Measuring Mortality in HIV-Focused Surveys: Experiences from the PHIA Project

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Outline

• ICAP at Columbia University

• Population HIV Impact Assessment (PHIA) Overview and Methods

• PHIA mortality results from six countries
  • Number of household deaths in past 3 years
  • Mortality results by age
  • Crude household mortality rates by household HIV and TB comorbidity status

• Discussion
Acknowledgements

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Survey participants

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Kay Yuengling
ICAP at Columbia University, Mailman School of Public Health

- leader in global public health with a broad portfolio of projects:
  - HIV, tuberculosis, malaria, maternal & child health, NCDs, COVID-19

Mission: Through innovative research, collaborative technical assistance, and a focus on strengthening health systems, ICAP transforms the health of populations and helps to create better, more accessible, health services to reduce the burden of illness on people and communities.
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**Asia & Europe**
Kazakhstan, Kyrgyzstan, Myanmar, Tajikistan
Population-based HIV Impact Assessment (PHIA) Project
Goal: Conduct nationally representative, HIV-focused household surveys to assess the status of the HIV epidemic and impact of national programs:

- 1° objectives: National HIV incidence and national prevalence of viral load suppression (HIV RNA <1,000 c/mL)
- 2° objectives: Subnational adult and pediatric HIV prevalence, HIV drug resistance, HIV knowledge, CD4 distribution, ART levels, SRH +
## PHIA Project Methods: Survey Design, Sample Size, Eligibility & Data Collection

<table>
<thead>
<tr>
<th>Survey Design</th>
<th>Cross-sectional, two-stage cluster sample of households in enumeration areas → nationally representative cohorts</th>
</tr>
</thead>
</table>
| Precision and Sample size | Powered for national HIV incidence and subnational viral load suppression  
Incidence: Relative standard error ≤ 0.30  
Viral load suppression (VLS): 95% confidence intervals between 5-10%  
→ ~ 30,000 participants, including 5,000 -10,000 children, per country |
| Eligibility | People who slept in the selected household the night before the survey |
| Questionnaires | Household, adult and adolescent demographic, behavioral and clinical information on HIV testing, status and treatment; HIV KAP; reproductive health and sexual activity, TB, etc. |
| Lab testing | HIV rapid and CD4 testing in the household; HIV RNA, LAg-Avidity EIA in lab |
| Data collection | Electronic data capture, approximately six months of field work |
| Weighting | Sample weighted to adjust for selection probability, differences in non-response (CHAID analysis) and to achieve population representativeness |
Data Quality: High Participation

  - Average household response 90.4%
    - Highest in Rwanda (2018-2019): 98.9%
    - Lowest in Zimbabwe (2015-2015): 83.9%
  - Average individual interview response for all adults 15+ of 91.9%
    - Highest in Rwanda (2018 – 2019): 99.0%
    - Lowest in Zambia (2015): 86.3%
  - Average individual interview response for women of 94%
  - Average individual interview response for men of 88.3%
PHIA Results

Fieldwork completed in 15 countries

469,713 Blood Draws Conducted

196,573 Households Interviewed

as of August 2022
PHIA 2015-2018 – Progress Toward UNAIDS 90-90-90 Targets

- People Living with HIV (%)

<table>
<thead>
<tr>
<th>Country</th>
<th>Diagnosed</th>
<th>On Treatment</th>
<th>Virally suppressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eswatini</td>
<td>87</td>
<td>88.8</td>
<td>91.4</td>
</tr>
<tr>
<td>Namibia</td>
<td>86</td>
<td>96.4</td>
<td>91.3</td>
</tr>
<tr>
<td>Lesotho</td>
<td>81</td>
<td>91.8</td>
<td>87.7</td>
</tr>
<tr>
<td>Malawi</td>
<td>76.8</td>
<td>91.4</td>
<td>91.3</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>76.8</td>
<td>88.4</td>
<td>85.3</td>
</tr>
<tr>
<td>Uganda</td>
<td>72.5</td>
<td>90.4</td>
<td>83.7</td>
</tr>
</tbody>
</table>

- People Living with HIV (%)

<table>
<thead>
<tr>
<th>Country</th>
<th>Diagnosed</th>
<th>On Treatment</th>
<th>Virally suppressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia†</td>
<td>72</td>
<td>98.6</td>
<td>89.6</td>
</tr>
<tr>
<td>Zambia</td>
<td>71.4</td>
<td>87.1</td>
<td>89.2</td>
</tr>
<tr>
<td>Tanzania</td>
<td>60.6</td>
<td>93.6</td>
<td>87</td>
</tr>
<tr>
<td>Cameroon</td>
<td>55.6</td>
<td>93.1</td>
<td>80.1</td>
</tr>
<tr>
<td>Côte d'Ivoire†</td>
<td>37.2</td>
<td>88.1</td>
<td>75.9</td>
</tr>
</tbody>
</table>

