

Integrated Mortality Surveillance in the United States, Colombia, & Zambia: Facilitators, Barriers & Lessons

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Mortality Surveillance

The ongoing systematic monitoring and analysis of mortality data and the dissemination of information that leads to actions being taken to address data quality and public health concerns.” (CDC NCHS, 2012)

Integrated Mortality Surveillance

Involves linking multiple data sources, people, processes, and technologies to continuously identify, notify, and record all deaths and their causes within a population, such that every death is not only registered by civil authorities for legal purposes but also analyzed to inform public health action. (CDC NCHS, 2012)

The 10 CRVS milestones within three mortality surveillance steps

(Munoz et al., 2019)
(NCHS, 2026 (unpublished))

Data collection and acquisition

1. Notification
2. Validation and verification of identity
3. Registration
4. Storage and archiving
5. Sharing of information
6. Certification (inclusive of medical certification of cause and manner of death and/or verbal autopsy)

Internal systems and processes

7. Compilation of vital statistics (inclusive of mortality coding to classify and determine the underlying cause of death)
8. Quality control of vital statistics

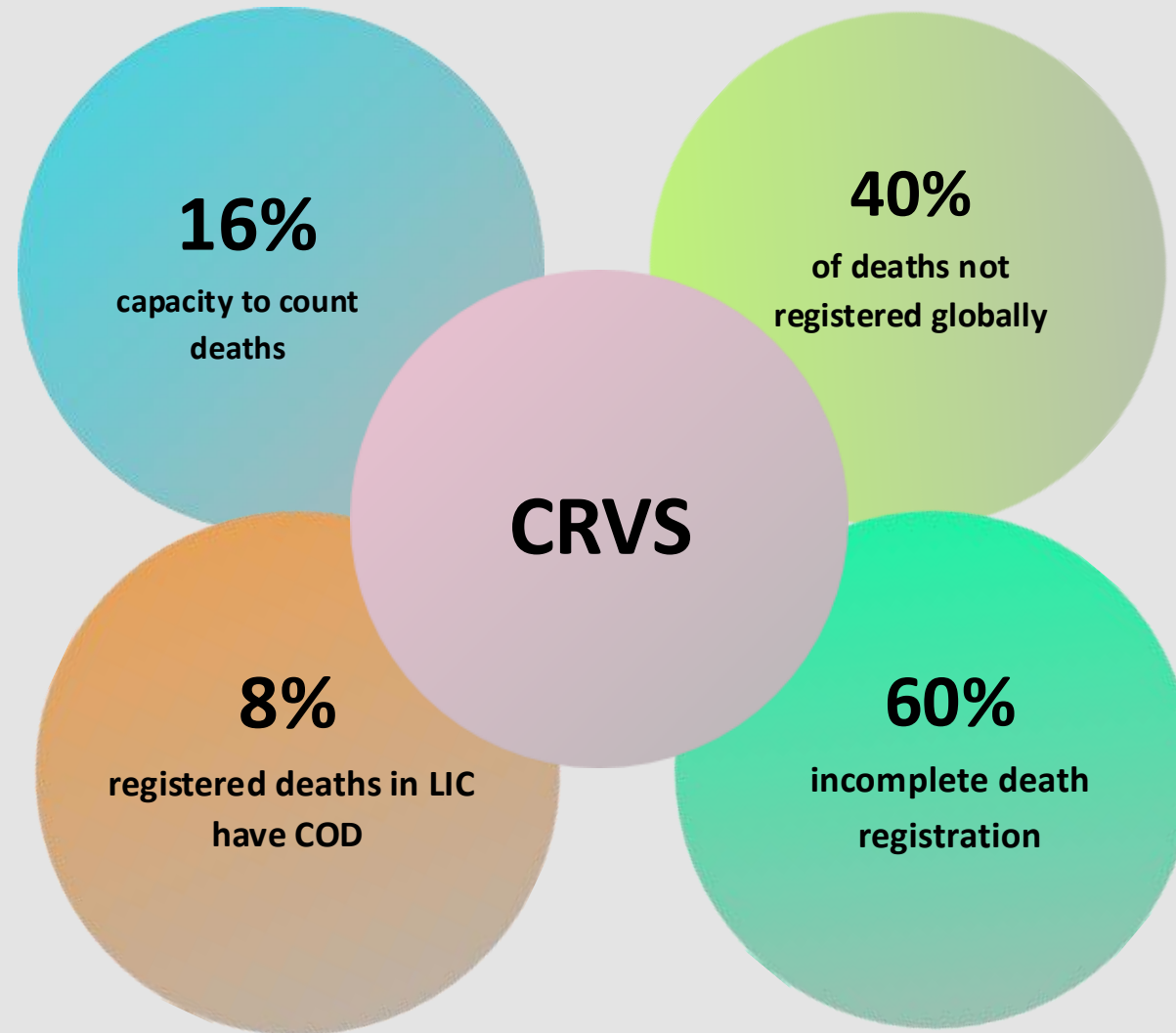
Data analysis and dissemination of actionable information

9. Generation of vital statistics
10. Dissemination of vital statistics

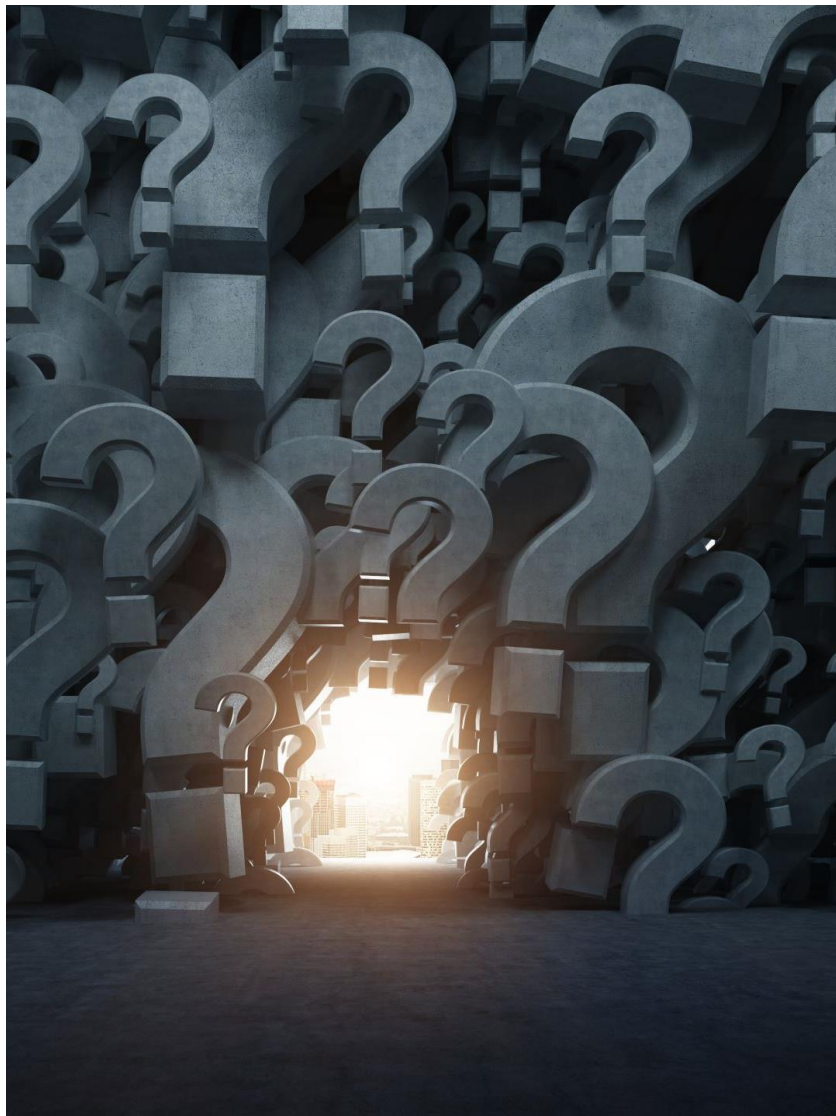
The Problem

CRVS PERFORMANCE

WHO SCORE, 2021, N=133



“Essential public health functions are not enough for effective public health systems.” – Zuber et al., 2023

