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Perceptions of Healthcare Workers on the Attributes of the Integrated Disease Surveillance and Response System in Zimbabwe

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Short running title: Perceptions of Healthcare Workers on the Integrated Disease Surveillance and Response System

Abstract

Objective: To investigate healthcare workers' perceptions of the integrated disease surveillance and response (IDSR) strategy.

Methods: A cross-sectional survey of healthcare workers (HCWs) was conducted from December 2021 to June 2022 to assess their perceptions of the IDSR system attributes.

Results: Of the 409 respondents, 12 (2.9%) reported no prior training on disease surveillance. The IDSR was deemed simple, acceptable, useful, and timely by most participants. There were sharp differences in perceptions of flexibility and simplicity between doctors and the other healthcare professionals. However, acceptability, timeliness, and usefulness were uniformly perceived. Healthcare workers with at least 11-years' experience perceived the usefulness of the IDSR system significantly higher than those with lesser years of experience. However, work experience did not have an impact on HCWs perceptions of the simplicity, timeliness, and flexibility of the IDSR system.

Conclusions: Most healthcare workers have positive perceptions of the IDSR approach. However, there are reservations about how well the system can adapt to changing conditions and demands (flexibility) and how well it simplifies the implementation processes. These findings demonstrate the necessity of adopting cutting-edge strategies for capacity building as well as ongoing professional development of healthcare professionals responsible for the implementation of the IDSR strategy.

Keywords: Communicable diseases, IDSR, surveillance system, healthcare workers, perceptions, system attributes

Introduction

Communicable diseases are among the leading causes of the global health burden, particularly in low-income countries.¹ According to the World Health Organisation (WHO) report for 2019, three of the top 10 causes of death were identified as communicable diseases, with pneumonia and other lower respiratory tract infections being the deadliest in this group.² In general, the proportion of deaths caused by communicable diseases has declined worldwide, but in Africa and South-East Asia, communicable diseases remain the most common of the 10 leading causes of death.³ Interestingly, 6 of the top 10 causes of death in low-income countries, particularly in Africa and Southeast Asia, are still communicable diseases, including malaria, tuberculosis and HIV/AIDS. Although some progress has been made so far in combating the impact of communicable diseases and there are signs of decline, these diseases remain a regional health burden.

Countries need to implement effective disease surveillance, reporting and notification systems to detect, monitor, and control the spread of deadly infectious diseases.⁴ The Global Preparedness Monitoring Board (GPMB) launched in 2017 by the United Nations Secretary-General's Global Health Crises Task Force, notes that despite progress made in major outbreaks such as Ebola in West Africa in 2014/2015 and other major outbreaks in recent years, "the recent COVID-19 pandemic revealed a collective failure to take pandemic prevention, preparedness and response seriously and to prioritise them accordingly."⁵ This lack of preparedness to deal with major global pandemics underscores the need to create robust, proactive systems to improve outbreak preparedness and response through effective surveillance systems for notifiable diseases. Therefore, there is a need for effective disease surveillance systems that enable early detection and control at the source, as well as prevention of the spread of disease. According to WHO, "Surveillance is the process of systematically collecting, compiling and analysing data with immediate dissemination to those who need to know so that appropriate action can be taken".⁶ A well-functioning disease surveillance system provides information for planning, implementing, monitoring and evaluating public health intervention programmes.

Effective public health is characterised by the continuous, systematic collection and analysis of health-related data to interpret the potential for disease outbreaks and draw conclusions on how to mitigate the impact in the event of an outbreak.⁷ It is critical that public health addresses the aetiological nature of disease before outbreaks become pandemics, and also

assesses the severity, temporal and spatial distribution, and the nature and effectiveness of outbreak responses.⁸ Integrated Disease Surveillance and Response (IDSR) is a strategy adopted in 1998 by countries in the WHO (African Region) to implement comprehensive public health surveillance and response systems for priority diseases, conditions and events at all levels of health systems. The strategy involves the systematic collection and analysis of medical data that will help prevent infectious diseases as they can be controlled early through a range of interventions.⁹ Successful implementation of the strategy therefore requires a well-trained, competent and committed workforce.

