

# International Challenges and Complexities of Data Collection in National Health Accounts: A Narrative Review (2024)

Yogesh Chandra<sup>1</sup>, Ajai Kumar Jain<sup>2</sup>

## ABSTRACT

National Health Accounts (NHAs) are a critical tool in hands of governments worldwide to decide upon the health policies and allocation of scarce healthcare resources. The outcomes depend on the quality and adequacy of NHA data. This international literature review examines the practical barriers and methodological challenges in collecting the data for NHAs. It ventures into the synthesis of findings based on 46 research papers published between 2000 AD and 2024 AD collected from various relevant sources. This study identifies multifaceted challenges spanning infrastructural, methodological, technological, institutional, and contextual dimensions. There are significant infrastructural constraints, particularly in developing regions of the world which include inadequate health management information systems, non-standardized data collection methods, and challenges in capturing the national health expenditures incurred on treatment by indigenous and traditional medicine systems in different countries. This review also highlights other critical impediments, such as methodological inconsistencies, technological limitations, data quality concerns, and governance and administrative challenges across different healthcare systems. The study emphasizes the urgent need for adequate investment in technological infrastructure, standardization of data collection methods, enhanced training programs, and stronger ethical frameworks for better outcomes. This study concludes that addressing these multifaceted challenges will play significant role in improving the reliability and utility of NHA data, ultimately enabling evidence-based policy-making, effective resource allocation, and enhanced healthcare outcomes on a global scale.

**Keywords:** International classification of health accounts-healthcare/healthcare provider/healthcare financier, National health accounts, Organization for economic cooperation and development, System of health accounts

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## INTRODUCTION

National Health Accounts (NHAs) are standardized tools used globally to track health expenditures, providing critical data for informed policy-making and efficient allocation of healthcare resources by generating reliable estimates on financing as well as consumption pattern experiments from various parts/types of a national healthcare system of the country. The study of these accounts yields critical information on the finance development regarding healthcare, which represent solid bases for a policy making process and are especially valuable in international comparisons. The systematic tracking of health expenditures began with the organization for economic co-operation and development (OECD) in the 1960s, culminating in the development of the System of Health Accounts (SHA) in the 1990s. Since then, international organizations, including the World Health Organization, have promoted the NHA framework to ensure standardized data collection across countries. This SHA framework was then globally adopted in the 2000s, as the World Health Organization also actively involved in promoting its implementation and providing technical assistance to countries for developing NHA systems. Ongoing global collaboration aims to continuously improve and standardize NHA methods to enhance the comparability and usefulness of health expenditure data across countries. National Health Accounts (NHAs) data collection presents significant challenges and complexities that fundamentally impact the precision, credibility, and utility of these critical healthcare financial records.

The aim of this comprehensive review is to illuminate the methodological issues and practical constraints in data collection for NHA. Through narrative review of the literature, we aim to contribute to discussions aimed at improving NHA methodologies and ensuring better quality health expenditure data worldwide. NHA data collection can be complicated because:

<sup>1</sup>Amity University, Noida, Uttar Pradesh, India

<sup>2</sup>Alard School of Health and Biosciences Alard University, Pune, Maharashtra, India

**Corresponding Author:** Yogesh Chandra, Amity University, Noida, Uttar Pradesh, India.

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1. Various healthcare systems and financing mechanisms from countries
2. Data definition and classification system issues
3. Vacuum of data, especially in low- and middle-income countries
4. Difficulties of collecting OOP expenditure and in kind payments
5. Problems in dis-aggregation of health expenditure data at the level of diseases, population groups or categories, and type-wise sanctioned functions
6. Capabilities in capturing and joining data sources are techno-centric.

To achieve this, a broad range of literature has been accessed and tried to paint a comprehensive picture regarding the possible complexities researchers and statisticians faced when it comes to the compilation process of NHAs. In addition, researchers also examined new and successful solutions to address these concerns, providing insights into potential solutions and areas for future research.

By critically analyzing the challenges and complexities in NHA data collection, this study aims to:

1. Enhance awareness of the limitations and potential biases in the current NHA data
2. Identify key areas for methodological improvements in data collection and analysis
3. Encourage the development of more robust and efficient data collection strategies.

As healthcare systems continue to evolve and face new challenges, the importance of accurate and comprehensive NHA is very important to address the health expenditures' issues. The review synthesizes findings from international literature published between 2000 and 2024, highlighting key impediments and exploring potential solutions for enhanced NHA data reliability.

## RESEARCH METHODOLOGY

This study is descriptive in nature and researchers conducted a comprehensive narrative literature review to identify known limitations, biases, and gaps in the current NHA data collection and reporting practices across different countries for the period from 2000 to 2024. Exhaustive process adopted for conducting this narrative review is mentioned as below:

1. Hundred research papers were initially identified with the title search "Challenges and Complexities in Data Collection for NHA: A Comprehensive Review of Methodological Issues and Practical Barriers" in Google Scholar database with following inclusion/exclusion criteria:

### Inclusion Criteria

#### Time period

It was identified for comprehensive review of research paper from 2000 to 2024 as this period reflects the adoption and evolution of the SHA framework and the increased global emphasis on implementing NHA. The WHO has started given a thrust on NHA implementation since 2005 to support the previous ongoing SHA framework adopted globally in the year 2000.