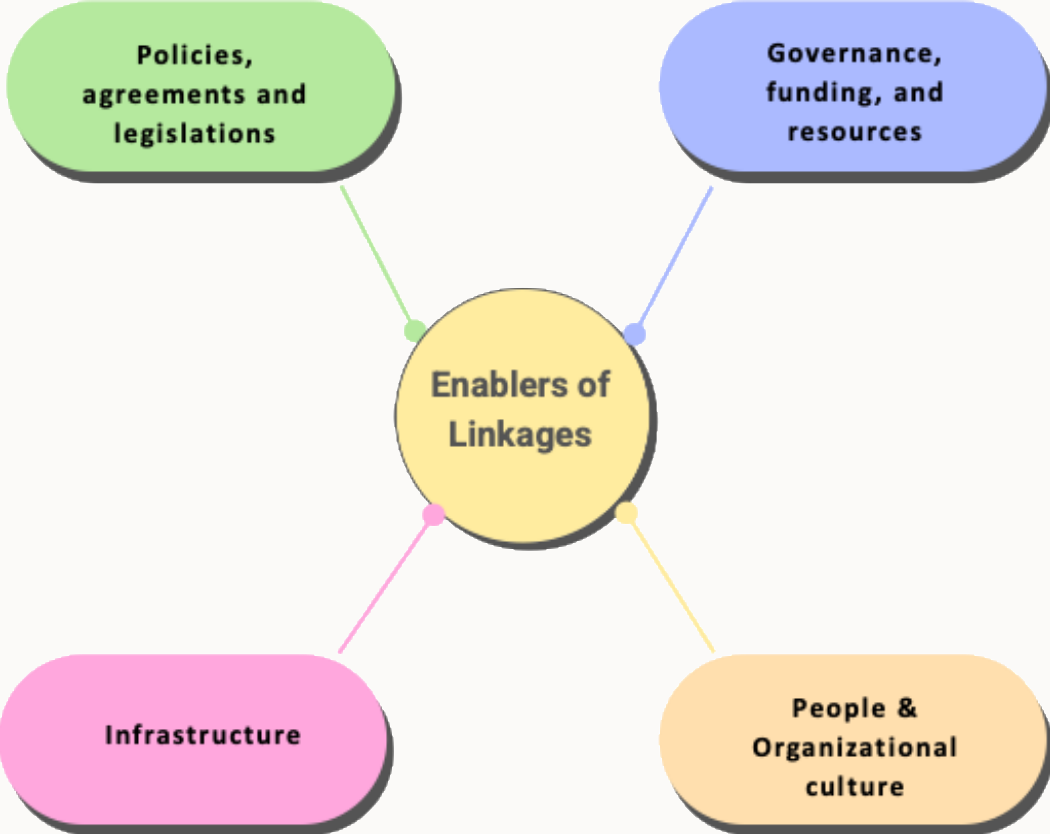


Essential Public Health Function 1*	Definition	Subfunctions
Public health surveillance & monitoring	Monitoring and surveillance of population health status, risk, protective and promotive factors, threats to health, and health system performance and service utilization	1.1: Planning for public health monitoring and surveillance
		1.2: Routine and systematic collection of public health data
		1.3: Analyzing and interpreting available public health data
		1.4: Communicating public health data, information and evidence with key stakeholders, including communities