Several studies have been conducted to assess how public health surveillance has worked. In a study conducted in the Sanyati district in Zimbabwe, healthcare workers described the system as useful, easy to use and adaptable to changing circumstances. However, there were also barriers to effective use, such as the fact that only 20% of respondents were aware of the legal requirements for reporting suspected cases, that only 3 out of 16 health facilities had T1 forms, and that less than half of respondents reported receiving feedback.¹⁰ These results are consistent with findings from the Centenary District in Zimbabwe, where healthcare workers cited a lack of feedback from higher up as a demotivating factor.¹¹ These two studies have shown that while laws exist, targeted means to ensure compliance is still lacking.^{10,11} In related studies on the system features of the IDSR, private medical facilities and religious health centres had little to no involvement in mandatory data submission. Only data from public facilities were available at the time the studies were conducted, suggesting that only public facilities were compliant.¹²⁻¹⁴ This leads to gaps in the representativeness of the surveillance data. Thus, the partial data available does not provide a clear picture of the state of play.

This work does not aim to make a technical proposal for an improved disease surveillance system. Rather, it aims to add to the literature on how to ensure effective use of the IDSR strategy by understanding the perceptions of healthcare workers on important features of the IDSR strategy. A study conducted in South Africa on the Notifiable Diseases Surveillance System, and another related study on health surveillance systems but focused on neglected tropical diseases in Kenya, explored system users' perceptions of the attributes to understand the system from the perspective of those charged with its implementation.^{15,16} The acceptance of a system is influenced by how the system is perceived. Therefore, this study examines how healthcare workers perceive the different components of the system (attributes). Healthcare workers play a crucial role in effectively implementing the IDSR strategy. In the case of

disease surveillance, it is those who are entrusted with the use of the system who can help improve the effectiveness of the system by finding out what they think about it. It is therefore crucial that this study thoroughly explores what healthcare workers think about the components of the IDSR strategy. In line with international health regulations and to ensure the implementation of the African region's IDSR strategy WHO, the Zimbabwe Public Health Act of 2018 introduced a system of notifiable disease surveillance that must be followed in the event of an outbreak of a communicable infection.¹⁷

Materials and Methods

In this study we employed a questionnaire-based approach to gather comprehensive data on the demographic characteristics of the respondents, such as their occupation, years of experience, and training in disease surveillance. We also collected data on the respondents' awareness of IDSR, their knowledge and skills related to the notifiable disease surveillance processes and finally their perception of IDSR. Purposive sampling was used to select 14 healthcare institutions across five provinces in Zimbabwe from which participants were drawn. The distribution included four facilities from Bulawayo Metropolitan Province, five from Harare Metropolitan Province, three from Matabeleland North Province, one from Matabeleland South Province, and one from Midlands Province. Notably, the study focused on hospital staff, excluding outpatient clinic personnel. The participants, comprising doctors, nurses, pediatricians, laboratory technicians, and pathologists, responded to a self-administered questionnaire. This questionnaire assessed their perceptions of IDSR characteristics, namely acceptability, simplicity, timeliness, usefulness, and flexibility. These attributes were measured on a scale of 1 to 7, with 1 being "strongly disagree", 7 being "strongly agree" and 4 being "neutral", i.e. "neither agree nor disagree".

Our sample encompassed a diverse range of facility types: 10 public facilities, one (1) private facility, and three (3) faith-based facilities. Of the 500 distributed questionnaires, 409 respondents completed the survey, resulting in an 81% response rate. This methodological approach not only allowed us to explore healthcare professionals' perceptions of IDSR but also provided a thorough understanding of the demographic and institutional landscape, enhancing the reliability and relevance of our study's findings.

Data analysis

IBM SPSS version 24 was used to perform quantitative statistical analyses. Data were analysed using descriptive statistics and inferential statistics including t-tests and analysis of variance (ANOVA). The sample was divided into two groups. Group one consisted of doctors only and group two consisted of nurses, laboratory technicians, and health records officers.

An independent samples t-test was conducted to determine whether the difference in means between the two groups was significant enough to affect their perceptions of each system attribute. ANOVA was used to examine whether the system users' work experience had a significant effect on their perceptions of the surveillance system attributes. Finally, descriptive statistics for each attribute were used to assess the overall perspective of healthcare workers.

