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Leveraging Citizen Data to Improve Public Services and Measure Progress Toward Sustainable Development Goal 16

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ABSTRACT

This paper presents the results of a pilot study conducted in Ghana that utilized citizen data approaches for monitoring a governance indicator within the SDG framework, focusing on indicator 16.6.2 *citizen satisfaction with public services*. This indicator is a crucial measure of governance quality, as emphasized by the UN Sustainable Development Goals (SDGs) through target 16.6 *Develop effective, accountable, and transparent institutions at all levels*. Indicator 16.6.2 specifically measures satisfaction with key public services, including health, education, and other government services, such as government-issued identification documents through a survey. However, with only 5 years remaining to achieve the SDGs, the lack of data continues to pose a significant challenge in monitoring progress toward this target, particularly regarding the experiences of marginalized populations. Our findings suggest that well-designed citizen data initiatives can effectively capture the experiences of marginalized individuals and communities. Additionally, they can serve as valuable supplements to official statistics, providing crucial data on population groups typically underrepresented in traditional surveys.

1 | Introduction

The Agenda 2030 and the Sustainable Development Goals (SDGs) are a global framework for collective action to eradicate poverty and inequality, to promote human health, prosperity, and well-being, and to halt environmental degradation by 2030 (UN 2015). They include 17 goals, 169 targets, and 231 unique indicators. Data exist to track 135 out of 169 targets. However, only 17% are on track for achievement. Additionally, about half of the assessable targets (48%) show moderate to severe deviations from the desired progress, and 17% fell behind the baseline in 2015, while 18% showed no progress since then (UN 2024).

This paper focuses on goal 16, designed to "promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels" (UN 2023). SDG 16 is critically important for achieving all the other SDGs (Wesley et al. 2016; Hope Sr. 2020), covering topics related to human rights, violence, corruption, responsible and inclusive decision-making, and accountable and transparent institutions. However, progress toward achieving SDG 16 has been slow (Dasandi and Mikhaylov 2019; Halkos and Gkampoura 2021). As of 2023, none of the SDG 16 targets were on track or had been fully achieved. Roughly one fifth showed moderate progress but need acceleration to meet the targets, while the remainder showed marginal progress or stagnation

(UN 2024). However, notable advancements have been made in certain areas. For example, as of 2024, over half of the countries (51%) have reported data for at least 1 year since 2015 for goal 16. This represents a significant improvement in comparison to 40% in 2023 and 23% in 2019 (UNODC, OHCHR, & UNDP 2024). Additionally, there has been an increase in independent human rights institutions and an increase in the number of countries that have implemented legislation for guaranteeing public access to information. However, there have also been several setbacks, including a rise in civilian deaths in armed conflicts, and an increase in the number of journalists killed in conflict affected countries, leading to negative impacts in achieving other goals (UNODC et al. 2024).

Several tools have been developed to address SDG 16 data gaps, assisting countries in monitoring governance, corruption, crime, and access to justice. These include the SDG 16 Survey Initiative (UNODC, OHCHR, and UNDP 2022), the Manual on Corruption Surveys and the Statistical Framework to Measure Corruption (UNODC 2018), a series of guidelines on the collection, production, dissemination, and use of high-quality crime and criminal justice data for statistical purposes, the UNODC-UNECE Manual on Victimization Surveys, the International Classification of Violence against Children, and the statistical framework for measuring femicide (UNODC and UN Women 2022; UNODC et al. 2024).

Moreover, new partnerships have been developed between national statistical offices (NSOs) and national human rights institutions (UNODC, OHCHR, and UNDP 2023), while new data sources from citizen science or citizen-generated data are being utilized to support the monitoring of SDG 16 (Fraisl et al. 2020, 2023).

Citizen science and citizen-generated data are just two of the terms used to describe the concept of citizen involvement in data collection and knowledge generation. Other terms, such as crowdsourcing and community-based monitoring, have also emerged due to varying contexts and interpretations of citizen and community engagement with research (Beck et al. 2024; Eitzel et al. 2017). Although used interchangeably, the term citizen science is mostly associated with scientific research context, while citizen-generated data are typically linked to community-based advocacy, with data collection led by civil society organizations. In this paper, we adopt the term "citizen data" to be in alignment with the global terminology used by the United Nations Statistics Division (UNSD) led "Collaborative on Citizen Data," which has developed the Copenhagen Framework on Citizen Data (UNSD 2024b). In this framework, citizen data are defined as the data collected by citizens who initiate or are engaged in at least the design stage and/or the collection phase of the data value chain (UNSD 2024a). In both the Copenhagen framework and this paper, the term "citizen" does not indicate legal citizenship; instead, it is used to refer to participants.

There are advantages to using a citizen data approach for SDG monitoring. These include the ability to complement surveys with timelier and more granular data (Fritz et al. 2019) while potentially reaching more marginalized and vulnerable populations (Pandya 2012; Howlett et al. 2021). The use of citizen data can also foster greater trust between citizens and other stakeholders (Vegt et al. 2023), particularly when citizens are involved in an inclusive design process and can provide feedback that is acted upon (Rönneberg and Kettunen 2023).

At the same time, there are challenges of using citizen data, which include data quality and statistical representativeness (Proden et al. 2023), participant retention and motivation (Hart et al. 2022), and technological barriers, especially in developing contexts (Benyei et al. 2023). Citizen data approaches can also create expectations for policy action as a result of participation, especially if a new citizen data initiative is launched by the NSOs or other government agencies. Participants who contribute data may expect a rapid response to their input, such as policy action. This can really spur policy action or generate frustration or lower motivation if these expectations are not met. Additionally, there is a risk of data generation becoming more data extraction, where the burden and cost of data collection fall on participants, but the value and the benefit primarily go to those who compile and present these data.

Many of these challenges can be tackled. For example, issues related to data quality can be addressed through appropriate quality assurance and control mechanisms during the design stage of the initiative. Automated tools or machine learning approaches that can automatically flag errors and anomalies, low technology solutions, and the use of inclusive design processes are a few examples of how quality issues are tackled in diverse citizen data projects (Kelling et al. 2013; van der Wal et al. 2016; Fraisl et al. 2022). Moreover, motivating participants and managing their expectations is essential. Clearly communicating the purpose, potential benefits, challenges, and limitations regarding the use and uptake of these data helps to minimize misunderstandings and manage expectations. Additionally, providing regular feedback to participants and actively integrating their input into the project can foster a collaborative environment and enhance both engagement and trust (Robinson et al. 2021). It is also important to highlight that placing a burden on participants, especially when they may not directly benefit from involvement, is a common issue not only in citizen data initiatives but also in traditional data collection methods such as household surveys. This consideration needs to be carefully integrated into both the design and implementation phases of any data initiative involving citizens and communities in data production (Meyer et al. 2015; Resnik et al. 2015).

In this paper, we present an example of the use of citizen data for collecting data on indicator 16.6.2 on citizen satisfaction with public services in Ghana. Based on a partnership forged between the Ghana Statistical Service (GSS) and the United Nations Development Program (UNDP) Global Policy Centre for Governance (GPCG), the custodian agency for this indicator, a feasibility and pilot study were undertaken to assess the potential of citizen data approaches in complementing the official methodology for measuring indicator 16.6.2, as outlined in the metadata (UN 2023). This initiative represents the first instance of using citizen data approaches to monitor a governance indicator in a project led by a UN agency and an NSO. Additionally, for the first time, the project compares the results from a citizen data initiative with both survey results based on a nationally representative sample and census data to understand the extent to which citizen data approaches can complement traditional data

sources and official statistics. Hence, the aim of this paper is to present the methodology, results, and additional insights from this initiative, which was carried out in two districts of Ghana, Ga East and Suhum. A secondary objective is to document the process and lessons learned to help other countries interested in adopting citizen data methodologies for this and other SDG indicators.

