

MORTALITY DATA COLLECTION PLATFORMS: COSTS & COMPARISONS

UNIVERSITY OF WASHINGTON STRATEGIC ANALYSIS,
RESEARCH & TRAINING (START) CENTER

REPORT TO THE BILL & MELINDA GATES FOUNDATION

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**START
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STRATEGIC ANALYSIS,
RESEARCH & TRAINING CENTER
Department of Global Health | University of Washington

PROJECT BACKGROUND



Complete civil registration and vital statistics (CRVS) systems are lacking in many low-and middle-income countries (LMICs) contributing to gaps in mortality estimates which constrains overall health planning, programming, and policy.



Over the years, a multitude of different initiatives have sought to address these gaps and collect mortality data through household surveys, censuses, and sample registration systems (SRS). This review focused on four (4) of these platforms including SRS, CRVS, Demographic and Health Surveys (DHS), and Multiple Indicator Cluster Surveys (MICS). While mortality data collection may not be the primary aim of each platform, they were considered in the context of their mortality data collection for this project due to their widespread use and recognition globally.



The aim of this summary document is to support greater understandings of the costs and characteristics of these four platforms. This may contribute to more informed decision-making around mortality data collection in LMICs, potentially reducing fragmentation and inefficiencies across multiple platforms.



PROJECT OBJECTIVES

01

Initial Scope: To conduct a comparative cost analysis of existing mortality data collection platforms using SRS compared to DHS/MICS surveys and CRVS systems for Sierra Leone or Mozambique.

02

Revised Scope: To summarize and compare the characteristics of four relevant data collection platforms (DHS, MICS, CRVS, SRS), and explore their pros and cons for improving mortality data in LMICs.

METHODS

Rapid Review of Published Literature

- ❖ **Initial:** focused on platform costs using a targeted search & snowball sampling (see Appendix 1).
- ❖ **Revised:** focused on platform characteristic and pros/cons using a new search (see Appendix 1).

Grey Literature

- ❖ Reviewed documents, conference records and toolkits.

Expert Opinions

- ❖ Fourteen (n=14) subject matter experts (SMEs) on mortality data collection and each platform.

Literature Review

Grey Literature

SMEs

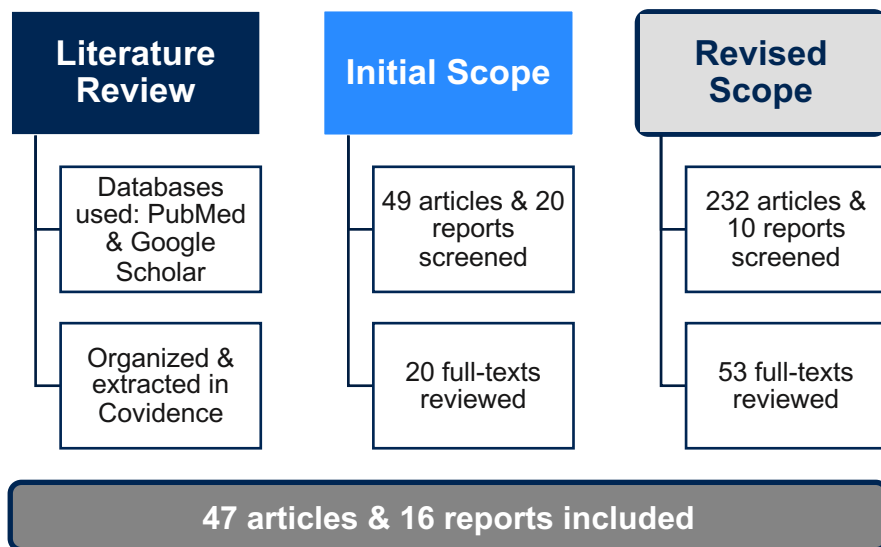


Figure 1: Summary of Project Literature Review

Four Mortality Data Platforms of Focus

Civil Registration and Vital Statistics (CRVS) Systems	Demographic and Health Surveys (DHS)
Sample Registration Systems (SRS)	Multiple Indicator Cluster Surveys (MICS)

PROJECT OUTPUTS

- This report provides **high-level summaries** of the four platforms of focus for this project.
- A **companion spreadsheet** captures more detailed information on platform characteristics for each platform across four categories:
 - general platform characteristics
 - platform costs
 - local ownership
 - platform benefits and limitations

SUMMARY OF INITIAL FINDINGS

Mortality data collection is a resource intensive undertaking due to the sensitive nature of each event and the complexity of discerning the cause of death¹. These limitations contribute to poor data quality, especially in lower resource settings where a greater number of deaths occur². Over the past 50 years, a plethora of local and global initiatives have sought to address these gaps with varying success³. The existence of multiple platforms has contributed additional complexity and fragmentation in the field, while also dividing limited financial and personnel resources across these platforms within and between countries^{3,4}.

