Simplifying pediatric immunization with a fully liquid pentavalent vaccine: Evidence from a time-motion study

Dr. Karin Anne Wiedenmayer
Swiss Tropical Institute
Basel, Switzerland
February 2008

Value of immunization

- Immunization is one of the most cost-effective public health interventions
- Immunization programs strengthen health systems
- Integration of other public health interventions:
  - ITN, vitamin A, intestinal worms, nutrition

- Cost-benefit analysis in the USA: $1 invested in vaccines saves $2-27 of health expenses
- Study on the value of immunization programs in LICs:
  - improves health, averts illness, saves lives
  - improves cognitive and educational development, and boosts economies

Bloom D, *et al. World Economics* 2005

Achievements and challenges

- Immunization programs have saved 2.3 million lives since 2000
- Significant contribution to prevention and containment of infectious disease
- Effective immunization programs promote sustainability by yielding healthier population and stronger economies
- New vaccine technology available but unevenly spread

But

- Immunization programs still don‘t reach all children of this world

Childhood immunization worldwide

- Routine vaccination in low income countries
  - DTP, BCG, OPV, and measles
  - HepB and Hib recommended by WHO

- 28 million children not immunized (one in four) in 2005
- Estimated 1.5 million children <5 years old die of vaccine-preventable diseases every year

DTP and HepB coverage globally

Global coverage of infants with three doses of DTP in 2004

78%

Global coverage of infants with three doses of HepB in 2004

48%

Global immunization data, WHO 2004

DTP and HepB coverage in Egypt

Coverage of infants with three doses of DTP in 2007

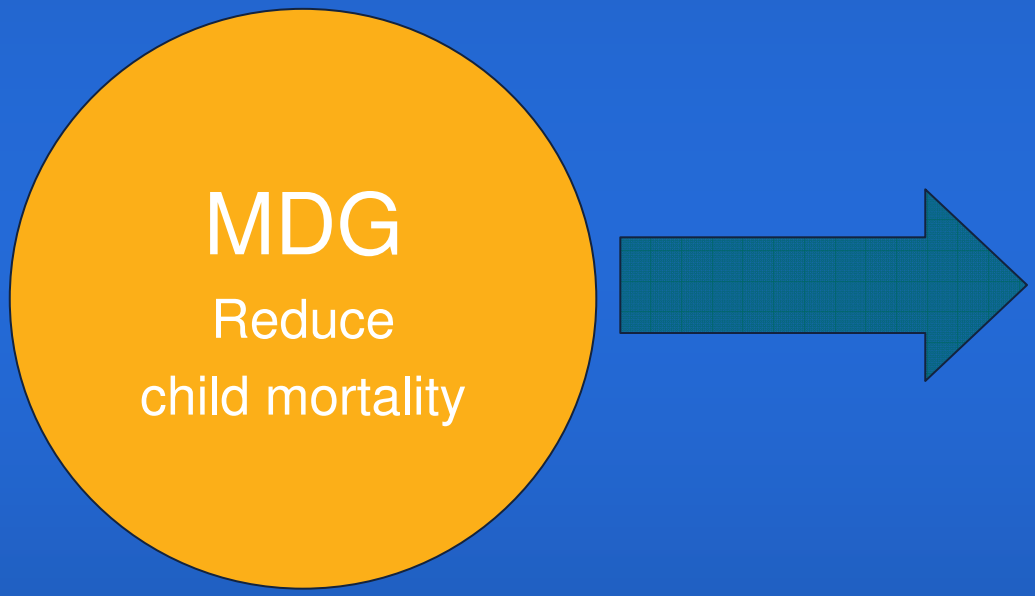
98%

Coverage of infants with three doses of HepB in 2007

98%

WHO data, 2007

Global goals and challenges



- **Access to new and underused vaccines**
- **Increase coverage**
- **Strengthen immunization programs**
- **Strengthen health systems**
- **Effective and easy to use technology**

Combination vaccines

Simplicity, efficiency, safety

- Vaccine shipping, handling, and storage
- Vaccine delivery and administration
- Immunization management
- Waste (vaccines, syringes, and safety boxes)
- Office time needed to deliver vaccines
- Reduced number of injections for children
- Timely and complete protection
- Adherence to vaccination schedules
- Introduction of new vaccines in EPI systems

