A Business Case for a Sample Registration System (SRS) in Ghana

Philip Setel (Data for Impact/Vital Strategies)
William Weiss (USAID)
Williams Kwarah (USAID)

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Purpose

- Clearly communicate the case for Ghana to use total and cause-specific mortality data and outputs from sample registration system (SRS) to meet numerous policy and practice-relevant information needs
- Clearly communicate the role SRS can play in Health Security
- Make the technical case for co-funding
- Understand the challenge, the solution set, and the comparative advantages and costs of an SRS system in Ghana

Sample Registration System (SRS)

- Continuously tracks births, deaths, causes of death in representative sample of national population
- Updates population denominators in sampled areas
- Embedded in CRVS system

The Challenge

- No system exists that permits the government of Ghana to reliably and continuously collect and use its own mortality data in a timely manner at the national and subnational levels
  - Deprives policy-makers of crucial public health intelligence on disease burdens
  - Renders monitoring and evaluation of the mortality impact of scaled policies and programs difficult to impossible
  - Compromises health security, makes it impossible to measure mortality impact of public health emergencies
- Census may provide total mortality, but too infrequently. Most mortality estimates are limited to rates of all-cause under-five mortality, or limited to specific mortality events (e.g., maternal deaths) without the underlying causes
  - Modeled estimates are available,[1] but problematic and have little country buy-in
- Ghana has many of the necessary institutions in place to solve the problem, but would require strengthening existing capacity and new skills transfer (e.g., training and supervision in verbal autopsy); coordination and collaboration among stakeholder ministries; a unifying structure at the national level to ensure the necessary long-term commitment, and adequate long-term resource advocacy and mobilization

Problem Statement

- Gaps in near-time mortality rate and cause data in Ghana hinder government efforts to serve and protect the population from preventable causes and emerging threats
- Lack of sub-national data hamper the development of health policies designed to address subnational variations in disease burden

Purpose

- To enable the government of Ghana to continuously and reliably, collect, analyze, and use its own data on levels and causes of mortality at the national and subnational levels for priority-setting, policy-making, and monitoring of impact of scaled health programs and policies

Values and Core Principles

Selecting a solution to address the current state of mortality measurement in Ghana depends on an agreed set of values and principles, including:

- A country's ability to collect and use its own health and population data (including deaths and causes of death) in near-time is central to its health security
- Registration, cause of death data production, and mortality surveillance are functions of the civil registration and vital statistics (CRVS) system that should be embedded in the institutions and operations legally responsible for them, including public health agencies and institutes
- Low- and middle-income countries (LMIC) should be supported to achieve the same standards of acceptable public health intelligence data as high-income countries
    - US government established analogous principles by ensuring LMIC access to anti-retroviral therapies for HIV/AIDS through the President's Emergency Plan for AIDS Relief (PEPFAR)
- Sustainability is best achieved by strengthening the capacity of stakeholder institutions combined with effective issue advocacy, change management, and budget advocacy
- SRS should be established quickly and used to inform scalable, cost-effective, and sustainable innovations for long-term CRVS improvement
- Regional efforts to strengthen continent- and country-wide mortality surveillance and build African capacity such as that of the Africa CDC should be supported

Scope, Scale, and Implementation

Scope

- Notification and registration of all incident births and deaths in sampled/model areas
- Assignment of cause of death to all incident deaths in sampled/model areas
- Collection of data on social causes and circumstances surrounding mortality in a sample of community deaths (e.g., care seeking and service use before death)
- Production of routine outputs for use in surveillance, policy and planning, and impact assessment

Scale

- An SRS is a nation-wide undertaking, requiring the establishment of government owned and operated surveillance sites in every region and investment at the central level to ensure collaboration, coordination, analytic, and data use capacities
- Scale will be driven by balancing
    - Resource availability
    - Necessary size of national sample to achieve desired level of reliable sub-national measures of total and cause-specific mortality

Implementation

- Implementation will be phased, starting with sampled areas in USAID regions of support