Comprehensive solutions to these challenges have been historically undermined by a lack of clear global leadership; however, in recent year, strong regional efforts from the Africa CDC and other organizations have helped to accelerate progress^{3,5,6}. Beyond the challenges of data fragmentation, quality, frequency, capacity, and level of effort involved, there is also a dearth of costing information to support decision-making around platform selection^{3,7-10}.

This gap informed the initial scope of this project: to conduct a comparative cost analysis of mortality data collection platforms. However, this scope was not feasible due to the lack of available cost information, the structural and contextual differences of platforms both within and across countries, and different use cases of platforms which limited direct comparisons. Therefore, the revised phase therefore sought to describe the characteristics of four platforms and explore their overall pros and cons.

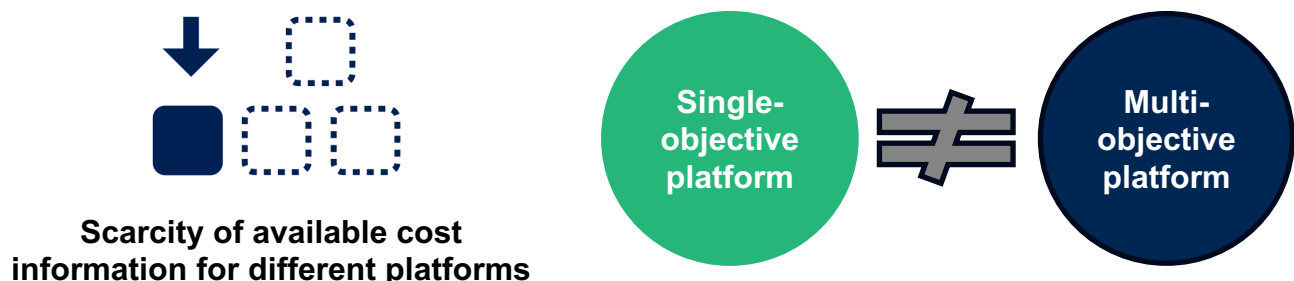


Figure 2: Key Limitations of Initial Project Scope

SAMPLE REGISTRATION SYSTEMS (SRS)

PLATFORM OBJECTIVES, SCOPE, & SCALE

- OBJECTIVE:** SRS is a data surveillance platform that estimates vital events from a population sample¹¹.
- SCOPE:** Number of vital statistics varies by specific SRS but typically includes births, deaths (incl. cause of death)^{11,12}.
- SCALE:** Nationally representative, continuous surveillance system. Sample sizes vary, from hundreds of thousands to hundreds of million in some countries¹³.
- DATA CAPTURE:** Typically by a CHW at the household level, using a mobile device or tablet¹⁴.
- DATA COLLECTION FREQUENCY:** Community based approach, continuous capture following vital events.

BENEFITS

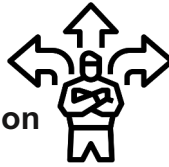
Continuous and Robust Data

- Collection of real-time data, offering robust all-cause mortality estimates.
- Timely and accurate assessment of public health trends and prompt policy and healthcare responses.
- **Cause of death information captured by integrating verbal autopsy and minimally invasive tissue sampling¹¹** in some settings, further supporting delivery of targeted health interventions.



Integration Flexibility

- Can be integrated into existing health information systems.
- Facilitates the **improvement and expansion of civil registration and vital statistics systems¹⁵** and promotes comprehensive health monitoring and planning.



LIMITATIONS

Role of verbal autopsies

- Cause-of-death determination often relies on verbal autopsies which can be **subject to human error**. Policymakers should be made aware of limitations of cause-specific mortality estimates which may be less robust than all-cause mortality estimates.



Operational Issues

- Requires **skilled personnel** and specific infrastructure.
- Sustained capacity of these resources may be challenging in lower-resource settings and **may require ongoing specialized training and infrastructure**.



SAMPLING CONSIDERATIONS:

- Samples may be segmented based on urban/rural distinctions.
- Frequent updates to the sampling framework are essential to ensure it remains representative.
- Provinces or districts can be sampled more heavily if certain regions are prioritized by the government.