Marcy SM, *Am J Manag Care* 2003; Decker *et al*. In *Vaccines* 2004; Kalies *et al. Peditr Infect Dis J* 2006

Fully liquid polyvalent combination vaccines

Advantages for the recipient and healthcare provider

- ready to inject in a few seconds
- no reconstitution
- simplifies logistics and saves resources
- minimizes risk of contamination and handling errors
- meets the EPI objective of minimizing waste
- saves delivery time

Fully liquid DTP-HepB-Hib combination vaccines

Goal of vaccine delivery: Simplicity, efficiency, safety

- Advantages and benefits!
- Advantages and benefits?

→ **Needed: supportive evidence and models**

Time-motion study

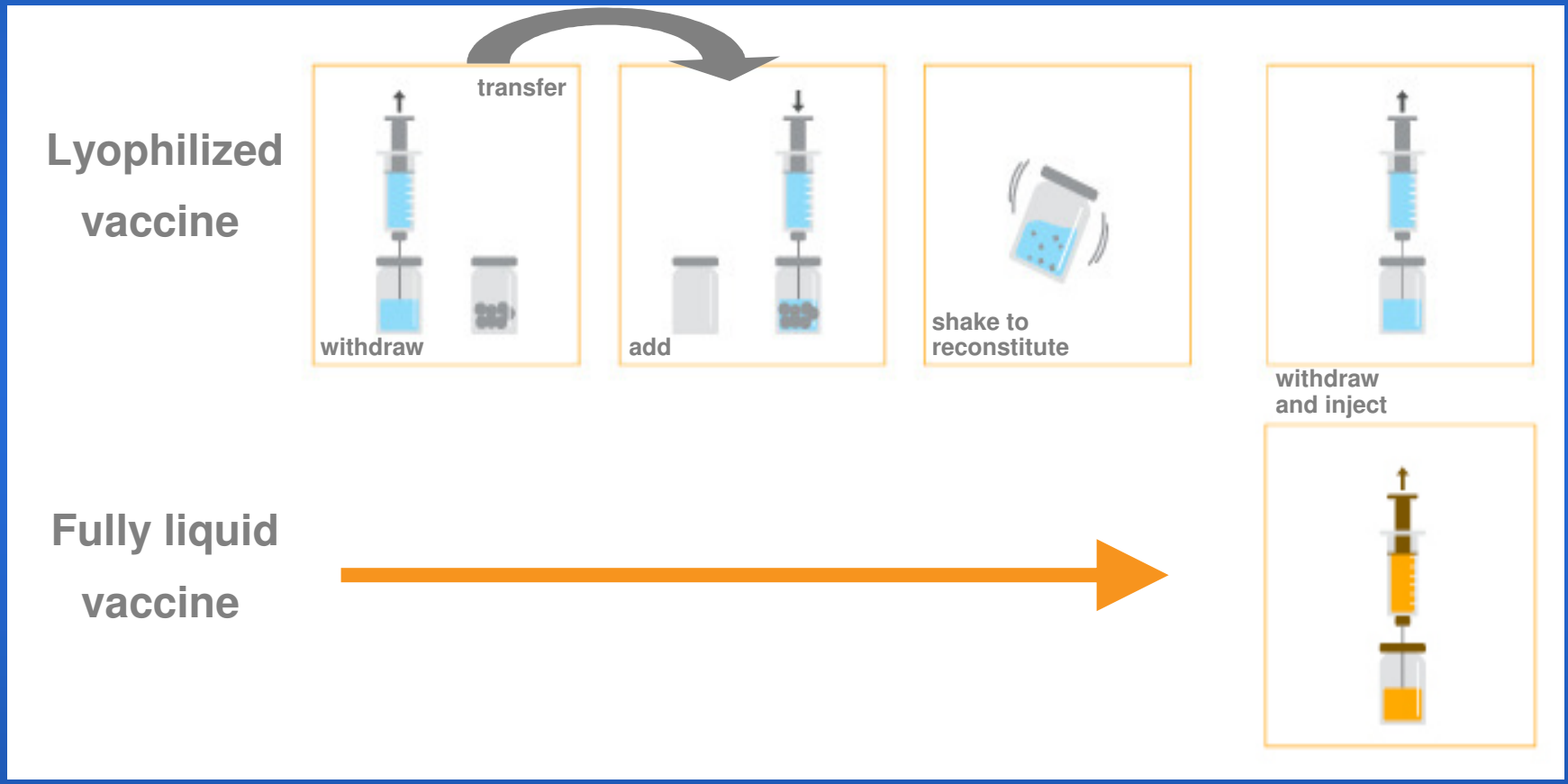
Objectives

- To study the time and programmatic implications of delivering a fully liquid vs lyophilized vaccine requiring reconstitution

DTP-HepB-Hib	vs	DTP-HepB + Hib
(1 vial*)		(2 vials**)