Results

Table 1a shows the socio-demographic characteristics of the participants. Of the 409 participants, more than 70% of them were female. Only 30% of the participants were doctors and the modal class for years of experience was 6-10 years. At least 97% of the participants acknowledged having received training on disease surveillance at some point. The participants were drawn from a total of 14 healthcare facilities distributed across five provinces in Zimbabwe. Harare Metropolitan and Bulawayo Metropolitan provinces had the highest representation, accounting for 40.3% and 21.3% of the total participants, respectively. Midlands Province had the lowest representation of 18 (4.4%) participants .

We used a chi-square test of association to gain more insight into the gender distribution in various professions. Table 1b shows the results of the chi-square test. The results of this study revealed a statistically significant association, as demonstrated by $\chi^2(1) = 7.573$, $p = .006$. These findings indicate a significant gender disparity in the quantity and diversity of doctors and nurses/other healthcare workers. When comparing doctors to nurses and other healthcare professions, it is evident that the percentage of males is substantially higher among doctors. We also examined the relationship between profession (doctors, nurses and others) and number of years of experience (1-5 years, 6-10 years, 11 years and above). The chi-squared tests revealed that there was a statistically significant relationship between these factors ($\chi^2(2)$

= 6.618, $p = .037$). Nurses and others were more likely to have higher number of years of experience compared to doctors.

Mean differences in perceptions of the five attributes between doctors and other healthcare workers were assessed using an independent samples t-test. Doctors perceived the simplicity of the IDSR system better ($M = 6.40$, $SD = 0.57$) than nurses and other healthcare workers ($M = 6.19$, $SD = 0.80$), $t(325) = 2.98$, $p = 0.003$. On the other hand, nurses and other healthcare workers perceived the flexibility of the IDSR system better ($M = 4.08$, $SD = 0.42$) than doctors ($M = 3.98$, $SD = 0.49$). However, no significant differences in perceptions were noted on the other attributes (acceptability, timeliness, and usefulness).

A one-way ANOVA was conducted to assess the relationship between years of work experience and various attributes of the IDSR system. The independent variable, years of work experience, had three levels: 1 to 5 years, 6 to 10 years, and 11 years upwards. The dependent variable was one attribute of the IDSR system each (simplicity, acceptability, timeliness, usefulness, and flexibility).

The results of the analysis of variance showed that work experience had a significant impact on how healthcare workers perceived the acceptability ($F(2, 406) = 4.63$, $p = 0.01$) and usefulness of the IDSR system ($F(2, 406) = 3.34$, $p = 0.037$). In terms of acceptability, a Scheffe post-hoc criterion for significance showed that healthcare workers with 6-10 years of experience perceived the acceptability of the IDSR system significantly better ($M = 6.18$, $SD = 0.84$) than those who had 1-5 years of experience ($M = 5.90$, $SD = 0.87$) and those who had at least 11 years of experience ($M = 5.94$, $SD = 0.88$). Regarding perceptions of the usefulness of the system, post hoc comparisons using Scheffe's post-hoc criterion indicated that the mean score for at least 11 years' experience ($M = 5.89$, $SD = 0.48$) was significantly different than the 6-10 years' experience ($M = 5.72$, $SD = 0.62$). However, the mean score for 1-5 years' experience ($M = 5.74$, $SD = 0.51$) did not significantly differ from the 6-10 years' experience."

On the contrary, the results showed that there was no significant evidence that years of work experience had an impact on how healthcare workers perceived the ease (simplicity), timeliness, and flexibility of the IDSR strategy.

Discussion

Communicable disease surveillance is part of public health surveillance, which in turn is part of the broader health information system. Every country must have a functioning surveillance system to ensure an effective response to communicable diseases and not be reactionary when a pandemic breaks out. Infectious disease surveillance is used as part of health systems management to provide early warning of a potential outbreak and facilitate early public health interventions, track the impact of public health interventions, and monitor trends in communicable disease epidemiology to inform policy development and change.

