [c,d], Emily Bancroft [e], Marie Spiker [c,d], Allen Wilcox [e], Ramya Ambikapathi [c,d], Vidya Sampath [e], Diana L. Connor [a,d], Bruce Y. Lee [a,c,d,*]



HERMES 1.0 now available @ hermes.psc.edu

Johns Hopkins Bloomberg School of Public Health
Global Health NOW

GHN EXCLUSIVE | VACCINES

The Journey Matters: Why Vaccine Supply Chains Deserve Much More Attention

World Health Organization — Global Immunization News (GIN) — April 2018

Next generation vaccine supply chain software available

User-friendly supply chain software can help guide decision makers through a hands-on approach

Sarah Rebbert, Johns Hopkins Bloomberg School of Public Health

HERMES — Highly Extensible Resource for Modeling Event-Driven Supply Chains

Vaccine supply chains are complex systems of storage locations, equipment, vehicles and personnel that get vaccines from the Central Store in a country to the population. Designing, planning, managing and fixing such complex systems has

HPCwire

Since 1987 - Covering the Fastest Computers in the World and the People Who Run Them

HERMES Public Health Modeling Software Released for Public Use

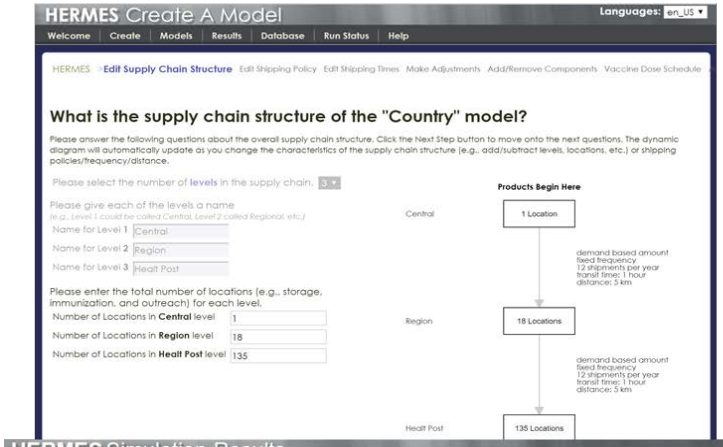
April 23, 2018

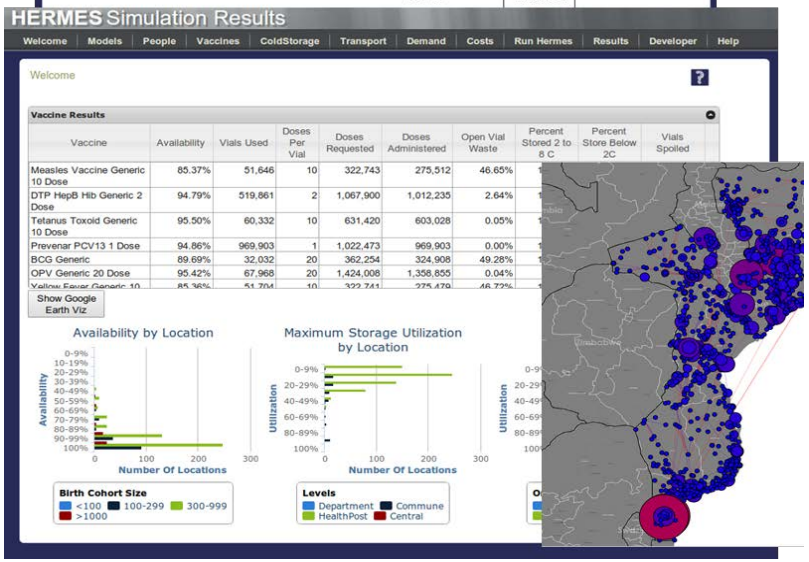
April 23, 2018 — Public health expe… Center (GOPC) at Johns Hopkins U…

International Vaccine Access Center at JHSPH @IVACtweets · Apr 25

~3 million people die every year due to **vaccine**-preventable diseases. #Vaccines are not getting to where they need to go. To address @GlobalObesit… & @psc_live are releasing their **HERMES** software to improve **vaccine** delivery TODAY #ImmunizationWeek bit.ly/2HpqZDM

Result: HERMES Helps Users Create a Working Supply Chain





Globalobesity.org

HERMES — HIGHLY EXTENSIBLE RESOURCE MODELING EVENT-DRIVEN SUPPLY CHAINS

PSC — PITTSBURGH SUPERCOMPUTING CENTER

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Thank you