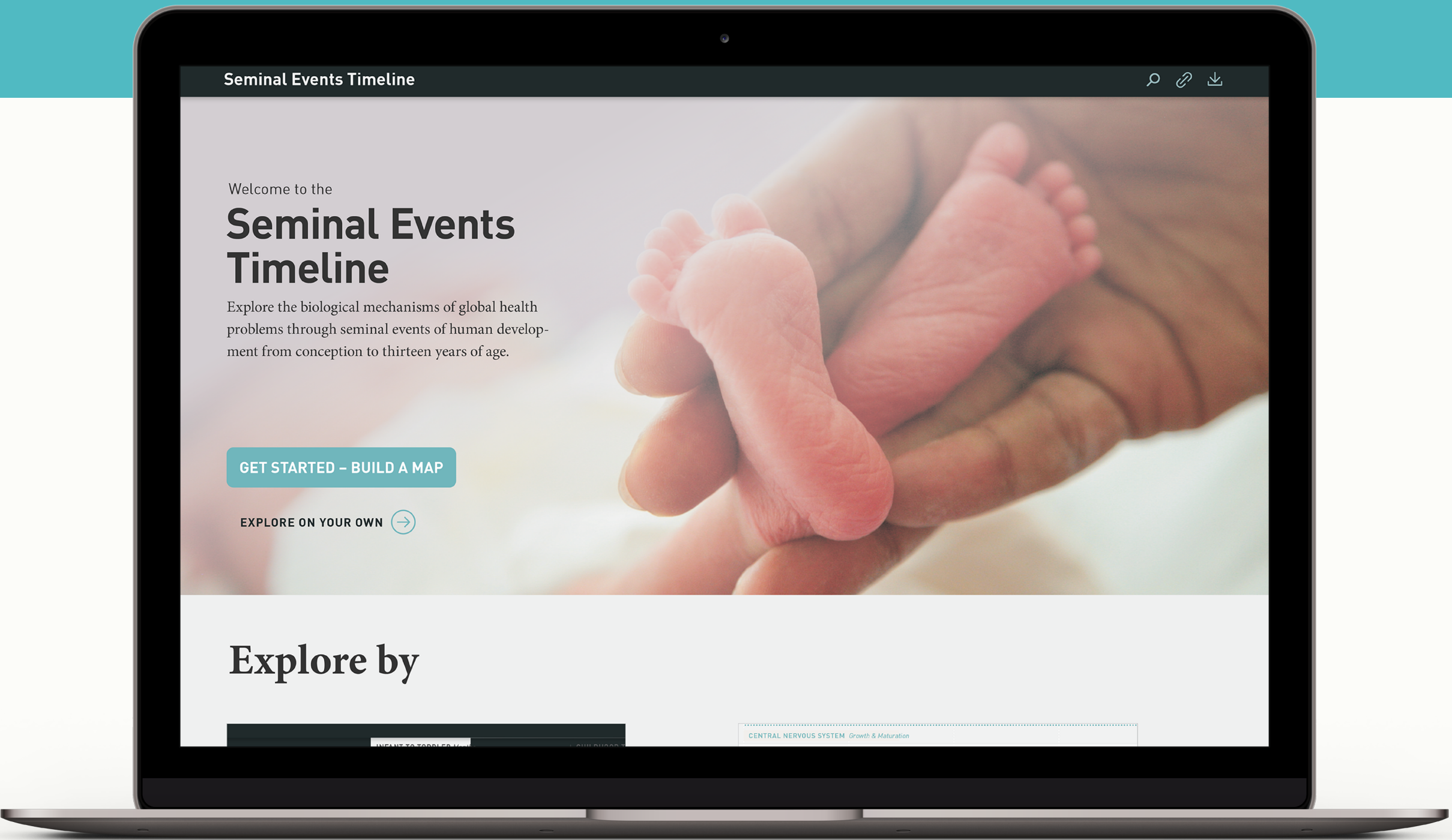


Interactive Digital Timeline of Seminal Events

in Human Neurodevelopment, Primary Organ Development and Maturation, and Physical Growth from Conception to Adolescence

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Objective

The Seminal Events Timeline is a knowledge map that illustrates child development from conception to age 13 years. Our objective is to develop a digital tool that facilitates collaboration, hypothesis development, and predictive modeling to improve our understanding of child growth and development, and is designed to visualize temporal and etiological connections between pathways and risk factors.