The study examined how doctors, nurses and other healthcare workers involved in disease surveillance perceived the five attributes of the IDSR strategy: simplicity, acceptability, timeliness, usefulness, and flexibility. Additionally, the effect of years of work experience and job title were examined to see if they affected how respondents assessed the IDSR system's features.

Most study participants said the IDSR was easy to use, acceptable, practical, and timely. The average responses, which varied from 5.56 to 6.26 and indicated agreement to strong agreement on a scale of 1 to 7, clearly demonstrate this. The average score for flexibility was 4.09, indicating that respondents were indifferent on the issue.

When comparing doctors and nurses (in combination with other healthcare workers in disease surveillance), the data show that there was a significant difference in the two groups' perception of the simplicity and flexibility of the IDSR. However, there was no significant difference in healthcare workers' perceptions of timeliness, acceptability and usefulness. The study found that years of work experience had a significant impact on the acceptability and usefulness of the IDSR. However, perceptions of the simplicity, timeliness and flexibility of the IDSR were not influenced by the years of professional experience of the healthcare worker.

An analysis of the influence of different professional categories on health professionals' perceptions of the system attributes revealed that doctors and other health professionals perceived the simplicity and flexibility of the IDSR significantly differently. Doctors were more likely to perceive the system as simple, with a mean score of 6.40, than nurses and other healthcare workers, with a mean score of 6.19. This is likely due to the fact that doctors receive rigorous training in disease surveillance in medical school and perform more complex medical interventions, making basic surveillance systems easier to understand compared to

other professions. However, nurses and other healthcare workers would likely perceive the system as more flexible than doctors. This finding supports the results of a survey on key stakeholders' perceptions of the features of the NNDSS in South Africa, where respondents from the 'other' category, which did not consist of doctors, in our case those categorised as 'nurses and other health professionals', perceived the system to be more flexible.¹⁵ However, in contrast to the findings of the same survey¹⁵, which concluded that "a higher percentage of health management participants perceived the system as easy, useful and timely", in our case the category of healthcare workers did not significantly affect how they perceived the acceptability, timeliness and usefulness of the system.

Our study also showed that years of work experience were related to perceived views on the acceptability and usefulness of the system. This is also consistent with a study conducted in Kenya to assess the characteristics of health monitoring systems. There, the work experience of healthcare workers had an influence on how they perceived the simplicity of the system: the more years of work experience, the higher they rated the system as simple.¹⁶ In South Africa, a study on the NNDSS confirmed this relationship when it found that respondents under 35 years of age were more likely to find the NNDSS acceptable. However, the study seems to indicate that healthcare workers' perceptions of the simplicity, timeliness and flexibility of the IDSR were not influenced by years of work experience. This finding confirms the results of a study on key stakeholders' perceptions of the features of the South African Notifiable Diseases Surveillance System, which found no association between years of work experience and healthcare workers' perceptions of the simplicity and flexibility of the system.¹⁵

The study found that respondents generally found the system useful, suggesting that health professionals are willing to participate in the IDSR strategy. This is consistent with Benson et al's study in South Africa, where the majority (over 50%) of stakeholders who participated in a survey to explore their perceptions of the South African NNDSS found the system useful.¹⁵ Usefulness needs to be demonstrated through public health interventions that result from surveillance data obtained during the processes. A surveillance system is supposed to provide accurate information for public health action, and therefore it is important that the main users of the system (HCWs) appreciate its usefulness. However, this finding contrasts with the results of the same study, where the majority of respondents reported not receiving adequate feedback from the top. Feedback is an essential part of the IDSR system cycle. When primary care nurses and doctors are involved in the surveillance processes (which also means that

they receive appropriate feedback), they feel part of the process and useful because they know that their efforts, time and commitment are valued. When healthcare workers do not feel valued, they become demotivated, which has a negative impact on the quality of surveillance data. This finding supports the findings of an evaluation of the perinatal mortality surveillance system in Bulawayo, which found that there was no feedback to the primary HCWs, resulting in users of the system becoming complacent.¹⁸

The majority of participants found the reporting forms and procedures easy to understand, and the time taken by agencies to take appropriate action after reporting an event was good on average. Similar findings were reported in an evaluation of the NNDSS in Beitbridge Zimbabwe, where all four key informants who participated in the study confirmed that it was easy to orient staff to the NNDSS and that completing the T1 forms was straightforward.¹⁹ When healthcare workers find the IDSR easy, it gives them confidence in using the system and has a positive impact on its optimal performance.