*Adjusted for ARVs unless otherwise specified; †Not adjusted for ARVs;
Column labels indicate conditional proportions; Column heights indicate unconditional proportions

https://phiaicap.columbia.edu/
PHIA Mortality Questions

The head of household is asked to provide information about "the persons who usually live in your household or guests of the household who stayed here last night":

1) “Has any usual resident of your household died since [Year – three years before survey]?”
   • Yes/No

2) “How many usual household residents died since [Year – three years before survey]?”
   • Number of deaths

3) “When did [NAME] die? Please give your best guess
   • Year, Month, Day

4) “Was [NAME] male or female?
   • Male/Female

5) “How old was [NAME] when he/she died?”
   • X Years, Don’t Know, Refused
<table>
<thead>
<tr>
<th>Country</th>
<th>Survey Year(s)</th>
<th>Deaths date cutoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameroon</td>
<td>2017-2018</td>
<td>January 1, 2014</td>
</tr>
<tr>
<td>Cote d'Ivoire</td>
<td>2017-2018</td>
<td>January 1, 2015</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>2017-2018</td>
<td>January 1, 2015</td>
</tr>
<tr>
<td>Malawi</td>
<td>2015-2016</td>
<td>January 1, 2013</td>
</tr>
<tr>
<td>Tanzania</td>
<td>2016-2017</td>
<td>January 1, 2014</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>2015-2016</td>
<td>January 1, 2013</td>
</tr>
</tbody>
</table>
PHIA Data Sets Selected

ZIMBABWE* (2015-16)
MALAWI (2015-16)
TANZANIA* (2016-17)
CAMEROON (2017-18)
COTE D'IVOIRE (2017-18)
ETHIOPIA (2017-18)

Inclusion: ages 0-64 y for these surveys
*Did not include an age cut off

Data are currently available to the public, by request at https://phia-data.icap.columbia.edu/

Additional PHIA data will be released to the public according to the schedule here: https://phia.icap.columbia.edu/surveys/timeline/
Data Quality Note: Very Complete Data

No missing data on age and gender

Self-reported household mortality data very complete:
  • Of households interviewed, only 0.1% were missing mortality data
    • Highest in Zimbabwe and Malawi (99.9% complete)
    • Lowest in Cameroon (99.7%)

Blood test response rates were typically high
  • Of interviewed men, 6.5% were missing a final HIV status
  • Of interviewed women, 5.4% were missing a final HIV status
## Households reporting death of a household member in past 3 years, selected PHIA countries

<table>
<thead>
<tr>
<th>Country</th>
<th># of households interviewed</th>
<th>% of households reporting any deaths (unweighted)</th>
<th>% of households reporting any deaths (weighted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameroon</td>
<td>11,623</td>
<td>12.9</td>
<td>11.5</td>
</tr>
<tr>
<td>Cote d'Ivoire</td>
<td>8,983</td>
<td>7.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>10,529</td>
<td>3.7</td>
<td>3.8</td>
</tr>
<tr>
<td>Malawi</td>
<td>11,386</td>
<td>8.8</td>
<td>9.0</td>
</tr>
<tr>
<td>Tanzania</td>
<td>14,811</td>
<td>8.2</td>
<td>8.3</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>11,717</td>
<td>10.4</td>
<td>10.0</td>
</tr>
<tr>
<td>Region</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>------------</td>
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<td>----</td>
</tr>
<tr>
<td>Cameroon</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cote d’Ivoire</td>
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<tr>
<td>Tanzania</td>
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<tr>
<td>Ethiopia</td>
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<tr>
<td>Malawi</td>
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<td></td>
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<tr>
<td>Zimbabwe</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mortality Results (by age)

