Science in Action: Saving 4 million lives a year

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Acknowledgments

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Wider team
Over 60 scientists mainly in Africa have contributed and reviewed

Funding
ASSAf, MARS, NAS, Save the Children, Johns Hopkins University
Outline for presentation

1. Interventions to reduce maternal, neonatal, and child mortality
2. Lives Saved Tool (LiST)
3. How many lives can be saved with achievable coverage in different health system contexts?
4. How many lives could be saved if essential MNCH interventions were at 90% coverage?
5. What are the steps from evidence to action?

Based on 5 questions
Question 1.

What are the evidence-based interventions to reduce maternal, newborn and child deaths?
# Proven interventions

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<tr>
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<tbody>
<tr>
<td>Comprehensive reviews</td>
<td></td>
<td>Community based interventions review</td>
<td>Literature &amp; Program review Few RCTs</td>
<td>Literature &amp; Program review RCTs &amp; observational studies</td>
</tr>
<tr>
<td>Focus</td>
<td>Under 5 child survival</td>
<td>Newborn deaths</td>
<td>Maternal deaths &amp; morbidity</td>
<td>Child &amp; maternal outcomes</td>
</tr>
<tr>
<td>Included</td>
<td>23 interventions reviewed</td>
<td>16 newborn interventions</td>
<td>120 interventions considered</td>
<td>45 interventions</td>
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</tbody>
</table>

- **Lancet Child Survival series (2003)**
- **Lancet Newborn Series (2005)**
- **Lancet Nutrition Series (2008)**
What to do with all of these proven interventions?

1. Currently variable implementation
2. Major funding in “vertical” approaches
3. Governments and health systems are being pulled in multiple directions

Package interventions and strengthen existing programmatic platforms to reach high coverage.

A paradigm shift to MNCH continuum of care
Variable coverage along the continuum of care


Data sources: Current coverage data based on UNICEF data bases and other sources

The bars signify the range between countries with the lowest and highest coverage.
Delivery of interventions

Source: Lawn JE  DCP chapter adapted for Lancet neonatal series executive summary
<table>
<thead>
<tr>
<th>Clinical</th>
<th>REPRODUCTIVE HEALTH CARE</th>
<th>ANTENATAL CARE</th>
<th>POSTNATAL CARE</th>
<th>EMERGENCY NEWBORN AND CHILD CARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Family planning</td>
<td>- 4-visit focused package</td>
<td>- IPTp and bednets for malaria</td>
<td>- Promotion of healthy behaviours</td>
<td>- Hospital care of newborn and childhood illness including HIV care</td>
</tr>
<tr>
<td>- Prevention and management of STIs and HIV</td>
<td>- Peri-conceptual folic acid</td>
<td>- PMTCT</td>
<td>- Early detection of and referral for illness</td>
<td>- Extra care of preterm babies including kangaroo mother care</td>
</tr>
<tr>
<td>- Peri-conceptual folic acid</td>
<td>- IPTp and bednets for malaria</td>
<td>- PMTCT</td>
<td>- Extra care of LBW babies</td>
<td>- Emergency care of sick newborns</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Outreach/outpatient</th>
<th>FAMILY AND COMMUNITY</th>
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</thead>
<tbody>
<tr>
<td>- Adolescent and pre-pregnancy nutrition</td>
<td>- Counselling and preparation for newborn care, breastfeeding, birth and emergency preparedness</td>
</tr>
<tr>
<td>- Education</td>
<td>- Where skilled care is not available, consider clean delivery and immediate newborn care including hygiene, warmth and early initiation of breastfeeding</td>
</tr>
<tr>
<td>- Prevention of STIs and HIV</td>
<td>- Newborn care (hygiene, warmth)</td>
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</tbody>
</table>

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<td>- Prevention of STIs and HIV</td>
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</tbody>
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<thead>
<tr>
<th>Healthy home care including:</th>
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<tbody>
<tr>
<td>- Newborn care (hygiene, warmth)</td>
</tr>
<tr>
<td>- Nutrition including exclusive breastfeeding and appropriate complementary feeding</td>
</tr>
<tr>
<td>- Seeking appropriate preventive care</td>
</tr>
<tr>
<td>- Danger sign recognition and careseeking for illness</td>
</tr>
<tr>
<td>- ORS and zinc for treatment of diarrhoea</td>
</tr>
<tr>
<td>- Where referral is not available, consider case management for pneumonia, malaria, neonatal sepsis</td>
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</tbody>
</table>