BROADER FUNCTIONALITY OF SRS

Identifying cause of death and improving disease surveillance

Supporting research and development and integrated sero-surveillance

Improving Civil Registration and Vital Statistics (CRVS) Systems

Public health response and informing public health policy

Pandemic response and preparedness

Identifying vulnerable populations and guiding resource allocation

SAMPLE REGISTRATION SYSTEMS (SRS)

EXAMPLES OF VITAL EVENT COSTS PER SRS PLATFORM

Country	Sample Size (# of People)	Cost of Death Registration Procedure per Surveillance Point/Cluster*	Cost Per Vital Event*	Verbal Autopsy? - Cost*
China ¹³	323.8 M	\$8,294.01	N/A	Yes – N/A
Mozambique ¹¹	800K	\$1,483.84	\$44–\$50	Yes - \$404
Sierra Leone ³¹	351.7K	\$1,057	N/A	Yes ~\$127.02



Summary SRS Cost Categories and Typical Activities in Each. Dark blue cells are activities identified as cost drivers.

	Start Up	Governance	Trainings, workshops & meetings	Program Management	Supervision	Direct SRS activities
Personnel						
Refresher trainings & workshops						
Communications						
Per diems & Transport cost						
Maintenance						
Supplies & utilities						
Other recurrent cost						
Buildings						
Vehicles						
Equipment						
Consultants						
Other capital costs						

"There is huge variation in costs and salaries across communities...often they will ask how much you are willing to give and then they will figure out how to spend this amount."

- Key informant 2 for SRS

KEY TAKEAWAYS

- A strict **in-country contextualization** is needed to analyze cost.
- Major **cost drivers for implementing** an SRS include the representative sample size and upfront implementation costs. **Operational cost drivers** include personnel and data collection.
- Annual SRS operating costs vary. Examples* include **\$698,600 USD in Sierra Leone vs. ~\$1.2 million USD in Mozambique.**
- **Capital resources** (e.g. government offices, capital expenditure, salaries of staff at more centralized levels etc.) are infrequently captured in current SRS cost analyses.

CONCLUSION: SRS platforms vary in structure and organization both within and between countries, and ultimately **support cause-specific mortality data collection at national and sub-national levels** in LMICs. SRS offers an alternative for continuous recording and reporting of key vital statistics in the absence of a comprehensive CRVS.

PLATFORM OBJECTIVES, SCOPE, & SCALE

OBJECTIVE(S): To accurately and comprehensively register vital events such as births, deaths, marriages, divorces, and adoptions¹⁶.

SCOPE: Indicators for **decision making** in public services, education, health, urban planning, legal identity, and human rights ^{1,17}.

SCALE: Complete population.

DATA CAPTURE: Varies, but often collated from different settings including health centers and communities.

DATA COLLECTION FREQUENCY: Continuous capture following vital events.

BENEFITS

Robust, Continuous data for Governments and SDG reporting

- Complete **population coverage**.
- Captures **cause of death**.
- Operated by **domestic Government** to inform **local-led** decision making and **accurate use of funds** for developmental initiatives across levels¹.



Links Citizens to Legal Frameworks

- Helps formulate, implement, and monitor **policies for public services** to meet the needs of citizens.
- By **proving one's identity** and the occurrence of vital events, citizens can claim services such as **survival benefits or child grants**¹⁸.