2 | Materials and Methods

The methodology can be divided into three main steps: (i) reviewing the global methodology of indicator 16.6.2 and conducting a feasibility study, (ii) designing and implementing the pilot project, and (iii) analyzing the results. Figure 1 illustrates the methodology applied in the project.

For clarity and ease of reference, Table 1 provides a list of acronyms that are used in this paper more than once.

2.1 | Step 1: Reviewing the Global Methodology of SDG 16.6.2 and the Feasibility Study

The first step involved reviewing the global methodology of indicator 16.6.2 and conducting a feasibility study to assess the viability of adapting the 16.6.2 methodology into a citizen data
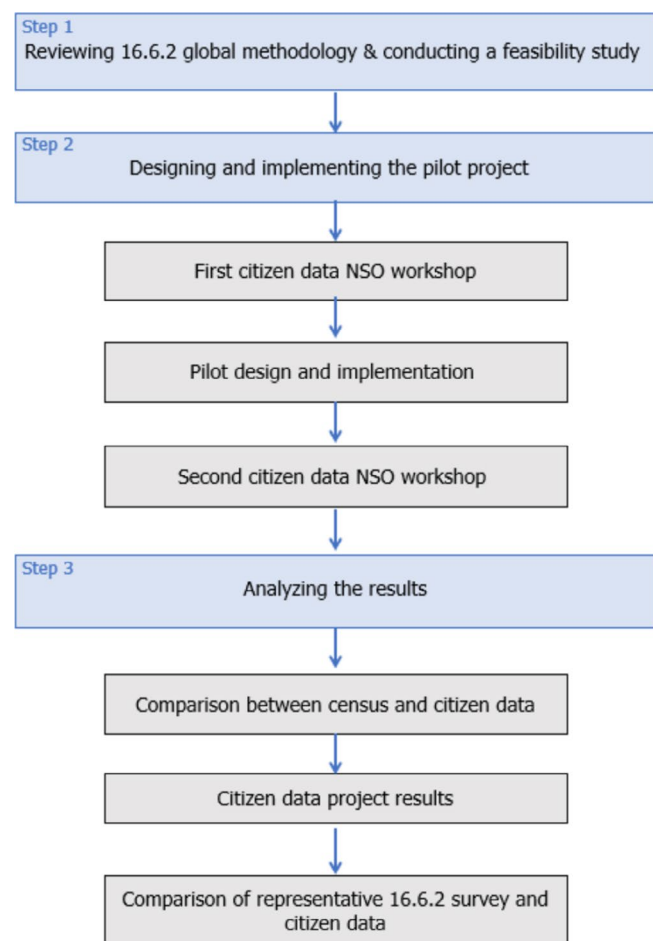
TABLE 1 | List of acronyms.

Acronym	Full name
SDGs	Sustainable Development Goals
NSO	National Statistical Office
UNSD	United Nations Statistics Division
GSS	Ghana Statistical Service
UNDP	United Nations Development Programme
UNDP GPCG	United Nations Development Programme—Global Policy Center for Governance
PSSS	Public Services Satisfaction Survey
USSD	Unstructured Supplementary Service Data
PHC	Population and Housing Census

approach. Both stages of Step 1 were conducted by the authors of this article. The global methodology for the indicator had already been developed under the leadership of UNDP GPCG, the custodian agency for this indicator. This methodology served as the foundation for the survey used in the citizen data pilot. The feasibility study began in October 2022 and was finalized in January 2023, following the First Citizen Data NSO Engagement Workshop, as described below.

2.1.1 | SDG Indicator 16.6.2 Methodology

Indicator 16.6.2 measures the degree of public satisfaction with key public services based on the last experience of citizens, including healthcare, education, and government services, such as government-issued identification documents and services for the civil registration of life events, including births and deaths (UN 2023). This indicator is based on data from representative population surveys conducted by NSOs, which capture specific aspects of citizen satisfaction with public services based on experiences rather than general perceptions. Countries are expected to report on this indicator at least once every 2 years. The UNDP GPCG is the custodian agency responsible for the global monitoring and reporting of this indicator.

In this survey, respondents are asked to reflect on their most recent interaction with the aforementioned services by providing a rating on specific "attributes." For example, for health services, the attributes include access to and affordability of the service, the quality of the facilities, and equal treatment for everyone, among others. A final question then asks about the overall satisfaction level with each service. The 16.6.2 questionnaire is provided in the Supporting Information.

The methodology for indicator 16.6.2 recommends disaggregating the survey results by sex, income level, and place of residence (urban/rural areas, administrative regions). Additionally, efforts should be made to disaggregate data by disability status and other nationally relevant population groups as much as possible.

FIGURE 1 | Methodology applied in the citizen data pilot project.

2.1.2 | Feasibility Study

The second stage of this step involved conducting a feasibility study to assess whether citizen data approaches can be leveraged to complement the 16.6.2 survey, along with a final report outlining recommendations for the next steps. The results showed that, when designed and implemented effectively with rigorous protocols, thoughtful communication strategies, and an understanding of participant motivations and interests, citizen data methodologies can create a continuous feedback loop between citizens and public authorities, leading to improvements in public services. The main finding was that, compared to traditional data collection methods, investing in a data ecosystem that incorporates citizen data approaches can empower hard-to-reach individuals and communities, leading to more inclusive decision-making. Citizen data approaches can help design effective policies and reveal gaps in the data, amplify the voices of marginalized populations, disclose misconceptions in existing data, and provide a more complete understanding of realities on the ground, particularly for those who are often left behind.

The key recommendations from the feasibility study were to (i) develop a pilot project at a local or community level, with the potential for national scaling if successful, (ii) establish partnerships with communities, local authorities, line ministries, civil society, and other stakeholders to set up and run the pilot project, (iii) develop a step-by-step methodology for pilot design and implementation including multiple stages, such as identifying the need or the problem, determining the specific potential of citizen data to complement the 16.6.2 methodology, and finally, and (iv) develop a smartphone application for data collection and citizen engagement, while ensuring that hard-to-reach populations are prioritized.

2.2 | Step 2: Designing and Implementing the Pilot Project

This step includes several stages, which are elaborated in detail below.

2.2.1 | First Citizen Data NSO Engagement Workshop

The workshop was convened online by the UNDP GPCG and the GSS on December 6, 2022, with participants representing the following NSOs:

- GSS

- National Bureau of Statistics of the Republic of Moldova (NBS Moldova)

- Bureau of national statistics of the Agency for strategic planning and reforms of the Republic of Kazakhstan (QAZ Stat)

- Colombia National Administrative Department of Statistics (DANE)

- Mexico National Institute of Statistics and Geography (INEGI)

These NSOs were selected for their shared commitment to enhancing SDG monitoring, particularly SDG 16 and citizen satisfaction with public services, through innovative data approaches. Their invitation to attend the workshop was based on several criteria: (i) they had previously expressed interest to the UNDP GPCG in using citizen data approaches for monitoring SDG indicator 16.6.2; (ii) they operate in resource-constrained contexts for SDG monitoring; and (iii) Ghana and Kazakhstan had already conducted a nationally representative 16.6.2 survey, providing an opportunity to benchmark citizen data approaches against representative survey data to assess complementarity. By engaging NSOs with experience in representative surveys and an interest in citizen data, the workshop aimed at a meaningful exchange on the feasibility, challenges, and opportunities of incorporating such data into official monitoring and reporting activities.