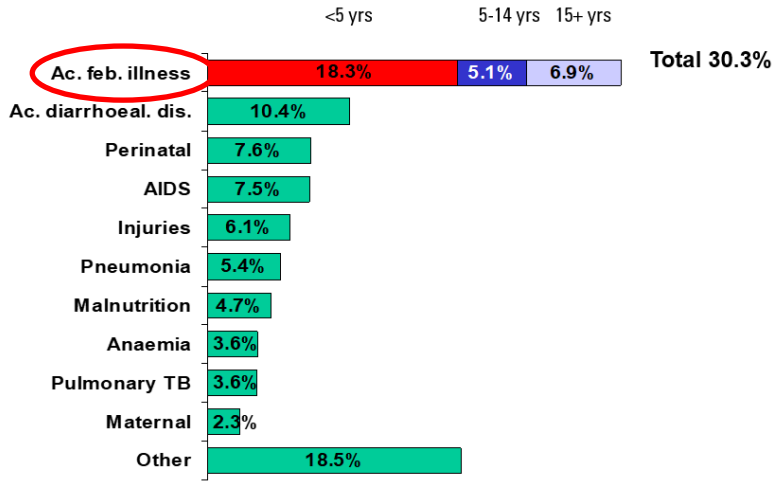
SRS is Feasible and Leads to Action

3 SRS systems in Africa as sample use cases

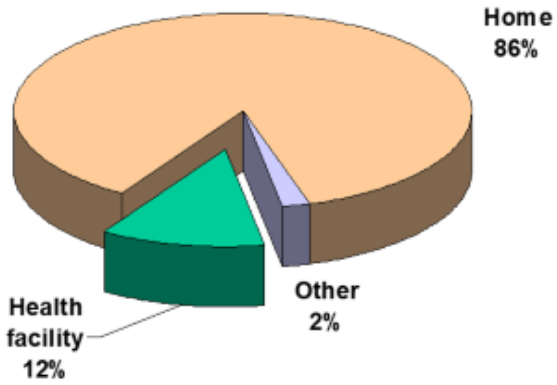
- **Sierra Leone** (2018–present)**:** Uncovered significant, previously undetected malaria mortality in adults. Led to deeper investigation, triangulation with other data sources, and influenced current policy discussions. Other findings led WHO to revise estimate of maternal mortality downward for Sierra Leone.[2]
- **Mozambique** (2018–present)**:** Fully integrated into government systems in 2022. Most recent data currently being fed into regional policy and planning process.
- **Tanzania** (1992–2004)**:** Uncovered huge burden of child malaria mortality occurring at home after treatment; district reallocated annual budget to establish bed net revolving fund; government changed first-line malaria drug.[3] Data also used to develop national NCD policy.[4]

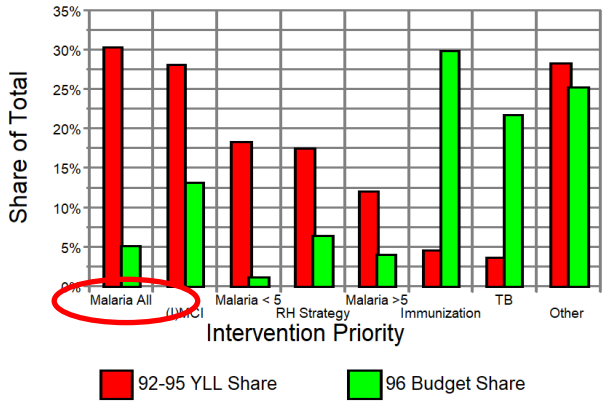
Better Allocative Efficiency

Greater impact can be achieved by closer alignment of budget priorities with disease burdens

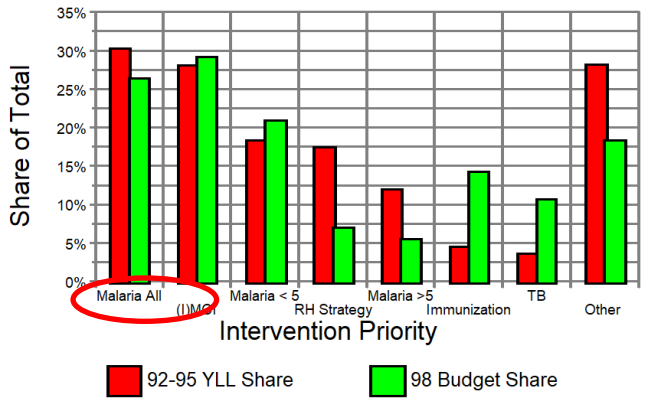


Acute Febrile Illness, including Malaria





Place of death all ages, both sexes 1992–1995



Existing Alternatives do not Meet the Need

Only SRS has the necessary combination of timeliness, representativeness, and cause of death data production

System	Representativeness	Sustainability	Timeliness	Mortality	Tradeoffs
National Census	• Entire population • High completeness	High	Once per decade	• Total & maternal mortality • No cause of death	• Inadequate timeliness • No cause of death
Surveys (e.g., DHS, MICS)	• National level • Regional level for some indicators • High for sample clusters	Medium	Five years	• Maternal and child mortality • Specific causes only with addition of verbal autopsy module	• Sample sizes usually too small to obtain cause data • Not timely
Health and Demographic Surveillance	• Not representative • High for surveillance site	Medium	Varies	• Varies	• Not representative
CRVS	• Entire population • Birth registration high (>80%) • Death registration low (<30%)	High	Currently no routinely produced statistical outputs	• Only for facility deaths	• Low completeness • Timeliness • Biased cause of death data
SRS	• **National and subnational levels** • **High for sampled/model areas**	**High**	**Continuous, near time**	• **Total and cause-specific mortality**	• Requires establishment & maintenance of sample sites

Comparative Costs

System	Annualized Cost	Five-year Cost	Ten-year Cost	Comment
National Population and Housing Census	$4.5m		$45.5	From government allocation for NPHC 2021
Demographic and Health Survey	$1m	$5m	$10m	USAID Contribution
Health and Demographic Surveillance Sites	Varies	Varies	Varies	Varies by site size and field methodology
Civil Registration and Vital Statistics System	$1.1m	$5.5m	$11m	From government appropriation bill
Sample Mortality Surveillance System	$0.78m–1.1m	$3.9–$5.5m	$7.8–$11m	[2,5]

What Does Success Look Like?

A Well-Functioning SRS delivers on the Pillars of Success

Primary Benefits

Pillar 1
Data-driven decision making

- Provides continuous source of crucial mortality burden data to prioritize, design, implement, and monitor scaled health and social policies
- Builds culture of collection and use of Ghana's own high quality mortality data

Pillar 2
Contributing to Health Security

- May enable detection and provides platform for deeper investigation and response to nearby outbreaks
- Total/Excess mortality measurement under pandemic conditions
- Platform for integrated disease surveillance

Pillar 3
CRVS Improvement

- Opportunity to develop, implement and ultimately scale optimal vital event notification & registration practices to achieve universal registration
- Creates in-country management and technical capacity

Secondary Benefits

Provides development partners and the global health community with accurate, current measures of core population health indicators