LIMITATIONS

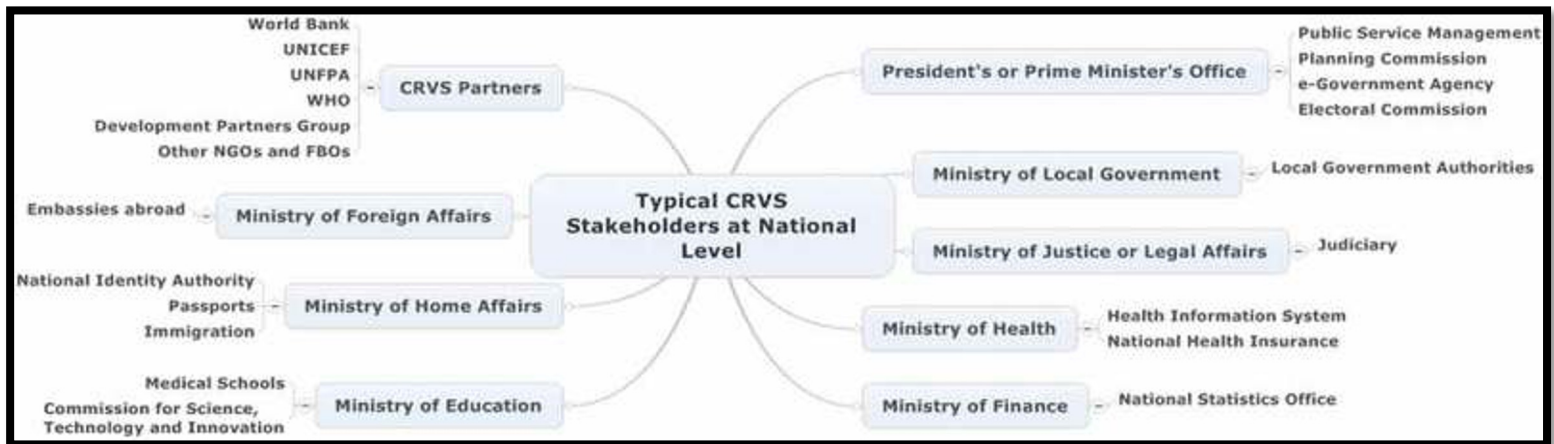
Operational Issues

- Insufficient **capacity**.
- High personnel **turnover**, e.g. in Punjab, India, >50% of CRVS statistical staff positions vacant¹⁹.
- Poor digital infrastructure, limiting **real-time notifications** of vital events⁴.



Bureaucratic Hurdles

- **Low coverage** of vital events owing to highly complex and bureaucratic CRVS operations²⁰.
- **Ownership of data** not with Ministry of Health.
- Lack of **inter-ministerial cooperation** on collectively using CRVS data.



DOI: [10.1080/16549716.2017.1272882](https://doi.org/10.1080/16549716.2017.1272882)

"Don't capture data that won't be used. DHS point estimates on maternal mortality aren't actionable. They are interesting academically but **difficult to act on** due to wide confidence intervals, and only collected every 5 years."

- Key Informant 1 for CRVS

"If these data collection and reporting is **streamlined**, and data collection is **digitized** then (most of) the issues will be resolved."

- Key informant 2 for CRVS

CIVIL REGISTRATION & VITAL STATISTICS (CRVS)

PLATFORM COST OVERVIEW

- **Low availability** of empirical **cost data** by cost category.
- Data capture and staff training are key **cost drivers**.



Summary CRVS Cost Categories and Typical Activities in Each. Dark blue cells are activities identified as cost drivers²¹.

	Start Up	Governance	Trainings, workshops & meetings	Program Management	Supervision	Direct CRVS activities
Personnel						
Refresher trainings & workshops						
Communications						
Per diems & Transport cost						
Maintenance						
Supplies & utilities						
Other recurrent cost						
Buildings						
Vehicles						
Equipment						
Consultants						
Other capital costs						

- Average of **US\$1.5 per capita** (higher for countries with rudimentary CRVS systems)²².
- Most costs incurred at system **establishment** (upfront), with returns over a long-time frame (~20 years) as demonstrated by Mills, et. al. **CRVS ranks highest**, when compared to the census and indicator surveys, on attributes such as **coverage, correctness, availability, timeliness, and data disaggregation**²².
- **Saves costs across other sectors** in a catalytic manner.

	Avg. cost per year	# of records/units	Composite quality index	Cost/quality adjusted unit
CRVS	\$1,973,000	6,700,000	0.92	\$0.32
Census	\$1,860,000	6,700,000	0.42	\$0.66
Survey	\$240,000	52,460	0.28	\$16.34

doi: [10.1186/s41043-019-0184-2](https://doi.org/10.1186/s41043-019-0184-2)

“Ghana spent \$150 million for a single use voter registration system which was not of use after the election. So, they considered building voter registration from CRVS.”

- Key informant 3 for CRVS

KEY TAKEAWAYS

- **Upfront investment** is required to generate strong evidence base for country health and development policies. Direct and indirect set up and registration costs for governments and citizens is offset by catalytic cost savings across sectors.
- Interim, **stop-gap systems** are useful but cannot replace CRVS functionality completely, which is the ultimate goal of most countries as improving birth and death registration is one of the SDG targets.
- Ministry of Health as **focal point** for CRVS management is imperative for smooth coordination.

CONCLUSION: Strengthening CRVS is crucial to ensure **robust, continuous data capture** of vital events for **decision-making across various sectors** and necessary for human rights, yet challenges such as suboptimal functioning, bureaucratic hurdles, and large upfront investment requirements remain.

PLATFORM OBJECTIVES, SCOPE, & SCALE

OBJECTIVE(S): DHS Surveys provide data to support the planning, monitoring, and evaluation of population health in collaboration with national and international partners²³.

SCOPE: Varies by survey, but can include a multitude of demographic and population health indicators on over 35 topics with 30 common indicators. Number of indicators tailored to country and available resources²³.