More specifically, the workshop aimed to (i) discuss the upcoming pilot in Ghana and explore interest in conducting additional pilot activities in the listed countries before the citizen data method is widely disseminated by the UNDP GPCG or considered for adoption by the UN Statistical Commission, the highest decision-making body for international statistical activities, (ii) identify the opportunities and challenges of using citizen data for the monitoring of indicator 16.6.2, (iii) gather ideas on how to leverage these opportunities and address the challenges of using citizen data approaches for monitoring 16.6.2, and (iv) discuss how to design and implement a pilot activity using citizen data approaches as the next step of the initiative. The goal was not necessarily to achieve cross-country comparability, given the differences in local contexts. If the pilot yielded promising results, a follow-up workshop was proposed to further engage NSOs and facilitate dissemination and knowledge sharing.

At the pilot stage, only NSOs were involved because they are responsible for official statistics and serve as the government agencies that collect or coordinate data collection across various government entities in a country. Moving forward, the next steps following this initial pilot could enable broader participation, including relevant ministries, local authorities, and other key stakeholders at both the national and global levels.

The workshop results indicated that citizen data approaches are new for NSOs in the context of monitoring goal 16 progress and other SDG indicators in general, requiring active citizen and community engagement in both data collection and decision-making processes. Therefore, it is critical to understand how to encourage and incentivize participation and to develop simple yet attractive technologies for data collection that consider user needs and expectations while designing and conducting the pilot and citizen data activities in general. Non-tech solutions, such as collecting data using data sheets or through messaging where internet access is limited, should also be considered to ensure inclusivity. Additionally, it is crucial to raise awareness among stakeholders about sustainability, data quality, and the added value of the approach, both within NSOs and externally, to ensure buy-in from the NSO staff, government actors, and policymakers. All recommendations provided by the participating NSOs were incorporated into the design and implementation of the pilot activity in Ghana, as detailed in the following parts of this methods section.

2.2.2 | Pilot Design and Implementation

In this stage, a strategy and methodology for conducting a pilot activity in Ghana were developed. The first step was to identify the objective of the pilot activity: to improve the production, timeliness, and use of statistics on citizen satisfaction with public services at subnational and national levels by engaging with individuals and communities. The specific objectives included (i) building statistical capacities nationwide focused on citizen data approaches, (ii) co-creating technological solutions for data gathering with relevant stakeholders to complement existing data sets that can help improve governance and policy, and foster a sense of voice, buy-in, and ownership of results among all actors involved, including citizens and communities, (iii) advocating for the use of local data in decision-making, and (iv) building an evidence base by documenting the learnings and limitations of citizen data approaches to inform potential replication and upscaling. The main motivation was to improve public service delivery and implement targeted interventions and policy adjustments based on data insights to enhance overall satisfaction and public service effectiveness.

Following this stage, the pilot districts were chosen based on their characteristics, as presented in Table 2.

Inception meetings between the UNDP and GSS were organized to discuss the development of the Public Service Satisfaction Survey (PSSS) app, which was developed as part of the project for data collection. The PSSS app was designed to offer a more efficient and scalable solution for collecting citizen data. The app provides advantages such as faster, more cost-effective data collection and enhanced user engagement compared to traditional methods. Furthermore, using apps for data collection allows for real-time input and immediate submission while minimizing human error, particularly in data entry and transcription. While the initial development of the app requires a higher investment, it is more cost-effective for data collection in the long run. Additionally, if the pilot proves successful, GSS is eager to expand this approach nationwide to enable more frequent data collection on public services. The PSSS app can be easily scaled up compared to traditional methods. With future features planned, the GSS intends to use the app to provide feedback to participants as well. All these reasons make the PSSS app a crucial tool not only for the pilot phase but also for long-term use.

The inception meetings focused on ensuring the app would align with the global methodology while addressing Ghana's specific needs. Subsequent meetings involved stakeholders

TABLE 2 | Districts selected for the citizen data pilot activity across two ecological zones in Ghana.

District	Region	Ecological zone	Characteristics
Suhum	Eastern region	Forest	Largely rural
Ga East	Greater accra region	Coastal	Largely urban

at both national and district levels in Suhum and Ga East. Participants included representatives from the UNDP Ghana Office, Commission on Human and Administrative Justice (CHRAJ), Ministry of Education (MOE), Ghana Health Service (GHS), Ministry of Local Government, Decentralization and Rural Development (MLGDRD), as well as civil society organizations and community leaders from both districts.

To obtain a better understanding of the pilot districts and their needs, field visits were conducted; the data landscape related to indicator 16.6.2 was mapped, and the stakeholders were identified. Additionally, potential barriers and enablers for implementing citizen data approaches in the pilot districts were identified. District Technical Teams were then formed in both pilot districts led by the "coordinating directors" with the support from "regional statisticians," who are the GSS officers in charge of the Greater Accra and Eastern Regions. A collaborative design process was then undertaken to develop the pilot project. The process involved the National and District Technical Teams, along with global partners such as UNDP, app developers, target users, data, and thematic experts. Stakeholders worked together to define the data and social issues to be addressed, considering the technological implications. The PSSS App was then developed and made available for download on the Google Play Store and Apple Store. Figure 2 includes some screenshots from the PSSS app.

The pilot and mobile application design prioritized inclusivity from the start to ensure that everyone interested could actively participate, including persons with disabilities. For example, in addition to a co-design process both for the project and app development, the project also offered an Unstructured Supplementary Service Data (USSD) option—a basic phone feature that works like text messages—for those without smartphones or internet access (Figure 3). Taking into account the local languages, the app offered English, Twi, and Ga as options for participants reflecting the primary languages spoken in the pilot districts. Furthermore, the app included features such as a text reader, a sign language interpreter, and dark and light mode options. For potential literacy barriers, the mobile application incorporated a voice recording option for answering the survey in Twi, Ga, and English. This decision was made by the National and District Technical Teams considering the possibility of a semi-literate or illiterate population in the pilot districts. Respecting data privacy was also a key concern for the GSS. The data collected via the app were kept confidential and then aggregated for reporting purposes.

Next, a data dashboard, a dashboard backend, and quality assurance processes were developed to ensure the completeness and accuracy of the collected data. These processes included functionalities for identifying and excluding test data gathered during the community workshops from the final analysis. Following this, the National and District Technical Teams worked together to identify communication channels and develop a communication strategy for the pilot districts, including communication and advocacy materials. Figure 3 shows examples of communication materials developed and used in the project.

