



INFANT HEARING LOSS IN DEVELOPING COUNTRIES - EXPOSING A SILENT EPIDEMIC

CHRIB Seminar
4 September 2010



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

De Wet Swanepoel
dewet.swanepoel@up.ac.za

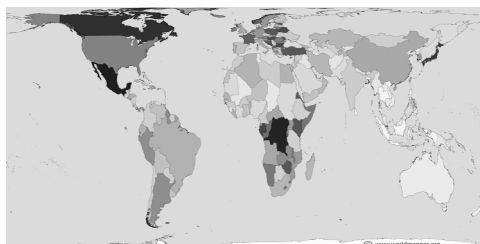
OUTLINE

- **OVERVIEW OF THE WORLD**
 - Developing World
- **CHILDHOOD HEARING LOSS**
 - Prevalence
 - Risk profile
 - Early identification
 - Burden of HL
- **SERVICES FOR HEARING LOSS**
- **WAY FORWARD**

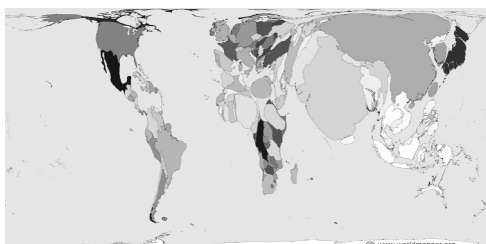


DIFFERENT WAYS OF LOOKING AT THE WORLD

THE WORLD AS WE KNOW IT...

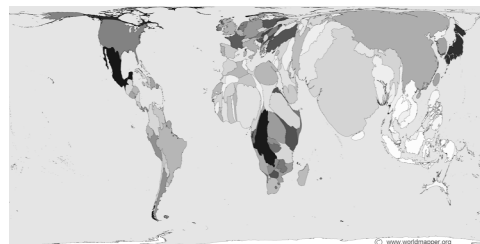


WORLD POPULATION

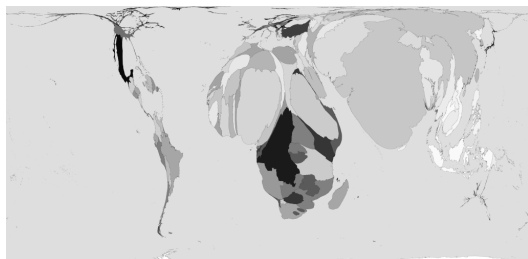


"Out of every 100 persons added to the population in the coming decade, 97 will live in developing countries." Hania Zlotnik, 2005

POPULATION 2015

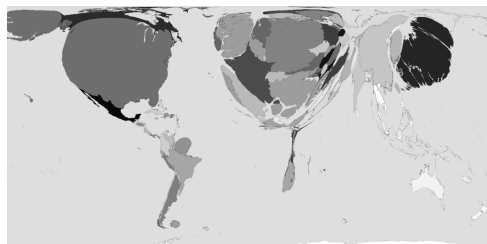


INFANT MORTALITY



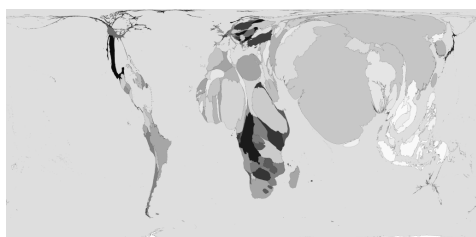
"If we are the future and we're dying, there is no future." Mary Phiri, 2001

PUBLIC HEALTH SPENDING



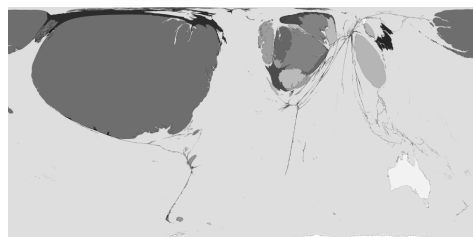
"... I brought my little girl to the health center in my district in the south of Bujumbura. But the nurse wouldn't see us as I didn't have any money to pay for the consultation." Simeon, 2004

POVERTY INDEX



The human poverty index uses indicators that capture non-financial elements of poverty, such as life expectancy, adult literacy, water quality, and children that are underweight.