#### Language

Search criteria were limited to research publications only in English language, given language constraints and the focus on international publications commonly accessible in this language.

#### Study type

Peer-reviewed research articles, systematic reviews, and narrative reviews focusing on NHA data collection, health expenditure tracking, and challenges in implementing health accounts framework were identified for the study.

#### Relevance to NHA

Out of total hundred identified research papers, 46 papers were included and limited to only, those studies that specifically address issues related to data collection, methodological challenges, technological barriers, or governance concerns in the context of NHAs.

### Exclusion Criteria

#### Non-English language studies

Studies published in languages other than English were excluded due to translation limitations.

#### Non-peer-reviewed sources

Gray literature, conference abstracts, editorials, and opinion pieces were excluded to ensure the use of reliable, peer-reviewed evidence.

#### Irrelevant focus

Studies focusing on broader national accounts or financial audits without a specific emphasis on health expenditures or NHA were excluded.

#### Duplicate studies

Duplicate studies or publications presenting the same data across different platforms were removed to avoid redundancy.

#### Inadequate methodological detail

Studies lacking sufficient methodological detail to assess their relevance or rigor in addressing NHA data collection challenges were excluded.

### Data Analysis

No statistical measures were used as research study was narrative review in nature hence only critical analysis was carried out to categorize and synthesize the key limitations and biases identified in current NHA data, highlighting their impact on data reliability and usability.

### Ethical Considerations

Nil as research papers were used only, available on open website.

## RESULTS

Figure 1 denotes the different phases of studies in last so many years, by the researchers to make the NHA framework more practical and adaptable:

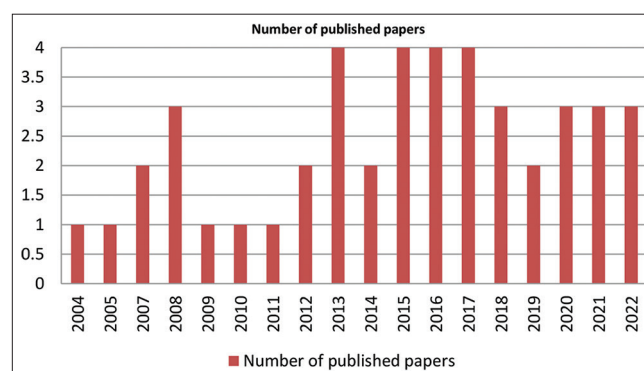


Figure 1: Year-wise published papers relevant to narrative review

1. Early focus (2004–2010):
  - Basic system challenges
  - Technical barriers
  - Resource constraints.
2. Middle period (2011–2016):
  - Methodological refinement
  - Quality assessment
  - Standardization efforts.
3. Recent developments (2017–2022):
  - Implementation challenges
  - System integration
  - Cross-border harmonization.

Trend over time: The data show a steady increase in the number of dates/publications over the years, starting from one in 2004 and reaching a peak of four in 2013, 2015, 2016, and 2017. This suggests a growing attention and activity in the area of NHA during this period globally.

These data suggest that there is growth in landscape of research and activity in this important area of NHA and also it has significant potential for interdisciplinary collaborations and continuous advancements in this field of healthcare policy and financing.

By review above literature, it is evident that data collection for NHA is very much concerning due to multifaceted challenges extending from methodological, technological, institutional, to contextual dimensions. Researchers have identified following several critical impediments to effective health data compilation across various global contexts.

### Methodological Complexities

One of the primary challenges lies in the methodological inconsistencies as highlighted by previous studies that there is deficit of universally accepted definitions for public health services, coupled with difficulties in accurately attributing expenditures to specific health conditions.<sup>[35,40]</sup> Data collection methods are varying across different regions and healthcare systems and this issue imposes a significant problem in the comprehensiveness and comparability of NHA.

### Technological and Infrastructural Limitations

Developing countries face particularly challenges in data collection infrastructure. It is observed that there are some lapses in government public expenditure management systems and inadequate record keeping of the same.<sup>[8,27]</sup> Technological plays a vital role in effective data management and mostly developing countries are struggling with poor IT systems and limited digital infrastructure, adversely affect the collection, integration, and analysis of health expenditure data.

### Data Quality and Reliability Concerns

Previous studies underscore the fundamental issues of data quality, such as incomplete reports, selection bias, and varying data quality that complicate health expenditure analysis.<sup>[29]</sup> Inconsistent information systems, cultural differences in health-seeking behaviors, and difficulties in maintaining appropriate data sources are few factors, affecting the data quality.

### Contextual and Practical Barriers

Besides the technical challenges, there are various other issues also identified as: Maintaining centralized data systems for data completeness and also facilitating data availability to local agency as different countries have different laws for the data sources accessibility.<sup>[6,25]</sup>

### Ethical and Governance Challenges

Various comprehensive sets of barriers are identified to data sharing, categorizing them into technical, motivational, economic, political, legal, and ethical domains.<sup>[45]</sup> Still, privacy concerns are major issue adding further another layer of complexity to health data collection.<sup>[46]</sup>

### Regional and Contextual Variations

Regional and contextual variations are also augmenting the challenges across regions, as inconsistencies in data availability, accessibility, quality, and comparability.<sup>[36]</sup> Similarly, studies from Africa, Asia, and other developing regions reveal unique local challenges that complicate standardized data collection.