Population denominators

Tracking of health-related SDGs

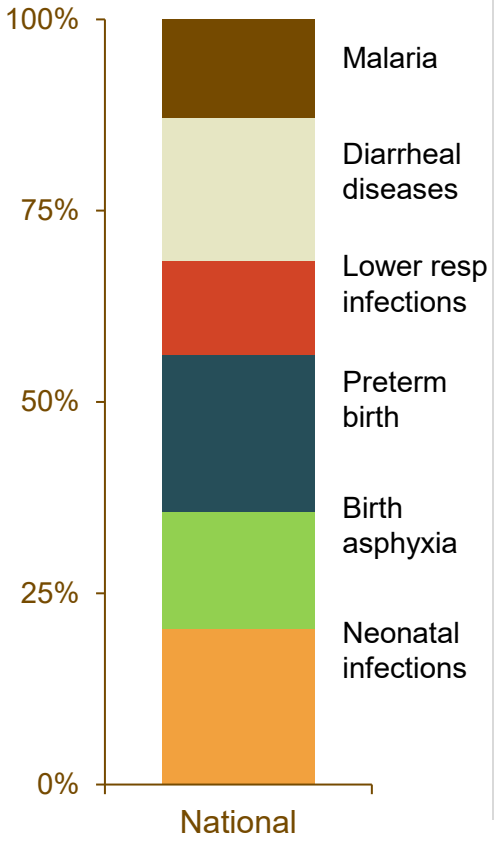
Cost savings by dropping mortality modules from household surveys

Adapted from [6]

Pillar 1: Data-Driven Decision Making

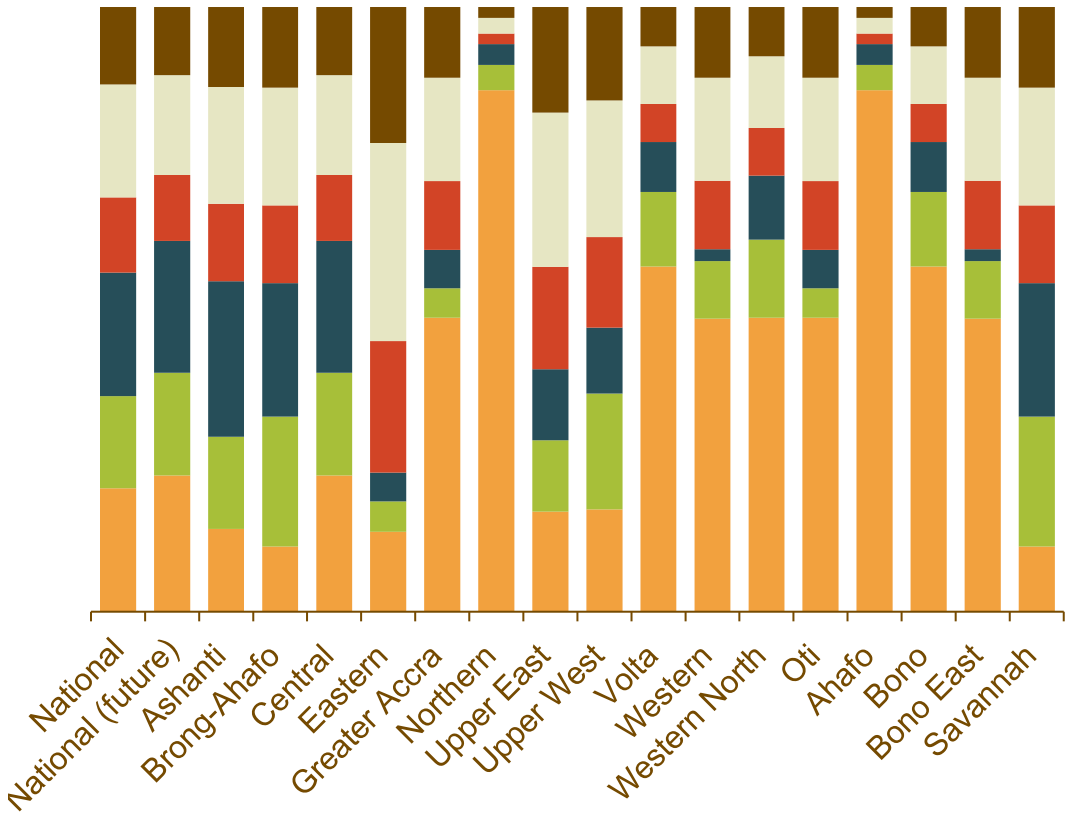
Accurate sub-national mortality data allows for targeted prioritization

Current state Under 5 Causes of Death[2]



- Low completion of national death registration data contributes to inaccurate aggregate estimates
- National estimates derived from models (e.g., GBD) and lack credibility
- Infrequent survey cycles result in outdated estimates

