Prevention of hepatitis B virus transmission from mother to child in the DRC

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Disclosures

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Outline

- **Background on the DRC**
- HBV in the DRC
- The AVERT-HBV Study

Map by TUBS. https://commons.wikimedia.org/w/index.php?curid=14823415

DRC vs. USA Statistics

Statistics (2019)	DRC	USA
Population	89 million	328 million
Per capita income	$580	$65,279
Life expectancy (women/men)	62/59	81/76
Fertility rate	5.8 births per woman	1.7 births per woman
Infant mortality rate	66/1000 live births	5.6/1000 live births
Under 5 mortality rate	85/1000 live births	6.5/1000 live births

UNICEF 2019; World Bank 2019; CDC Health, U.S.

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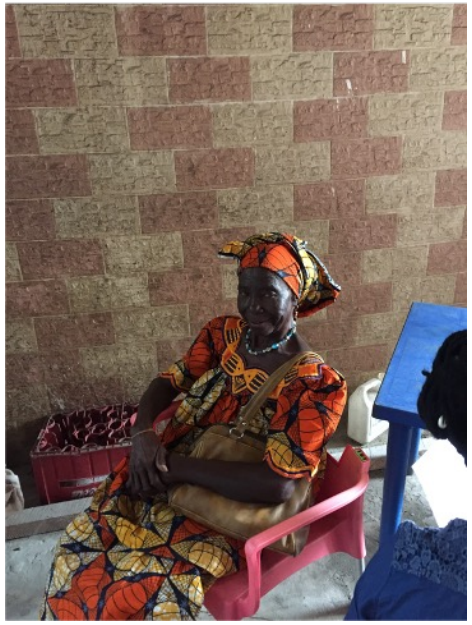
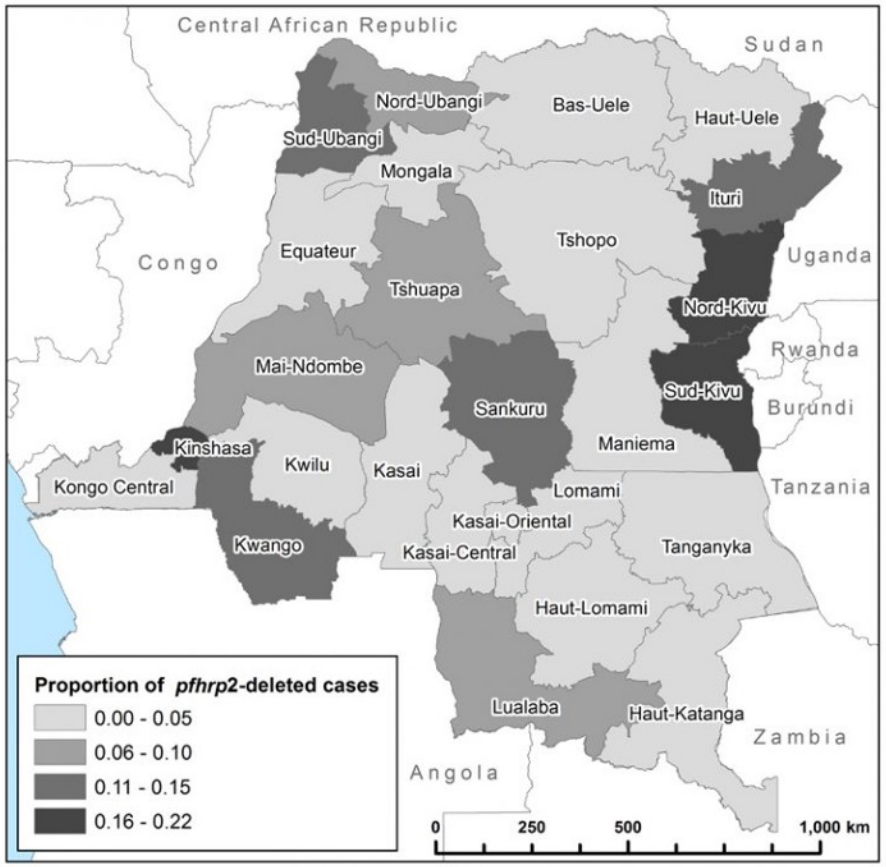
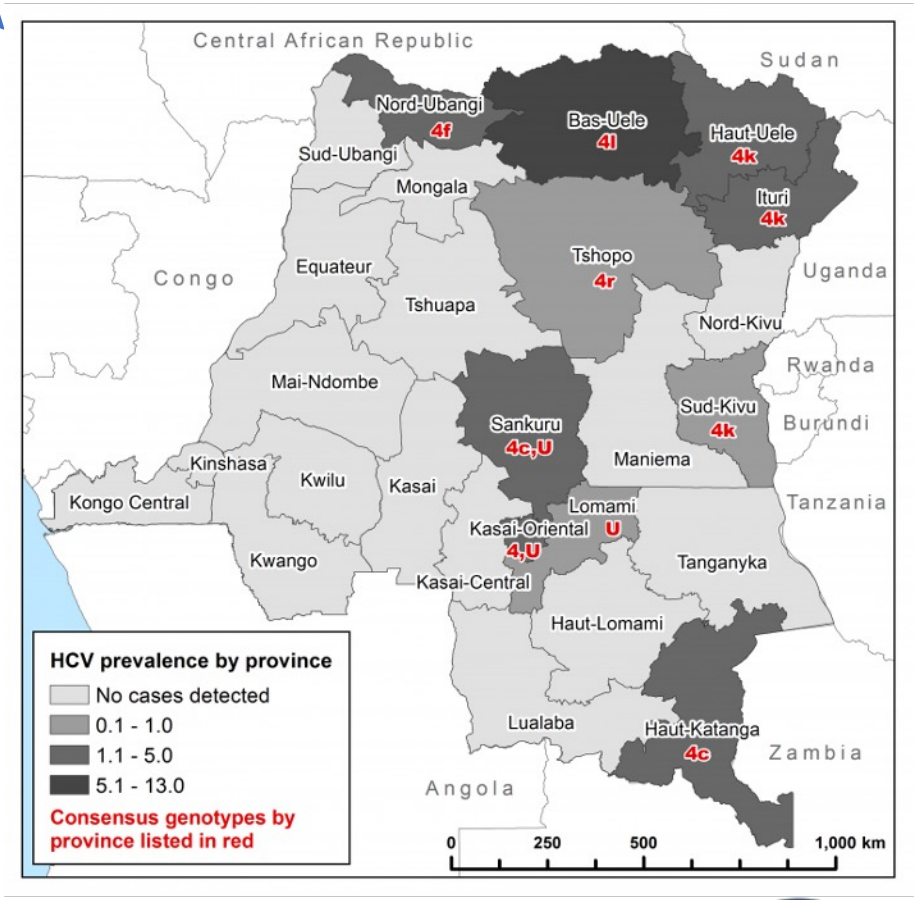