SCALE: Nationally representative household surveys. Sample sizes vary, typically between 5,000-30,000 households and based on available budget^{23,24}.

DATA CAPTURE: Carried out by trained enumerators at the household and individual level, using a mobile device or tablet.

DATA COLLECTION FREQUENCY: Typically carried out every five years with an 18-20 month lifecycle. However this can vary by country based on different contextual factors^{10,25}.

BENEFITS

Globally Established

- DHS Surveys are a globally established data collection platform, having been conducted in ≥90 countries over the past 40 years²⁶.
- The use of standardized methods allows for inter-country comparison and increasing local ownership over time²⁷.



Information Rich

- The depth and breadth of DHS Surveys is expansive, capturing a wealth of information on multiple indicators to support health planning and programming²³.



"It would be a terrible idea to have multiple surveys in a short period of time. In country X we collected mortality data with DHS, but the census was also doing this. Ultimately, their findings were different and so the data was questioned by the government especially as it contradicted their primary means of data collection (e.g. census)...How death is reported differs: e.g. self-report versus health-facility report. One is more inclusive and one is more official."

- Key Informant 2 for DHS

LIMITATIONS

Limited Mortality Data

- Mortality estimates are infrequent, collected approximately every 4-7 years and may not include all age-groups¹⁰.
- DHS mortality data typically does not include cause of death, unless verbal autopsies included, and often only provides national level estimates which have wider confidence intervals related to methodological limitations^{3,10}.
- DHS does not register or provide legal documentation for reported deaths³.



Resource Intensive

- DHS Surveys require a significant investment of time and resources both in the planning and implementation phases. While conducting field work, each survey can be quite time consuming as it is first conducted at the household level and then at the individual level^{24,27}.



May Miss Rare Conditions

- Due to the multi-indicator nature of DHS Surveys, sometimes rarer health conditions will be intentionally scoped out of the survey, as their inclusion would add significant cost yet only impact a very small proportion of the population.



"The actual cost of a DHS Survey is proprietary. I haven't even seen it and the information isn't shared with partners."

- Key Informant 1 for DHS

COST CONSIDERATIONS



DHS cost information is proprietary, and thus not readily available in the peer-reviewed or grey/white literature. Any cost information presented here should therefore be interpreted with caution.



Key DHS cost drivers typically include the sample size, the local context, and the number and type of modules, especially if biometrics are included. It is important to note that cost drivers for DHS surveys may occur outside any mortality modules limiting mortality data collection cost comparisons with other platforms.



DHS Survey costs vary widely. The initial country budget and survey scope are developed in collaboration with local officials and partners, which may occur over multiple country visits and negotiations. Modules for low prevalence health conditions (e.g. fistulas) may not be cost-effective and better collected using a different platform.



There is interest to conduct DHS Surveys more frequently but **this is limited by resources because they are so intensive (time and expenditure)**. Surveys are very time consuming as they are first administered at the household level followed by the individual level²⁴.



Total DHS Survey costs may range from approximately \$870,000 - \$12,000,000 USD per survey^{8,9}. These estimates include modeled approximations and are not adjusted for inflation. DHS uses vehicles and personnel (e.g. trainers from government statistics office) whenever possible.



DHS Survey field team structure is quite homogenous, typically involving two enumerators (male and female), a supervisor, field editor, driver, and biomarker specialist if relevant. **Workload can vary by population demographics**, as communities with fewer children ≤ 5 years will have fewer surveys conducted.

KEY TAKEAWAYS

DHS mortality estimates may be useful in the absence of another mortality data collection platform. However, in settings with other sources of mortality data their utility is limited as they are not sufficiently detailed to inform actionable health planning or programming. DHS mortality estimates often lack cause-specificity and are collected approximately every ≥ 5 years¹⁰. In addition, they often provide national-level, but not sub-national, estimates with wider confidence intervals.

- **The cost-benefit of DHS mortality modules may be lower in countries where mortality data is captured using other platforms**, particularly as these modules can require larger sample sizes and corresponding survey costs (e.g., maternal mortality module needs a sample of $\geq 10,000$).

CONCLUSION: The Demographic and Health Surveys (DHS) are a key resource, providing vital information for a range of demographic and health indicators for multiple countries worldwide. DHS mortality estimates however provide more limited value, especially in settings with other mortality data collection platforms. Costs of DHS Surveys vary widely by country; cost information is proprietary.

PLATFORM OBJECTIVES, SCOPE, & SCALE

OBJECTIVE(S): To assess the situation of children, women and men in the areas of health, education, and child protection²⁸.