*WHO & IANPHI, 2024

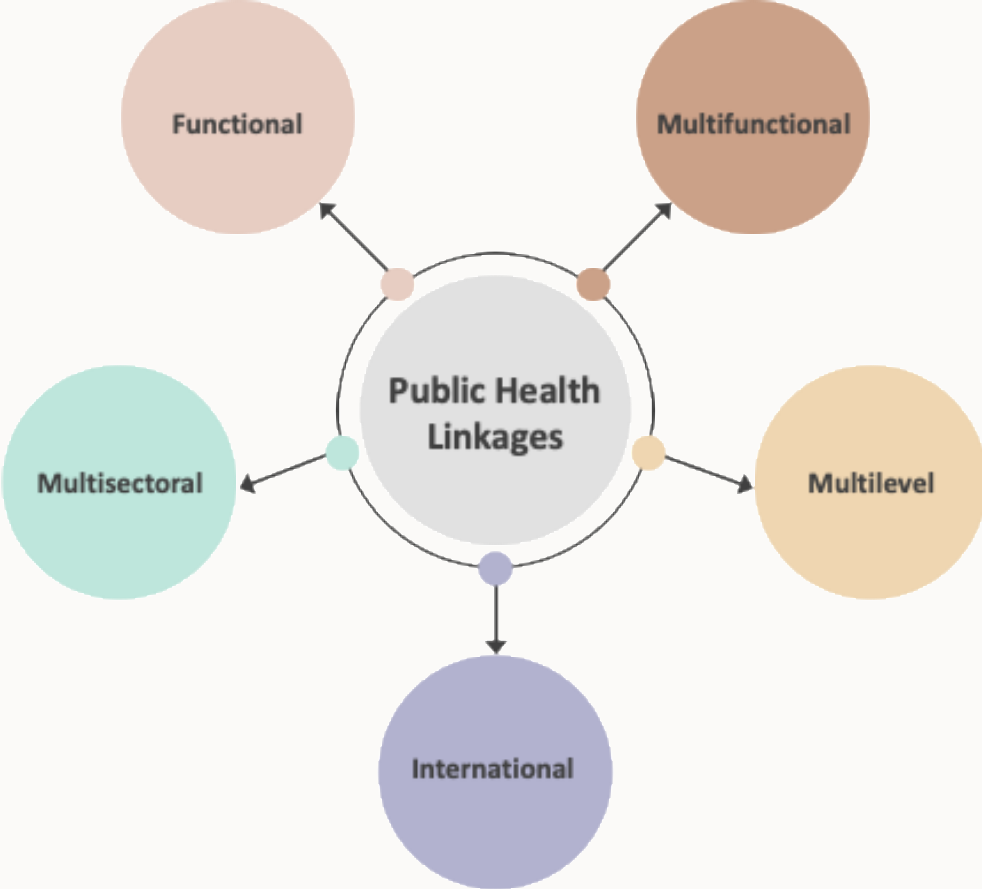
Linkage enablers

Zuber et al., 2023



Typology of Linkages in Public Health

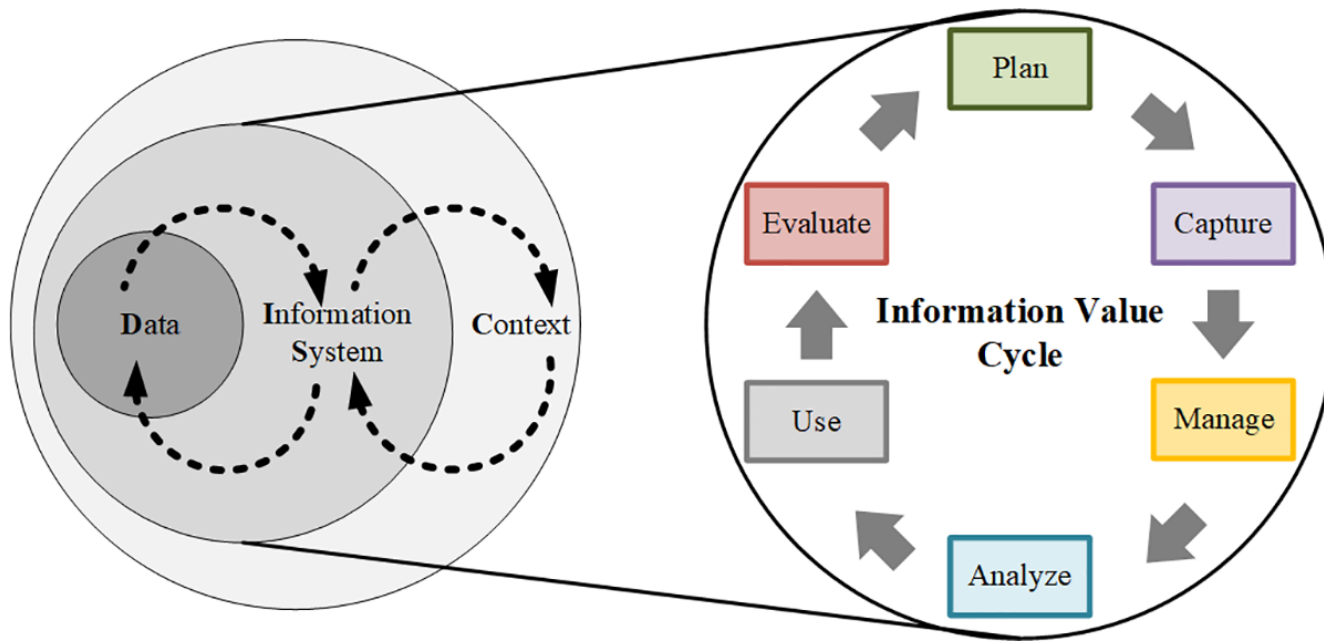
Zuber et al, 2023





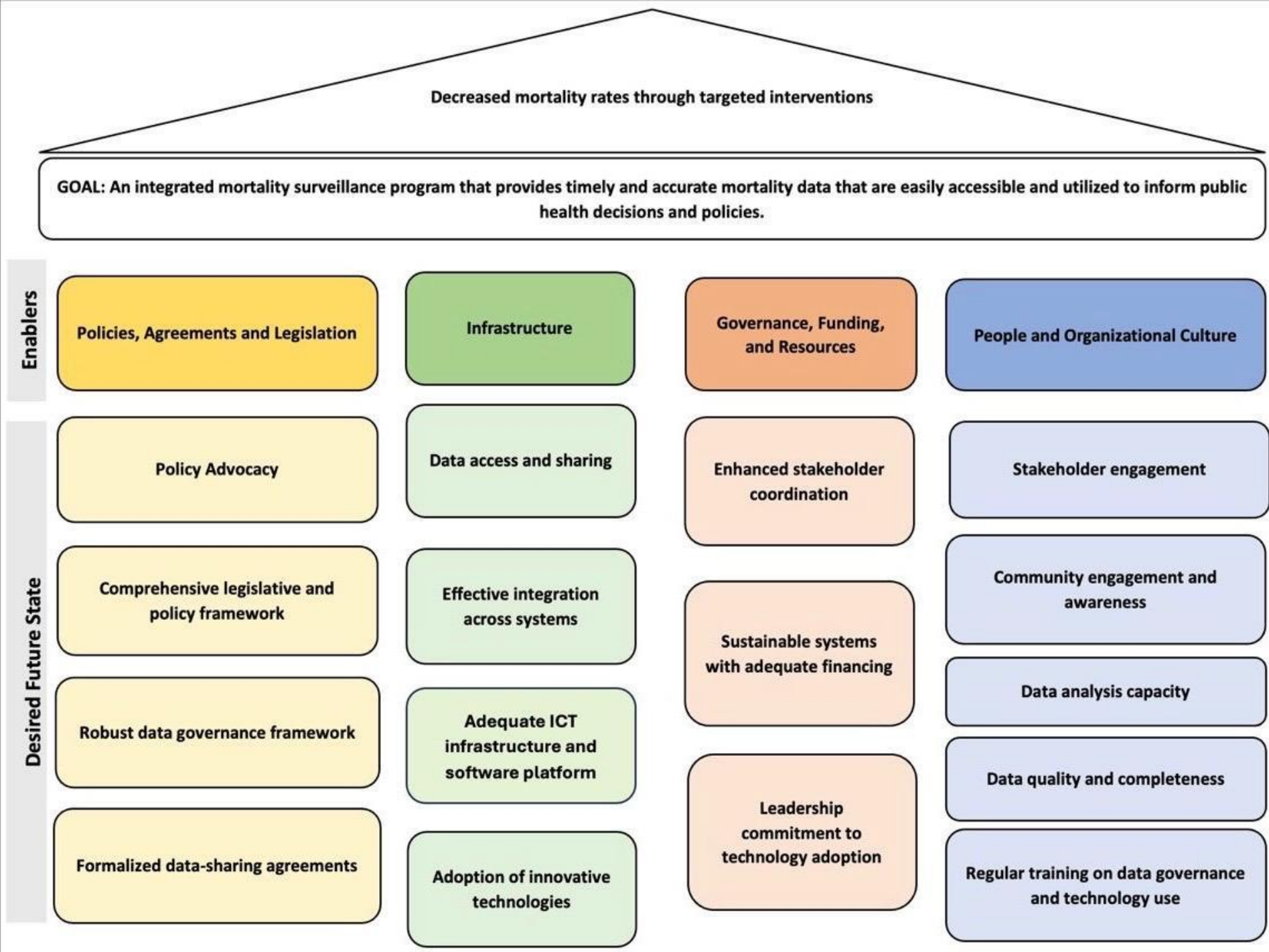
Theoretical Frameworks

IVC-DISC Framework (Karki et al., 2021)



IVC-DISC	
Data	Information
Information System	<ul style="list-style-type: none">• People• Process• Technology
Context	<ul style="list-style-type: none">• Organization• Environment

CDC's Theory of Change for Integration of MSS





Overarching Aim

Improve understanding of how civil registration and vital statistics (CRVS) and mortality surveillance functions are effectively integrated through case studies in the U.S., Colombia, and Zambia using the CDC's 'Theory of Change (ToC) Model for Integrated Mortality Surveillance'

Specific Aims

Aim 1: Describe how CRVS and mortality surveillance functions are organized in the U.S., Colombia, and Zambia

Aim 2: Assess the degree of integration and associated outcomes for each country's CRVS and mortality surveillance functions using the CDC ToC model

Aim 3: Understand the causal roots for success in integrating the CRVS and mortality surveillance functions in each country

Research Questions

What information systems and infrastructure are used in performing the functions of death and cause of death reporting, registration/certification, coding, and statistical tabulation through the CRVS systems in the U.S., Colombia, and Zambia?

What processes are used by each country to conduct population mortality surveillance in the service of the essential public health functions?

Research Questions

What enablers are in place to support integration between CRVS and mortality surveillance functions in each country across the ToC domains?

How are mortality data linked across different data sources and systems?

What are the products of each country's CRVS and mortality surveillance programs, & how are they used?

Research Questions

What are the facilitators and barriers to integrating the CRVS and mortality surveillance systems in the U.S., Colombia, and Zambia?

What are the lessons learned from the process of integrating the CRVS and mortality surveillance systems in the US, Colombia, and Zambia?



Methods





Methods

Study design:

Qualitative study using a phenomenological multi-country case study approach

Study settings:

United States – HIC - well-established & advanced CRVS system

Colombia – U-MIC – fairly advanced CRVS

Zambia – L-MIC – emerging CRVS

Case analytical approach

The design was not strictly comparative because of the varied contexts, but rather a country-specific and cross-country case analysis that retained the contextual nuances.