IDEEL lab – Malaria and HepC in the DRC



Dr. Jonathan Parr



Parr JB et al. *JID* 2017; Parr JB et al. *CID* 2018

Seroepidemiology of HBV in the DRC

- Study Design:
  - Cross-sectional survey
  - Dried blood spots (DBS) and survey information collected during the 2013-2014 DRC Demographic and Health Survey
    - >18,000 DBS stored at UNC in Dr. Meshnick's lab
  - Randomly sampled 1,000 DBS from various provinces for HBsAg testing
- Study Procedures:
  - Determination/mapping of seroprevalence using HBsAg assay
  - Phylogenetic analyses
  - Risk factor analysis
  - Assessment of research use of Abbott ARCHITECT HBsAg Qualitative assay on DBS

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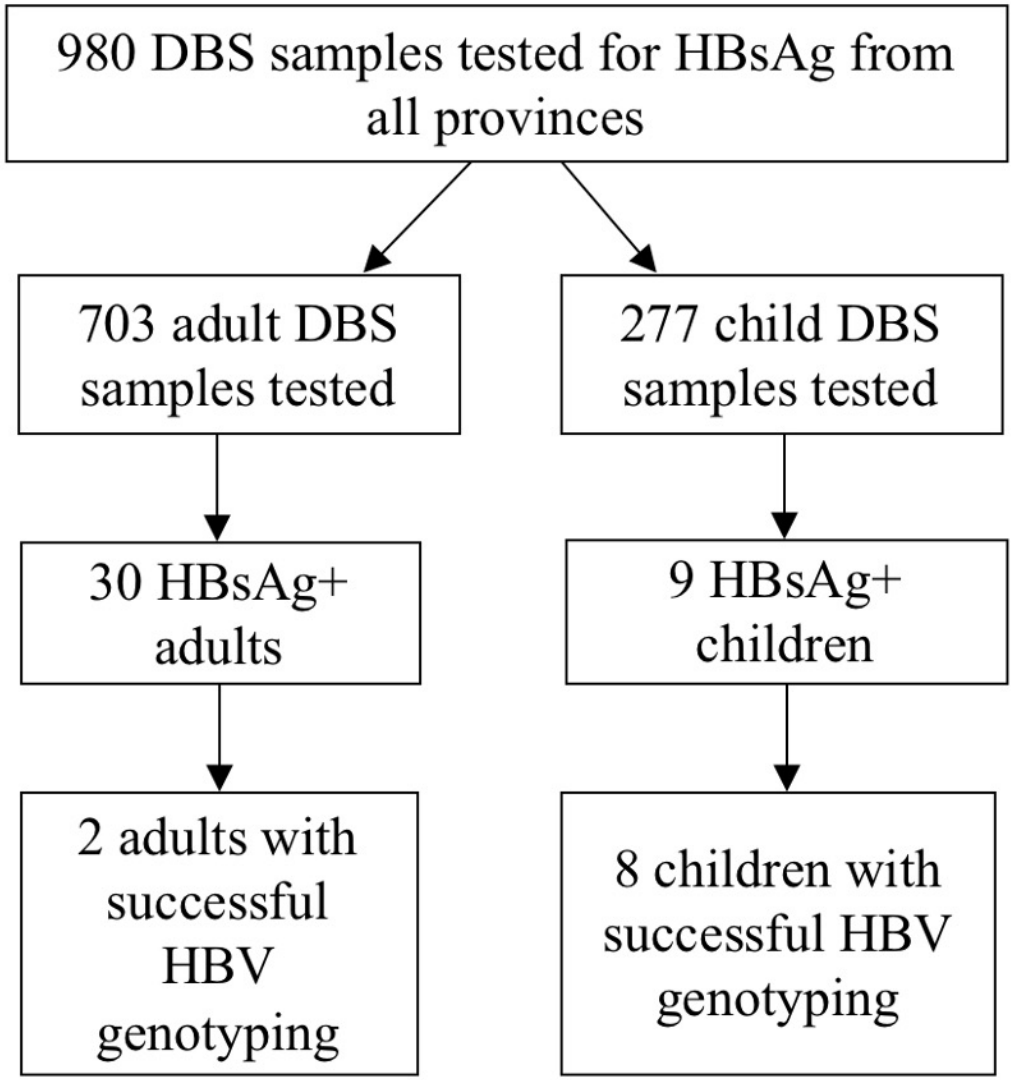
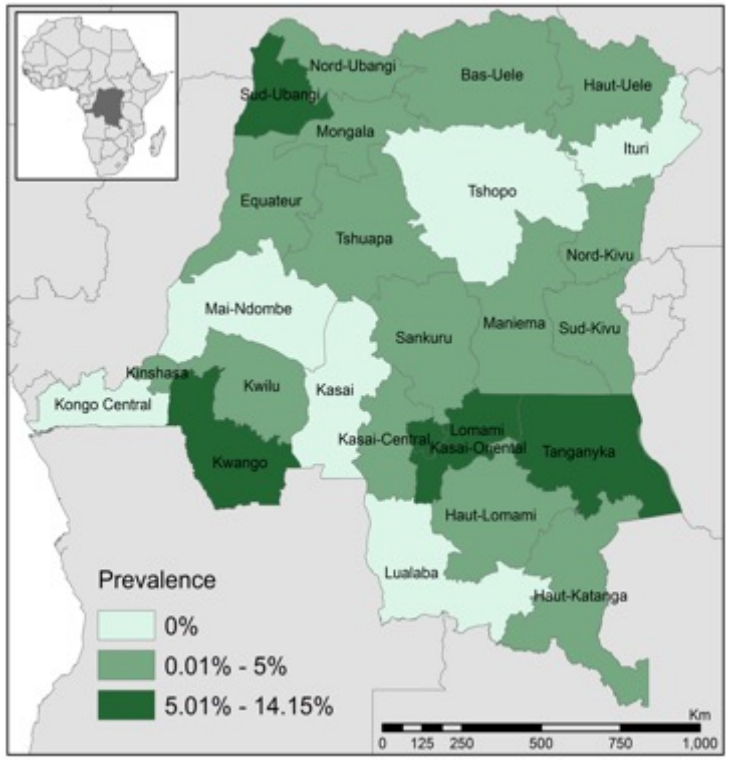
Thompson P, Parr JB, et al. *AJTMH* 2019

Study Population



Thompson P, Parr JB, et al. *AJTMH* 2019

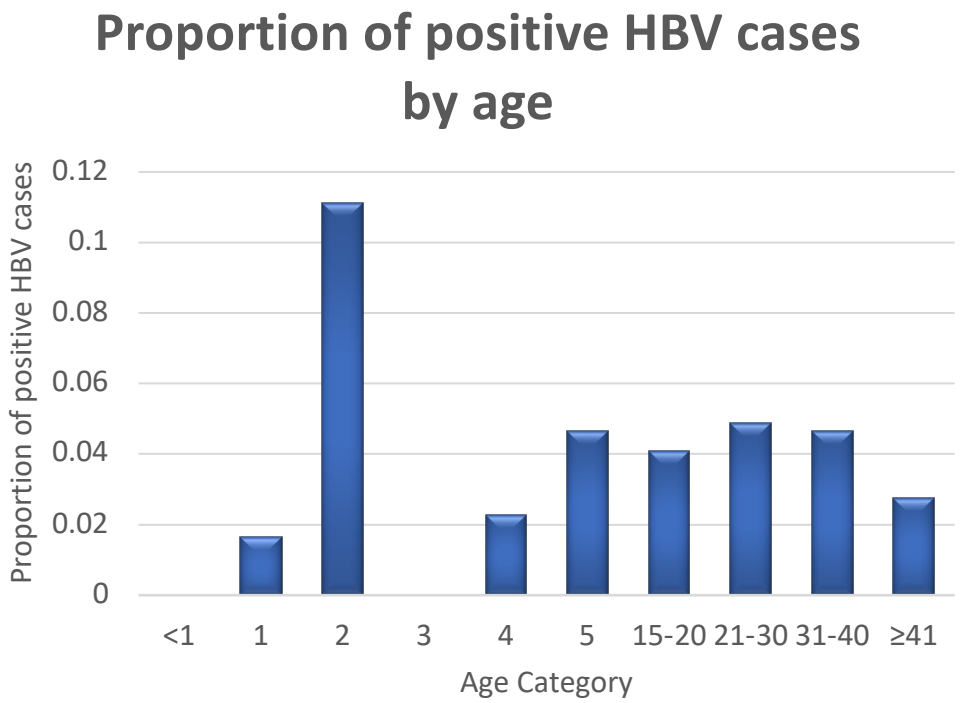
Hepatitis B in the Democratic Republic of the Congo