SCOPE: Internationally comparable estimates of >200 indicators related to children’s well-being, women, and households, ranging from health and education to child protection, and water and sanitation²⁸.

SCALE: May or may not be nationally representative. Sample sizes vary, typically between 1,000 - 40,000 households. Some may cover a specific population group while others may cover a specific geographical area within a country²⁸.

DATA CAPTURE: Digitally at household and individual level by trained enumerators.

DATA COLLECTION FREQUENCY: Periodic data collection every four to ten years²⁹.

BENEFITS

Robust, Standardized Survey

- MICS Surveys are also globally established, having been conducted in 120 countries over the past 29 years.
- The use of standardized methods allows for inter-country comparison and has facilitated a model that builds domestic capacity and ownership of surveys over time²⁸.
- Rich data source for collection of Sustainable Development Goals (SDG) indicators²⁸.



Complements CRVS

- Survey questions allow estimating completeness of civil registration¹⁰.



LIMITATIONS

Limited Use Mortality Data

- Lacks cause-specific mortality information³, unless verbal autopsies added on.
- Limited sample size and low data collection frequency are insufficient to detect fluctuations in mortality associated with recent epidemics.
- MICS does not register or provide legal documentation for reported deaths.



Scope for Better Coordination

- Low communication between countries leading to inefficiencies in data capture.



Long, Time Consuming Surveys (like the DHS)

- Added pressure on data collectors and respondents.



“We should look at the mortality data with caution due to methods such as sibling survival history, which might overestimate mortality.”

- Key informant for MICS

MICS Can be Optimized for Vital Statistics:

- The survey design can be altered to **better complement the CRVS¹⁰** by:
 - Oversampling** strategies to account for households with recent deaths, thereby capturing a greater number of reported deaths.
 - Including **survey questions around death registration** which help to discern the completeness of civil registration in a country.



COST CONSIDERATIONS



No open data or reporting of MICS survey costs were identified. Ball-park estimates and understandings of cost drivers were provided by key informants. The MICS Budget Planning Tool provides information on cost categories and activities³⁰.



Identifying average cost for a MICS survey is challenging as **costs are dependent on a wide range of factors** including available budget, unit costs, transportation costs, types of activities that need to be carried out, the sample size, questionnaire size, questionnaire content, etc.



There is **wide heterogeneity in total survey costs** owing to cost drivers, differences in survey scope, and other contextual factors. Total MICS survey costs can range from \$250,000 to \$10.5 million USD. These estimates are not adjusted for inflation.



Unit costs, transportation costs, the sample size, biometric data capture, addition of modules, and overall questionnaire size are all **key drivers of costs**. These cost drivers may occur outside of any mortality modules, limiting cost comparisons with other data collection platforms that primarily capture mortality data.



MICS surveys are typically funded by UNICEF, international partners, and the National Government. Increasingly all survey costs are fully funded by the countries in which they are being conducted²⁸.