The synthesis reveals that NHA data collection is a complex, multidimensional challenge requiring holistic approaches. Existing challenges demand interdisciplinary collaboration, technological innovation, standardized methodologies, and context-sensitive strategies for effective data collection in NHA.

### DISCUSSION

The present narrative review highlights the significant infrastructural constraints hindering the quality of NHA data, particularly in developing regions. Technology infrastructure plays a vital role in NHA data collection by ensuring integrated systems to track and analyze healthcare expenditure flows across different healthcare sectors. The infrastructure consists of three core components: Data collection systems that include automated financial data feeds from government systems, healthcare providers, insurance companies, and digital survey management tools for household and provider expenditure surveys. Developing countries are facing challenges to manage these three components effectively. Good data quality needs robust health management information system (HMIS) along with adequate staff training supported by management commitment.<sup>[47]</sup>

Data collection methods significantly influence the quality and comprehensiveness of NHA data. The evolution of standardized methods has been crucial in enhancing the correctness of health expenditure tracking, which plays a crucial role in effective policy-making and resource allocation. OECD countries are following (SHA, 2022) frameworks to capture the flow of healthcare expenditures consisting of three components: Financing agent, Healthcare providers, and Healthcare functions while the World Health Organization issued the guideline with four components – Finance resources, Financing agents, Healthcare providers, and Healthcare functions, NHA framework for developing countries. Sometimes, comparison becomes difficult due to these different frameworks. Building micro datasets that reconcile survey data with national health expenditure estimates helps in more detailed understanding of individual-level spending.<sup>[48]</sup>

**Table 1:** Summarization of important aspects of the studies undertaken for narrative review

S. No.	Title of the study	Author (s)	Publication month and year	Summary relevant to NHA
1	A prospective study of the practical issues of local involvement in national audit of COPD <sup>[1]</sup>	Chris Roberts +3 more	May-04	The paper focuses on local participation in COPD audits, highlighting barriers such as inadequate resources, poor IT systems, and methodological issues but does not address national health accounts data collection challenges.
2	Investigating International Health Markets: Methodological Problems and Challenges <sup>[2]</sup>	Chris Holden	October-05	The article highlights the inadequacy of existing data, diverse levels of analysis, and the need for harmonization, complicating the collection of comprehensive National Health Accounts.
3	Problems of measurement and analysis in the national accounts under rapidly growing globalization <sup>[3]</sup>	Soli Peleg +1	February-07	The paper focuses on measurement problems in national accounts due to globalization, not specifically on national health accounts or their data collection challenges and complexities.
4	Refining estimates of public health spending as measured in national health expenditures accounts: the United States experience <sup>[4]</sup>	Arthur L. Sensenig	March-07	The primary challenges in data collection for National Health Accounts include the lack of a universally accepted definition of public health services, inconsistent state and local data, and reconciling methodologies.
5	A review of health resource tracking in developing countries <sup>[5]</sup>	Timothy Powell-Jackson +1	November-07	Weak government public expenditure management and inconsistent information systems present significant challenges in data collection for National Health Accounts, undermining reliability and timeliness of health resource tracking.
6	Collecting adequate data on racial and ethnic disparities in health: the challenges continue <sup>[6]</sup>	Linda T. Bilheimer +1 more	March-08	The paper highlights data limitations, inadequate sample sizes, and missing data as key challenges in identifying racial and ethnic health disparities, complicating national health accounts analysis.
7	Methodologies for data collection <sup>[7]</sup>	Sheryl Happel Lewis +1	November-08	The paper highlights challenges such as data completeness, timeliness, cultural differences in health-seeking behavior, and the complexities of maintaining appropriate data sources for effective surveillance systems.
8	The strategic management of data quality in healthcare <sup>[8]</sup>	Karolyn Kerr +2	December-08	The paper focuses on strategic management of data quality in healthcare, not specifically addressing challenges in data collection for national health accounts or related methodological issues.
9	Challenges in building disease-based national health accounts <sup>[9]</sup>	Allison B. Rosen +1	July-09	Methodological challenges in building disease-based national health accounts include linking micro data to macro totals, selecting disease classifications, and accurately attributing expenditures to specific conditions.
10	Data and Measurement Issues in the Analysis of Health Disparities <sup>[10]</sup>	Linda T. Bilheimer +1	October-10	The paper discusses measurement challenges in health disparities, emphasizing the need for larger sample sizes, granular data collection, and interdisciplinary approaches to address methodological complexities in data collection.
11	Data management for meeting global health challenges <sup>[11]</sup>	Tapan S. Parikh +1	August-11	The paper does not specifically address challenges and complexities in data collection for National Health Accounts, focusing instead on broader data management issues in global health contexts.

(Contd...)