Research Strategy

Documents Review: policies, SOPs, guidelines & products of CRVS & MSS

In-depth interviews of purposively selected key informants who play strategic roles as policymakers, implementers, or stakeholders, using pretested semi-structured interview guides

Ethical & regulatory approvals

S/No.	Type	Institution	Date	Approval Number
1.	Letter of support	ZNPHI	March 13, 2025	Not applicable
2.	IRB exempt determination	GW	March 24, 2025	IRB# NCR256336
3.	Permission to conduct research	DNRPC, Zambia	August 14, 2025	Not applicable
4.	Ethics and Research Methodologies Committee (CEMIN) Approval	INS, Colombia	August 14, 2025	CEMIN Code 04-2025
5.	NASREC IRB Approval	University of Zambia	September 18, 2025	Ref No. NASREC: 2025-JUL-005
6.	Certificate of registration as a researcher	NHRA, Zambia	September 30, 2025	NHRAR-R-3292/26/09/2025
7.	Authority to conduct research	NHRA, Zambia	October 14, 2025	NHRA-2763/01/10/2025



Participant Recruitment, Data Collection & Ethics

From July to November 2025

Email invitation sent with PIS & consent form

Written & verbal consent obtained before interview & recording

Semi-structured, conversational key informant in-depth interviews conducted via a secured Zoom account

Professional interpretation for participants from Colombia

Interpreters signed a confidentiality agreement before engagement

Recordings will be destroyed after the defense & transcripts stored securely for ≥ 10 years



Transcription, Coding, Analysis & Presentation of Data

Audio recordings transcribed verbatim

Coded by two independent coders per country using NVivo, following an iteratively developed, shared codebook

Coding emphasized close engagement with participants' language

Discrepancies resolved through consensus to preserve participant-proximal meaning

Codes in Spanish translated to English using an official secure translation platform

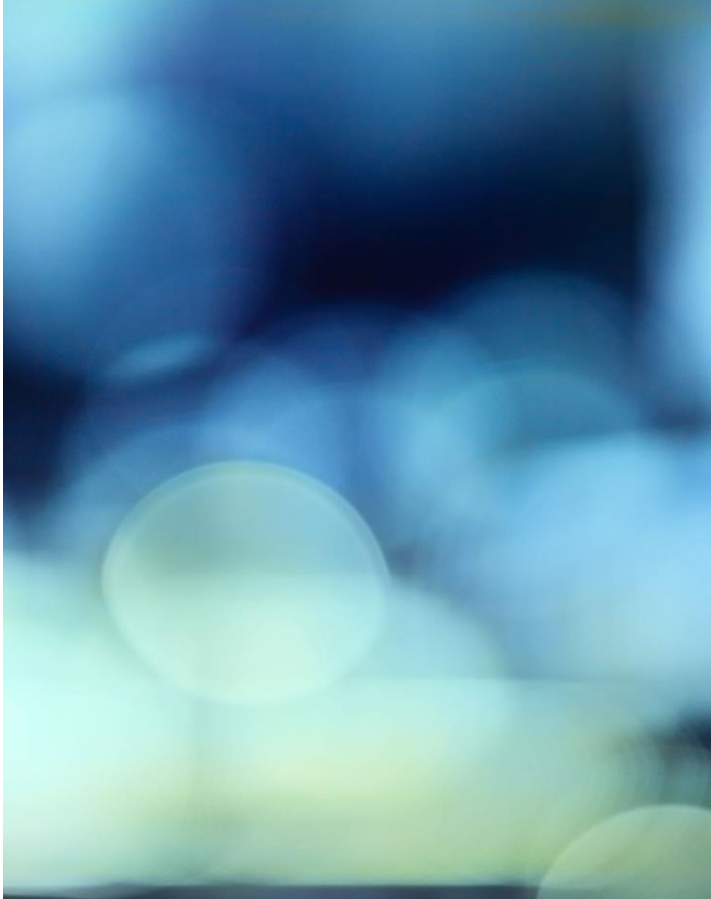
Framework & reflexive thematic analysis of coded data. Stakeholder validation of the data flow process

Empirical grounding of themes while supporting cross-country analytic synthesis & retention of contextual nuance.

TOC Codes

Enabler	Code Alphabets
Policies, Agreements, and Legislations	A
Infrastructure	B
Governance, Funding, and Resources	C
People and Organizational Culture	D
Desired Future State	Code ID
Policy Advocacy Interventions	A1
Comprehensive Legislative and Policy Framework Interventions	A2
Robust Data Governance Framework Interventions	A3
Formalized Data Sharing Agreements Interventions	A4
Adequate ICT Infrastructure and Software Platform Interventions	B1
Data Access and Sharing Interventions	B2
Effective Integration across Systems Interventions	B3
Adoption of Innovative Technologies Intervention	B4
Strong Partner Coordination Interventions	C1
Sustainable Systems with Adequate Financing Interventions	C2
Leadership Commitment to Technology Interventions	C3
Strong Partner Engagement Interventions	D1
Community Engagement and Awareness Interventions	D2
Data Quality and Completeness Interventions	D3
Data Analysis Capacity Interventions	D4
Regular Training on Data Governance and Technology Use	D5

Reflexive Statement



Professional experience in CRVS and MS, including prior engagement with institutions connected to IMSS

Influenced both access to respondents and interpretive perspectives

Employed a reflexive thematic analysis approach supported by paired coding and iterative team dialogue.

Early coding decisions grounded in participants' accounts

Later stages involved collective reflection to develop higher-level interpretations

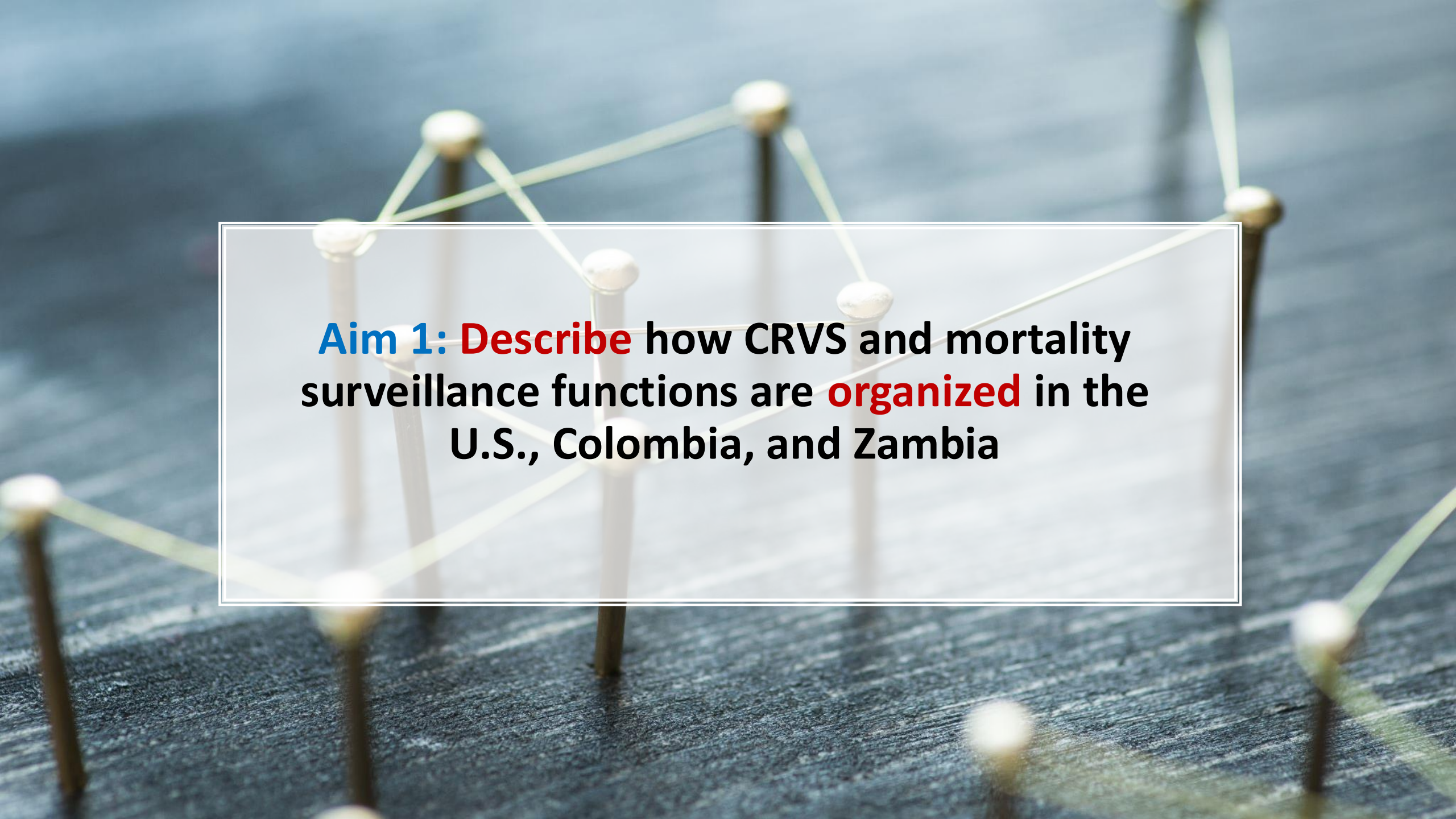
The background of the slide is a blurred image of an open book, showing the pages and the spine. The colors are in shades of blue and grey, with a soft, out-of-focus effect. The word "Results" is written in white, sans-serif font on the left side of the page.