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<td>- Peri-conceptual folic acid</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Immunisations, nutrition, e.g. Vitamin A supplementation and growth monitoring</th>
</tr>
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<tbody>
<tr>
<td>- IPTp and bednets for malaria</td>
</tr>
<tr>
<td>- Care of children with HIV including cotrimoxazole</td>
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<tr>
<td>- IMNCI</td>
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<tr>
<th>Intersectoral</th>
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<tbody>
<tr>
<td>Improved living and working conditions – Housing, water and sanitation, and nutrition</td>
</tr>
<tr>
<td>Education and empowerment</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Pre-pregnancy</th>
<th>Pregnancy</th>
<th>Birth</th>
<th>Newborn/postnatal</th>
<th>Childhood</th>
</tr>
</thead>
</table>
Current situation….

- Difficult to maximize all interventions in low-resource settings

- Health systems vary and local context matters
  - Epidemiology
  - Health system performance
  - Funding opportunities and constraints

- Need to use scientific approach to prioritize interventions
Question 2.

The Lives Saved Tool (LiST) - what interventions would have the greatest impact on mortality and what would they cost?
**LiST - what does it do?**

- Predicts lives saved by various interventions for
  - Causes of death for women, newborns, children
  - Under 5 mortality
  - Maternal mortality

- Data included for 68 priority countries
  - Data for numbers, rates and causes of death
  - Data for coverage of interventions
    - Eg facility birth, immunisation, ORS etc.
  - Global effect sizes of interventions based on systematic reviews and the best available evidence
**LiST - Design**

- Program planning and prioritization tool for MoH and partners to estimate mortality reduction and cost of interventions
- Freely downloadable, user-friendly interactive software as *LiST* module added to existing planning software (Spectrum)
  - DemProj – module used for 20 years for population modeling
  - AIM - UNAIDS lives saved module for all HIV/AIDS interventions

LiST - How does it work?

- User sets yearly coverage targets for each intervention starting from the most recent data
- Coverage is linked to a mortality effect on a specific cause of death (mothers, newborns, children)
- Cohort-based model
  - Lives cannot be saved multiple times
    - eg. by both preventive and curative interventions
  - Risk factors are included
    - eg. nutrition, breastfeeding
- Cost for increased intervention coverage can be calculated
Eg *LiST* modeling for neonatal lives saved

For each country

**Number of neonatal deaths by cause**

- **CHERG/UN estimates of cause of death**

**Impact on NMR**

- Effectiveness based on systematic reviews

**Coverage targets change by year**

- Difference between current coverage and target coverage for each intervention

**Systematic reviews in process at Int Journal of Epidemiology**

**Numbers of lives saved**

Numbers of neonatal lives saved added up after each intervention is applied, avoiding double counting of lives saved
Which interventions are included?

DIRECT
• Peri-conceptual
• Pregnancy
• Childbirth
• Early postnatal
• Child preventive
• Child curative

INDIRECT
• Nutritional
• Water and sanitation
• Contraception

NOT INCLUDED - income, education and crowding, etc
**LiST menu for neonatal – Direct effects**

### Periconceptual
- Folic acid fortification /supplementation

### Pregnancy
- Tetanus toxoid
- Syphilis detection/case mx

### Childbirth – facility
- Skilled attendance
- BLEmOC
- CEmOC
- Neonatal resus
- Antenatal steroids
- Antibiotics for PROM

### Childbirth - home
- Clean delivery
- Simple immediate newborn care
- Resuscitation

### Postnatal
- Preventive postnatal care practices

### Curative outpatient
- Infections case management (oral)
- Infections case management (injection)
- ORS

### Curative inpatient
- Kangaroo mother care
- Neonatal illness full case management
**LiST menu for neonatal - Indirect effects**

### Nutrition (thru IUGR)
- Balanced protein energy nutrition
- Multiple micronutrient supplementation

### Malaria (thru IUGR)
- IPTp

### PMTCT (thru AIM module)

### Contraception (thru FP module)
**LiST costing module**

- Considers the type and amount of drugs, supplies, and personnel time required for each intervention
- Uses standard WHO protocols and expert opinion
- Data from UNICEF, MSH, and WHO CHOICE
Question 3.