**Table 1:** (Continued)

S. No.	Title of the study	Author (s)	Publication month and year	Summary relevant to NHA
12	Improving Comparability and Availability of Private Health Expenditure Data in Health Accounts in the Asia-Pacific Region: A Case of India <sup>[12]</sup>	Sarit Kumar Rout	June-12	The paper highlights challenges in collecting accurate private health expenditure data in India, emphasizing the reliance on independent surveys and the need for systematic data sources for health accounts.
13	National Health Accounts estimation: lessons from the Nigerian experience <sup>[13]</sup>	Akanni O. Lawanson +2	December-12	Challenges include skewed spending, inadequate recordkeeping, and data collection difficulties at federal and state levels, necessitating institutionalized procedures for effective health financing data management.
14	Managing and exploiting routinely collected NHS data for research <sup>[14]</sup>	Vasa Curcin +2 more	January-13	The paper identifies challenges in utilizing NHS data, including legislative barriers, poor data management practices, and lack of informatics skills, hindering optimal research exploitation.
15	Barriers to the routine collection of health outcome data in an Australian community care organization <sup>[15]</sup>	Susan Nancarrow	January-13	The paper identifies technical and practical barriers to routine health outcome data collection, including poor adherence to datasets, standardization difficulties, and low tool usage, impacting national health account methodologies.
16	Privacy and Anonymity Challenges When Collecting Data for Public Health Purposes <sup>[16]</sup>	Khaled El Emam +1	March-13	The paper focuses on de-identifying geospatial information and ensuring accurate provider performance data, highlighting the need for trust-building measures between providers and public health for effective data collection.
17	Collecting and analyzing cost data for complex public health trials: reflections on practice <sup>[17]</sup>	Neha Batura +11 more	February-14	The paper discusses challenges in standardizing cost data collection across multiple sites, including varying funder accounting methods and human resource constraints, impacting national health accounts' data reliability.
18	Overcoming barriers to a research-ready national commercial claims database <sup>[18]</sup>	David Newman +2 more	November-14	The paper discusses governance, distribution, and accessibility challenges in healthcare data, highlighting complexities in data holding models and technological investments necessary for effective data transport and accessibility.
19	A systematic review of barriers to data sharing in public health <sup>[19]</sup>	Willem G. van Panhuis +7 more	November-14	The paper identifies 20 barriers to public health data sharing, categorized into technical, motivational, economic, political, legal, and ethical challenges, complicating effective data collection for national health accounts.
20	National health accounts data from 1996 to 2010: A systematic review <sup>[20]</sup>	Anthony L. Bui	May-15	Data collection for National Health Accounts faces challenges such as incomplete reports, selection bias, and varying data quality, complicating accurate health expenditure analysis across countries and time.
21	Utilization and Monetization of Healthcare Data in Developing Countries <sup>[21]</sup>	Joshua T. Bram +3	June-15	The paper discusses challenges in reliable data collection in developing countries, including contextual, communication, business, and technological factors that hinder effective aggregation and digitization of health data.
22	Making the Case for a New National Data Collection Effort on Physicians and Their Practices <sup>[22]</sup>	Catherine M. DesRoches +3	June-15	The paper discusses challenges in physician data collection, including the complexity of physician organizations, changing workforce dynamics, and the need for comprehensive metrics to assess healthcare costs and quality.
23	Methodological Issues to Consider When Collecting Data to Estimate Poverty Impact in Economic Evaluations in Low-income and Middle-income Countries <sup>[23]</sup>	Sedona Sweeney +7	January-16	The paper identifies methodological challenges in collecting patient cost data in LMICs, emphasizing issues such as sampling, survey administration, and the need for robust reporting of data collection methods.

(Contd...)



**Table 1: (Continued)**

S. No.	Title of the study	Author (s)	Publication month and year	Summary relevant to NHA
24	Methodological challenges and analytic opportunities for modeling and interpreting Big Healthcare Data <sup>[24]</sup>	Ivo D. Dinov	February-16	The paper discusses barriers in managing big healthcare data, including technical problems, resource costs, and the complexity of unstructured data, which hinder effective data collection and analysis.
25	Methodology and Applications of Building a National File of Health and Mortality Data <sup>[25]</sup>	Leicester Gill	April-16	The paper focuses on probabilistic record linkage methodologies and does not specifically address challenges and complexities in data collection for National Health Accounts.
26	How to do (or not to do) ... translation of national health accounts data to evidence for policy making in a low resourced setting. <sup>[26]</sup>	Price, J., Guinness +3	May-16	Structural and technical constraints, rather than cost, impede institutionalizing National Health Accounts in low- and middle-income countries, complicating data collection and analysis for effective policy-making.
27	Methodological Challenges and Lessons Learned from Assessing the Routine Health Information Management Data Quality: Experience from Tanzania <sup>[27]</sup>	Severin Kabakama +2	April-17	The paper discusses methodological challenges in assessing Routine Health Information Systems data quality, highlighting time consumption, cost, and difficulties in data transcription and classification as significant barriers.
28	Opportunities and Challenges in Public Health Data Collection in Southern Asia: Examples from Western India and Kathmandu Valley, Nepal <sup>[28]</sup>	Amruta Nori-Sarma +6	June-17	The paper highlights challenges in data collection, including maintaining centralized systems, standardizing data, ensuring completeness, and overcoming local agency data access issues in developing countries.
29	"You cannot collect data using your own resources and put it on open access:" Perspectives from Africa about public health data-sharing <sup>[29]</sup>	Evelyn Anane-Sarpong +5	July-17	The paper does not address challenges and complexities in data collection for National Health Accounts; specifically, it focuses on public health data-sharing perspectives in Africa.
30	From a system of national accounts to a process of national wellbeing accounting <sup>[30]</sup>	Paul Allin +1 more	August-17	The paper does not address challenges and complexities in data collection for National Health Accounts, focusing instead on broader national well-being accounting and the integration of non-monetary indicators.
31	Using flawed, uncertain, proximate, and sparse (FUPS) data in the context of complexity: learning from the case of child mental health <sup>[31]</sup>	Miranda Wolpert +1 more	June-18	The paper does not address challenges and complexities in data collection for National Health Accounts, focusing instead on the use of flawed, uncertain, proximate, and sparse data in child mental health.
32	Challenges in accessing routinely collected data from multiple providers in the UK for primary studies: Managing the morass <sup>[32]</sup>	Fiona Lugg-Widger +6	September-18	The paper discusses challenges in accessing routinely collected data, including application processes, project timelines, consent dependencies, information governance, and contractual issues, impacting data collection for health research.
33	Development of a data collection and management system in West Africa: Challenges and sustainability <sup>[33]</sup>	Jeffrey G. Shaffer +14	November-18	The paper discusses challenges in developing a data collection and management system, including limited resources, internet access, and trained personnel, which are critical for effective health data management.
34	Methodological Challenges to collecting Clinical and Economic Outcome data: Lessons from the Pilot Dialysis Outcomes India Study <sup>[34]</sup>	Abhinav Bassi +10	April-19	The paper highlights challenges in collecting clinical and economic data, including patient sensitivity to financial information, high out-of-pocket costs, and difficulties in tracking patient outcomes post-dialysis initiation.
35	Health Data Linkage for UK Public Interest Research: Key Obstacles and Solutions <sup>[35]</sup>	Miranda Mourby +10 more	April-19	The paper identifies legal uncertainties, systemic delays, and public backlash as key challenges in health data linkage, necessitating updated guidance and improved transparency for effective data collection.