Cameroon

Cote d'Ivoire

Ethiopia

Malawi

Tanzania

Zimbabwe

0-5 6-14 15-24 25-34 35-44 45-54 55-64 65+

icap Global Health
## Crude Death Rate Over 3 Years, selected countries

<table>
<thead>
<tr>
<th>Characteristic*</th>
<th>Cameroon</th>
<th>Cote d'Ivoire</th>
<th>Ethiopia</th>
<th>Malawi</th>
<th>Tanzania</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # household deaths (N)</td>
<td>1767</td>
<td>729</td>
<td>407</td>
<td>891</td>
<td>1359</td>
<td>1208</td>
</tr>
<tr>
<td>Total de facto household population</td>
<td>54,553</td>
<td>39,270</td>
<td>34,093</td>
<td>44,658</td>
<td>67,667</td>
<td>46,787</td>
</tr>
<tr>
<td>Crude death rate for the three years before the PHIA survey per 1,000 people</td>
<td>32.39</td>
<td>18.56</td>
<td>11.94</td>
<td>19.95</td>
<td>20.08</td>
<td>25.82</td>
</tr>
</tbody>
</table>

*Unweighted counts

Notes: Death count are from the three years before each survey; Population denominator for the crude death rate calculation includes all de facto household members, including guests who slept over the night before the survey; Crude death rate calculation = (Total deaths in PHIA households during the three years before the survey/Total de facto household population reported during the PHIA survey) * 1,000
<table>
<thead>
<tr>
<th>Category</th>
<th>Crude Death Rate /1,000 over 3 years prior to PHIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLWH in Household</td>
<td>29.64</td>
</tr>
<tr>
<td>No PLWH in Household</td>
<td>19.81</td>
</tr>
<tr>
<td>PLWTB in Household</td>
<td>24.31</td>
</tr>
<tr>
<td>No PLWTB in Household</td>
<td>20.64</td>
</tr>
<tr>
<td>Both in Household</td>
<td>27.44</td>
</tr>
<tr>
<td>Neither in Household</td>
<td>19.79</td>
</tr>
</tbody>
</table>
Crude Death Rate by Household HIV Status

Crude death rate for the three years before the PHIA survey among households with any PLHIV per 1,000

Crude death rate for the three years before the PHIA survey among households without any PLHIV per 1,000

Countries included:
- Cameroon
- Cote d'Ivoire
- Ethiopia
- Malawi
- Tanzania
- Zimbabwe

Graph shows the comparison of crude death rates among households with and without HIV in these countries.
Crude Death Rate by Household TB Status

Crude death rate for the three years before the PHIA survey among households with anyone with TB per 1,000.

Crude death rate for the three years before the PHIA survey among households without anyone with TB per 1,000.
Crude Death Rate by Household HIV and TB Status

- Cameroon: Crude death rate for the three years before the PHIA survey among households with anyone with HIV or TB per 1,000
- Côte d'Ivoire: Crude death rate for the three years before the PHIA survey among households with anyone with HIV or TB per 1,000
- Ethiopia: Crude death rate for the three years before the PHIA survey among households with anyone with HIV or TB per 1,000
- Malawi: Crude death rate for the three years before the PHIA survey among households with anyone with HIV or TB per 1,000
- Tanzania: Crude death rate for the three years before the PHIA survey among households with anyone with HIV or TB per 1,000
- Zimbabwe: Crude death rate for the three years before the PHIA survey among households with anyone with HIV or TB per 1,000

For households without anyone with HIV or TB per 1,000:
- Cameroon: 30
- Côte d'Ivoire: 25
- Ethiopia: 15
- Malawi: 20
- Tanzania: 25
- Zimbabwe: 30
Key Takeaways

• Feasible to include standardized mortality questions in household questionnaire of HIV-focused nationally representative PHIA surveys, with collection of detailed biomarker data.

• Between 2015-2019, in 6 selected countries, 4-12% of households reported deaths in the 3 prior years.

• Crude mortality rates ranged from 12 to 32/1000 persons over 3 years in six selected countries.

• HHs with residents who had verified HIV and/or reported TB showed, as expected, higher patterns in crude mortality rates compared to HHs with residents who did not have HIV or TB.
Key Takeaways

- Feasible to include standardized mortality questions in household questionnaire of HIV-focused nationally representative PHIA surveys, with collection of detailed biomarker data.
- Between 2015-2019, in 6 selected countries, 4-12% of households reported deaths in the 3 prior years.
- Crude mortality rates ranged from 12 to 32/1000 persons over 3 years in six selected countries.
- HHs with residents who had verified HIV and/or reported TB showed, as expected, higher patterns in crude mortality rates compared to HHs with residents who did not have HIV or TB.
Discussion

• All prior to COVID

• Reference period was based on a specific date but the ~3 yr recall period varied during data collection and enrollment periods differed by country

• Face to face data collection

• Weights adjusted for non-response

• District level estimates possible

• Mortality questions could be refined to collect more details and interviewers could use standardized methods (eg, Timeline Follow Back) to enhance participant recall

• Implications for COVID-19 surveys
Thank You