Results



US (12), Colombia (6), Zambia (5) = 23

Country	Participants	Response ID
United States	Program expert, vital statistics systems (CDC Center)	R-U01-PROGRAM-VS
	Policy expert, public health mortality surveillance (CDC Center)	R-U02-POLICY-PHMS
	Program expert, public health mortality surveillance (CDC Center)	R-U03-PROGRAM-PHMS
	Policy expert, vital statistics systems (CDC Center)	R-U04-POLICY-VS
	Expert, vital statistics data systems (CDC Center)	R-U05-DATASYSTEMS-VS
	Expert, public health mortality surveillance data systems (CDC Center)	R-U06-DATASYSTEMS-PHMS
	Senior personnel, population health data science, New York	R-U07-NY
	Senior personnel, Flu surveillance Program (Flu mortality surveillance)	R-U08-FLUSURV
	Senior personnel, Cancer Control program (cancer mortality surveillance)	R-U09-CCP
	Expert, state-national-data use	R-U10-DataUseExpert
	Senior personnel, injury prevention and control (drug overdose mortality surveillance)	R-U11-INJURYSURV
	Executive personnel, NAPHSIS	R-U12-NAPHSIS
Colombia	Expert, public health mortality surveillance data systems	R-C01-DATASYSTEMS-PHMS
	Policymaker, public health mortality surveillance	R-C02-POLICY-PHMS
	Expert, CRVS subsystems	R-C03-SUBSYSTEMS-CRVS
	Senior personnel, perinatal mortality surveillance	R-C04-PerinatalSurv
	Senior personnel, under-five mortality surveillance	R-C05-U-5-SURV
	Policy & program expert, CRVS	R-C06-PP-CRVS
Zambia	Policy & program expert, CRVS	R-Z01-PP-CRVS
	Expert, CRVS data systems	R-Z02-DATASYSTEMS-CRVS
	Program expert, public health mortality surveillance	R-Z03-PROGRAM-PHMS
	Policy & program expert, public health mortality surveillance	R-Z04-PP-PHMS
	Expert, public health mortality data systems	R-Z05-DATASYSTEMS-PHMS



Aim 1: Describe how CRVS and mortality surveillance functions are **organized** in the U.S., Colombia, and Zambia



United States – Organization & Process

Organization of the CRVS & MS in the US

Historical & Legal Foundation

- Death registration dates to 1850; all states added to NRS by 1933
- 50 states & 7 territories provide near 100% CRVS coverage
- US Constitution & state laws support the federated structure
- Public Health Service Act authorizes NCHS to operate NVSS

Structure & Stakeholders

- Federated cooperative structure via Federal-State Agreements
- States handle death registration; NVSS provides national coordination, standard-setting & statistical compilation
- NAPHSIS represents states in federal negotiations & provides technical support
- Multiple stakeholders: NCHS, state VR offices, SSA, Census Bureau, IT vendors, PH programs, academia

Mapping the U.S. CRVS process to the 'Ten CRVS Milestones' framework

Milestone	Match	Status	Gap/Caveat
1. Notification	Strong	Death triggers medical certification via EDRS	Medicolegal deaths
2. Validation & verification	Strong	VR offices review submissions	Jurisdictional differences
3. Registration	Strong	Death registered at local/council/state via EDRS	Variable timing & procedures
4. Certification	Strong	States issue legal death certificates	Medical vs Registrar certification
5. Information sharing	Strong	Share data with NVSS, jurisdictions, PH programs through STEVE/FHIR	Confidentiality rules & varying state policies
6. Storage & archiving	Strong	States VR archives /NCHS storage-secure databases; public & restricted-use files	Variation by state
7. Compilation of VS	Strong	NCHS links demographic & medical data	Depends on data receipt from states
8. Quality control of VS	Strong	Automated checks & coding + nosologist review	Can originate upstream
9. Generation of VS	Strong	Frequently refreshed provisional & annual final VS	Provisional vs final products
10. Dissemination of VS	Strong	Public query platforms (CDC WONDER) & finalized public-use/ restricted-use datasets	Variations in annual timelines



Colombia – Organization & Process

Organization of the CRVS & MS in Colombia

Historical & Legal Foundation

- CR transitioned from Church-led to State-led in 1852
- National Civil Registry (RNEC) established 1948; nationwide registrations since 2010
- Legal foundation in the Constitution, backed by multiple laws
- Intersectoral Commission on Vital Statistics provides national guidance

Institutional Roles

- MoH leads MCCD & manages RUAF-ND
- NCR registers deaths & issues death certificates
- INS leads PHMS & manages SIVIGILA
- DANE handles centralized coding of cause of death
- NILM&FS registers deaths from external/violent causes via SIRDEC
- Parallel pathways for CRVS, MS & forensic drawing from the same data source

Mapping the Colombia's CRVS process to the 'Ten CRVS Milestones' framework

Milestone	Match	Status	Gap/Caveat
1. Notification	Strong-Partial	Death occurrence notified but through multiple channels	Notification timeliness varies by pathway
2. Validation & verification	Strong	Validation routines check for completeness & plausibility	Validation capacity can differ by territory
3. Registration	Strong	Deaths registered thru national CRVS pathway	Completeness >90% but can be weaker in remote areas
4. Certification	Strong	MCCD feeds legal reg. & certification & triggers coding	Certification quality varies & can delay coding
5. Information sharing	Strong-Partial	Sharing through defined data exchanges	Differentiated sharing, some < automated
6. Storage & archiving	Strong	Consolidated databases & archives	Archival integrity is strong; but still upstream-dependent
7. Compilation of VS	Strong	Registered deaths compiled into national mortality datasets	Official compilation slower than MS outputs
8. Quality control of VS	Strong	Automated/expert checks/reconciliation	Quality improvements depend on territorial compliance
9. Generation of VS	Strong-Partial	Official statistics generated after extended processing; PHMS faster	Tradeoff between speed and stability
10. Dissemination of VS	Strong	Disseminated through official statistics releases; open data for research	Interpretability depends on communicating provisional vs finalized



Zambia – Organization & Process

Organization of the CRVS & MS in Zambia

Historical & Legal Foundation

- CR system dates to 1964, at independence
- 1971 Birth & Death Registration Act is the legislative backbone
- DNRPC holds legal authority for civil registration
- MS subcommittee provides interministerial coordination