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**Table 1:** (Continued)

S. No.	Title of the study	Author (s)	Publication month and year	Summary relevant to NHA
36	Barriers to Working With National Health Service England's Open Data <sup>[36]</sup>	Seb Bacon +1 more	January-20	The paper does not address challenges in data collection for National Health Accounts, focusing instead on barriers to working with NHS England's open data and its implications.
37	Measuring follow-up time in routinely-collected health datasets: Challenges and solutions <sup>[37]</sup>	Daniel Thayer +8 more	February-20	The paper focuses on measuring follow-up time in health datasets, addressing challenges such as data availability, individual registration complexities, and ensuring accurate representation of patient histories in research.
38	"When you are a data collector you must expect anything." Barriers, boundaries, and breakthroughs: insights from the South African data-collection experience <sup>[38]</sup>	Kathryn J. Roberts +7	June-20	The paper highlights emotional and practical challenges faced by data collectors, including high workloads, safety concerns, role conflict, and the need for specialized training in low- and middle-income contexts.
39	Developing health accounts following SHA 2011: A situational analysis of countries in the WHO Eastern Mediterranean Region <sup>[15]</sup>	Nila Nathan +2	July-20	High employee turnover, restrictive data laws, and lengthy survey templates hinder effective data collection for national health accounts in the WHO Eastern Mediterranean Region.
40	A Multi-layered Data Preparation Model for Health Information in Sudan <sup>[39]</sup>	Ahmed Mustafa Abd-Alrhman +1	December-20	The paper identifies challenges in Sudan's health data collection, including data incompleteness, inconsistency, fragmentation, and lack of integration mechanisms, which hinder effective national health accounts.
41	Collecting quantitative experimental data from a non-WEIRD population: challenges and practical recommendations from a field experiment in rural Sierra Leone <sup>[40]</sup>	Hanna Luetke Lanfer +2	January-21	The paper discusses challenges in collecting quantitative survey data in non-WEIRD contexts, emphasizing the need for extensive pilot testing and local involvement in research design and data collection strategies.
42	Evaluation in Our New Normal Environment: Navigating the Challenges with Data Collection <sup>[41]</sup>	Nadini Persaud +1 more	January-21	The paper discusses challenges in data collection exacerbated by COVID-19, including budget constraints, ethical concerns, reliance on local liaisons, and difficulties in engaging diverse stakeholders.
43	Electronic data collection for multi-country, hospital-based, clinical observation of maternal and newborn care: EN-BIRTH study experiences <sup>[42]</sup>	Harriet Ruysen +19 more	March-21	The paper's title matches the query, but it does not address the specific question. The EN-BIRTH study assessed maternal and newborn care indicators using a mixed methods approach and a five-step conceptual framework [Figure 1]. Custom-built electronic data tools improved data collection and quality.
44	Health data collection methods and procedures across EU member states: Findings from the InfAct Joint Action on health information <sup>[43]</sup>	Brigid Unim +11	January-22	The paper identifies challenges in health data collection across EU Member States, including variability in availability, accessibility, quality, comparability, and adherence to standardized procedures and FAIR Data principles.
45	Challenges in Data Collection for Research During and After the Pandemic <sup>[44]</sup>	Malina Osman	November-22	The paper identifies challenges such as stakeholder disinterest, poor data coordination, regulatory issues, and institutional rivalry, complicating effective data collection during and after the pandemic.
46	CHSI costing study–Challenges and solutions for cost data collection in private hospitals in India <sup>[45]</sup>	Maninder Singh +27	December-22	The paper identifies challenges in collecting cost data from private hospitals, particularly regarding human resources, which was the most time-consuming and difficult aspect of the data collection process.