Province-level, weighted HBV prevalence, measured by HBsAg positivity

DRC overall prevalence:
3.3% (1.8-4.7%)
- Adults: 3.7% (1.9-5.5)
- Children: 2.2% (0.3-4.1)

Comparison to U.S. Prevalence (2013): 0.3%



Thompson P, Parr JB, Holzmayer V et al. *AJTMH* 2019; Schweitzer et al 2015

Vaccination and wealth were protective factors against HBV acquisition in children

Characteristic	Crude OR (95% CI)	Wald p-value	Adjusted OR (95% CI)	Wald p-value
Vaccination of any kind	0.04 (0.005-0.40)	0.006	0.04 (0.00-1.03)	0.05
Wealth index score	0.45 (0.28-0.74)	0.002	0.85 (0.40-1.82)	0.67

Thompson P, Parr JB, et al. *AJTMH* 2019

HBV Prevention

Prevention of vertical transmission:

- HepB vaccine + HBIG at birth (90-95% effective)
- Antivirals for women with *high-risk HBV* (High viral load and/or HBeAg positivity)

Prevention of horizontal transmission:

- 3-dose vaccine series (>95% effective)

The Noun Project

Barriers to Preventing Vertical Transmission of HBV in Africa

- Pregnant women aren't routinely tested for HBV
- Antivirals are available through HIV programs (active against both HIV and HBV)…but only given to HIV+ women
- Birth dose vaccine is not given to infants
  - Only **10%** of African children receive a birth dose
- HBIG is not available
  - Not recommended by the WHO

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Breakwell et al. Pan African Medical Journal 2017

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Preventing Vertical Transmission: The AVERT-HBV Study

- **A**rresting **Ver**tical **T**ransmission of **HBV** in the DRC
- **Goal:** To prevent vertical transmission of HBV through:
  1) Identification and treatment of pregnant women with high-risk HBV
  2) Implementation of a birth dose vaccine for all exposed infants
- **Novelty**:
  - Builds upon the HIV framework to screen and treat pregnant women and their infants for HBV
  - Use of existing resources: study staff, laboratory equipment/personnel, HBV vaccine, antivirals
- **Funding**: Gillings Innovation Laboratory award (UNC School of Public Health)

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AVERT Study Objectives

- **Primary objective**: To demonstrate the feasibility of adding hepatitis B testing and prevention measures to the existing HIV prevention platform in maternity centers in the DRC

- **Secondary objectives**:
  - Determine the incidence of vertical transmission of hepatitis B
  - Evaluate adherence to tenofovir therapy
  - Evaluate the timeliness of birth dose vaccination

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AVERT Study Design/Setting

- Study design
  - Pilot feasibility study
  - Prospective cohort of 100 HBV-infected pregnant women and their infants (mother-infant dyads)
- Study setting
  - 2 maternity health centers in Kinshasa that together see >1,000 deliveries per month

AVERT Study Participants

- Pregnant women
  - Hepatitis B infected (HBsAg+)
  - <24 weeks' gestation
  - Plan to receive care at one of the 2 maternity centers

- Hepatitis B-exposed infants

AVERT Study Procedures

1. Screening and enrollment
   - Screening for hepatitis B with HBsAg
   - Informed consent and enrollment
2. Determination of risk status
   - HBeAg and HBV DNA testing
3. Antivirals for high-risk women
   - 28-32 weeks' gestation
4. Birth dose vaccine for all infants
   - Within 24 hours of life

Maman Martine –
laboratory logistician

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AVERT Follow Up Visits

- Mothers
  - Low-risk: 24 weeks' postpartum
  - High-risk: Monthly during pregnancy; 10 & 24 weeks' postpartum
- Infants
  - 24 weeks: HBsAg and anti-HBs testing

Jolie Matondo, study nurse
Patrick Ngimbi, study physician
Sarah Ntambua, study nurse