Hypothetical future scenario with SRS Data



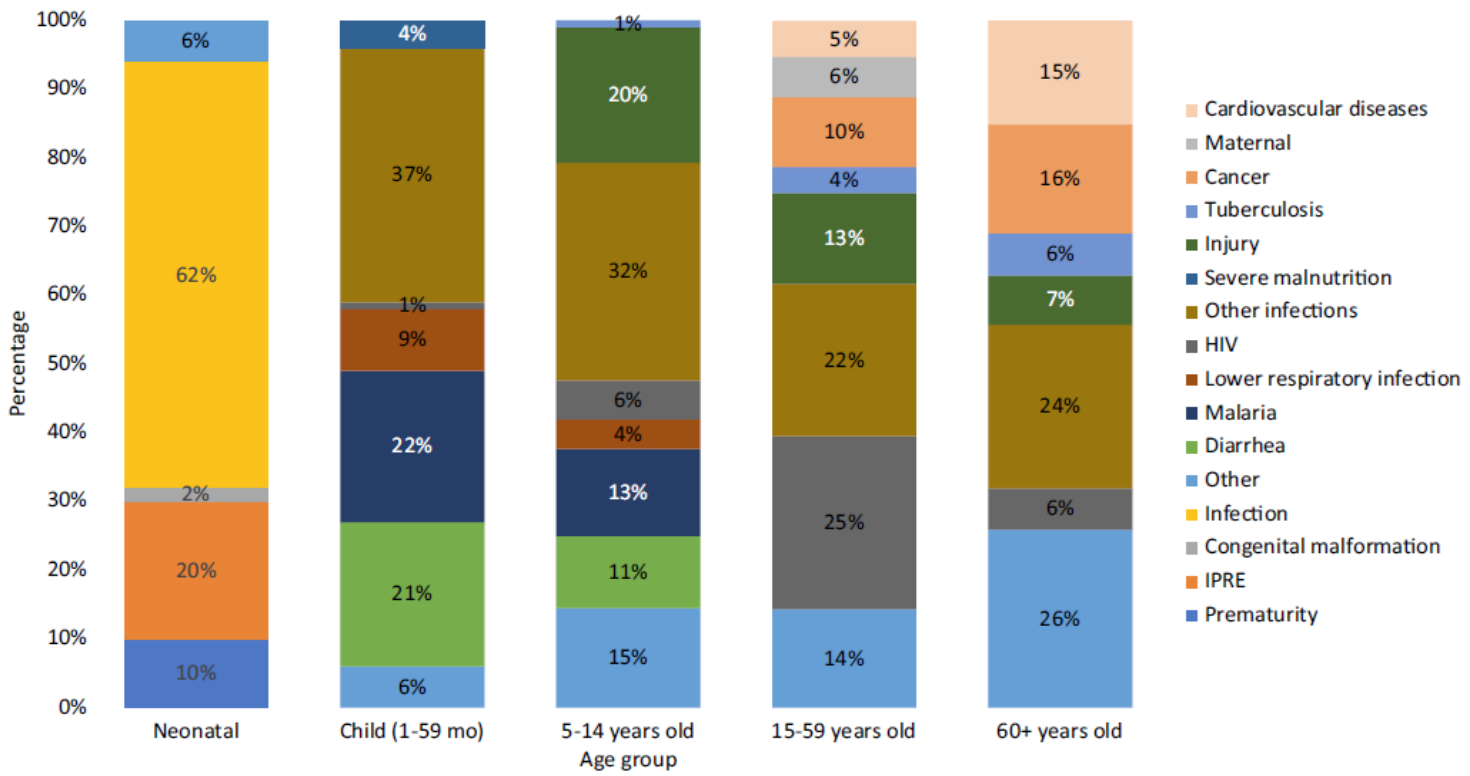
- With SRS, national data measures COD distribution
- Accurate sub-national COD burden available and regularly updated, permitting analysis of trends

1. This slide is adapted from [6]
2. All data on this slide is hypothetical – not based on models or measurements for Ghana

Mozambique Example: Causes of Death by Age Group

- Provides proportional cause of death data for all age groups
- Demonstrates to Networks/MOH need for tiered services: acute and episodic care for under 5s (infections), long-term care and management for adults (CVD; Cancer)

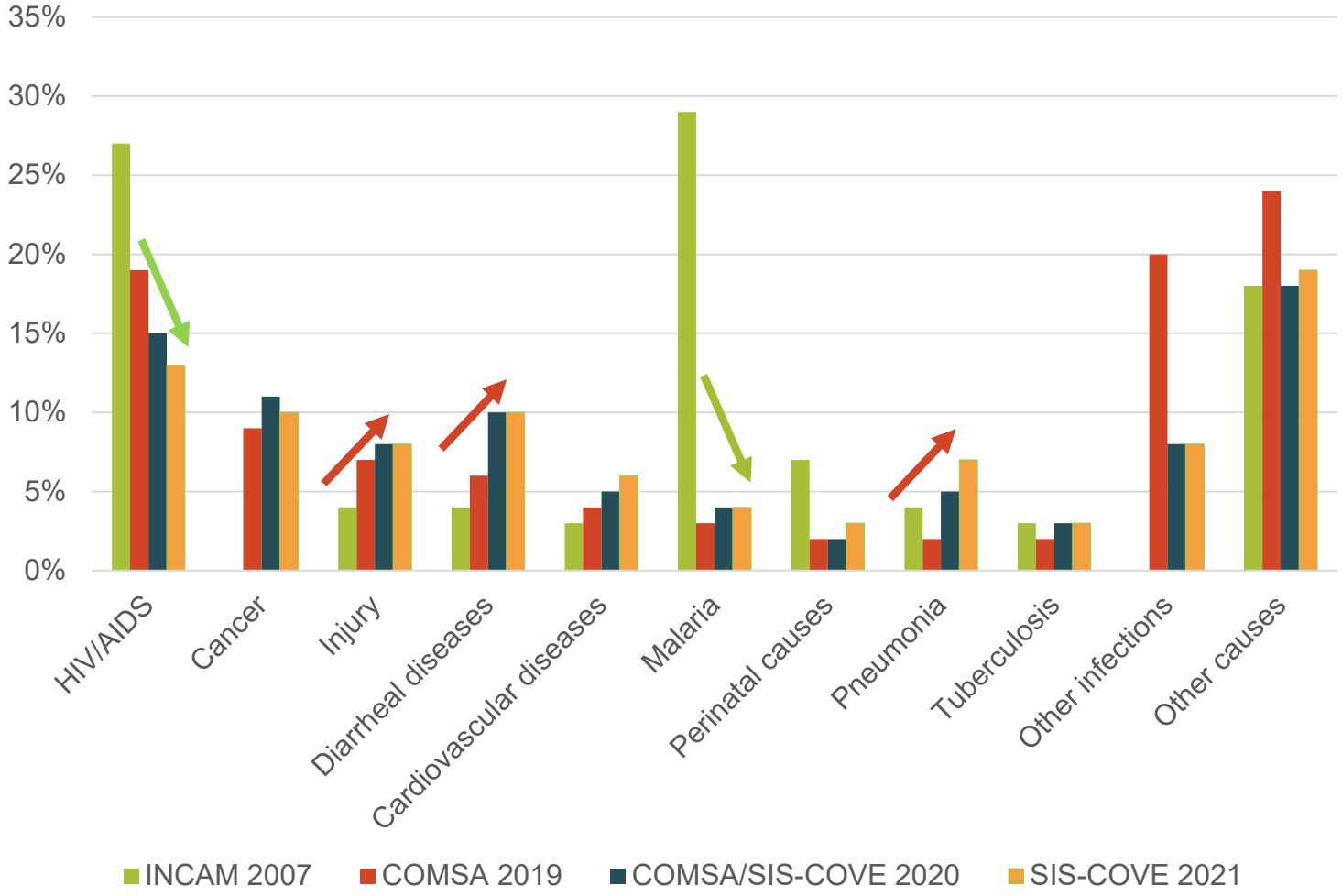
Cause of death fraction (%) by age Group - COMSA Data 2019-2020[7]