NHA: National health accounts, OECD: Organization for economic co-operation and development, WHO: World Health Organization

Many countries in the world are significantly inclined for traditional medicine also and payment for these services is still not following standardized pricing systems. Expenditure incurred for the services poses significant data quality challenges for NHAs due to unreported informal payments and random pricing practices. In various parts of the world, even situation is further complicated by in-kind payments through goods or services and limited or no documentation practices, creating challenges to capture accurately and classify these healthcare expenditures within the NHA framework.

Data privacy concerns are also imposing restriction for health expenditure data tracking and protection of various sensitive financial data and information across various healthcare stakeholders. NHAs face significant ethical and governance challenges in creating reliable and realistic healthcare expenditure data due to various other governance issues such as fragmented health financing systems and lack of standardization.

NHA is still evolving in various developing countries due to complex methodologies for data collection. Staff are still not well versed with the NHA frameworks necessitating effective training and capacity building to develop the required skill for effective data collection, analysis, and interpretation of the information derived to use them for pro-citizen healthcare policies making and implementation. It is a great concern as limited technical expertise in SHA 2011 methodology, classification systems, and data validation processes can lead to inconsistent reporting and inappropriate classification of health expenditures. The situation is often compounded by high staff turnover, inadequate resources for continuous professional development, and the complex nature of tracking health expenditure flows across multiple sources. This necessitates the establishment of sustainable training programs and mentorship systems to ensure the continued availability of skilled NHA teams.

Our findings emphasize the urgent need of:

1. Investment in technology infrastructure: There is a pressing need for investments in technology that supports integrated data collection systems is critical to overcoming these technological barriers. Emerging technologies such as blockchain for data verification and machine learning for automated classification of health expenditures can enhance the accuracy and efficiency of data collection.
2. Standardization of data collection methods: One of the primary challenges identified in this review is the lack of standardized data collection methods across different countries and regions. The varying frameworks used by OECD countries (SHAs, 2022) versus the World Health Organization's guidelines for developing countries complicate direct comparisons and hinder comprehensive analysis. Developing a unified framework can improve comparability and consistency in reporting, which is crucial for effective policy-making and resource allocation.
3. Enhancing training programs, ethical governance: Given the significant impact of training on the quality of NHA data, it is essential to invest in comprehensive training programs for staff. This includes ongoing professional development in the SHA methodology and data validation processes to ensure consistency and accuracy in reporting. Strengthening ethical and governance frameworks around data privacy and consent is critical. Establishing clear guidelines for data handling and ensuring stakeholder engagement can help build trust and facilitate more robust data collection practices.
4. Addressing indigenous/alternative medicine expenditures: The unique challenges posed by traditional medicine expenditures require targeted strategies. This might involve developing specific guidelines for capturing informal payments and in-kind contributions, as well as enhancing documentation practices to ensure these expenditures are accurately reflected in the NHA.
5. Focus on capacity building: To tackle the challenges of high staff turnover and limited resources, we need to invest in long-term solutions. Mentoring programs can help our team members grow and develop their skills. By partnering with institutions, we can access expert knowledge and ensure that our National Health Agency (NHA) teams have the right tools and training to handle complex data and analysis tasks.
6. Collaboration across sectors: Collaboration among various stakeholders, including government agencies, healthcare providers, and insurance companies, is required to improve the NHA data quality. Promoting multi-sectoral partnerships can enhance data sharing and integration, leading to a more comprehensive and practical understanding of health expenditures.

Ultimately, ensuring the quality of NHA data has significant policy implications. Accurate data can affect health policy decisions, facilitate effective resource allocation, and enhance the overall performance of health systems, particularly in developing countries. Accurate, standardized data collection is not only vital for effective health policy-making and resource allocation but also for ensuring equity in healthcare access and outcomes.

## Limitations of Study

- a. The review was limited to English-language publications, potentially excluding valuable insights from non-English literature. Valuable insights and regional studies published in languages other than English, especially from non-English-speaking countries, could have provided a more diverse set of perspectives on the challenges faced in NHA data collection.
- b. The study primarily focused on published research, potentially overlooking relevant grey literature and unpublished reports from international organizations (e.g., WHO, World Bank) that often provide critical data on health systems and expenditures.
- c. The methodology lacked a systematic quality assessment of included studies, which could have impacted the overall reliability of the findings. A more rigorous approach, such as using a standardized quality assessment tool like the Critical Appraisal Skills Programme (CASP), could have mitigated this limitation.

## CONCLUSION

This narrative review explored the limitations in sampling, data sources, definitions, and reporting which contribute to inconsistencies, biases, and comparability issues in NHA data globally. Implementation of integrated health information systems or cloud-based data platforms and various other suggested measures are needed to enhance the reliability and utility of health expenditure information for evidence-based decision-making in the public interest.



## Future Research Scope

**Comparative analysis:** Future studies could conduct cross-country comparative analyses of NHA data collection methodologies to identify best practices and region-specific solutions.

