Background

- Diarrhea related mortality has decreased in recent decades as countries improve social, economical, and environmental conditions.1
- However, diarrhea remains a leading cause of mortality among children under 5, causing nearly 500,000 deaths in 2015.2,3
- Understanding the drivers of mortality in the past two decades will be useful in achieving sustainable global development goals of reducing child mortality diarrhea associated deaths to less than 1 per 1,000 live births.3
- Mathematical modeling suggests drivers for changes in diarrhea mortality include reduction in unsafe sanitation, childhood wasting and an increase in oral rehydration solution coverage.4,5
- Primary collected data on diarrhea mortality and risk factors will complement mathematical models to understand the drivers of the decline in diarrhea mortality.

Objective & Hypotheses

1) Quantify the prevalence of diarrhea risk factors and interventions.
2) Assess the relative contribution of these factors on diarrhea mortality.
3) Assess the contribution of change in risk factor prevalence on diarrhea mortality over time.

Hypotheses: We expected to see a decline in risk factors for diarrhea mortality such as unsafe water and sanitation and malnutrition and an increase in interventions to prevent diarrhea such as rotavirus vaccine and oral rehydration solution (ORS) coverage.

We expect changes in rotavirus and oral rehydration solution coverage as well as a reduction in malnutrition to be the biggest drivers in the decline of diarrhea mortality between GEMS and VIDA.

Methods

Participants/study sites:

Study Design:
- Each country site provided a censused population study through a demographic surveillance system (DSS) updated two to four times per year.
- CASES: Children aged 0-59 months with moderate-to-severe diarrhea were enrolled from sentinel health centers.
- CONTROLS: Up to 3 controls per case, matched by age, sex, and neighborhood, were randomly selected from the DSS and enrolled within 14 days of the case enrollment. Controls were excluded if they had diarrhea in the previous 7 days.
- Cases and controls were followed up ~60 days for health status.
- The proportion of children with moderate to severe diarrhea who sought care at a sentinel health centers (r-value; derived from DSS interviews) was used to derive prevalence estimates for the population.

Statistical Analysis:
- Prevalence of risks and interventions: Coverage of ORS for treatment of enrollment diarrhea only taken from cases, all other risks and interventions were taken only from the controls at enrollment. Proportions of cases or controls exposed to each factor, the estimated DSS population, and the r-value were used to calculate the population-level prevalence for each factor by age group, site, and study. Risks and interventions were established through literature review and data available from GEMS and VIDA.
- Mortality: Average annual deaths among cases, the DSS population, and r-value for each age group, site, and study.
- Population attributable fraction (PAF): We used the causal risk ratio (RR) and theoretical minimal risk exposure level (TMREL) from literature as well as the above calculated prevalence of risk to calculate PAF per factor, age group, site, and study.
- Drivers of change in diarrhea mortality: We used a decomposition of the effects of change in risk exposure on the diarrhea mortality rate between GEMS and VIDA while accounting for independent effects of population growth, population ageing, and the underlying mortality rate.

Results

Table 1: Enrollment of cases and controls in GEMS and VIDA across three country sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>GEMS</th>
<th>VIDA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases</td>
<td>Controls</td>
</tr>
<tr>
<td>Basse &amp; Bansang</td>
<td>1,029</td>
<td>1,569</td>
</tr>
<tr>
<td>Nyanza Province</td>
<td>1,476</td>
<td>1,883</td>
</tr>
<tr>
<td>Bamako, Mali</td>
<td>2,033</td>
<td>2,064</td>
</tr>
<tr>
<td>Total</td>
<td>4,538</td>
<td>5,526</td>
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</tbody>
</table>

Figure 1: VIDA Sites: The Gambia, Kenya, Mali

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References