Mortality Trends for Multiple Causes

- Shows trends in leading causes of death
- Note decreases in HIV/AIDS and malaria
- Note rise in NCDs and increase of pneumonia deaths during Covid pandemic

Trend in proportional mortality in Mozambique showing declines and increases 2007, 2019–2021[7]



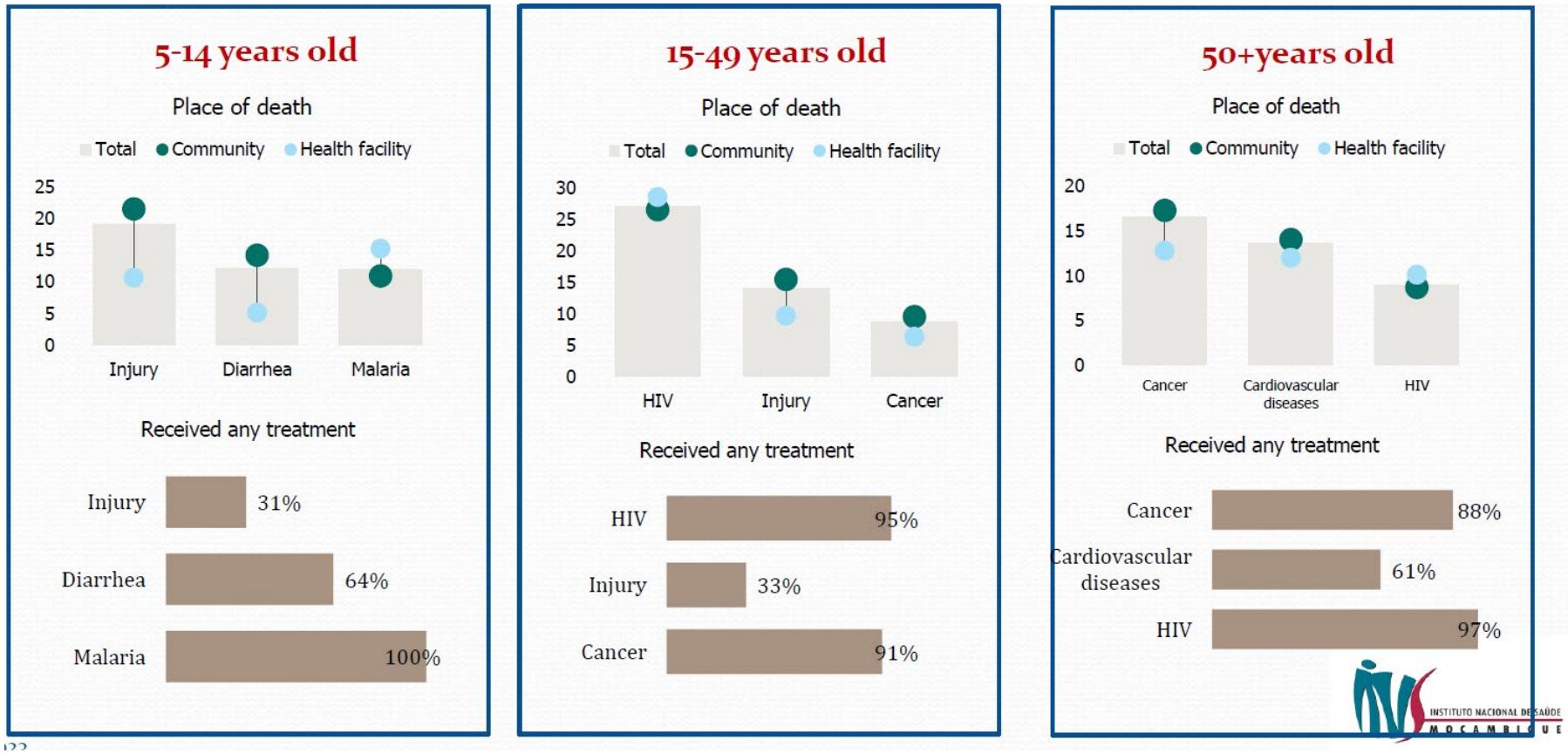
Timely Source of Mortality Rates

Adults ages 30–69 cause specific mortality rates, Sierra Leone 2022[2]