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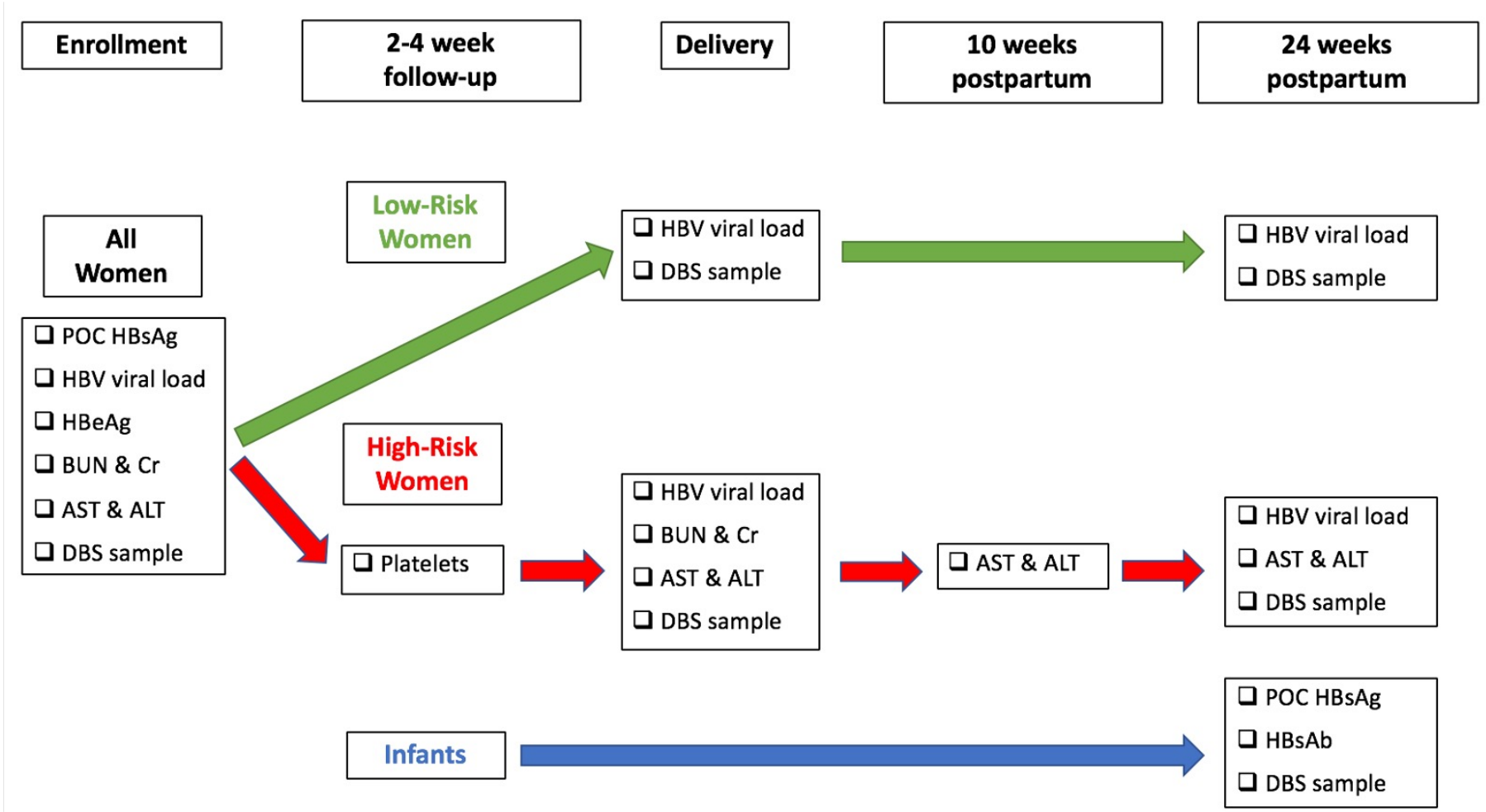
AVERT Laboratory Flowchart



AVERT-HBV Results

Arresting vertical transmission of hepatitis B virus (AVERT-HBV) in pregnant women and their neonates in the Democratic Republic of the Congo: a feasibility study

Peyton Thompson, Camille E Morgan, Patrick Ngimbi*, Kashamuka Mwandagalirwa, Noro L R Ravelomanana, Martine Tabala, Malongo Fathy, Bienvenu Kawende, Jérémie Muwonga, Pacifique Misingi, Charles Mbendi, Christophe Luhata, Ravi Jhaveri, Gavin Cloherty, Didine Kaba, Marcel Yotebieng, Jonathan B Parr*

Summary

Background Hepatitis B virus (HBV) remains endemic throughout sub-Saharan Africa despite the widespread availability of effective childhood vaccines. In the Democratic Republic of the Congo, HBV treatment and birth-dose vaccination programmes are not established. We, therefore, aimed to evaluate the feasibility and acceptability of adding HBV testing and treatment of pregnant women as well as the birth-dose vaccination of HBV-exposed infants to the HIV prevention of mother-to-child transmission programme infrastructure in the Democratic Republic of the Congo.