The developed app was then thoroughly tested by the GSS, UNDP, and District Technical Teams. Feedback was
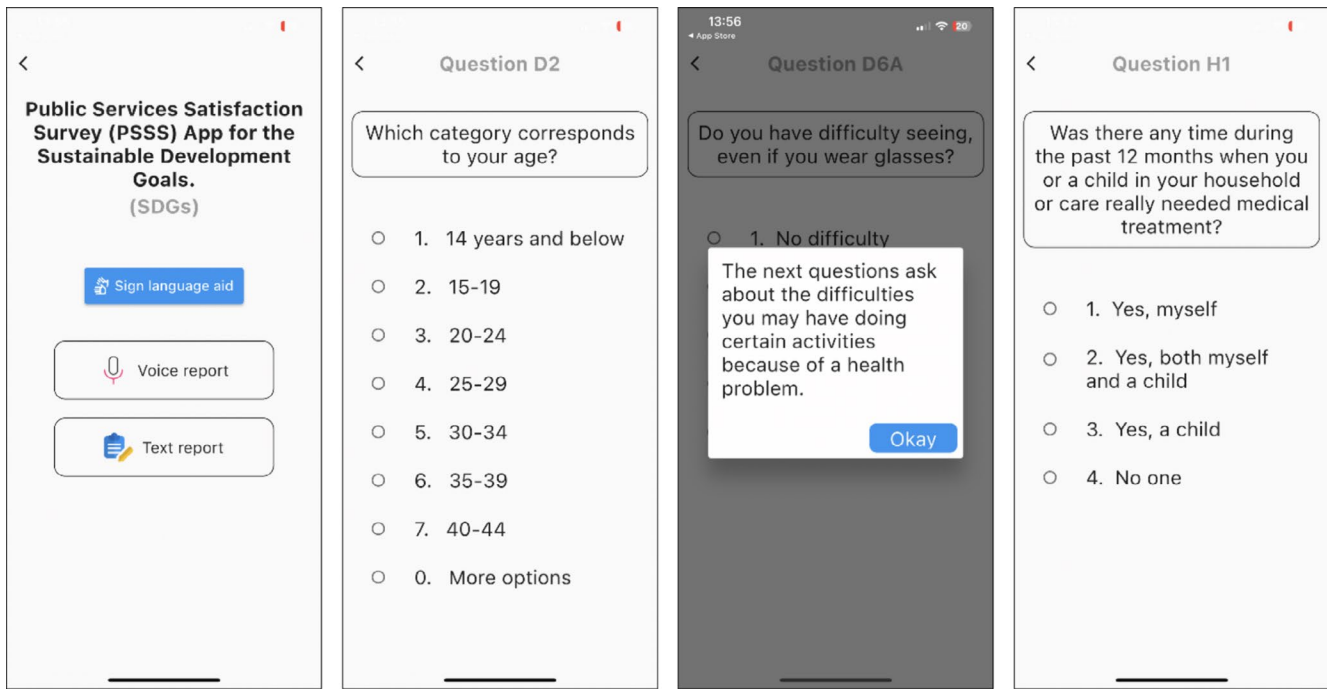
FIGURE 2 | Screenshots from the Public Services Satisfaction Survey smartphone application developed as part of the citizen data initiative in Ghana.

FIGURE 3 | Examples of communication materials developed and used in the 16.6.2 project in the pilot districts of Ghana.

incorporated before submitting the PSSS app to the Google Play Store and Apple Store. To raise awareness and educate the public, the National Technical Team, along with regional and district teams, organized community workshops in both pilot districts. The workshops also aimed at providing training to the participants on the use of the app and gathering feedback for the next iteration of the app and implementation of the project, which was part of the co-design process. The community workshops were open to anyone interested in participating, generating community engagement. The PSSS app was then launched in January 2024, with data collection running for 3 weeks. After this period, the GSS team analyzed the data collected and held meetings with local stakeholders in both districts, as well as the national-level stakeholders to share the project findings, disseminate results, and discuss policy engagement opportunities.

2.2.3 | Second Citizen Data NSO Engagement Workshop

Following the pilot, the second citizen data NSO engagement workshop was organized virtually on 23 May 2024 with the same NSOs who attended the first workshop, except for the representatives from the National Bureau of Statistics of the Republic of Moldova due to their unavailability. The UNSD also attended, given their interest in the project and citizen data initiatives in general. The workshop aimed to (i) present the process and results of the pilot activity, (ii) discuss the opportunities and challenges of using citizen data approaches for the monitoring of indicator 16.6.2 and for the entire SDG 16, and (iii) develop a roadmap for the practical implementation and potential upscaling of this approach.

The workshop participants recognized the benefits of the added value of citizen data approaches, particularly in their ability to provide more timely and granular information. They also emphasized the value and effectiveness of the approach in reaching hard-to-reach and marginalized segments of the population. The participants suggested that better design, active stakeholder involvement, and co-design processes involving citizens and communities can enhance data quality and help build trust in citizen data initiatives. Another important outcome of the workshop was that the NSOs need guidance in handling such novel approaches to data and collaborating with their producers, such as civil society organizations, academia, and other actors. They also require support in developing and implementing quality frameworks for citizen data initiatives, including technology and co-design processes. The NSOs also expressed interest in implementing similar initiatives in their countries and establishing peer-learning networks between NSOs on citizen data initiatives.

2.3 | Step 3: Analyzing the Results

The demographics of participants in the citizen data pilot initiative were compared with the most recent census data from the 2021 Population and Housing Census (PHC) conducted by the GSS. The 2021 PHC aimed to gather up-to-date information on demographics, social, and economic characteristics of Ghana for use in research, policy formulation, and development planning. It also serves to track progress toward various development goals at national, regional, and global levels, including the SDGs and the Agenda 2063: The Africa We Want (African Union 2013; Ghana Statistical Service 2021).

PHC implementation differed significantly from the 16.6.2 citizen data pilot implementation. As with every census, the PHC aimed to reach out to everyone through a comprehensive and nationwide enumeration process (Ghana Statistical Service 2021). However, as is the case with many such initiatives, the citizen data pilot initiative was open to anyone interested in contributing, which may have an impact on the representativeness of the resulting data (de Sherbinin et al. 2021; Fraisl et al. 2022). Hence, this comparison assesses the extent to which the citizen data reflect the characteristics of the overall population living in the two pilot districts of Ghana, helps in identifying any discrepancies or biases in the data collection process, and provides a benchmark for interpreting the findings of the study. Key demographic characteristics from the 2021 PHC in Ghana and the citizen data pilot were compared, including gender, age, and disability status. Further demographic comparisons are provided in the Supporting Information.

The second analysis focused on key findings from the citizen data initiative in the pilot districts regarding satisfaction with health, education, and the issuing of government documents. This analysis allowed for a deeper understanding of current satisfaction with public services in the two Ghanaian districts. The 2019 data from the 16.6.2 representative survey conducted by the GSS served as a benchmark for assessing the results of the 2024 citizen data pilot initiative, highlighting the potential similarities and differences between the two approaches to data collection. However, it is important to note the five-year gap between the two data collection periods. The GSS conducted the 16.6.2 survey following the global methodology recommended by the custodian agency, UNDP GPCG. The citizen data pilot project also adopted this methodology and its questionnaire.

3 | Results

3.1 | Comparison of Demographic Data in Ghana based on the 2021 Population and Housing Census and the Citizen Data Pilot Initiative

To ensure a meaningful comparison between the citizen data and official demographics, the 2021 PHC data for Ga East and Suhum were filtered. This filtering focused on residents aged 15 years or older, aligning with the demographic focus of the study. This resulted in a total population of 287,032 individuals within this age group across both districts (203,238 in Ga East and 83,794 in Suhum). While the citizen data initiative attracted 1068 entries, a two-step filtering process was necessary to guarantee that the data accurately reflected the intended demographic of the study, i.e., participants aged 15 or above. The first step involved excluding data from seven underage participants, while the second step involved removing 164 test cases. These test cases were specifically submitted by the project team to validate the functionality of the PSSS app and did not represent genuine citizen experiences. This resulted in 897 valid cases, 417 in Ga East (0.2% of the total population) and 480 participants in Suhum (0.6% of the total population).

The analysis showed that the distribution of gender was balanced in both districts according to the results from the PHC survey and citizen data pilot. For instance, according to the PHC, 50.7% of people in Ga East are female and 49.3% are male. In the same district, the percentages for male and female participants in the citizen data pilot were 50.1% and 49.9%, respectively (Figure 4a); similar results were found in Suhum (Figure 4b).

Figure 5 shows the age distribution in Ga East, comparing data from the PHC with the citizen data pilot project. While the citizen data pilot project had higher participation from those aged 55 and over, as well as those between 35 and 54 compared to the overall population in the district, there was a lower participation rate among the younger population (aged between 15 and 34) in the citizen data initiative. Unlike Ga East, citizen data pilot participation in Suhum was lower for the population aged 55 and older, suggesting that the citizen data pilot results may not fully capture the older population in Suhum (Figure 6).

Both the 2021 PHC and the citizen data initiative included questions on "experiencing difficulties" related to seeing, hearing, walking, remembering or concentrating, communicating, and self-care. To ensure international comparability, the terminology and data collection methods followed the guidelines established by the Washington Group on Disability Statistics. This group, which was established under the UN Statistical Commission, provides tools for collecting standardized disability data in censuses and surveys (Washington Group on Disability Statistics 2020, 2024).