*Easy5®, Chiron-Panacea;
**Tritanrix-HepB® + Hiberix®, GSK

Fully liquid vaccines vs lyophilized vaccine



Methodology (I)

- Time-motion study
- Observational comparative case study
- Institute of Child Health (ICH), Calcutta, India
- Actual program setting
- Fully liquid vs lyophilized pentavalent vaccine
- Alternating vaccines with each child
- Timing and recording five vaccination steps
- Questionnaires
- Ethical clearance

Methodology (II)

Time-motion study variables

1. Obtain
2. Prepare vaccine
3. Administer
4. Dispose
5. Document
6. Overall duration of vaccine visit

Methodology (III)

Vaccination campaign

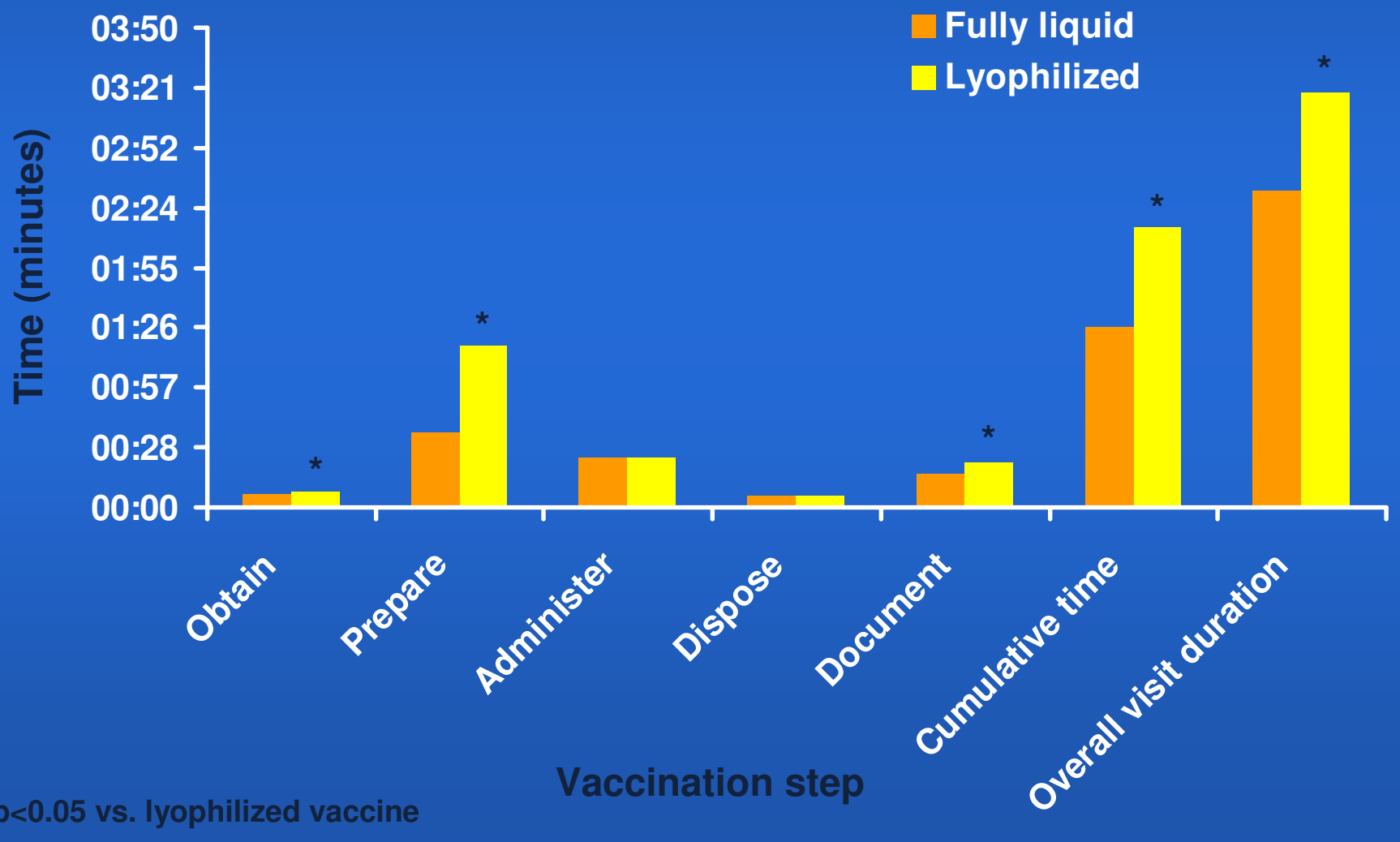
- Television, radio, newspaper, flyers, banners, community mobilization, whispering campaign
- Free vaccination for eligible children with full immunization schedule (three doses)
- Vaccines provided: DTP, HepB, Hib, and polio