Lancet Glob Health 2021

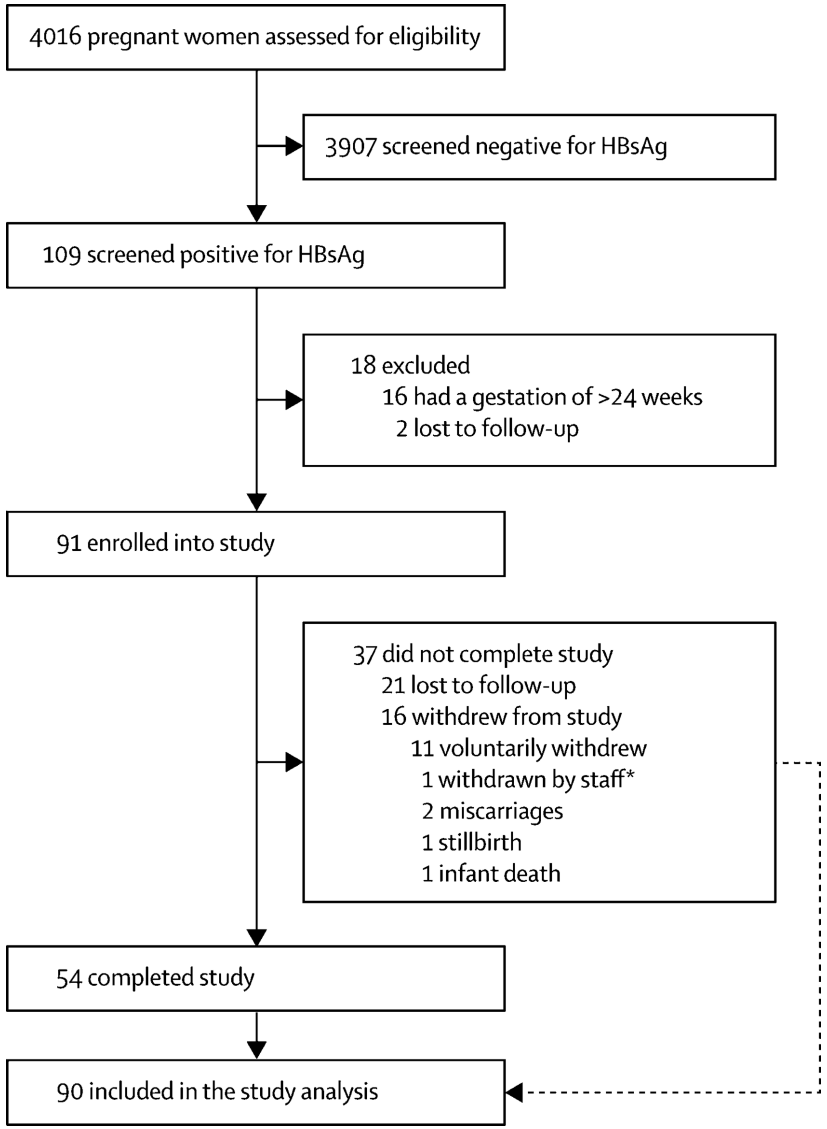
Published Online
August 17, 2021
https://doi.org/10.1016/S2214-109X(21)00304-1

For the French translation of the abstract see Online for

Thompson P, Morgan CE, Ngimbi P et al, *Lancet Glob Health*, 2021

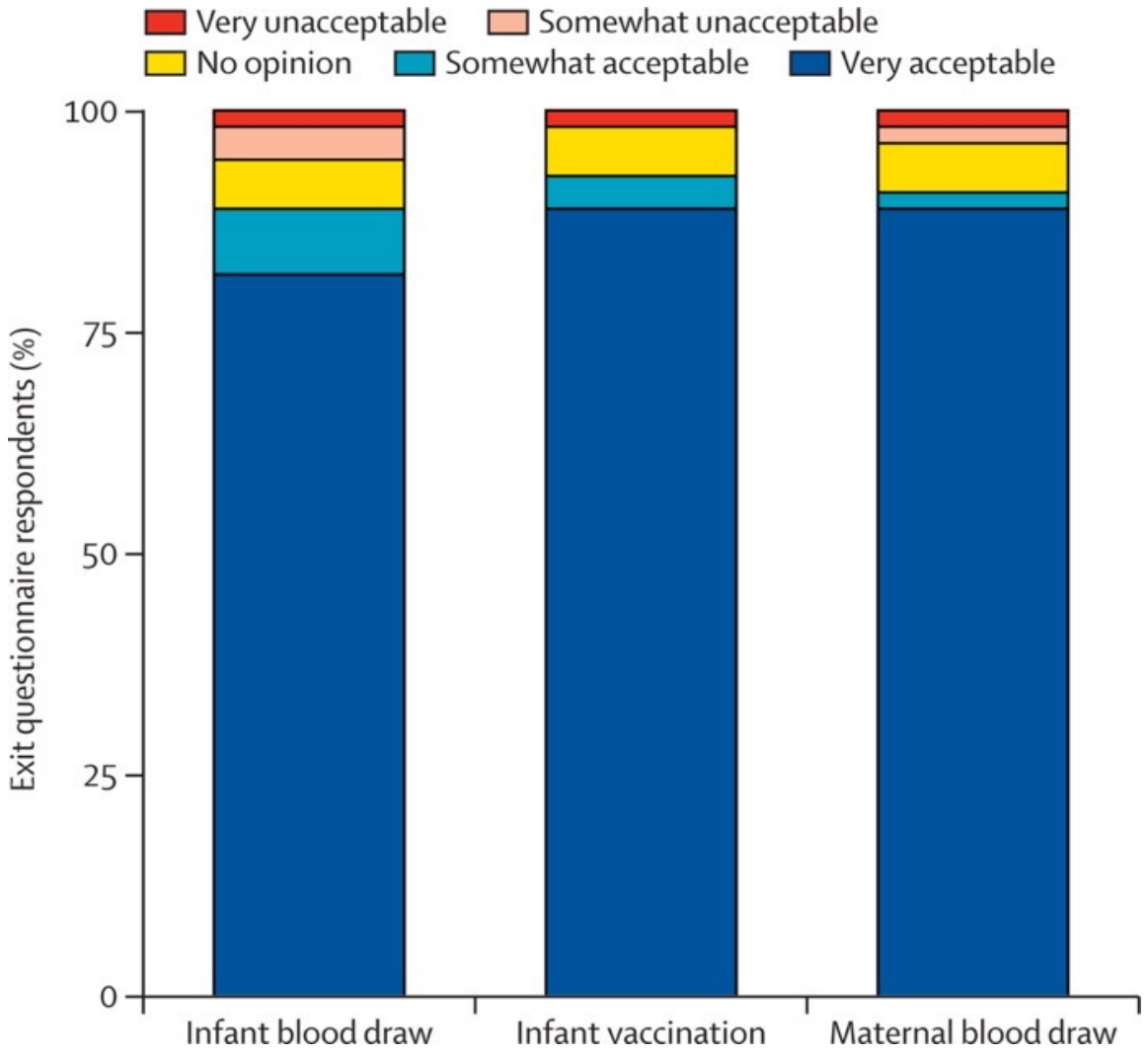
AVERT-HBV Results: Hepatitis B screening