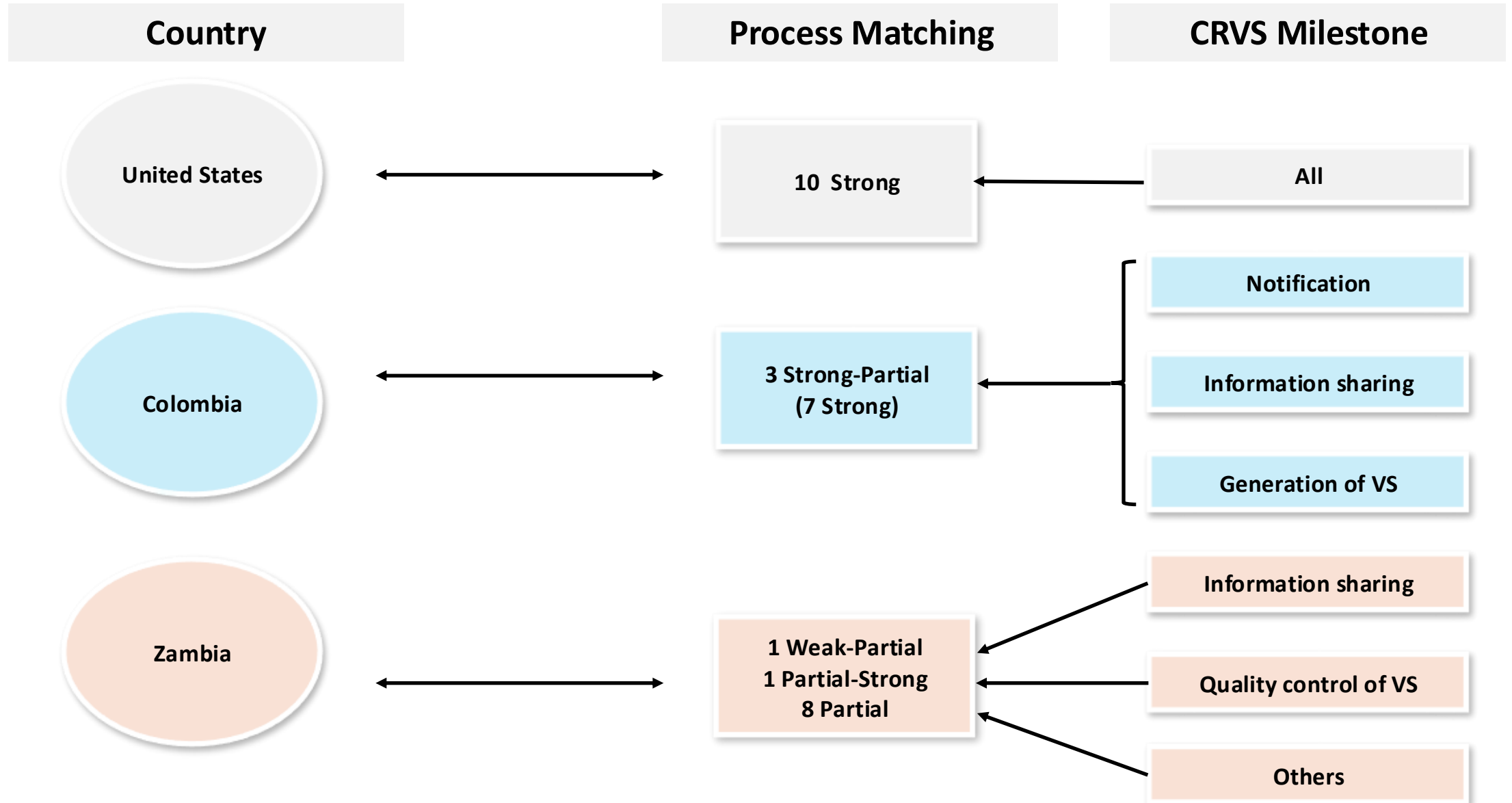
System Characteristics

- Ministry of Health leads facility-based deaths & MCCDs; ZNPHI focuses on PHMS; ZamStat compiles national mortality statistics
- Highly fragmented systems with minimal interoperability; coverage consistently below 50%
- Passive, family-driven death registration
- SRS supplements CRVS data; progressive investments stalled by funding constraints

Mapping Zambia's CRVS Process to the Ten CRVS Milestones

Milestone	Status	Match	Gap/Caveat
1. Notification	Partial	Deaths notified through HFs, CSAs & VA processes	Fragmented; often informal, family/volunteer-driven
2. Validation & verification	Partial	Basic validation by FDs; CDs via VA	Varied verification practices
3. Registration	Partial	DNRPC-led with limited coverage	Under-registration persists
4. Certification	Partial	MCCDs & verbal autopsies	Incomplete MCCD delays certification
5. Information sharing	Weak-Partial	Paper forms, manual reporting & ad hoc requests	Poor interoperability restricts timely sharing
6. Storage & archiving	Partial	DNRPC & separate surveillance datasets	Parallel archives complicate retrieval
7. Compilation of VS	Partial	DNRPC & ZamStat compile with substantial delays	Incomplete registration limits representativeness
8. Quality control	Partial-Strong	Quality checks, nosologist, biometric de-duplication	Upstream data gaps remain
9. Generation of VS	Partial	Official VS infrequent; MS for situational awareness	CRVS limited as timely statistical source
10. Dissemination	Partial	Periodic reports & partner-supported outputs	Limited timeliness reduces routine PH use

Countries' Process Alignment with the CRVS Milestones



A network diagram consisting of several nodes (small white spheres) connected by thin, light-colored lines. The nodes are arranged in a roughly circular pattern on a dark, textured surface. The background is a blurred, dark blue-grey color.

Aim 2: Assess the *degree of integration* and *associated outcomes* for each country's CRVS and mortality surveillance functions using the CDC ToC model

United States

“I’d say it’s **wholly integrated** with the statistical system... the information that we get for mortality surveillance comes directly from the statistical system.”

R-U02-Policy-PHMS

Colombia

“I think we still need to work on **integration**... that integration between RUAFA and SIVIGILA ... **It is not perfect, but it exists.**”

R-C05-U-5-Surv

Zambia

“Q: “On a scale of one to five... **where one is not integrated at all and five is perfectly integrated**, where will you place the level of integration?”

R: “**One.**”

R-Z01-PP-CRVS

“We have **almost complete 99.99%** of deaths are captured in the US, and that’s just the way it’s done.”

R-U04-Policy-VS

“**Coverage is very high** in the country. However, there are **some that are missed**; those that occur in indigenous communities.”

R-C05-U-5-Surv

“As a country, when it comes to death reporting and registration, **we are well below the 50% mark** because most deaths happen outside health facilities.”

R-Z05-DataSystems-PHMS

Integration

Coverage

A network diagram consisting of several nodes (small white spheres) connected by thin, light-colored lines. The nodes are arranged in a roughly circular pattern on a dark, textured surface. The background is a blurred, light blue-grey color.

AIM 3: IMSS Facilitators, Barriers & Lessons

Policies, Agreements & Legislation

Country	Key Facilitators	Key Barriers	Quote
us United States	State ownership with federal coordination; contractual governance; standardized reporting; centralized COD coding; model law	Variation in state laws; legal & confidentiality constraints on data sharing	<i>"Every state has its own system. That is a major problem with the American vital record system." (R-U10)</i>
co Colombia	Harmonized regulatory frameworks; unique identifiers; mandatory reporting & legal accountability	Incomplete harmonization of rules across systems	<i>"Having a solid information base of unique identifiers" (R-C03)</i>
zm Zambia	Legal mandates & institutional authority for death registration & reporting	Absence of a dedicated legal framework for mortality surveillance	<i>"We often find ourselves in between different Acts... with nothing really to speak to the entire spectrum." (R-Z04)</i>

Infrastructure

Country	Key Facilitators	Key Barriers	Quote
us United States	Modern ICT infrastructure; FHIR-enabled exchange	No universal personal health identifier; ICT heterogeneity & legacy systems; timeliness variability across jurisdictions	<i>"They register it, Boom! We get it. We code the cause of death... Boom! It's back to them."</i> (R-U04)
co Colombia	Digital transformation; interoperability, automation & de-duplication; online death certification	Incomplete interoperability; connectivity constraints; manual processes & duplication	<i>"In terms of technological challenges, I would say interoperability, data exchange."</i> (R-C03)
zm Zambia	Incremental digital investments; national digital health strategy alignment	Paper-based processes; limited interoperability; fragmentation & parallel systems; connectivity & power supply issues; vendor lock-in	<i>"Because of lack of integration, we have multiple reporting systems on the same mortality matters."</i> (R-Z01)

Governance, Funding & Resources

Country	Key Facilitators	Key Barriers	Quote
us United States	Long-standing institutional arrangement; funding incentives; integrated placement within health agencies; leadership & partnerships; NAPHSIS	Historical underfunding of public health & forensic systems; local-level resource constraints	<i>"That little bit of funding... is absolutely essential to have truly national coverage." (R-U04)</i>
co Colombia	Intersectoral governance & institutional coordination; sustained state financing & catalytic external support	Chronic resource constraints; gaps in governance clarity & operational coordination	<i>"The financier is the State... each agency includes in its budget the resources necessary." (R-C06)</i>
zm Zambia	Partner engagement & resource mobilization; multi-sectoral coordination mechanisms	Lack of standardized coding & data governance; dependence on external funding	<i>"Mortality surveillance is extremely vulnerable to external funding shocks." (R-Z04)</i>