CHILDREN WITH HEARING LOSS? ~~WHY NOT BECOME SOMEONE'S~~ MEMBERS OF THEIR ECONOMIES?



*Estimated

WHO IS THE DEVELOPING WORLD?

- 164 Developing countries
- 31 Developed countries
- Heterogeneous group

REGION	NUMBER OF COUNTRIES
Sub-Saharan Africa (SSA)	46
Middle East & North Africa (MEN)	21
South Asia (SOA)	8
East Asia & Pacific (EAP)	29
Latin America & Caribbean (LAC)	33
Central/Eastern Europe & Baltic State Countries (CEE)	27

WHO IS THE DEVELOPING WORLD?

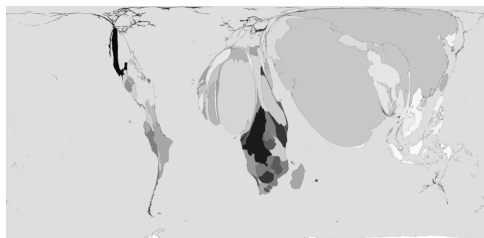
- 5+ billion people
- Global population: >80%
- 90% of children under 5 live in Developing world
- Classified by indicators of development (e.g.)



[UNICEF, 2008; Alberti, 1999]

WHO IS THE DEVELOPING WORLD?

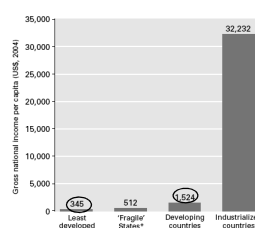
Proportion of people living under \$1/day



WHO IS THE DEVELOPING WORLD?

- Globally **20%** live on less than \$1 per day
- <**1%** in developed countries
- SSA: **43%** of live on less than \$1 per day
- 225** richest control wealth equivalent to annual income of poorest **2.5 billion**

Annual per Capita income

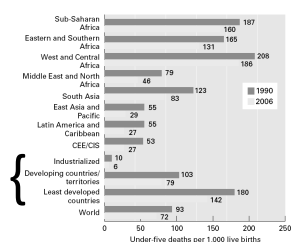


(UNICEF, 2008)

WHO IS THE DEVELOPING WORLD?

Infant mortality rate

- Mortality: **0.6 vs 8 & 14%**
- Developing world spend **13%** of global healthcare
- Life expectancy:
79 Developed
66 Developing
55 Least developed



(UNICEF, 2008)

WHO IS THE DEVELOPING WORLD?

The 60 priority countries for child survival targeted by Countdown to 2015



PREVALENCE OF INFANT HL



4-6/1000 bilateral HL (>40 dB HL)
 + mild losses more
 2-5% in high risk

PREVALENCE OF INFANT HL

- Disabling HL (>40dB) prevalence:
 - **120 mil in 1995**
 - **278 mil in 2005**
 - **642 mil in 2005***
 *(including mild HL, 26-40dB)
- 25%** from childhood
- More than **62 million** children younger than 15 years
- Mild and greater – **160 million** children



(WHO, 2006; Olusanya & Newton, 2007)

PREVALENCE OF INFANT HL

- **120 million** annual births in developing world
- **718 000** - permanent bilateral HL (25% from SSA)
- **53 150** - permanent bilateral HL in all developed countries



(UNICEF, 2008; Olusanya & Newton, 2007; Smith et al, 2005)

PREVALENCE OF INFANT HL

Global Situation

- Everyday **2 118** born with significant permanent SNHL:
 - **1 972** born in developing world (6/1000)
 - **146** born in developed countries (4/1000)
- **>90%** born in developing world