Overall HBV prevalence:
2.7% (2.2 - 3.2%)



Thompson P, Morgan CE, Ngimbi P et al, *Lancet Glob Health*, 2021

HBV screening of pregnant women and infant birth dose is feasible and acceptable



All 7 high-risk respondents reported tenofovir prophylaxis was “very acceptable”

Thompson P, Morgan CE, Ngimbi P et al, *Lancet Glob Health*, 2021

Participant satisfaction

- 100% reported no problem for:
  - Ability to discuss own health concerns
  - Availability of medicines
  - Cost of services
  - Explanations of problems
  - Facility cleanliness
  - Privacy from others hearing your exam
  - Privacy from others seeing your exam
  - Treatment from staff
- Wait time: 2 of 54 reported as a minor problem

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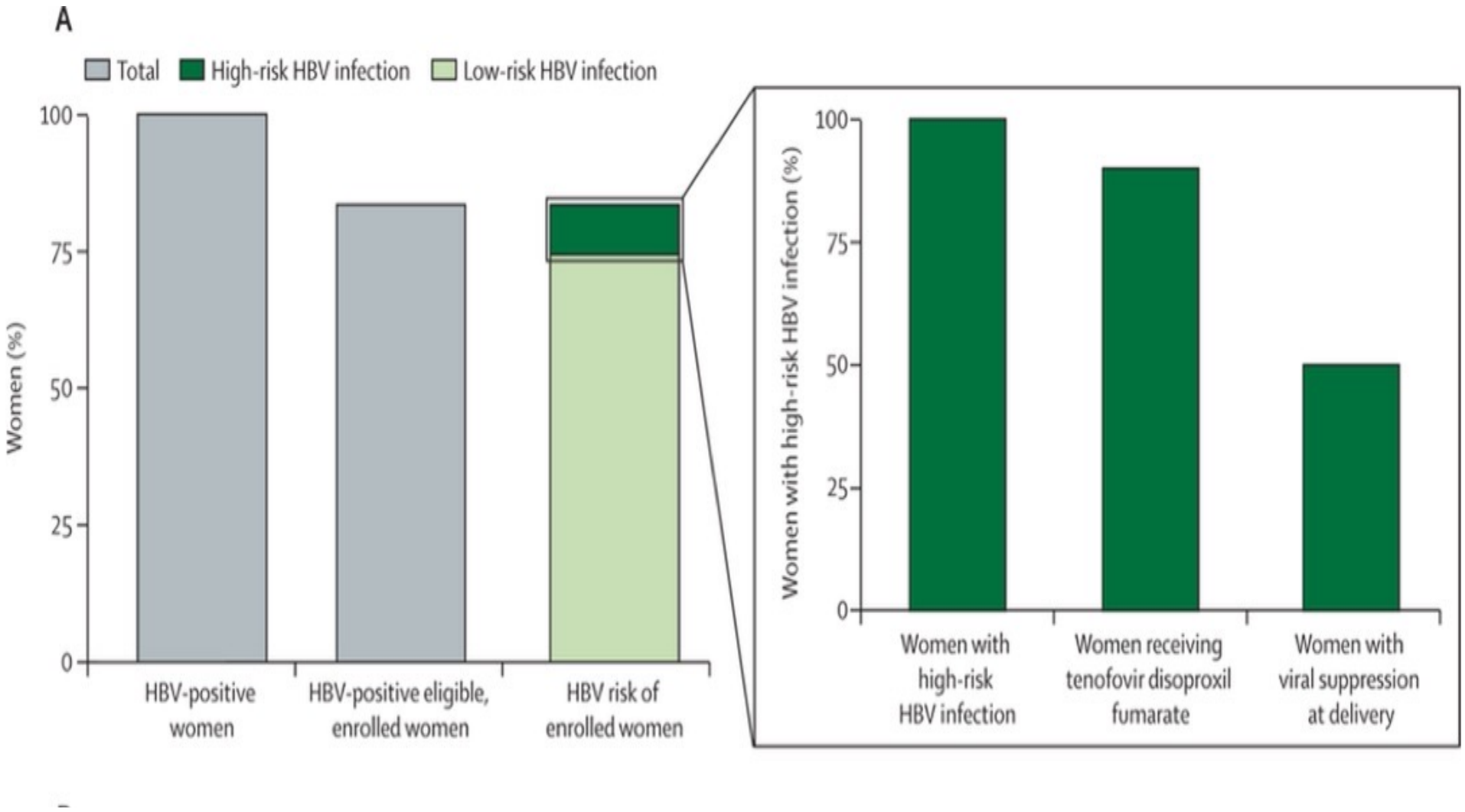
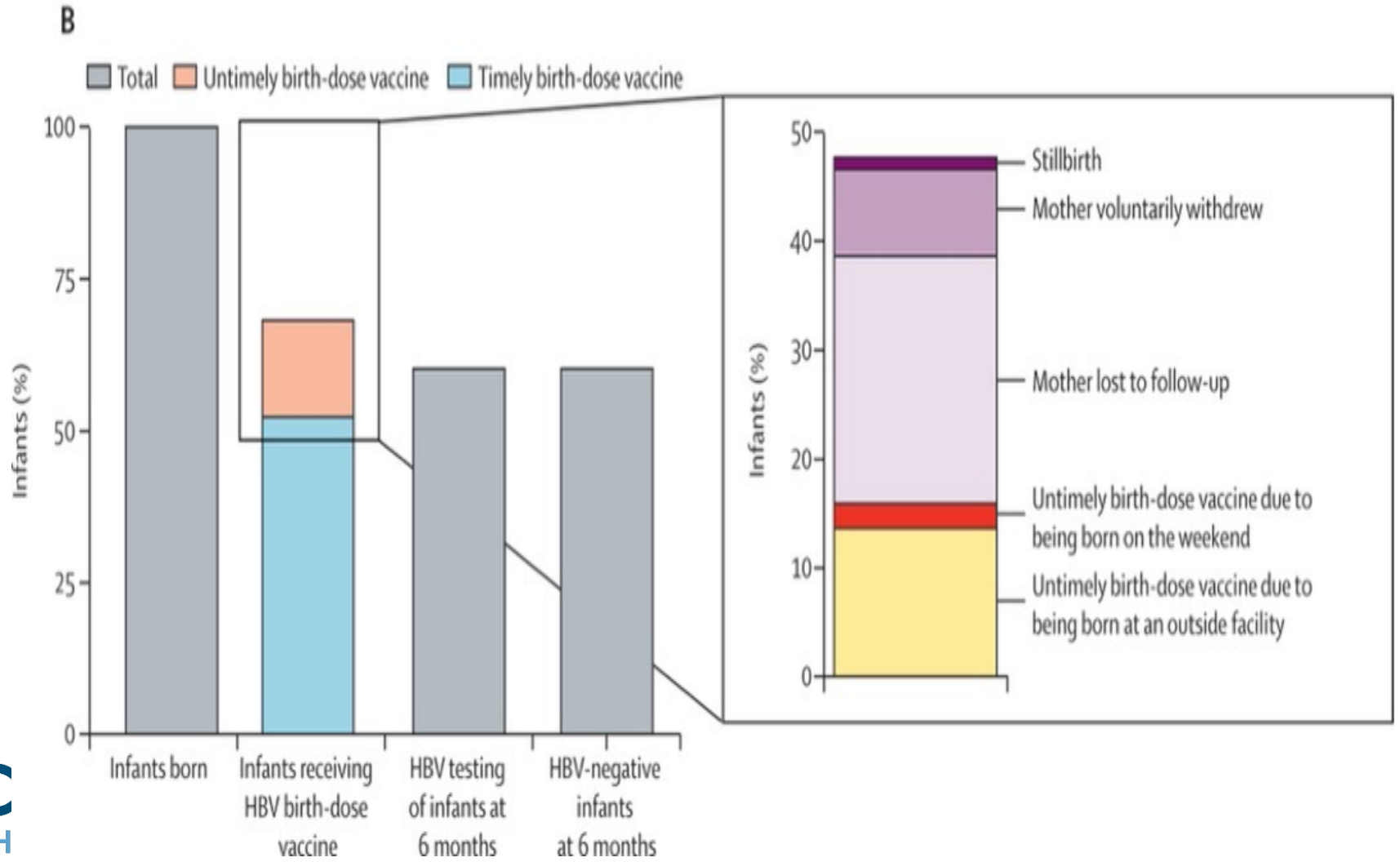
Thompson P, Morgan CE, Ngimbi P et al, *Lancet Glob Health*, 2021

AVERT-HBV Care Continuum: Mothers



Thompson P, Morgan CE, Ngimbi P et al, *Lancet Glob Health*, 2021

AVERT-HBV Care Continuum: Infants



68% of all infants followed to delivery received birth dose

77% of these were timely

Of all infants followed to delivery, 52% received timely birth dose

Thompson P, Morgan CE, Ngimbi P et al, *Lancet Glob Health*, 2021

AVERT-HBV Conclusions

- It is feasible to add hepatitis B testing and prevention measures to the existing HIV infrastructure in the DRC.
- Using this two-pronged prevention approach, we prevented vertical transmission in all babies followed through 6 months!
- The overall prevalence of hepatitis B among pregnant women was 2.7%.
  - 11.1% of women with high-risk disease
- Challenges exist in implementing a **timely** birth dose vaccine and ensuring adherence to follow-up visits.

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Delegation to promote universal birth-dose vaccination

Kinshasa, January 2020

Future directions/initiatives

- Publish results of HBV knowledge surveys
- Educational initiative
- Implementation of birth-dose vaccine study
- Household transmission study
- Future clinical trials related to prevention of vertical and horizontal transmission

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Questions?