Results

Comparison of a fully liquid and a lyophilized pentavalent combination vaccine

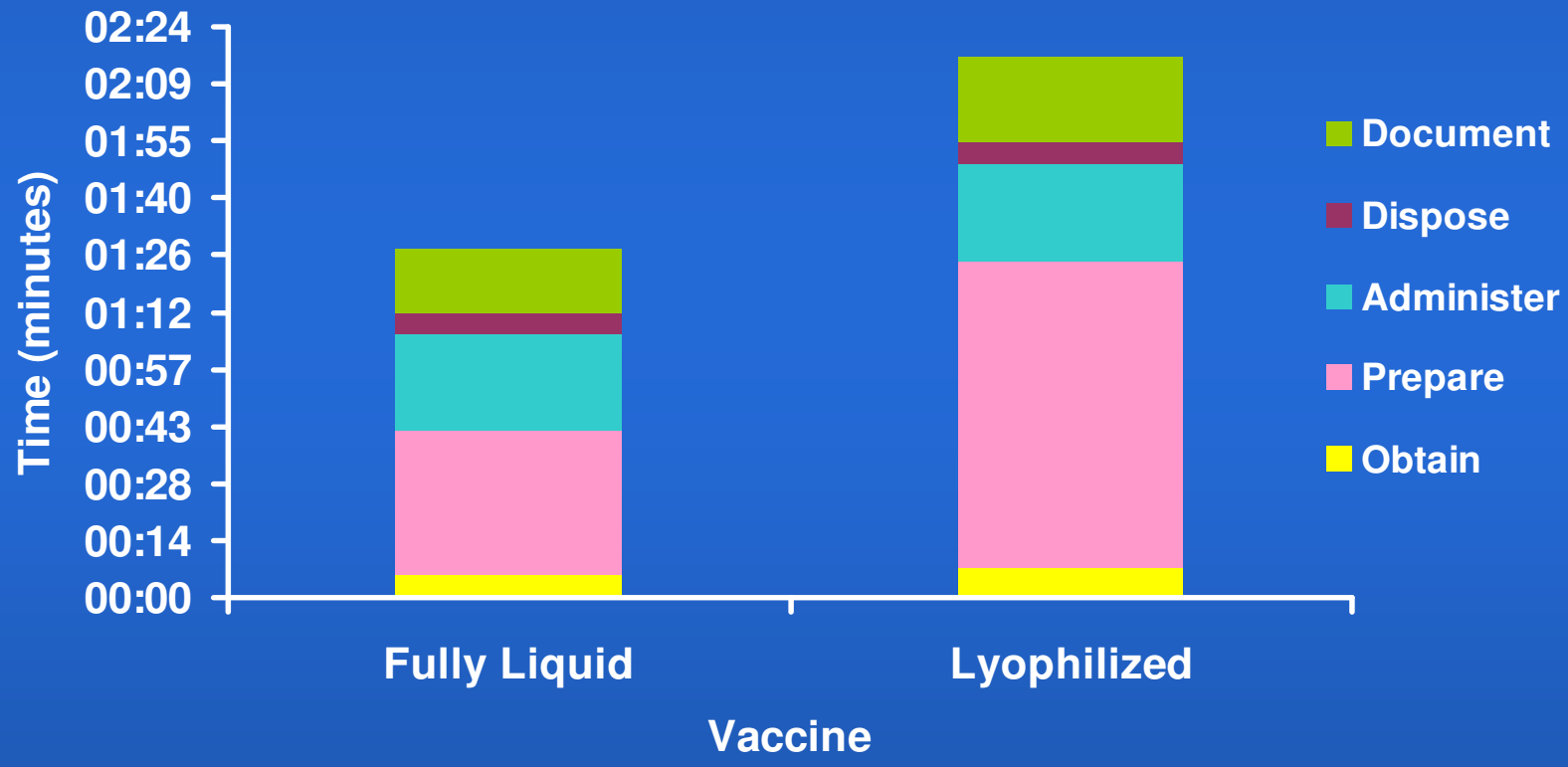
- Children vaccinated (n=312)
- Two data collectors: same results
- Competent, experienced, and efficient vaccination team