**Addressing data gaps in traditional and informal healthcare expenditures:** It is not easy to address the complexities of capturing expenditures on traditional and alternative medicine and it is an area needing focused research. Future studies should develop and test specific guidelines and tools for documenting informal payments and in-kind contributions associated with these services for quality NHA data. Pilot projects could be conducted in those countries where traditional medicine system is still adopted by the citizens to meet their healthcare needs, to evaluate methods for integrating these expenditures into the NHA framework more effectively.

**Technology integration:** Research is needed on the effectiveness of emerging technologies (blockchain, AI, machine learning) in improving NHA data collection accuracy and efficiency. Integration of NHA data with other health information systems (e.g., hospital records or electronic health records) for more comprehensive health expenditure tracking can be explored in future studies.

**Cost-benefit analysis:** Studies could examine the economic implications of implementing various data collection improvements and their return on investment.

**Standardization framework:** Development and validation of a unified framework for NHA data collection that accommodates both developed and developing nations' contexts.

**Privacy solutions:** Research on innovative solutions for balancing data privacy requirements with the need for comprehensive health expenditure tracking.

## Declaration

### Funding and/or Conflicts of interests/Competing interests.

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## REFERENCES

- Roberts CM, Lowe D, Barnes S, Pearson MG. A prospective study of the practical issues of local involvement in national audit of COPD. *J Eval Clin Pract* 2004;10:281-90.
- Holden C. Investigating international health markets: Methodological problems and challenges. *Soc Policy Soc* 2005;4:427-35.
- Peleg S, Arieli S. Problems of measurement and analysis in the national accounts under rapidly growing globalization. *Stat J U N Econ Comm Eur* 2007;23:143-53.
- Sensenig AL. Refining estimates of public health spending as measured in national health expenditures accounts: The United States experience. *J Public Health Manag Pract* 2007;13:103-14.
- Powell-Jackson T, Mills A. A review of health resource tracking in developing countries. *Health Policy Plann* 2007;22:353-62.
- Bilheimer LT, Sisk JE. Collecting adequate data on racial and ethnic disparities in health: The challenges continue. *Health Aff (Millwood)* 2008;27:383-91.
- Happel Lewis S, Wojcik R. Methodologies for data collection. *BMC Proc* 2008;2:S5.
- Kerr K, Norris T, Stockdale R. The strategic management of data quality in healthcare. *Health Informatics J* 2008;14:259-66.
- Rosen AB, Cutler DM. Challenges in building disease-based national health accounts. *Med Care* 2009;47:S7-13.
- Bilheimer LT, Klein RJ. Data and measurement issues in the analysis of health disparities. *Health Serv Res* 2010;45:1489-507.
- Parikh TS, Chen K. Data management for meeting global health challenges. *Proc VLDB Endowment* 2011;4:1514.
- Rout SK. Improving comparability and availability of private health expenditure data in health accounts in the Asia-Pacific region: A case of India. *J Health Manag* 2012;14.
- Lawanson AO, Olaniyan O, Soyibo A. National Health accounts estimation: Lessons from the Nigerian experience. *Afr J Med Med Sci* 2012;41:357-64.
- Curcin V, Soljak M, Majeed A. Managing and exploiting routinely collected NHS data for research. *Inform Prim Care* 2013;20:225-31.
- Nathan N, Dastan I, Mataria A. Developing health accounts following SHA 2011: A situational analysis of countries in WHO Eastern Mediterranean Region. *East Mediterr Health J* 2020;26:810-9.
- El Emam K, Moher E. Privacy and anonymity challenges when collecting data for public health purposes. *J Law Med Ethics* 2013;41:37-41.
- Batura N, Pulkki-Brännström AM, Agrawal P, Bagra A, Haghparsat-Bidgoli H, Bozzani F, et al. Collecting and analysing cost data for complex public health trials: Reflections on practice. *Glob Health Action* 2014;7:23257.
- Newman D, Herrera C, Parente ST. Overcoming barriers to a research-ready national commercial claims database. *Am J Manag Care* 2014;20:eSP25-30.
- Van Panhuis WG, Paul P, Emerson C, Grefenstette JJ, Wilder R, Herbst AJ, et al. A systematic review of barriers to data sharing in public health. *BMC Public Health* 2014;14:1144.
- Bui AL, Lavado RF, Johnson E, Brooks BP, Freeman M, Graves CM, et al. National health accounts data from 1996 to 2010: A systematic review. *Bull World Health Organ* 2015;93:566-76D.
- Bram JT, Warwick-Clark B, Obeysekere E, Mehta K. Utilization and monetization of healthcare data in developing countries. *Big Data* 2015;3:59-66.
- DesRoches CM, Wong HS, Rich EC, Majumdar SR. Making the case for a new national data collection effort on physicians and their practices. *J Gen Intern Med* 2015;30:S553-4.
- Sweeney S, Vassall A, Foster NL, Simms V, Ilboudo P, Kimaro G, et al. Methodological issues to consider when collecting data to estimate poverty impact in economic evaluations in low-income and middle-income countries. *Health Econ* 2016;25:42-52.
- Dinov ID. Methodological challenges and analytic opportunities for modeling and interpreting big healthcare data. *Gigascience* 2016;5:12.
- Gill L. Methodology and applications of building a national file of health and mortality data. *Austrian J Stat* 2016;33:101-24.
- Price J, Guinness L, Irava W, Khan I, Asante A, Wiseman V. How to do (or not to do)... translation of national health accounts data to evidence for policy making in a low resourced setting. *Health Policy Plann* 2016;31:472-81.
- Kabakama S, Konje E, Ngallaba SE. Methodological challenges and lessons learned from assessing the routine health information management data quality: Experience from Tanzania. *J Health Med Inform* 2017;8:2.
- Nori-Sarma A, Gurung A, Azhar GS, Rajiva A, Mavalankar D, Sheffield P, et al. Opportunities and challenges in public health data collection in Southern Asia: Examples from Western India and Kathmandu Valley, Nepal. *Sustainability* 2017;9:1106.
- Anane-Sarpong E, Wangmo T, Ward CL, Sankoh O, Tanner M, Elger BS. "You cannot collect data using your own resources and put it on open access": Perspectives from Africa about public health data-sharing. *Dev World Bioeth* 2017;18:394-405.
- Allin P, Hand DJ. From a system of national accounts to a process of national wellbeing accounting. *Int Stat Rev* 2017;85:355-70.