INFANT HEARING LOSS

SOUTH AFRICAN SITUATION

HEALTH SECTOR	PREVALENCE / 1000	ANNUAL RATE	DAILY RATE	SOURCES
Private (15%)	3 / 1000	496	1.5 / day	Swanepoel, Ebrahim & Friedland, 2007; Olusanya, Somelun & Swanepoel, 2008; UNICEF, 2008; National Treasury Department, Republic of South Africa, 2005; Olusanya & Newton, 2007
Public (85%)	6 / 1000	5620	15.5 / day	
National (100%)	5.5 / 1000	6116	17 / day	

INFANT HEARING LOSS

Review of NHS in Developing countries (2000 - 2008)

Authors	Year	Country	No with hearing loss (Rate/1,000)
Olusanya et al	2008a	Nigeria	7/1,330 [5.3]
Olusanya et al	2008b	Nigeria	66/2,003 [28.0]
Swanepoel et al	2007	South Africa	6/6,241 [1.0]
Mahur & Dhwani	2007	India	5/1,000 [5.0]
Nagapoomima et al	2007	India	10/1,769 [5.6]
Chiong et al	2007	Philippines	16/724 [22.1]
Telik et al	2007	Turkey	3/711 [4.2]
Al-Kandari & Alshuib	2007	Kuwait	11/215 [51.2]
Swanepoel et al	2006	South Africa	0/489 [0]
Atlas et al	2006	Jordan	11/38,251 [13.7]
Khandekar et al	2006	Oman	26/21,387 [11.2]
Tang et al	2006	China	55/19,302 [2.8]
Abdullah et al	2006	Malaysia	16/3,762 [4.3]
Yee-Aralano et al	2006	Mexico	5/3,066 [1.6]
Habb & Abdelgaffar	2005	Saudi Arabia	22/11,986 [1.8]
Bener et al	2005	Qatar	119/2,227 [53.4]
Low et al	2005	Singapore	146/36,095 [4.0]
Mukari et al	2005	Malaysia	34/4,437 [7.7]
Chan & Leung	2004	Hong Kong	16/3,949 [4.1]
Ng et al	2004	Hong Kong	6/1,064 [5.6]
Lin et al	2004	Taiwan	9/5,938 [1.5]
Lin et al	2002	Taiwan	35/6,765 [5.2]
Chapchap & Segre	2001	Brazil	10/4,123 [2.4]
Ali et al	2000	Pakistan	6/756 [7.9]
TOTAL			732/147590 [5.0]

INFANT HEARING LOSS

Review of NHS in Developing countries (2000 - 2008) – Risk population

Authors	Year	Country	No with hearing loss (Rate/1,000)
Khairi et al	2006	Malaysia	5/401* [12.5]
Lima et al	2006	Brazil	100/975* [102.1]
Srisapang et al	2006	Thailand	34/507* [67.1]
Steam et al.	2006	South Africa	3/129 [23.3]
TOTAL			142/2016 [70.0]

RISK PROFILE

Developed countries

- **54%** of HL genetic at 4 years

Developing countries

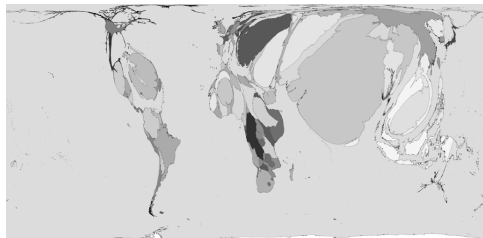
- Risks **abundant, complex & varied**
- Poor **maternal-child** health care
- Adverse **peri- & postnatal** conditions
- **Consanguinity**
- Infectious disease burden



(Mortza & Nance, 2006; Morzaria et al, 2007; Davis et al, 1997; Olusanya & Okolo, 2006)