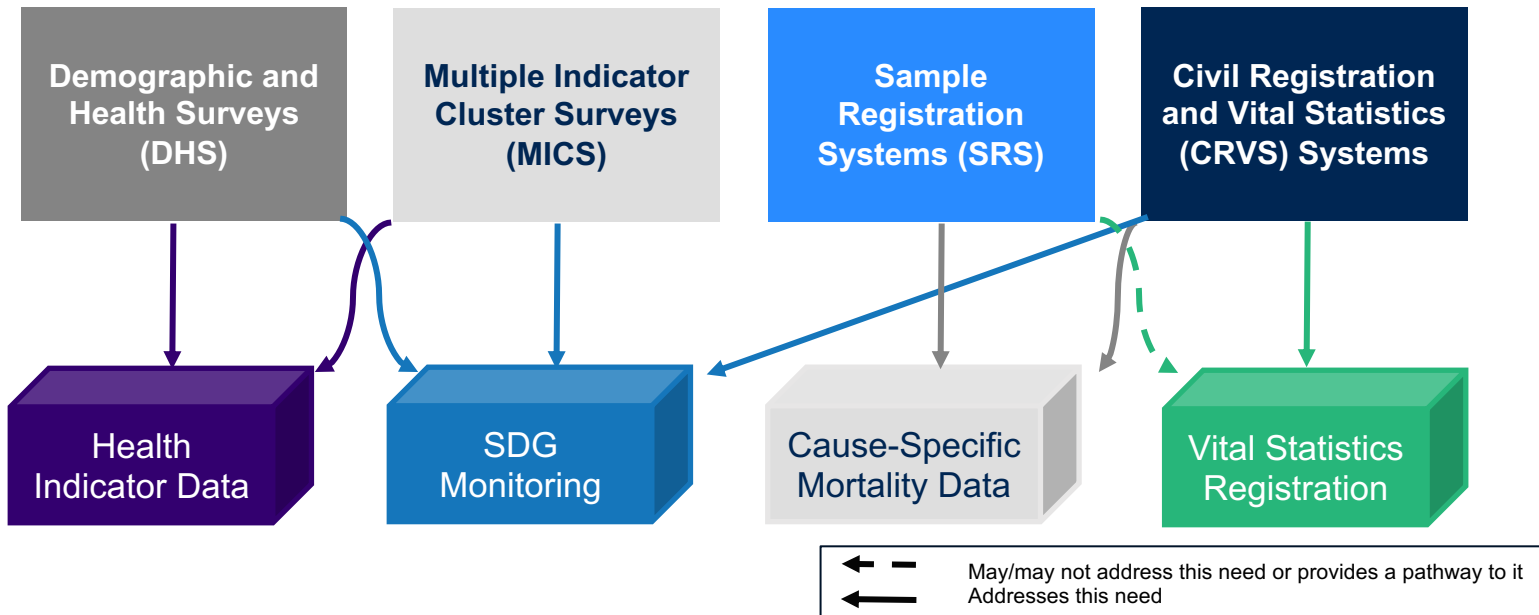
KEY TAKEAWAYS

The **local leadership of MICS programs in-country, complementing the CRVS**, offers a sustainable model where platform teams can communicate with one another fulfilling data needs by reducing inefficiencies and cost duplicates. However, the mortality data collected by MICS offer more limited value due to methodological concerns, lack of cause specificity, and infrequency of reporting for all population groups (e.g. if collected emphasis may be on child or maternal mortality).

CONCLUSION: While the Multiple Indicator Cluster Surveys (MICS) provide invaluable insights into various socio-economic indicators globally, **addressing limitations such as the limited use of mortality data and fostering collaboration among nations** is crucial for enhancing their relevance for capturing vital statistics.

SUMMARY OF FINDINGS

Each platform has an important role and addresses different needs



PLATFORM COST CONSIDERATIONS

- **Costs** vary widely across platforms by survey objective, end case, scale, scope, data capture method, and frequency of collection. This variation impacts both overall and unit costs.
- Long-term cross-sector benefits may be achieved from upfront investment in national systems.
- **Cost data** for each platform is seldom available in the literature, from other data sources, and may be proprietary. Informed decision-making would be supported by more comprehensive understandings of platform costs.

MORTALITY DATA ACROSS PLATFORMS

- **DHS & MICS** offer a way to capture some mortality data in multi-indicator survey. This data may be more appropriate for settings where *no other* mortality data is captured due to its limitations.
- **SRS** offers crucial continuous, timely, cause-specific mortality data.
- **CRVS** systems provide cause-specific mortality data & death registration. Added benefits of a fully functional CRVS include more accurate population denominators & sampling frames for other surveys, surveillance systems, and health initiatives.

KEY TAKEAWAYS



Mortality data collection is collected by a range of platforms that are all **resource intensive**.

- Cost data is lacking, limiting overall understandings of costs across platforms.
- Verbal autopsy can be added to any platform to capture cause-specific mortality data.



Different use cases of each platform make cost comparisons challenging and must be taken into account when contrasting costs.

- One single platform is not the answer.



Greater local ownership is needed for overall sustainability and may help to reduce costs by reducing inefficiencies.

- Improved coordination and harmonization between platforms could have synergistic effects tailored to each specific country context (e.g. reduced duplication and burden on staff and respondents, and additional cost-benefits from stronger in-country systems).

SUBJECT MATTER EXPERTS (SMEs)

14 subject matter experts with expertise on mortality data collection or a specific platform (e.g. DHS, MICS, SRS, CRVS) were interviewed between November 2023 - January 2024 and helped inform all deliverables.



CENTRE OF EXCELLENCE
for CRVS Systems



Bio-Metrics, LLC
Specializing in biomarker research and testing



The DHS Program
Demographic and Health Surveys

SEARCH STRINGS

Search String (snowball sampling)

Initial Scope:

After conducting exploratory searches in collaboration with the University of Washington Librarians a snowball sampling approach was used.

Similar articles generated by PubMed for *"Implementing the Countrywide Mortality Surveillance in Action in Mozambique: How Much Did It Cost?"*.