USE CASE #1

Generate hypotheses about biological mechanisms linking malnutrition to impaired cognitive development.

USE CASE #2

Determine health outcomes and biological measures that can be used to evaluate a breastfeeding promotion intervention. This tool allows users to identify potential mediating as well as confounding factors.

USE CASE #3

Develop a list of risk factors for infectious health outcomes linked to growth faltering (such as pneumonia and diarrheal disease), and examine the temporality of risk factors as they relate to key markers of growth faltering.

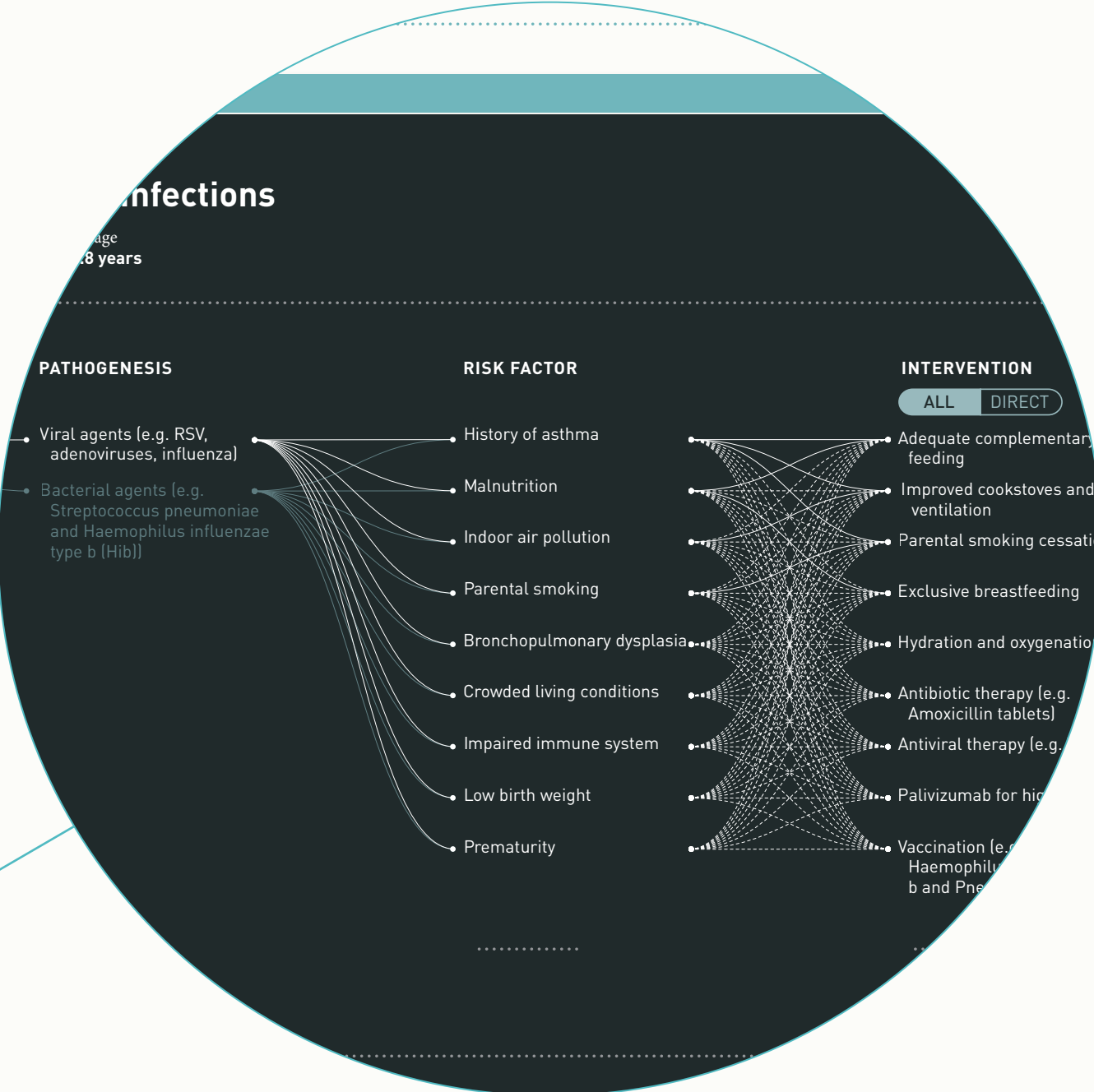
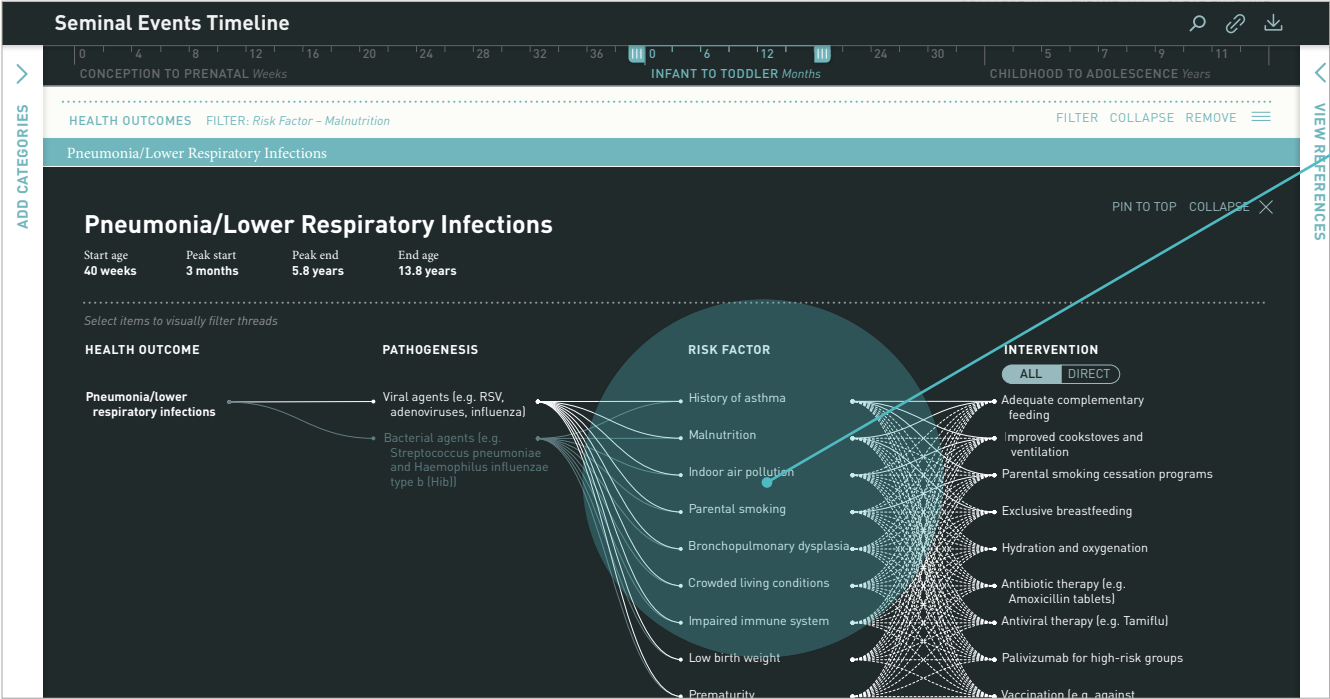
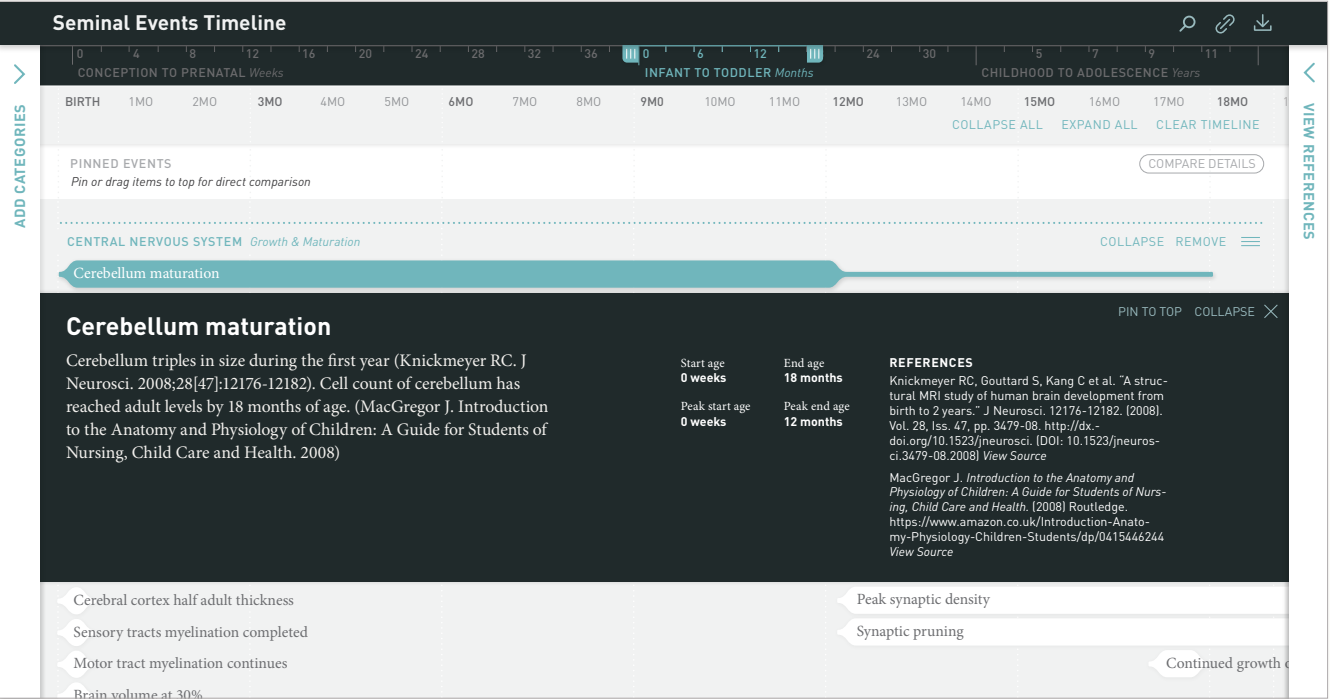
METHODOLOGY & SCOPE