31. Wolpert M, Rutter H. Using flawed, uncertain, proximate and sparse (FUPS) data in the context of complexity: Learning from the case of child mental health. *BMC Med* 2018;16:82.
32. Lugg-Widger F, Angel L, Cannings-John R, Hood K, Hughes K, Moody G, *et al.* Challenges in accessing routinely collected data from multiple providers in the UK for primary studies: Managing the morass. *Int J Popul Data Sci* 2018;3:432.
33. Shaffer JG, Doumbia S, Ndiaye D, Diarra A, Gomis JF, Nwakanma D, *et al.* Development of a data collection and management system in West Africa: Challenges and sustainability. *Infect Dis Poverty* 2018;7:125.
34. Bassi A, John O, Gallagher M, Kotwal S, Joshi R, Essue BM, *et al.* Methodological challenges to collecting clinical and economic outcome data: Lessons from the pilot dialysis outcomes India study. *Nephrology (Carlton)* 2019;24:445-9.
35. Mourby M, Doidge JC, Jones KH, Aidinlis S, Smith H, Bell J, *et al.* Health data linkage for UK public interest research: Key obstacles and solutions. *Int J Popul Data Sci* 2019;4:1093.
36. Bacon S, Goldacre B. Barriers to working with national health service England's open data. *J Med Internet Res* 2020;22:e15603.
37. Thayer D, Rees A, Kennedy J, Collins H, Harris D, Halcox J, *et al.* Measuring follow-up time in routinely-collected health datasets: Challenges and solutions. *PLoS One* 2020;15:e0228545.
38. Roberts KJ, Gordon S, Sherr L, Stewart J, Skeen S, Macedo A, *et al.* 'When you are a data collector you must expect anything': Barriers, boundaries and breakthroughs: Insights from the South African data-collection experience. *Glob Health Promot* 2020;27:54-62.
39. Abd-Alrhman AM, Ekenberg L. A multi-layered data preparation model for health information in Sudan. *Int J Adv ICT Emerg Res* 2020;13:1-14.
40. Luetke Lanfer H, Reifegerste D, Kargbo SI. Collecting quantitative experimental data from a non-WEIRD population: Challenges and practical recommendations from a field experiment in rural Sierra Leone. *BMC Res Notes* 2021;14:414.
41. Persaud N, Dagher R. Evaluation in our new normal environment: Navigating the challenges with data collection. *J Multidiscip Eval* 2021;17:1-14.
42. Ruysen H, Rahman AE, Gordeev VS, Hossain T, Basnet O, Shirima K, *et al.* Electronic data collection for multi-country, hospital-based, clinical observation of maternal and newborn care: EN-BIRTH study experiences. *BMC Pregnancy Childbirth* 2021;21:234.
43. Unim B, Mattei E, Carle F, Tolonen H, Bernal-Delgado E, Achterberg P, *et al.* Health data collection methods and procedures across EU member states: Findings from the infact joint action on health information. *Arch Public Health* 2022;80:17.
44. Osman M. Challenges in data collection for research during and after the pandemic. *Asian J Med Biomed* 2022;6:39-40.
45. Singh M, Popli R, Brar S, Rajsekar K, Sachin O, Naik J, *et al.* CHSI costing study-Challenges and solutions for cost data collection in private hospitals in India. *PLoS One* 2022;17:e0276399.
46. Nancarrow SA. Barriers to the routine collection of health outcome data in an Australian community care organization. *J Multidiscip Healthc* 2013;6:1-16.
47. Tolera A, Firdisa D, Roba HS, Motuma A, Kitesa M, Abaerei AA. Barriers to healthcare data quality and recommendations in public health facilities in Dire Dawa city administration, eastern Ethiopia: A qualitative study. *Front Digit Health* 2024;6:1261031.
48. Rosen AB, Ghosh K, Pape ES, Perrailon MC, Bondarenko I, Messer KL, *et al.* Strengthening National Data to Better Measure what we are Buying in Health Care: Reconciling National Health Expenditures with Detailed Survey Data. NBER Working Paper No. W23290. National Bureau of Economic Research; 2017.