The results revealed that the citizen data initiative was successful in capturing persons with disabilities. For example, the PHC data showed that 3% of the Ga East population had difficulty seeing. The citizen data pilot project reached a high proportion
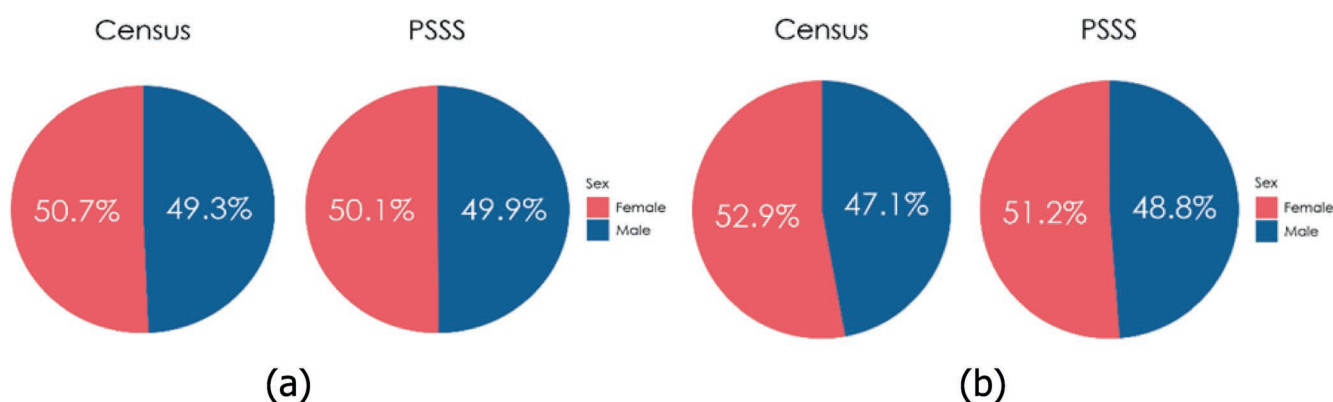

FIGURE 4 | Comparison of the gender distribution of the 2021 Ghana Population and Housing Census and the 16.6.2 citizen data initiative in (a) Ga East and (b) Suhum.
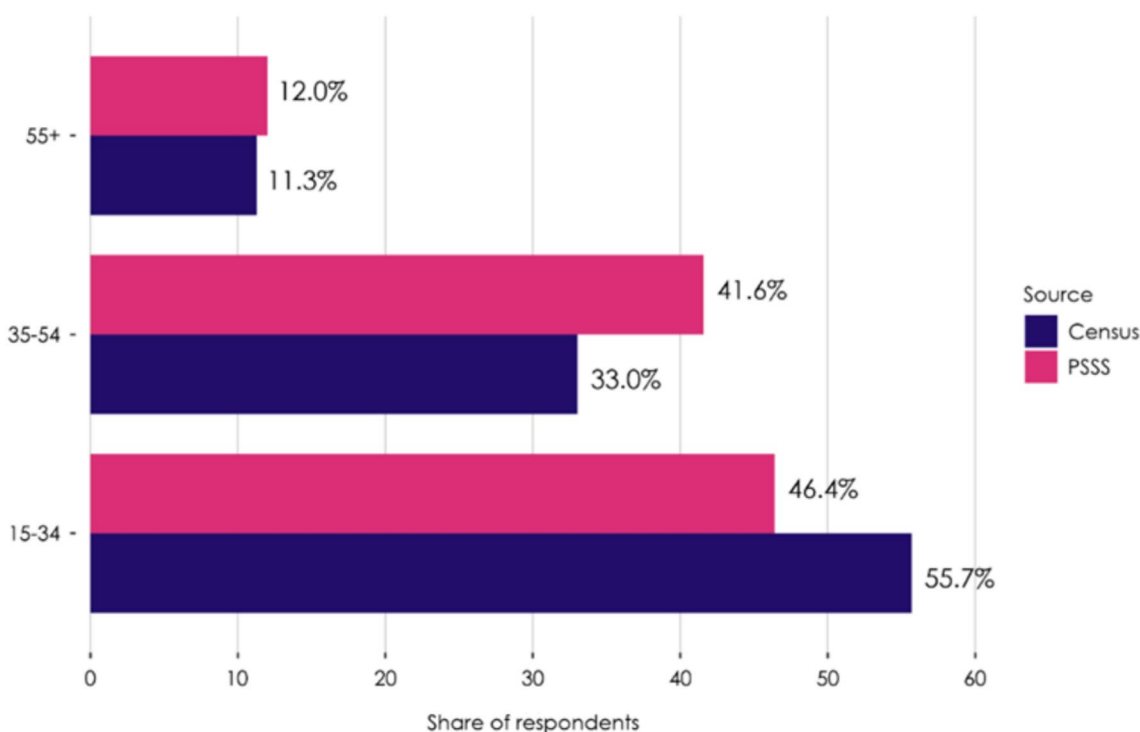

FIGURE 5 | Age distribution comparison between the 2021 Ghana Population and Housing Census and the 16.6.2 citizen data effort in Ga East.

of participants reporting seeing difficulties (12.4%) (Figure 7). Similar trends were evident in Suhum, with 5.9% of the population having difficulty seeing captured by the census, while the citizen data pilot project showed a rate of 12.4% (Figure 8). It is important to note that this overrepresentation of persons with disabilities in the citizen data initiative compared to the PHC data may be due to several factors, including the result of the communication strategy and the community workshops organized as part of the citizen data initiative, and differences in the data collection methodologies. Further research is needed to fully understand these discrepancies and their implications.

Further detailed results are presented in the Supporting Information.