A literature review was performed by the START Center at the University of Washington in conjunction with the HBGDKi initiative at the Bill & Melinda Gates Foundation, with the aim of providing a holistic view of growth and development:

- Conducted a comprehensive review of > 850 peer-reviewed articles, medical textbooks, and online resources;
- Accumulated data on seminal events in normal organ growth and development from conception to adolescence at age 13;
- The data also include risk factors and diseases that may interrupt normal growth; as well as interventions that may improve health outcomes.

To align with HBGDKi goals of answering questions about preterm birth, growth faltering, and impaired neurocognitive development, content inclusion was guided by the following principles:

- Emphasized health outcomes of key importance in low- and middle-income countries using a global burden of disease tool developed by Institute of Health Metrics and Evaluation (IHME);
- Interventions were included based on empirical evidence of efficacy in peer-reviewed studies. Interventions deemed impractical in low- and middle-income countries were excluded.



EXPLORE THE
USE CASE PROTOTYPES
<http://bit.ly/seminal-events>

1,425 DEVELOPMENTAL EVENTS AND PROCESSES

10 Organ systems

Central nervous system
Peripheral nervous system
Respiratory system
Cardiovascular system
Gastrointestinal system
Blood/immune system
Musculoskeletal system
Genitourinary system
Endocrine system
Skin/integument system

4 Developmental domains

Language development
Motor development
Cognitive development
Emotional development

2,355 PATHWAYS CONNECTING OUTCOMES TO RISK FACTORS AND INTERVENTIONS

33 Health outcomes & 44 associated pathogeneses

— Infectious and parasitic agents (e.g. HIV, leishmaniasis)
— Non-infectious outcomes (e.g. preterm birth, malnutrition)
— Genetic and/or chronic conditions (e.g. congenital anomalies, diabetes)

222 Risk factors

— Maternal and parental risk factors (e.g. smoking)
— Environmental risk factor (e.g. socioeconomic status)
— Genetic risk factors (e.g. congenital anomalies)
— Other risk factors (e.g. low birth weight)

199 Interventions

— Preventative interventions (e.g. vaccination)
— Treatment and disease management (e.g. school based deworming programs)
— Medical and non-medical interventions (e.g. antimicrobial therapy, community WASH education programs)