Similar articles for PMID: 37037435

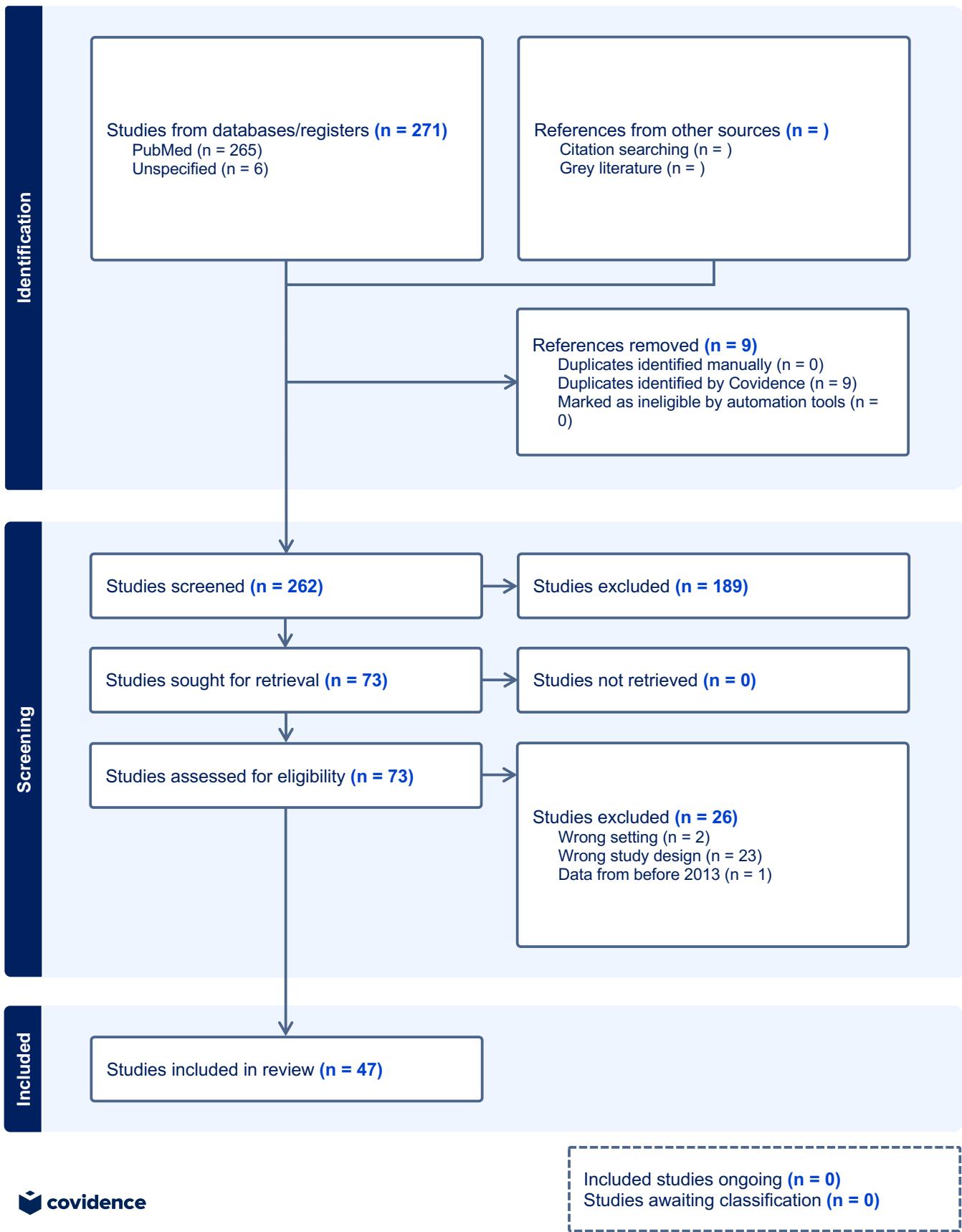
Revised Scope:

Search in PubMed and Google Scholar: **"Civil Registration and Vital Statistics"** Sort by: **Most Recent**
"Civil Registration and Vital Statistics"[All Fields]

Search in PubMed and Google Scholar: **"Sample Registration System"** Sort by: **Most Recent**
"Sample Registration System"[All Fields]

Additional articles for each platform identified through snowball sampling in PubMed and Google Scholar during both the initial and revised project scopes as captured in Covidence PRISMA Flowchart (page 14).

PROJECT LITERATURE REVIEW: COVIDENCE PRISMA FLOWCHART



In addition to the peer-reviewed articles captured in the PRISMA flowchart, we identified grey literature using targeted searches and reviewed platform-specific websites across the four platforms.

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