Time differences between vaccines by vaccination step



*p<0.05 vs. lyophilized vaccine

Time differences between vaccines



Delivery time savings

Fully liquid pentavalent combination vaccine

- 53% time savings for preparation of vaccine
- 24% time savings for total vaccination visit

- Improved convenience
- Easier handling and preparation
- Less emotional stress for children

Potential delivery time savings:
illustrative examples for fully liquid vaccine

ICH Calcutta: 20 working days per year

Assumptions:

- Current workload of 50 children vaccinated per day
- ICH open 5 days a week and 48 weeks per year

India: 100,000 working days per year

Assumptions:

- EPI coverage for DTP3 in 2004: 64%
- Live births 27.5 million
- Infant mortality rate: 68 per 1000 live births
- One working day = 6 hours

Economic implications for South Africa

- To assess potential implications of introducing fully liquid pentavalent DTP-HepB- Hib vaccine into national EPI program in South Africa

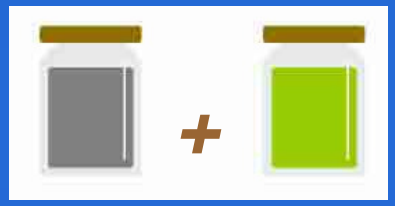
DTP-HepB-Hib (1 vial)*

***Quinvaxem®, Novartis Vaccines**

Economic and financial assessment: Comparison in South Africa

- DTP-HepB-Hib *vs* DTP-Hib + HepB

Fully liquid pentavalent vaccine



Currently used in South Africa

Components of economic analysis

- Time savings (1min)
- Salary package of vaccination nurse (10’000$)
- Number of children vaccinated (1 mio/year)
- Vaccine doses
- Wastage rate (multidose vs single vial)
- Syringes, needles, safety boxes
- Storage and distribution
- Waste management
- Training costs

Potential economic implications for South Africa

- Fully liquid pentavalent DTP-HepB-Hib vaccine compared to currently used vaccines in South Africa
  - Cost savings: US$ 2.5 mio
  - Reduction in delivery time: 7700 working days

Conclusion

Programmatic implications

Fully liquid pentavalent DTP-HepB-Hib vaccine

Simplicity of vaccine delivery

Alleviate immunization workload

Vaccination coverage, health system performance

Conclusion

Financial and economic implications

Fully liquid pentavalent DTP-HepB-Hib vaccine

Cost savings

Efficiency gains at health facility level

Health workers shortage

Acknowledgements

Fabrizio Tediosi, Swiss Tropical Institute
Svenja Weiss, Swiss Tropical Institute
SBDevi Charity Home, Calcutta, India
Institute of Child Health Calcutta, India

This study was financially supported by Novartis Vaccines

Acknowledgements

Acknowledgements