30-69 years deaths in HEAL-SL	study deaths (male/female)	National annual deaths	Mortality rates (100,000 pop)
Malaria	647 (356/291)	2928	112.9 (108.9-117.1)
Stroke	415 (213/202)	1978	76.3 (73-79.7)
Ischaemic heart	316 (174/142)	1510	58.2 (55.3-61.2)
Other infections	287 (163/124)	1710	66 (62.9-69.2)
Diarrhoea	265 (134/131)	1418	54.7 (51.9-57.6)
Tuberculosis	215 (140/75)	1184	45.7 (43.2-48.4)
Pneumonia	210 (125/85)	1013	39.1 (36.8-41.6)
Liver and alcohol related	189 (119/70)	904	34.9 (32.7-37.3)
Road traffic accidents	180 (129/51)	838	32.3 (30.2-34.6)
Other digestive	177 (142/35)	1013	39.1 (36.8-41.6)
Gastroesophageal	140 (78/62)	767	29.6 (27.6-31.8)
All 30-69 years	**4708 (2664/2044)**	**23735**	**915.2 (903.6-926.9)**

Only Continuous Source of Social Factors Related to Death

Place of death and treatment among deceased, Mozambique[7]



Pillar 2: Contributing to Health Security

Contribution	Current Status	Case or Potential Benefit
Contributing to early outbreak detection, investigation and response	No routine system capable of detecting outbreaks of known epidemic-prone or new, fatal diseases	Prepared and trained teams of verbal autopsy interviewers and supervisors can be mobilized as part of outbreak detection and response effort
Timely measurement of excess mortality during a pandemic	Limited, un-sustained success implementing rapid mortality surveillance in hospitals only, no timely source of community mortality	Direct measurement of excess mortality due to pandemics
Integrated Collaborative Surveillance	Siloed surveillance, no mortality surveillance	Contributes to Health Security and MOH-led use of multiple surveillance system outputs for comprehensive approach to early detection, response and impact measurement