3.2 | Satisfaction With Public Services From the Citizen Data Pilot Project

Over 80% of the citizen data pilot project participants in both districts used an Android mobile app. There was also some usage of the USSD version of the app, with 12.7% participation in Ga East and 18.5% in Suhum. Text reports submitted through the
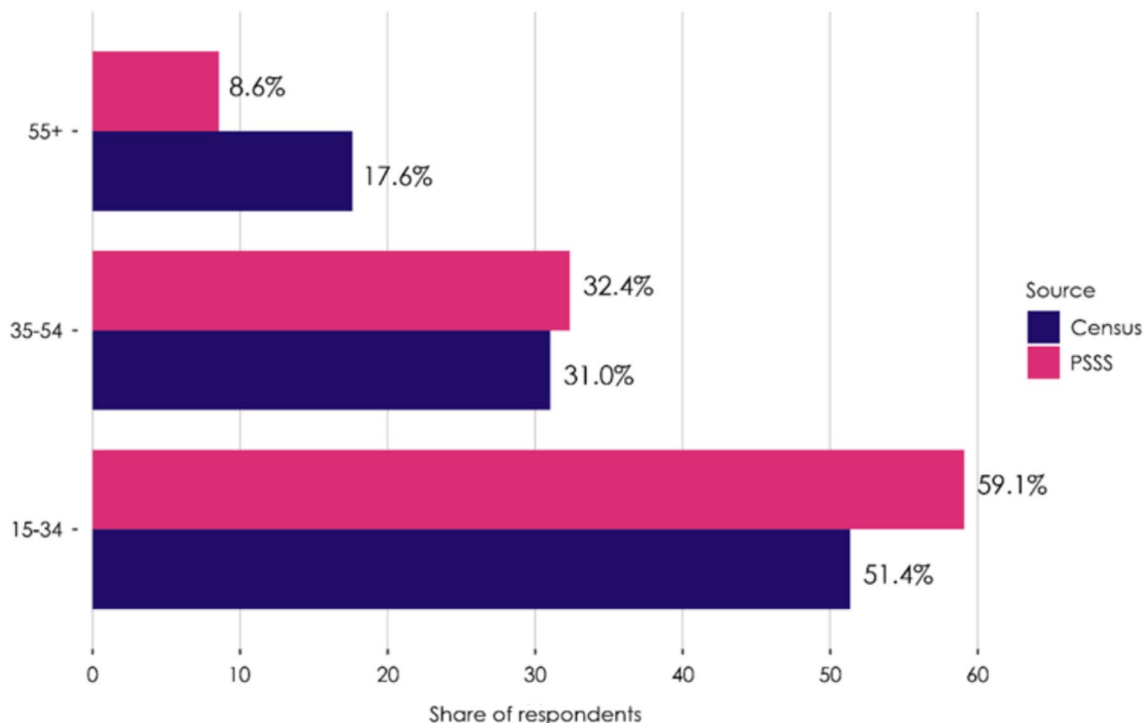
FIGURE 6 | Age distribution comparison between the 2021 Ghana Population and Housing Census and the 16.6.2 citizen data effort in Suhum.
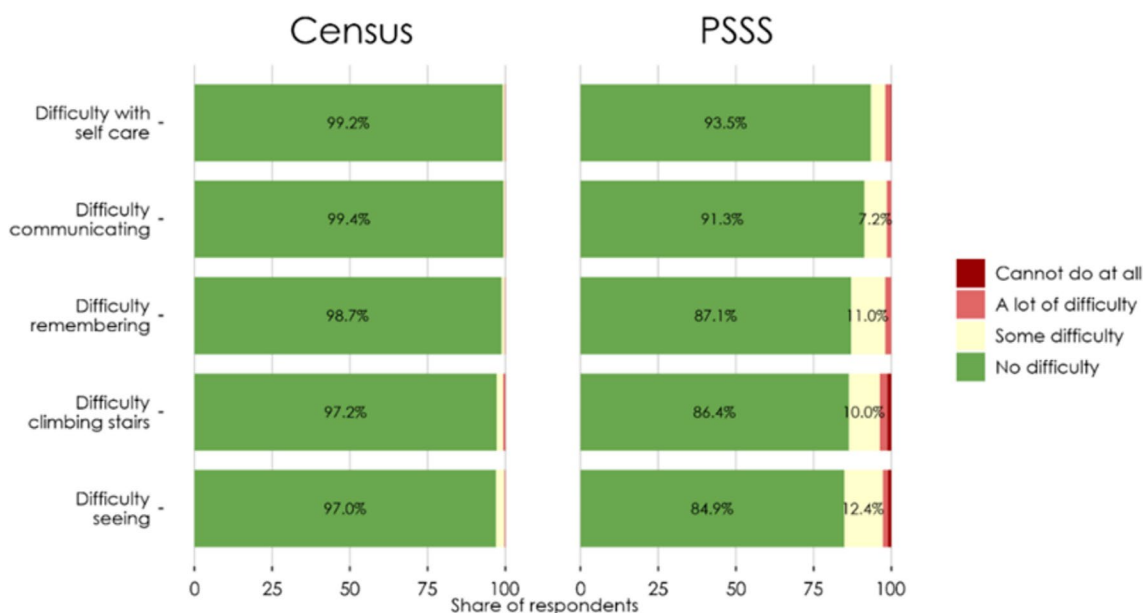
FIGURE 7 | Disability status comparison between the 2021 Ghana Population and Housing Census and the 16.6.2 citizen data effort in Ga East.
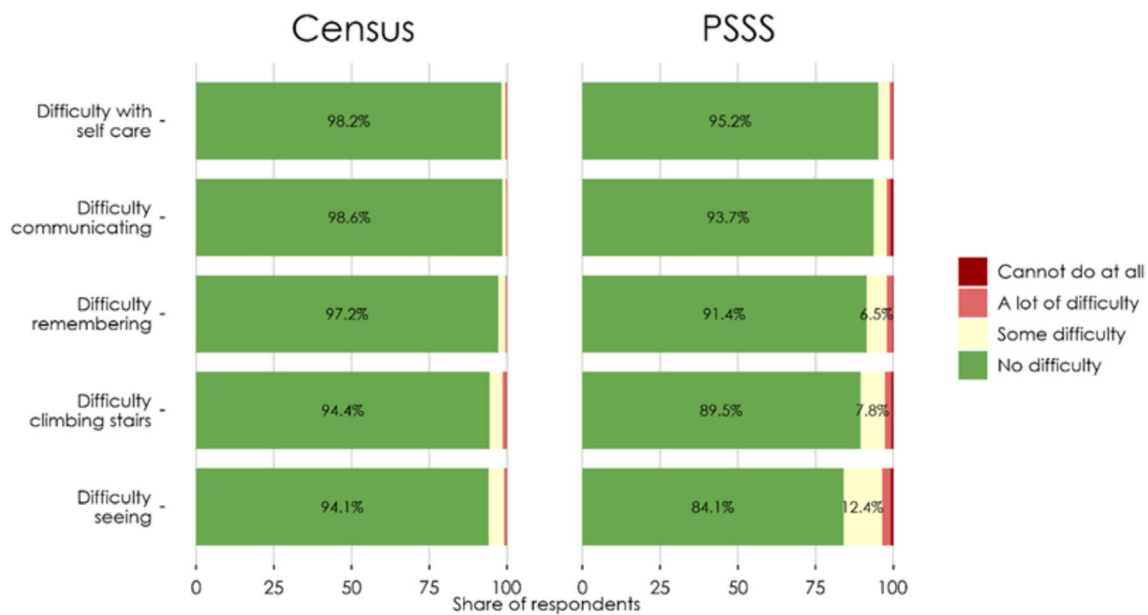
FIGURE 8 | Disability status comparison between the 2021 Ghana Population and Housing Census and the 16.6.2 citizen data effort in Suhum.

smartphone application were the most common method for participation in both districts, with around 55% in Ga East and 70% in Suhum. Voice recording functionality was used by about 27% of participants in Ga East and 8.5% of participants in Suhum. Sign language reporting had the lowest use rates, nearly 5% in Ga East and 3.5% in Suhum. These results demonstrate the potential for increased inclusivity compared to traditional methods like household surveys. The citizen data method allowed participation from individuals who might not be easily reached through official channels, such as those with illiteracy or hearing disabilities.

Looking specifically at public services covering healthcare, education, and government services such as government-issued identification, the citizen data pilot revealed important results in both Ga East and Suhum. For example, a significant portion of participants needed healthcare in the last 12 months (69.1% in Ga East and 56.5% in Suhum). About half in Ga East (45%) and over half in Suhum (53%) reported either no access or inconsistent access to healthcare. Among those with limited access, about half managed to receive healthcare when needed (55.2% in Ga East and 46.9% in Suhum). In both districts, those with limited access highlighted affordability as a major barrier to access to healthcare (around 28% in Ga East and 43% in Suhum). While the accessibility of health facilities received the highest satisfaction ratings in both Ga East and Suhum, affordability remained the least satisfactory aspect. Despite this, a significant majority of participants expressed overall satisfaction with public healthcare services. Around 77% in Ga East and 69% in Suhum reported being either very satisfied or satisfied. Only about 20% in each district indicated dissatisfaction.

Around 65% of participants in Ga East and 50% in Suhum reported having one or more school-aged children (5–18 years old) in their household. While a high proportion of school-aged children in both districts attend primary or secondary public school (84.5% in Ga East, 86.5% in Suhum), over 10% of school-aged

children did not attend public school (15% in Ga East, 13% in Suhum). Accessibility issues such as lack of public transportation and poor school conditions were the most highlighted reasons for not attending public schools in both districts. Despite significant dissatisfaction with school expenses and the condition of the facilities (around 40% dissatisfied in each), most participants expressed overall satisfaction with public education services (75.2% in Ga East and 72.2 in Suhum being satisfied or very satisfied).

