The KEMRI/CDC Health & Demographic Surveillance System

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Introduction

- Timely and accurate population-based information is critical in the fight against disease and poverty

- The Millennium Development Goals as a framework for poverty reduction and sustainable development comes with obligations to monitor progress

- Global health initiatives like the Global Fund to combat AIDS, TB and Malaria, PEPFAR, or PMI require monitoring of progress and evaluation of impact
The KEMRI/CDC DSS

• Provides a platform for action-oriented research to test and evaluate public health interventions

• Provides a suitable sampling frame for clinical research, including vaccine trials

• Provides timely information for policy formulation and rational resource allocation
Nyanza Province

- Malaria – intense and holoendemic: highest incidence in country (EIR 100-300 annually)

- HIV highest prevalence in country (15%, DHS)

- TB – greatest burden in Kenya

- Other infectious diseases
  - Schistosomiasis endemic
  - Diarrhea (*Shigellae* including *dysenteriae*, cholera, rotavirus)
Demographic Surveillance System (DSS)

- Launched in September 2001
  - As a collaborative effort between the Kenya Medical Research Institute (KEMRI) and the Centers for Disease Control and Prevention (CDC)

- Continuous demographic monitoring of a geographically defined population in Bondo and Siaya districts, Nyanza province
  - 135,000 since 2001 [Asembo and Gem]; 85,000 added in April 2007 [Karemo]
  - Birth rates
  - Mortality rates
  - Causes of death
  - Morbidity
  - Migration
  - Socio-economic indicators
  - EIR data since 1990’s
  - Includes Siaya District Hospital
The Demographic Surveillance Area

Lake Victoria

- Siaya D. H.
- Bondo D. H.
- Lwak H.
- Asembo
- Karemo
- Gem
- Kombewa
- Yala Sub D.H.
- Kisian
- Kisumu
DSS Methods
Field Operations and Data Processing

- Mapping of compounds and enumeration of households
- Household surveillance and socio-economic surveys
  - Immunization survey
  - HIV status/ care-seeking survey
  - Marriage status form
- Health facility surveillance
- Entomology surveillance and insecticide treated bednets
- Quality control
- Data entry and management
Verbal Autopsy (VA)

- Indirect method of ascertaining cause of death from information about symptoms and signs obtained from bereaved relatives

- Conducted for both children & adults
  - Child VA data (from 2001 to date)
  - Adult VA data (from 2003 to date)

- Both questionnaires (child and adult) adopted from INDEPTH
Results
The Surveillance Population: Asembo and Gem

- Population: 135,887 (2005 mid-year pop.)
  - 95% Luo ethnic group
  - 217 villages, 500 sq km
  - Males: 47%
  - Children <15 years: 44%
  - Children <5 years: 16%
  - Adults ≥65+: 7%
  - Total Fertility Rate = 5.2
  - Rural subsistence agriculture, fishing
Age Specific Migration Rates by Year (Males)

Out Migration

In Migration
Age Specific Migration Rates by Year (Females)

**Out Migration**

**In Migration**
Causes of Clinic Attendance Among Children, 2003-2006
Life Expectancy at Birth for the Resident Population, 2002-2006

- Males: 36.1, 37.6, 38.7, 41.7, 44.8
- Females: 39.7, 39.9, 43.0, 41.7, 44.8
Age-specific Mortality Rates (2003-2006)

121/1000 live births – IMR (2005)
Causes of Death Among Infants and Children, 2003-2005

![Bar chart showing the proportion of deaths due to various causes from 2003 to 2005.](chart.png)
HIV Prevalence by Age & Sex, 2003/2004

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male</th>
<th>Female</th>
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<tbody>
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<td>32</td>
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<tr>
<td>All</td>
<td>10</td>
<td>20</td>
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</tbody>
</table>
School Enrollment for Residents Aged 6-9, 2002-2006
School Dropout

- Approximately 9% of children aged 10-17 dropped out of school in 2003-2006

- Reasons proffered for drop out include
  - Inability to pay fees
  - Ill health (of child or parent)
  - Poor performance
  - Early marriage and child bearing
Operational Research in the DSS

- KEMRI/CDC DSS allows operational research where malaria transmission is intense, ITN coverage is high, and HIV prevalence is high.

- Expansion to include Siaya District Hospital will facilitate more clinic-based research.
  - Siaya District Hospital Annex, with pharmacy, laboratory, surgical suite, patient support center, and training/conference rooms, will allow rigorous clinical trial research.
Operational Research in the DSS

- Malaria
  - Drug efficacy, including in pregnant and HIV(+) persons
  - Intermittent preventive treatment of malaria in infants/pregnant mothers
  - Transmission reduction
    - ITN coverage use, resistance
    - Larval breeding sites
    - Vector control interventions

- Tuberculosis
  - TB prevalence survey

- Schistosomiasis

- Emerging infections
  - Population-based morbidity surveillance
  - Diarrheal diseases surveillance: incidence and etiology
  - Expanded flu/respiratory surveillance
Operational Research in the DSS

- HIV
  - Baseline cross-sectional surveys
  - Collection of self-reported status, care-seeking
  - Impact of ARVs at population level
  - Orphan prevalence/incidence
  - Planned comprehensive evaluation of HIV home-based testing, community-based care and treatment service delivery, and circumcision uptake and feasibility

- Vaccine trials
  - Rotavirus – Phase III
  - Malaria – Phase III
  - TB vaccine trial site development
Training and Collaborations in the DSS

- **Training**
  - Provide data for MA theses & PhD dissertations
  - Data for epidemiological capacity building

- **Cross-site collaboration**
  - Contributed data to the cross-site cause-specific mortality analysis initiated by the INDEPTH and published in WHO Bulletin 84(3)
  - Contributed data to the cross-site “Patterns of age-specific malaria mortality in children in endemic areas of sub-Saharan Africa” initiated by the INDEPTH and accepted for publication AJTMH
  - Participating in the cross-site HIV research proposal initiated by INDEPTH
  - Contributing a chapter to the INDEPTH monograph on Migration, Urbanization & Health
Concluding Remarks

- The KEMRI/CDC DSS data have shown excessively high mortality and morbidity rates among the DSS residents
  - Resulting largely from infectious diseases (malaria & HIV/AIDS)

- The life expectancy at birth for the resident population is among the lowest in the world, but appears to be improving

- The morbidity and mortality epidemiological profile in the KEMRI/CDC DSS is well-characterized; the DSS is well-positioned, and intends, to provide the platform to measure the impact of coming interventions (vaccines, scale up of HIV services, etc)
Acknowledgements

- Dr Adazu Kubaje
- DSS staff
- KEMRI/CDC program, past and present
- Dr John Vulule, KEMRI
EXTRA SLIDES
Age Specific Migration Rates by Sex

Out migration

In migration

![Graph showing out and in migration rates by age and sex](chart.png)
Monthly Clinic Attendance Among Children, 2003-2006

Number of visits

12-59 mo 0-11 mo

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Reasons for Dropping Out Among Children Aged 10-17 (KHDSS, 2003)
Age-specific Mortality Rates by Year (2003-2006)

Males

Females

CDC
Literacy by Sex for Residents aged 10+, 2003-2006

Graph showing the proportion (%) of the population with literacy by sex and year, with categories for not at all, with difficulty, and easily.