How many lives can be saved in different health system contexts with achievable coverage?
Saving lives with achievable coverage increases

Three categories of health system context based on coverage of skilled birth attendance:

- **Low**: skilled birth attendance < 30%
- **Middle**: skilled birth attendance 30-60%
- **High**: skilled birth attendance > 60%
Nine example countries – health system context based on skilled attendance

<table>
<thead>
<tr>
<th>Coverage of skilled attendance at birth</th>
<th>Countries with &lt;30% coverage</th>
<th>Countries with 31-60% coverage</th>
<th>Countries with &gt;60% coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where do the nine example countries currently fit in?</td>
<td>Ethiopia and Northern Nigeria</td>
<td>Ghana, Kenya, Senegal, Uganda and Tanzania</td>
<td>Cameroon, South Africa and Southern Nigeria</td>
</tr>
<tr>
<td>Total number of annual maternal, newborn, and child deaths</td>
<td>1,140,000</td>
<td>724,000</td>
<td>528,000</td>
</tr>
</tbody>
</table>

51% of all MNC deaths in sub Saharan Africa
Births already happening in facilities
QUALITY GAPS = MISSED OPPORTUNITIES
Eg Uganda

Missed opportunities to save lives in facilities

Data sources: Current coverage data in LiST. Not all interventions for the report analyses are included. For a complete list of outreach and community interventions please see final report or visit www.nationalacademies.org/asadi:
Analysis of lives saved with achievable coverage increases - part 2 outreach/community level

Uganda example

Increase coverage by 20%

Outreach/community interventions - feasible (20%) increases
### Low health system context

Egs. Ethiopia and Northern Nigeria

**Situation:** low coverage levels and a lack of supplies

#### Maternal

- **Contraception prevalence**
- **Active case management of 3rd stage of labor**
  - 16,200 lives saved
  - US$ 0.17 per capita
  - (38% reduction)

#### Newborn

- **Tetanus toxoid**
- **Preventative postnatal care**
  - 24,000 lives saved
  - US$ 0.03 per capita
  - (8% reduction)
- **Oral antibiotics for neonates**

#### Child

- **Breastfeeding improvements**
- **Vit A**
- **Malaria prevention**
  - 188,700 lives saved
  - US$ 0.57 per capita
  - (25% reduction)
- **Vaccines**
- **Child curative**
Mid health system context
Egs. Ghana, Kenya, Senegal, Tanzania, Uganda

**Situation:** constraints on supply of outreach and quality of care within health facilities with barriers preventing demand of services

<table>
<thead>
<tr>
<th>Maternal</th>
<th>8,300 lives saved (19% reduction)</th>
<th>US$ 0.29 per capita</th>
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<tbody>
<tr>
<td>Comprehensive emergency obstetric care</td>
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</table>

<table>
<thead>
<tr>
<th>Newborn</th>
<th>42,300 lives saved (22% reduction)</th>
<th>US$ 0.42 per capita</th>
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</thead>
<tbody>
<tr>
<td>Antenatal steroids, neonatal resus, Kangaroo mother care, injectable antibiotics</td>
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</table>

<table>
<thead>
<tr>
<th>Child</th>
<th>174,800 lives saved (47% reduction)</th>
<th>US$ 1.60 per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition and hygiene</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria prevention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaccines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child curative</td>
<td></td>
<td></td>
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</tbody>
</table>
High health system context
Egs. Cameroon, South Africa, Southern Nigeria

**Situation:** Coverage of basic health packages is high but quality is often lacking

### Maternal
- Comprehensive emergency obstetric care
- Antenatal coverage

<table>
<thead>
<tr>
<th>Service</th>
<th>Lives Saved</th>
<th>Cost per Capita</th>
</tr>
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<tbody>
<tr>
<td>5,400 lives saved (15% reduction)</td>
<td>US$ 0.11</td>
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</table>

### Newborn
- Antenatal steroids, neonatal resus, Kangaroo Mother Care, preventative postnatal care, case management of illness