Across Ga East and Suhum, about 70% of participants indicated that they needed a government-issued identification document in the last 12 months. However, a significant barrier that prevented some of the participants from accessing these services was affordability. Over 80% of those who did not utilize government identification services in both districts mentioned cost as the primary reason; in Suhum, this statistic reached 90.2%. Passports and national identification cards were the most needed documents in both Ga East and Suhum. However, the reasons for dissatisfaction related to such services differed in both districts. In Suhum, participants highlighted general frustration with the entire process, while in Ga East, long waiting times and discrimination experienced during the process were the main reasons for dissatisfaction.

Relevant results providing additional insights can be found in the Supporting Information.

3.3 | Comparison of the Citizen Data Pilot With the Representative 2019 16.6.2 Survey

The 2019 survey used a nationally representative sample of Ghana, gathering data from 4369 individuals aged 18 and over. The 2024 citizen data initiative focused on two pilot districts, collecting responses from 897 participants who were at least 15 years old. Despite the difference in methods, both initiatives resulted in similar gender distributions. The probability sample

used in the 2019 survey resulted in 43.3% male and 56.7% female participation. The citizen data initiative, open to anyone residing in pilot districts, showed similar results with 49.3% male and 50.7% female participants. However, while the 35–44 age group showed comparable results in both data sets, there were differences in other age groups. This may be related to (i) the five-year gap between the surveys as the social demographics might have changed over time, (ii) potential bias in the citizen data approach, because anyone could participate, certain demographics or individuals with extreme opinions, such as those highly satisfied or dissatisfied, are more likely to self-select and could be overrepresented, (iii) smartphone usage for data collection since the citizen data pilot might have attracted younger participants (45 years old or younger), who are more comfortable with smartphones and led to lower participation from older age groups, (iv) a combination of all of these.

In terms of the findings on healthcare, the reported need for health services in the last 12 months differed slightly between the two data collection periods and methods. In the 2019 16.6.2 survey, 64.3% of participants indicated needing healthcare, compared to 62.3% in the 2024 citizen data pilot. Access to public health facilities also showed similar results. 97% of the participants in the 2019 survey reported having access when needed, while 89% of participants in the citizen data pilot selected this response. The main reason for not receiving medical care differed in both initiatives. Affordability was the primary barrier for 18% of respondents in the 2019 survey. However, in the 2024 citizen data pilot, a higher percentage (34%) mentioned affordability as the main obstacle for seeking healthcare.

While it is important to note that the 2019 survey and the 2024 citizen data used different methodologies, observing these data trends can be helpful in understanding public perceptions.

Education-related results show that the distribution of children between ages 5–18 years in households was similar (55.1% in 2019 and 56.7% in 2024). Among those, 84.3% attended public school in 2019 according to the 16.6.2 survey result and 85.5% in 2024 according to the citizen data pilot results. Among children who did not attend public school 72.8% were enrolled in private school in 2019 and 81.2% in 2024, while 26% in 2019 and 7.2% in 2024 did not attend any school.

The reported need for obtaining or renewing government-issued identification differed between the two data collection methods. The 2019 survey indicated 36.5% of participants needed an ID in the last 12 months, while 70.5% reported the same need in the 2024 citizen data pilot. Nearly 100% tried to obtain or renew an ID compared to 80% in the 2024 citizen data pilot. The reasons for not obtaining an ID were also different. The 2019 survey indicated the "process being too complicated" as the main reason for 43% of participants, whereas only 1% of participants in the 2024 pilot selected this reason. In contrast, affordability was the main reason according to the 2024 citizen data pilot results, with 86.6% of participants selecting it as the primary barrier compared to only 11% in 2019.

A one-page fact sheet highlighting key insights from the data presented in the results section is also included in the Supporting Information.

4 | Discussion

Our study represents an innovative approach and a step forward in how UN agencies and NSOs can monitor governance and the SDGs in an inclusive way. The project represents pioneering efforts in two ways. First, it uses citizen data approaches to monitor a governance indicator, which can assist in capturing the experiences and perspectives of individuals and communities that are difficult to gather through traditional methods. By engaging harder-to-reach populations, this approach creates opportunities to refine traditional survey methods, allowing for more targeted data collection among specific groups, such as those with the greatest need for particular public services. This targeted approach is especially valuable as it helps address the unique needs of different communities, ultimately contributing to improved service delivery and governance. Second, the study provides, for the first time, a comparison of the results from citizen data approaches with two established methods in official statistics, namely surveys and censuses. This comparison is key to understanding how citizen data approaches can complement traditional sources of data and methodologies. By analyzing the strengths and weaknesses of citizen data and traditional approaches, the study helps to provide a more comprehensive and nuanced understanding of governance indicators. This understanding has the potential to lead to more effective and targeted initiatives aimed at improving governance while ensuring inclusivity.

Although the citizen data pilot and the representative survey in this study share a common element, which is that the citizen data pilot utilized a slightly modified version of the representative 16.6.2 survey, their methodological and conceptual foundations and processes are quite distinct. Citizen data adopts a more participatory, near real-time, and adaptive approach, allowing for continuous or more frequent data collection, depending on how the initiative is designed. Additionally, citizen data initiatives can be tailored to target specific locations, population groups, or topics, offering a level of flexibility that representative surveys lack. Furthermore, they can be designed to provide feedback to participants, which household surveys do not typically support. By incorporating new technologies such as mobile applications, citizen data approaches can enhance responsiveness, inclusivity, and adaptability, positioning them as part of an evolving framework of current, traditional practices. Our findings from the Ghana pilot show that although the first-time investment can be costly, mostly due to the initial cost of technology development and first-time stakeholder and community engagement, citizen data approaches may require lower long-term investments compared to traditional data collection methods (Ferri et al. 2020). However, this requires a more comprehensive study before conclusions about cost efficiency can be made.

Through citizen data initiatives, more frequent data collection cycles can be achieved, enabling the understanding of evolving citizen satisfaction levels in response to policy changes or progress tracking over time (Fritz et al. 2019). Such a time-sensitive approach is crucial for informing responsive governance interventions that effectively address citizen needs.

Beyond data collection, citizen data initiatives can foster a more inclusive and participatory approach to governance by actively involving citizens in data collection and analysis, as these projects can raise awareness about public services and empower citizens to hold governments accountable (Benyei et al. 2023; Dhrami and Prodromidou 2024). Additionally, citizen data approaches can create a platform for citizen input into the design, delivery, and decision-making processes related to public services, fostering a sense of ownership and promoting more responsive governance (Danielsen et al. 2014; de Sherbinin et al. 2021).

If designed well, citizen data approaches can help to reach marginalized and vulnerable populations, who might otherwise be excluded from official statistics due to potential barriers such as disability (Purcell et al. 2017; Wünsche and Schimmler 2019). Through inclusive design and leveraging diverse communication channels, such as community workshops and multistakeholder partnerships at a local and global level, as implemented in this project, citizen data initiatives can assist in ensuring a more representative understanding of citizen experiences (Pandya 2012).

This particular citizen data initiative also resulted in an increased level of awareness, knowledge, and skills related to designing and implementing citizen data initiatives both at a local and national level in Ghana, similar to other studies (Greving et al. 2022; Serbe-Kamp et al. 2023). This is due to the strengthened capabilities of the GSS staff and the district and local authorities in working with citizen data approaches. This aspect is critically important considering the data gaps and issues in official monitoring and policy development faced by NSOs and the National Statistical Systems, in Ghana and globally, as well as the costs associated with traditional data collection methods and the limited resources available for such activities (Development Initiatives 2023). Moreover, the project showcased the potential of citizen data for local decision-making to relevant stakeholders, especially policymakers.