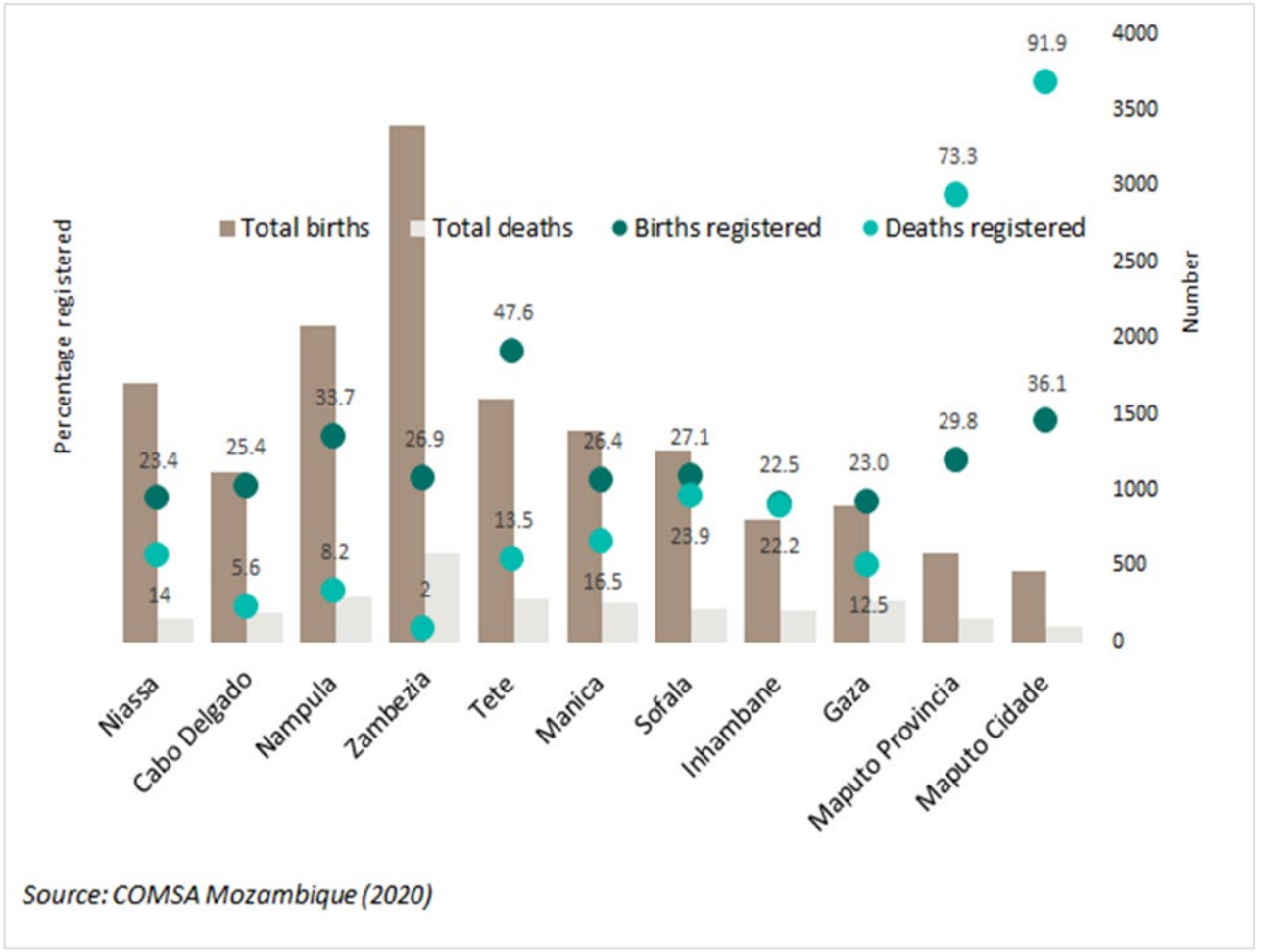
Pillar 3: CRVS Learning and Improvement

Function	Current Status	Opportunities for Improvement Through SRS
Death notification and registration (BDR)	Low completeness	Design and implement sustainable, scalable active death notification for eventual national expansion
Causes of death in population (MOH)	Cause of death available only at facilities; 70–80% mortality occurs elsewhere	Develop complete picture of leading causes of death by age group and sex through application of verbal autopsy; strengthened cause of death certification at health facilities

Opportunity for CRVS Innovation and Improvement

- In Mozambique, SRS continuously tracks registration completeness
- Currently serving as platform to test e-notification of vital events at scale to improve country-wide completeness of birth and death registration

Percentage of births and deaths registered through civil registration and total number of births and deaths by province (2020)



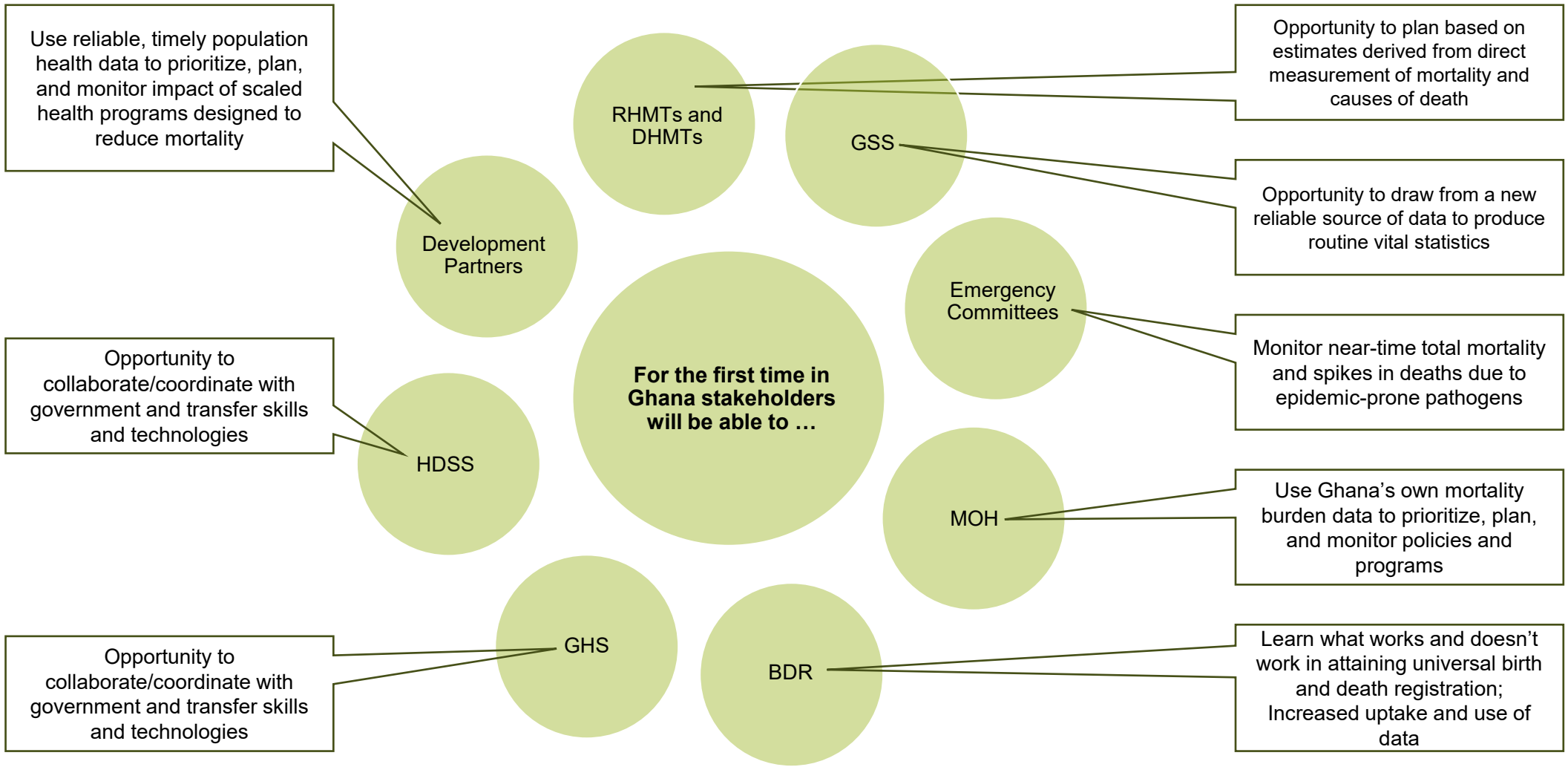
Source: COMSA Mozambique (2020)

Compliance with Global Best Practice

- Civil Registration system already largely comports to international best practice according to UN Principles and Guidelines[8]
- Cause of death for facility and community data collected and analyzed according to WHO standards (International Classification of Diseases); WHO standard verbal autopsy
- System will adhere to Ghanaian regulations on digital data standards, security, and interoperability