RISK PROFILE

Meningitis deaths



RISK PROFILE

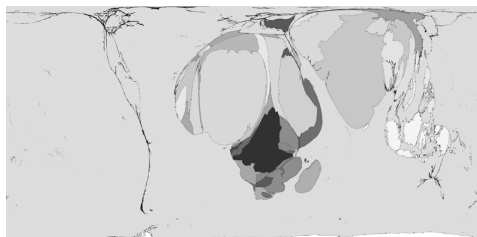
Meningitis deaths

- **Most common** cause
- Incidence **~10 times higher** in developing world
- **350 000 – 560 000** annual child deaths in Africa
- Majority survive (**18-50%**); **1 in 3 to 1 in 5** have HL

(Baroff et al. 1993; Goetghebuer et al. 2000; Molyneux, 2006)

RISK PROFILE

Proportion of Measles deaths



RISK PROFILE

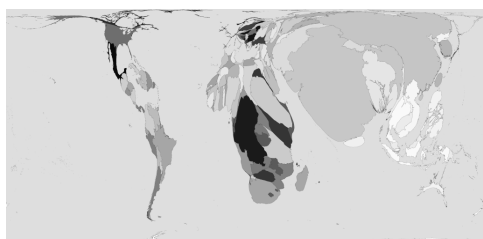
Proportion of Measles deaths

- Vaccine 1968 - But still **rife** in developing countries
- **345 000** deaths in 2007 (875 000 in 2001)
- **25 – 30 million** children infected annually
- Significant % at risk of SNHL

(WHO/UNICEF, 2001; Olusanya, 2006; UNICEF, 2008)

RISK PROFILE

Undernourishment



RISK PROFILE

Undernourishment

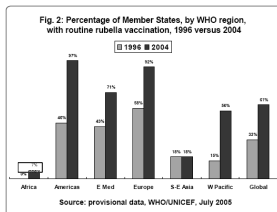
- **80%** of world's undernourished children live in **20** countries
- Recent study first to **link** undernourishment of infants to CESH.
- May be due to **intra-uterine growth** retardation, **maternal problems** (including mothers nutritional status) or insults arising from **infectious disease** at or soon after birth
- Infants significantly **more likely** to have CESH and of a **severe-to-profound** degree

(Olusanya, 2010)

RISK PROFILE

Rubella

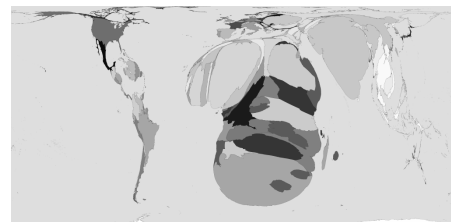
- Worldwide CRS – **110 000** annual cases
- 70 – 90%** of CRS cases - hearing loss
- HL most common (**50%** only symptom)
- High vaccination uptake necessary



(Vallely et al. 2002)

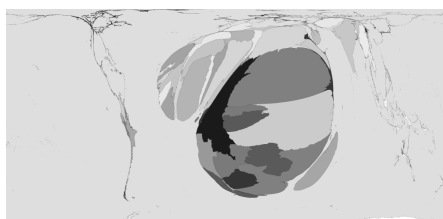
RISK PROFILE

HIV prevalence



RISK PROFILE

Malaria



EARLY IDENTIFICATION?

What is the reality in developing countries?

EARLY IDENTIFICATION?

- CA, 7 year 10 month old girl
- 1st diagnosis
- Profound bilateral hearing loss



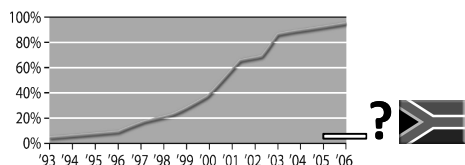
EARLY IDENTIFICATION?