People & Organizational Culture

Country	Key Facilitators	Key Barriers	Quote
us United States	Culture of timeliness; demonstrated data utility; skilled workforce & training	Local-level capacity constraints; incomplete clinical information for COD certification; limited training & incentives for certifiers	<i>"Most often, the issues of data quality come from resource and capacity at the local level." (R-U01)</i>
co Colombia	Professional norms, quality assurance & accountability; training & technical assistance; community engagement & feedback loops	Gaps in training & certification; limited front-line feedback; underreporting in marginalized populations	<i>"We present our results and ask what we could improve." (R-C02)</i>
zm Zambia	Workforce capacity, professional norms & learning systems; national MS strategic plan	Passive & incentive-driven registration; incomplete MCCD; human resource & skills gaps	<i>"It's a very passive, family-driven system; in most cases, the MCCDs are retained by the family." (R-Z04)</i>

Emerging Cross-Country & Country-Specific Lessons

Lesson Theme	Cross-Cutting	United States	Colombia	Zambia
Integration is institutional, not just technical	Requires sustained coordination, clear roles & institutional commitment beyond technology	Long-standing institutionalization normalizes integration & reduces transaction costs	Centralized authority accelerates integration when mandates are clear	Parallel mandates with no legal linkage framework reveals integration as both political & institutional
Data exist but require effective systems to be accessible & useful	Core challenge is enabling data to move across systems for analysis & use	High integration minimizes data loss, but timeliness still varies across states	Interoperability gaps limit real-time exchange despite centralized systems	Deaths are often recorded somewhere but fail to reach analytic & policy spaces

Emerging Lessons (Continued)

Lesson Theme	Cross-Cutting	United States	Colombia	Zambia
Incentives Shape Reporting Behavior	Perceived benefits influence whether deaths are reported & registered	Public transparency & service delivery reinforce compliance	Administrative & social incentives support registration uptake	Limited perceived benefit discourages death reporting, especially in communities
Digitization Improves Timeliness but Requires Governance	Digital tools improve timeliness but do not resolve governance or coordination gaps alone	FHIR-enabled systems demonstrate the value of standards-based exchange	National platforms require continuous governance to remain interoperable	Digitization without legal & infrastructure support creates parallel systems

Emerging Lessons (Continued)

Lesson Theme	Cross-Cutting	United States	Colombia	Zambia
Crises Accelerate System Change	Public health emergencies elevate the importance of mortality surveillance	COVID-19 accelerated provisional data release & real-time reporting	Pandemics reinforced intersectoral coordination & data use	COVID-19 & cholera outbreaks created momentum for surveillance investments
Sustainability Requires Domestic Ownership	Long-term viability depends on embedding IMSS within routine government systems	Stable domestic funding supports continuity & system maturity	Government leadership reduces reliance on external partners	Dependence on donor funding highlights vulnerability & need for domestic investment

Cross-Cutting Lessons Aligned with IMSS Enablers

Cross-Cutting Lesson	Primary IMSS Enabler(s)	Explanation of Alignment
Integration is institutional and requires clear roles and sustained coordination	Policy, agreement & legislation Governance, funding & resources	Clear mandates and formal coordination structures institutionalize integration.
Digitalization improves timeliness, but does not substitute for governance	Infrastructure Governance, funding & resources	Digital tools require governance to ensure interoperability and routine use.
Sustained financing is essential for system stability and national coverage	Governance, funding & resources	Predictable financing supports continuity, coverage, and workforce retention.
Human capacity and professional norms underpin data quality	People & organizational culture	Training and professional norms ensure accuracy, completeness, and trust.
Community engagement influences completeness of mortality data	Policy, agreements, & legislation People & organizational culture	Policy support and social engagement shape reporting behaviors.



Discussion



United States

Critique of the Decentralized System

Integration focus in the U.S. is not about creating new systems but aligning existing ones and making them more interoperable by adopting FHIR standards.

Institutional maturity enables integration to proceed through standardization, incentives, and incremental technological enhancement.

However, system maturity can mask variability across jurisdictions and create complacency about inequities in performance (Cisewski et al., 2024).

Adapt operational considerations to context (Suthar et al., 2019)

Colombia

Critique of Centralized Mortality Function Governance

Produce a single, coherent national mortality dataset that supports both PH action and official statistics.

Workload & decision authority concentrated at the national level - reporting bottlenecks & delayed feedback for subnational use

Obscure subnational inequities, e.g., delays in certification, connectivity barriers, or limited local analytic capacity.

Aligning central coordination & cross-sector boundaries – legal registration, health sector guidelines, & statistical standards

Central rules are only as effective as their implementation capacity across territories (Gordillo et al., 2024).

Critique of Catalytic Facilitators in Emerging Systems



Zambia

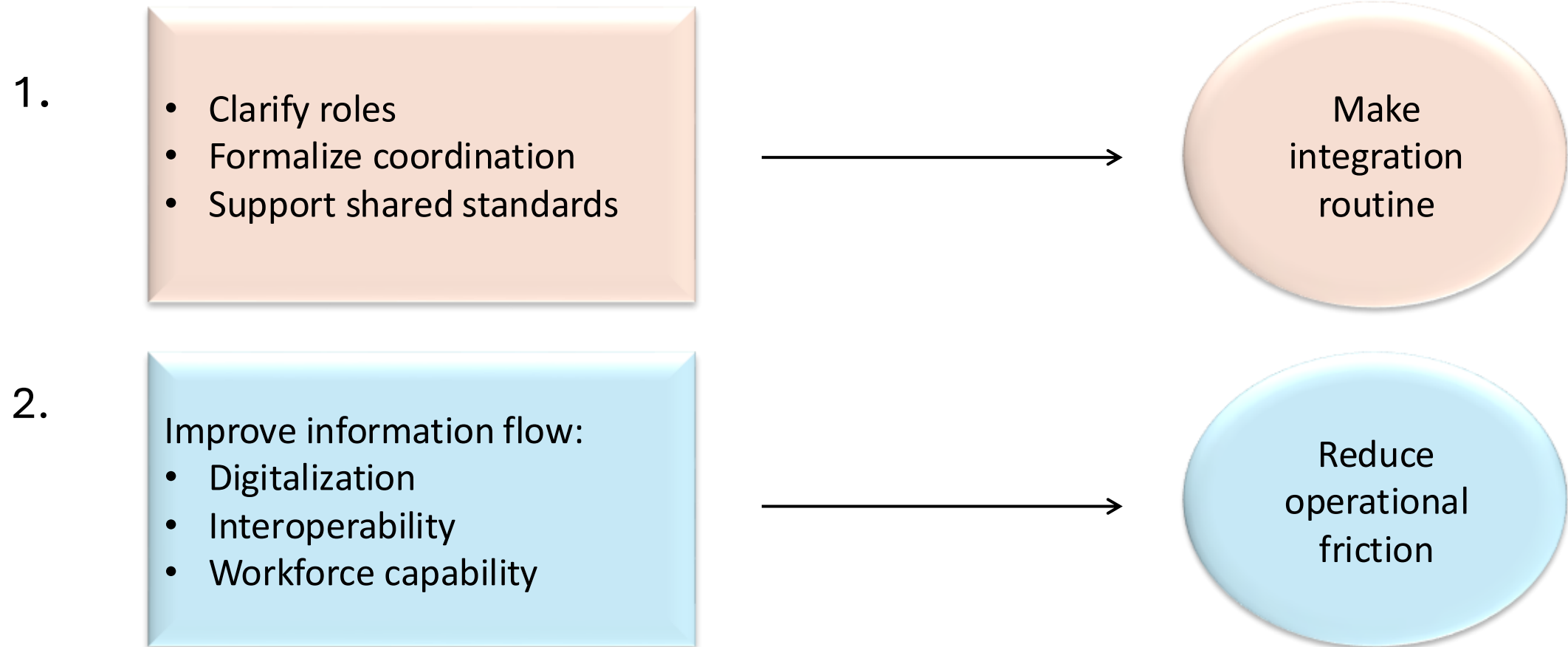
Partner-supported innovations accelerate progress, but also create sustainability risks

Common in low-resource settings, short-term partner investment triggers longer-term institutional reforms when domestic systems absorb recurrent costs (GFF, 2025; Open Data Watch, 2025).