<table>
<thead>
<tr>
<th>Service</th>
<th>Lives Saved</th>
<th>Cost per Capita</th>
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</thead>
<tbody>
<tr>
<td>46,800 lives saved (34% reduction)</td>
<td>US$ 0.80</td>
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</tbody>
</table>

### Child
- Nutrition and hygiene
- Malaria prevention
- Vaccines
- Child curative

<table>
<thead>
<tr>
<th>Service</th>
<th>Lives Saved</th>
<th>Cost per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>83,200 lives saved (29% reduction)</td>
<td>US$ 1.21</td>
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</table>
Lives saved with achievable coverage increases

<table>
<thead>
<tr>
<th>Coverage of skilled attendance at birth:</th>
<th>Countries with &lt;30% coverage</th>
<th>Countries with 31-60% coverage</th>
<th>Countries with &gt;60% coverage</th>
<th>Total for all 9 countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 example countries</td>
<td>Ethiopia Northern Nigeria</td>
<td>Ghana, Kenya Senegal, Uganda</td>
<td>Cameroon South Africa Southern Nigeria</td>
<td></td>
</tr>
<tr>
<td>Total maternal, newborn, and child lives saved</td>
<td>344,400</td>
<td>263,300</td>
<td>162,200</td>
<td>769,800</td>
</tr>
<tr>
<td>Percentage of maternal, newborn, and child deaths</td>
<td></td>
<td></td>
<td>31%</td>
<td>32%</td>
</tr>
</tbody>
</table>

770,000 million lives saved
Priority strategies for each health system context

• **Low health system context:**
  – Increase coverage levels of community/outreach interventions and supplies while strengthening facility based care

• **Middle health system context:**
  – Improve quality of care in health facilities while increasing demand and reach full coverage of community/outreach interventions

• **High health system context:**
  – Improve quality and equity of care in health facilities and increase complexity of community/outreach interventions
Question 4.

How many lives could be saved if essential MNCH interventions were implemented in all of Africa?
**Lives saved with 90% coverage**

<table>
<thead>
<tr>
<th>Coverage of skilled attendance at birth:</th>
<th>Countries with &lt;30% coverage</th>
<th>Countries with 31-60% coverage</th>
<th>Countries with &gt;60% coverage</th>
<th>Total for all countries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 countries plus Northern Nigeria</td>
<td>25 countries</td>
<td>13 countries plus Southern Nigeria</td>
<td>42 countries</td>
</tr>
<tr>
<td>Total maternal, newborn, and child lives saved</td>
<td>1,017,600</td>
<td>1,956,700</td>
<td>1,005,600</td>
<td>3,979,900</td>
</tr>
<tr>
<td>Percentage of maternal, newborn, and child deaths avoided</td>
<td>81%</td>
<td>89%</td>
<td>83%</td>
<td>85%</td>
</tr>
</tbody>
</table>

**Nearly 4 million lives saved**
Priorities based on evidence

• Make childbirth wanted and safe
  – Skilled care at birth and emergency obstetric care if required

• Give newborn babies a healthy start
  – Providing effective care at birth, promotion of breastfeeding, antenatal steroids and KMC for preterm babies

• Prevent infections
  – Treated nets and IPTp/I for malaria, PMTCT, nutrition, immunisation, and hygiene

• Manage infections
  – Case management through IMCI
Question 5

What are the steps to action?
Actions

• Invest and track resources

• Implement and apply current knowledge to carry out policies and programmes equitably

• Innovate and develop new research and new technologies

• Inform - use evidence as a basis for health policy and resource allocation
Who needs to act?

- **Government** (Ministry of Health and Ministry of Finance)
- Health policy planners and implementers
- Health care professionals
- Development partners
- Academies of science and researchers
- Civil society and communities
Actions for researchers

• Invest in the right research using systematic priority setting
• Implement effective research strategies that inform health systems
• Involve stakeholders in the process of priority setting
• Share knowledge with policy makers and program implementers
Conclusions

• Many proven interventions that can be combined into maternal, neonatal, child service packages

• Health system strength and local context are critical re what is feasible to deliver

• LiST useful to support priority setting

• With modest increases in intervention coverage there can be substantial reductions in deaths

• With high coverage up to 4M deaths could be averted annually