- SM- 4 year 10 months old girl
- 1st Diagnosis with HL
- AN – no response to sound at 95 dB
- Parental suspicion? 3 years
- Thought child was “rude”



PERCENTAGE OF NEWBORNS SCREENED

USA (White et al. 2009 – EHDl e-Book)



EARLY IDENTIFICATION?

- >90% of babies born with HL - no prospect of EI
- Detection primarily **passive**:
 - Complications of OM
 - Speech & language delays
 - Unusual behavior
- Exacerbate impact of HL - consigns to **seclusion, limited access & quality of life**



EARLY IDENTIFICATION?

Nigeria (n=363) (Olusanya et al. 2005)

- Parents first to suspect (**81%**); Health workers (**9%**)
- **12%** suspected in 6 months; **4%** after 5 years
- Suspicion mean (**12–24m**)
- **18** month delay suspicion to confirmation
- **80%** no hearing aids provided
- Only **6%** enrolled in school for deaf by **6 years**

EARLY IDENTIFICATION?

Angola (n=105) (Bastos et al. 1990)

- Parents brought due to delayed speech / suspected HL
- Median age: **6 years** (Range 1-15)



Mauritius (Gopal et al. 2001)

- Median age of identification **24 months**



EARLY IDENTIFICATION?

Kenya (n=122) (Omondi et al. 2007)

- First detection **5.5 years** (mean age)
- **57%** detected after 2 years
- **27%** visited healthcare provider for assessment
- Only **9%** received council on HL
- None received a hearing aid



EARLY IDENTIFICATION?

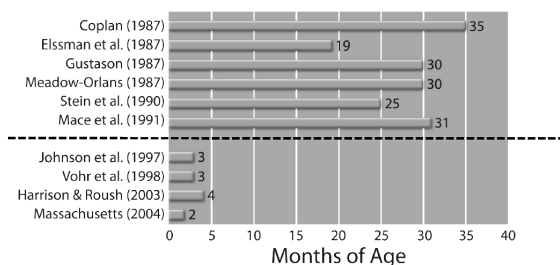
South Africa (Van der Spuy & Pottas, 2008; Venter & Viljoen, 2008)

- Urban samples

	Western Cape	Gauteng
Ave age of diagnosis	23 months	31 months
Ave age of initial HA fitting	28 months	39 months
Ave age of enrollment into EI	31 months	43 months

EARLY IDENTIFICATION?

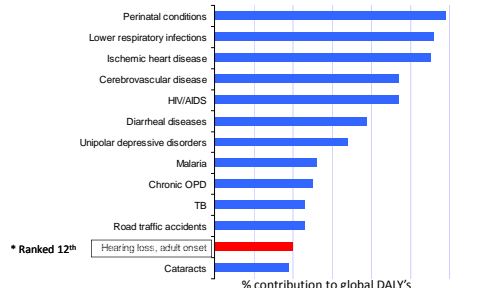
USA (White et al. 2009)



BURDEN OF HEARING LOSS

Global Burden of Disease Report (2006)

1 DALY = loss of 1 year of equivalent full health



BURDEN OF HEARING LOSS

- Global Burden of Disease Report (2006)
 - Adult-onset HL 12th of all diseases based on DALY's
 - 3rd based on Healthy Life Lost due to disability

MALES		FEMALES	
Cause	Percentage of total YLD	Cause	Percentage of total YLD
1 Unipolar depressive disorders	7.7	1 Unipolar depressive disorders	11.0
2 Hearing loss, adult onset	5.6	2 Cataracts	5.8
3 Cataracts	4.6	3 Hearing loss, adult onset	5.3
4 Alcohol use disorders	4.3	4 Osteoarthritis	3.8
5 Cerebrovascular disease	2.9	5 Vision disorders, age-related	3.4
6 Vision disorders, age-related	2.7	6 Alzheimer's and other dementias	3.3
7 Perinatal conditions	2.7	7 Cerebrovascular disease	2.5
8 Osteoarthritis	2.5	8 Perinatal conditions	2.4
9 Chronic obstructive pulmonary ds	2.5	9 Schizophrenia	2.0
10 Schizophrenia	2.1	10 Bipolar disorder	1.7