Benefits Analysis and Return on Investment

Beneficiaries and Benefits of an SRS



Operational Efficiency

- An SRS represents the most operationally efficient system to achieve the intended purpose of equipping the government of Ghana with the ability to collect and use its own timely and continuous source of reliable and representative mortality data
- Should obviate need for other scaled mortality measurement efforts
- Other efficiencies are gained by the institutionalization of SRS functions in existing institutions and not establishing parallel structures and business processes
- Operational efficiency of the system will be achieved by digitization and applying contemporary business process mapping and design practices
- Parsimonious sampling will contribute to operational efficiency

Cost, Cost Drivers, and Return on Investment

Cost Savings & Return on Investment

- Scant research on cost and benefits or ROI of health information systems in LMIC,[9] though recent research by the UN[10] suggests up a $32 return on every dollar invested in a country's information ecosystem.
- Potential savings will not entirely offset system costs
  - Could drop mortality modules from household surveys (e.g., DHS or MICS)
  - Would avoid costs of mortality-specific data collection (e.g., maternal mortality surveys)

Costs and Cost Drivers

Scant literature on costs of system operations

- Mozambique (COMSA/SIS-COVE)[5] includes updating cluster denominators
- Sierra Leone (HEAL-SL)[2] does not include costs for updating denominators

Cost	COMSA/SIS-COVE	HEAL-SL
Per capita (annual)	$1–$1.30	
Start up	$2 million Infrastructure, technology, training (80% of start-up costs)	
Operational	$1 million Wages, data collection incentives (66% of operational costs)	$780,000

Risk Assessment

Operational Risks and Mitigation Strategies

- Institutional roles need further clarity to ensure necessary coordination and collaboration among stakeholders
  - Seek guidance from MOH
- Governance structure and convening authority(ies) need further clarity or needs officialization
  - Seek support from President's or Vice President's Office
- Buy-in for change among stakeholders needed
  - Advocate with stakeholders at all levels for vision and benefits of SRS
- Ensure fair remuneration for human resources within limits of government regulations
  - Need for cost-sharing
- Support appropriate government partner to undertake issue and budget advocacy to Ministry of Finance and Economic Planning
  - Seek buy-in from in-country Development Partners, focusing on their areas of strategic priorities in health

Technical Risks and Mitigation Strategies

- Sample is not representative or otherwise problematic
  - Foster/offer technical partnership for GSS to strengthen sampling capacity
- Completeness of vital events notification and registration below target
  - Supportive supervision
  - Evaluate protocols and incentives for active notification of vital events
- Completeness (total and by age and sex) of verbal autopsy data below target
  - Supportive supervision
  - Evaluate protocols and incentives for verbal autopsy follow-up
- Data do not meet targets for timeliness
  - Supportive supervision
  - Assess bottlenecks and redesign processes where necessary

Financial Risks and Mitigation Strategies

Sustained and sustainable funding not secured

- Donor coordination
- Domestic issue and budget advocacy
- Negotiation with Treasury and other stakeholders to create budget line-item

A Balancing Act

- Sustainable impact requires government ownership and leadership in balancing key success factors

Conclusion

Summary

- SRS provides a fit-for-purpose and cost-effective means of filling a crucial gap in public health intelligence in Ghana
- SRS is relatively recent in Africa, but already showing results
- SRS is the only solution that offers the necessary combination of government ownership and leadership, sub-national representativeness, timeliness, and data on causes and circumstances of death
- Beneficiaries include government entities at national, regional, and district levels, as well as development partners
- Total ten-year costs, including start-up, compare favorably with other sources

References

[1] E.g., The Global Burden of Diseases (https://www.healthdata.org/research-analysis/gbd) provides modeled estimated of overall and cause-specific mortality

[2] Ronald Carshon, Marsh, Rashid Ansumana, Amara Jambai, Ibrahim Bob Swaray, et. al. on behalf of the HEAL SL Team. (2023) “Healthy Sierra Leone (HEAL-SL): Causes of death in Sierra Leone 2018–2022: Lessons learned” LEAPS CONVENING (Learning, Expanding and Adapting Public Health Surveillance: Leveraging Sampling-Based Platforms), June 19, 2023

[3] de Savigny, D., Setel, P. Whiting, D., Kasale, H. et al. (undated) “Linking Demographic Surveillance and Health Service Needs: The AMMP/TEHIP Experience in Morogoro, Tanzania.” Ministry of Health, The Policy Implications of Adult Morbidity and Mortality Project (AMMP), and Tanzania Essential Health Intervention Project (TEHIP)

[4] Ministry of Health, United Republic of Tanzania (2004). “The Policy Implications of Tanzania’s Mortality Burden: a Ten-Year Community-Based Perspective. Ministry of Health, Dar es Salaam

[5] Jiwani, S. S., et al. (2023). “Implementing the Countrywide Mortality Surveillance in Action in Mozambique: How Much Did It Cost?” Am J Trop Med Hyg 108(5_Suppl): 40–46

[6] Anon. (2017) “A childhood mortality focused Enhanced Sample Registration System providing precision public health and continental vital statistics: Co-Funding Investment Case – Summary of Key Findings,” Bill and Melinda Gates Foundation, Seattle

[7] Mozambique Institute of Public Health/Ministry of Health

[8] UN Statistics Division (2001). Principles and recommendations for a vital statistics system. U.N.S. Division. New York, United Nations

[9] Rommelmann, V., et al. (2005). “Cost and results of information systems for health and poverty indicators in the United Republic of Tanzania.” Bull World Health Organ 83(8): 569–577

[10] United Nations and Global Partnership for Sustainable Development Data. (nd). “Investment Case: Multiplying progress through data ecosystems.” United Nations, NY

[11] https://www.prosci.com/methodology/adkar

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