Our findings also demonstrate that, although citizen data approaches offer great potential for 16.6.2 monitoring, they also have limitations. One of the most common challenges is related to potential biases with specific implications related to 16.6.2 monitoring. Representativeness is one such bias (Blake et al. 2020). Citizen data approaches, when poorly designed, can fail to include participants from diverse backgrounds, ethnicities, income and education levels including illiterate populations, vulnerable or marginalized communities, or people with low levels of access to the internet and technologies, such as smartphones (Cooper et al. 2021; Dalby et al. 2021). However, it is crucial to ensure participation from all parts of the population not only to mitigate risks related to such biases from a data quality perspective, but also from an ethical standpoint (Resnik et al. 2015). Additionally, the "leaving no one behind" principle of the 2030 Agenda requires inclusivity (Gupta and Vegelin 2016). To mitigate the risks related to such biases, careful project design and an inclusive community building plan are needed that consider the specifics of the localities in which the citizen data initiatives are implemented (Varga et al. 2023).

In the context of the Ghana citizen data initiative, inclusivity has been achieved to a certain extent through community workshops and the involvement of the local and national technical teams as well as the global actors, such as the UNDP GPCG, as they can help align with good practice guidelines and global standards regarding inclusivity, such as the UNDP Data Principles and Digital Standards (UNDP 2024a, 2024b).

Another challenge or limitation is engaging the public to take part in the project and sustaining their engagement over time (West and Pateman 2016), especially when funding is limited or provided for a certain amount of time, as was the case in this initiative. Understanding participant motivations is therefore found to be crucial in order to incorporate this knowledge into project design (Gómez-Barrón et al. 2019). Involving potential participants and key stakeholders during the design stage, along with the government officials, provided incentives for participation in the case of Ghana. Additionally, community awareness-raising workshops were held to ensure that the goal of influencing policy decisions that can positively impact well-being was clearly communicated to participants.

Furthermore, both traditional surveys and citizen data initiatives have distinct strengths and limitations. For example, traditional surveys may struggle with declining response rates (Czajka and Beyler 2015) in many parts of the world, as well as the related risk of nonresponse bias (Atrostic et al. 2001; Berg 2010; Beullens et al. 2018). Citizen data approaches can potentially help mitigate these issues by reaching out to a broader range of participants, especially those who are marginalized, providing complementarity (König et al. 2021). However, the representativeness of citizen data initiatives is an issue as well, as previously mentioned, and requires careful design and consideration. By strategically combining citizen data approaches with traditional methods, the strengths of both approaches to gather more comprehensive and reliable data can be achieved (Hadj-Hammou et al. 2017).

Another limitation of our study was technology-related and had an impact on efficiency and data collection. For example, the initial app development phase took significantly longer than anticipated. For future iterations, allocating more time and dedicating sufficient resources for testing and refinement is crucial. During the implementation phase, some problems occurred with both the smartphone app and the USSD short code. These issues included slow app loading times and unresponsive short codes. The root cause of these issues was the limited server storage capacity during the initial launch. The reason was mostly a lack of immediate access of app developers to the GSS server environment. This limited their ability to proactively address the server capacity issues. Furthermore, delays in granting access to the GSS environment contributed to additional difficulties in providing a dashboard for monitoring district performance during the initial data collection phase. Downloadable data in user-friendly formats (like CSVs) were also not readily available. To mitigate these challenges in the future, developing a more realistic timeline for app development and factoring in adequate testing and refinement phases is necessary.

Finally, building on the results and learnings from this initiative, future work can focus on refining the citizen data approach for nationwide implementation in Ghana, expanding beyond the localized scale used in the pilot. Additionally, future work

can explore its application in other contexts, including implementation in different countries and regions, which was a key motivation for the NSO engagement workshops. Through further pilots and implementation in other contexts, UNDP GPCG aims to continue strengthening evidence on the feasibility of citizen data in governance statistics with a focus on public service delivery.

Refining citizen data process and approach encompasses five key areas: (i) allocating sufficient time for both the design and implementation phases, including the development and testing of the application, as well as securing adequate technical infrastructure, (ii) enhancing stakeholder and community engagement, (iii) reconsidering the length of the survey and exploring more intuitive design practices; and (iv) further engaging with local and other relevant authorities at the district level and national policy actors to raise awareness of the citizen data approach, and (v) developing effective communication strategies tailored for other contexts and for nationwide scale, while also providing regular feedback to participants. These efforts would significantly enhance data collection capabilities and address existing data gaps in monitoring 16.6.2 and other governance indicators. Additionally, beyond Ghana, future research can explore the use of this approach in diverse geographic settings. This will provide insights into whether the approach can be effectively adapted to various countries and local contexts to enhance its potential for widespread adoption.

5 | Conclusion

This study presents a pioneering approach to monitoring governance by leveraging citizen data approaches. The findings highlight the potential of citizen data for monitoring indicator 16.6.2, which assesses citizen satisfaction with public services. Integrating citizen data approaches into established data collection methods such as representative surveys offers a solution to address data challenges, ultimately enhancing governance practices.

Traditional survey methods have limitations in capturing data from geographically dispersed or marginalized populations. Citizen data initiatives can assist in bridging this gap by empowering citizens and communities, especially by involving those who are marginalized and hard to reach through traditional data collection methods, to contribute data from their unique perspectives, which helps to provide a more comprehensive understanding of governance issues across diverse populations. Additionally, citizen data methodologies can serve as a valuable complement to global methodologies and surveys, providing richer insights into citizen experiences as they encourage participation from a wider range of individuals and communities. Citizen data projects can gather more granular details about specific public service delivery variations or accessibility challenges faced by different population groups, including those with disabilities.

Building on the results of this study, we recommend establishing platforms for knowledge sharing between NSOs on citizen data approaches, focusing on governance. This fosters a collaborative environment, enabling NSOs to adapt such approaches to their specific national and local contexts, facilitating wider implementation for more effective governance monitoring. Developing guidelines and training workshops to build capacities to equip NSOs with the necessary skills for implementing citizen data initiatives is another recommendation from this study. Increasing the number of pilot projects is an important next step, which can help facilitate broader experimentation, allowing for further refinement of citizen data methodologies to foster widespread adoption by NSOs.

It is important to note that co-designing approaches by engaging stakeholders in the design phase, including government agencies and civil society organizations, ensured inclusivity and fostered ownership of the initiative. It is also important to highlight the need for an enabling environment for such initiatives where appropriate legal and regulatory frameworks and funding are in place for NSOs to adopt such approaches.

The next steps involve expanding the pilot project to other districts in Ghana and conducting further pilots in diverse settings depending on funding availability. A nationwide implementation can help to understand the scalability of this approach and lead to its integration into a monitoring system for indicator 16.6.2 across the country. Additional pilots will also provide valuable insights into the applicability of this approach across different contexts and geographical regions. By fostering collaboration, capacity building, and an enabling environment, citizen data can become key to effective and inclusive governance monitoring and policymaking worldwide.

Finally, the rapidly evolving data landscape presents an opportunity to reconsider the changing role of NSOs, expanding beyond the production of statistics to actively shaping solutions. Rather than only tracking sustainable development and governance issues more specifically, NSOs could take a leadership role in fostering new partnerships with citizen data producers and other key stakeholders. This way, they can become key actors in driving meaningful change, leveraging citizen data insights to inform policies, improve governance, and enhance community engagement. This shift may also call for redefined roles of public institutions in general, emphasizing collaboration and adaptability in addressing societal challenges.

Conflicts of Interest

The authors declare no conflicts of interest.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.