Investments that prioritize short-term platforms over long-term recurrent costs keep the system vulnerable (Open Data Watch, 2025).

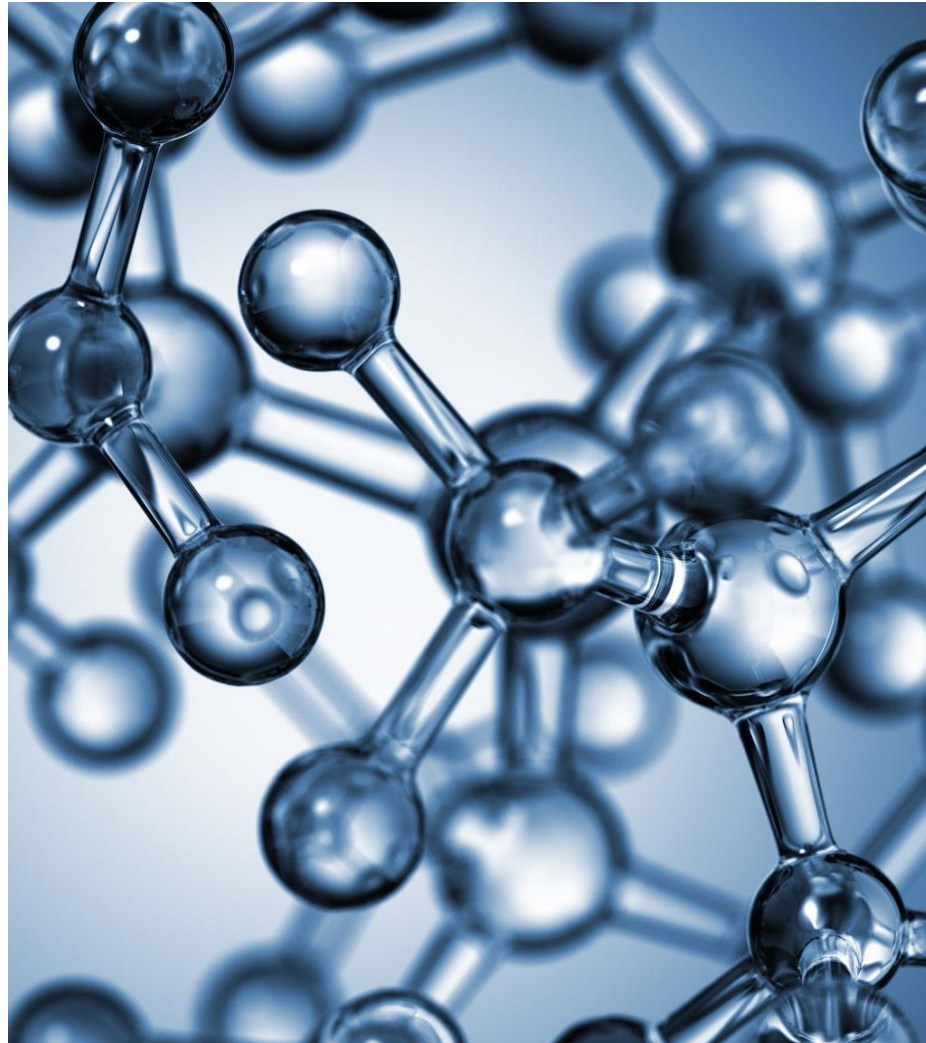
Verbal autopsy programs can become isolated if their outputs are not systematically linked to CRVS registration and to national statistics (Chanda et al., 2024).

Pathways for strengthening Integrated Mortality Surveillance



Lesson: Investments in technology should be paired with investments in organizational capacity, particularly governance, financing, and training, so that integration can be sustained and scaled.

Transferable Lessons



United States

From Colombia - Two-way feedback loops, e.g., through NAPHSIS platforms

From Zambia – Equity in modernization

Make official crisis-driven emergency adaptations

Colombia

From the U.S. - Large-scale standardization; interoperability

From Zambia - Protect fairness during modernization for rural communities

Zambia

From Colombia - Operational model of routine reconciliation

From the United States - Workforce systems and quality management

Create a single national resource roadmap to reduce donor-dependence

Recommendations

Recommendation Theme	Cross-Cutting Recommendations (All Countries)	United States Context-Specific	Colombia Context-Specific	Zambia Context-Specific
Strengthen Governance and Coordination <i>(Governance, funding & resources)</i>	Formalize and sustain inter-institutional coordination mechanisms for IMSS.	Enhance federal-state coordination to reduce variability and accelerate harmonization.	Further strengthen centralized intersectoral governance to sustain integration gains.	Operationalize & empower the mortality surveillance subcommittee to reduce fragmentation.
Ensure Sustainable Financing <i>(Governance, funding & resources)</i>	Move from project-based funding toward predictable, long-term financing for IMSS.	Protect and stabilize federal funding streams supporting state participation.	Institutionalize IMSS financing within national and subnational budgets.	Increase domestic budget allocations to reduce reliance on donor funding.

Recommendations Contd

Recommendation Theme	Cross-Cutting Recommendations (All Countries)	United States Context-Specific	Colombia Context-Specific	Zambia Context-Specific
Invest in Human Capacity <small>(People & organizational culture)</small>	Sustain continuous training in data governance, analytics, and digital systems.	Address subnational workforce shortages and succession planning.	Expand training and professionalization across regions and municipalities.	Invest in digital health, informatics, and nosology skills.
Enhance Community Engagement and Incentives <small>(People & organizational culture)</small>	Design systems that align community incentives with death reporting and data use.	Strengthen public communication and transparency to maintain trust.	Expand outreach strategies to improve completeness in hard-to-reach populations.	Develop incentive-aligned approaches to encourage timely death reporting.

Recommendations contd

Recommendation Theme	Cross-Cutting Recommendations (All Countries)	United States Context-Specific	Colombia Context-Specific	Zambia Context-Specific
Modernize Legal and Policy Frameworks <small>(Policy, agreements & legal framework)</small>	Align legal frameworks with digital and integrated surveillance practices.	Address legal barriers to data sharing across states and agencies.	Update decrees and policies to reflect expanded digital and surveillance functions.	Establish a dedicated legal mandate for mortality surveillance and electronic notification.
Improve Data Sharing and Interoperability <small>(Infrastructure)</small>	Standardize data sharing agreements and interoperability protocols.	Expand and maintain FHIR-enabled, standards-based exchange nationwide.	Strengthen interoperability across national platforms and registries.	Develop APIs and integration layers linking CRVS, health, and surveillance systems.



Summary

US: Institutional maturity can make integration standard, but this requires continuous engagement & investment.

Colombia: Centralized management provides national coordination of standards and workflows, but this still requires coordination across institutional lines.

Zambia: Technical capacity, such as digital platforms and surveillance tools, only promotes integration when matched formally with governance, clarity in roles, and alignment in operational standards.

Study Limitations

Analysis of qualitative interviews with a purposeful sample may not be representative

Self-reported experiences and perceptions prone to recall and social desirability biases

Comparison of 3 countries with different governance structures, system maturity levels, and resource environments.

Study did not independently verify administrative data, system documentation, or performance metrics mentioned by respondents

The study captures systems at a specific time, which may change after data collection.

Nevertheless,

Study offers a solid, analytically grounded account of how CRVS and mortality surveillance systems are organized and integrated in three different contexts.

Investigates country-specific and cross-cutting facilitators, challenges, and lessons of IMSS to aid system improvement and policy reforms.

By clearly identifying limitations and incorporating strategies to address them within the study design, the analysis provides credible and transparent insights that can inform policy and future research.



Conclusion

The comparative insights from this study provide useful lessons for countries at different stages of developing CRVS and mortality surveillance systems and contribute to the growing body of knowledge on improving the timeliness, completeness, and usefulness of mortality data for public health.

Future Steps & Recommended Studies

Present findings to countries

Scientific publications

Support countries to develop policy briefs & hold policy dialogues

Facilitate cross-country learning platforms & COPs

A study to quantitatively assess integration as an abstract construct with domains based on this study

Implementation research for the rollout of HL7 FHIR standards and other digital transformation projects

Declarations

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