(Olusanya & Newton, 2007; Lopez et al. 2006)

BURDEN OF HEARING LOSS

- Excluding Childhood HL?
- Justified as sequelae of congenital conditions, infectious diseases or injuries
- BUT:**
 - ~50% known causes genetic
 - Major congenital causes omitted (CMV, rubella, toxoplasmosis, herpes, mumps)
 - Neonatal jaundice excluded
 - INFANT HL due to ototoxic drugs not accounted

(Olusanya & Newton, 2007; Lopez et al. 2006; Smith, Bale & White, 2005)

BURDEN OF HEARING LOSS

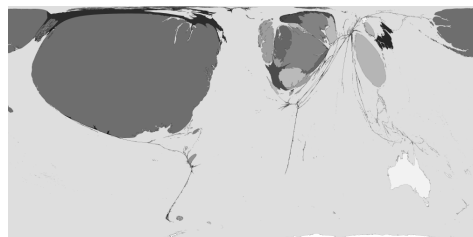
- Irreversible deficits, poor educational & vocational attainment
- 66 year life expectancy – great cost to society
- Global burden of infant HL likely to exceed adult-onset
- Disease control priority project – exclusion prevents worldwide attention



(Olusanya & Newton, 2007; Lopez et al. 2006)

HEARING HEALTHCARE RESOURCES

Distribution of hearing healthcare personnel



*Estimated

HEARING HEALTHCARE RESOURCES

- Africa – 53 countries. Two offer professional education in Audiology (1 in SSA)
- **Mismatch in need and supply and unequal distribution** globally/regional
- Ratio of audiologists to people:
 - Developing World **1 : 0.5 – 6.25 million**
 - Developed World **1 : 20 000**
 - Africa **1 : 1 million**



WHO, 2009; Goulios & Patuzzi, 2008; Fagan & Jacobs, 2009

AUDIOLOGY SERVICES - AFRICA

- Fagan & Jacobs (2009)
 - Surveyed **18/46** SSA countries
 - Average audiologist-to-pop ratio **1: 1 mil** (ENT 0.95 : 1 mil)
- Goulios & Patuzzi (2008)
 - **250,000 to 7.1 million** people per ENT
 - **1 : 10 – 30 000** people in Europe
 - Audiologists may even be less
- Countries **not surveyed?** Dire state for hearing health care



WAY FORWARD?

“Although the world is full of suffering, it is also full of the overcoming of it”

Helen Keller



WAY FORWARD?

- Growing **momentum** for EHLI in developing world
- Reports on **IHL in developing countries** recent phenomenon
 - Search (SCOPUS) “**IHS/NHS**” AND “**Developing Country**” [Title/Abstract/Keywords]
 - **36** Hits
 - First **2001**
 - <2005 = **4/36**
 - ≥2005 = **32/36**
 - “**Africa**”: **19** hits. First **2004. 8/19** in 2009/2010



WAY FORWARD?

- **Differentiating** healthcare priorities – when is infant hearing loss a **priority**?
- What **local mechanisms** should be pursued to **prioritize** infant hearing loss?
- What **global mechanisms** should be pursued to **prioritize** infant hearing loss in developing countries?



WAY FORWARD?

- Reduce **costs** by global **collaborations** (private/public) through **economies of scale**
- **Pilot programmes** at various levels – different systems.
- **Education** programmes for non-specialist personnel
- **Telemedicine & e-Health**



WAY FORWARD?

- Narrowing avoidable **disparities** - important pressing imperative – Global attention to childhood HL
- Moral obligation **to extend benefits** of EHDl
- **“Better hearing for persons of ALL nations is an achievable, important goal”** - Morton & Nance, 2006
- Urgency for **most vulnerable**– infants and children with HL