Four hundred and four (98.8%) respondents expressed their willingness to participate in disease surveillance. If those charged with using the system are willing to participate, this will give the system the momentum it needs to be functional. Resources can then be focused on training and equipping healthcare workers with the tools and skills needed to best implement the IDSR strategy. In a study conducted in Sanyati, 100% uptake was found.¹⁰ In another related evaluation of the NNDSS in the Chegutu district in Zimbabwe, findings were that the majority (80%) of participants understood that completing the reporting forms was part of their job and that they were willing to continue doing so.²⁰ No information was missing from the T1 reporting forms assessed, showing that the system was acceptable. They also demonstrated their commitment to the surveillance processes through evidence of minutes of meetings they attended weekly and monthly for disease surveillance.

However, in terms of healthcare workers' perception of flexibility, the study found that the majority neither agreed nor disagreed with the statement that the system was adaptable to changing circumstances and situations. This contradicts the assumption that the IDSR strategy was flexible from the beginning.²¹ This may have been exacerbated by the fact that there have been no significant communicable disease outbreaks in Zimbabwe in the last decade. The only major pandemic outbreak that affected Zimbabwe after the revision of the WHO-AFRO technical guidelines of the IDSR was the global Covid 19 pandemic outbreak, which was different in scale from the other outbreaks that the IDSR had faced previously.

Thus, the expectations of system users may have been higher than the system could actually hold. As a result, they felt that the IDSR was not flexible enough to respond to changing needs and circumstances.

While our study revealed significant findings with the potential to affect the future of the healthcare sector, particularly in the field of disease surveillance, it is critical to acknowledge the presence of many inherent limitations that deserve consideration. We only included five of Zimbabwe's provinces and this could be a potential source of sampling bias. Furthermore, our study relied on self-reported data which could be susceptible to response bias. Finally, because the study is cross-sectional, it does not capture changes in perceptions over time. Our findings cannot be generalized to other healthcare settings with different contextual factors or IDSR implementations due to these constraints.

Several next steps emerge from this study. These include expanding the study to all ten provinces to improve reliability, supplementing survey data with qualitative methods for deeper insights, addressing challenges raised by healthcare workers with negative perceptions, and offering policy recommendations to contribute to the improvement of disease surveillance and response systems in Zimbabwe. We also propose to further break up the profession categories to investigate nuances in perceptions among doctors, nurses, and other healthcare workers.

Conclusions

Study findings showed that most healthcare workers who participated in the survey perceived the IDSR system to be acceptable, useful, simple, and timely, with one exception in the perception of flexibility, where most respondents were indifferent about the flexibility of the system. Furthermore, doctors and other healthcare workers perceived the simplicity and flexibility of the IDSR system differently. Similar observations were noted with regards to the impact of healthcare workers' experience on IDSR perceptions. These findings demonstrate the necessity of adopting cutting-edge strategies for capacity building as well as ongoing professional development of healthcare professionals responsible for the implementation of the IDSR strategy.

Authors' Contributions

Conceptualization, F.M, E.C; methodology, F.M; formal analysis, F.M, E.C; data curation, F.M; A.A, N.M and E.C; writing, original draft preparation, F.M; writing, review and editing, F.M, E.C, N.M and AA supervision, E.C, AA, and N.M. All authors have read and agreed to the submitted version of the manuscript.

Abbreviations

AIDS- Acquired Immunodeficiency Syndrome

COVID 19- Coronavirus disease - 19

GPMB- Global Preparedness Monitoring Board

HCWs- Healthcare Workers

HIV- Human immunodeficiency virus

IDSR- Integrated Disease Surveillance and Response

NNDSS- National Notifiable Disease Surveillance System

WHO- World Health Organisation

WHO/AFRO- World Health Organisation African Region

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Availability of data and materials. The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of interests. The authors declare that they have no conflicting interests.

Consent for publication. Not applicable.

Ethics approval and consent to participate

The Human Research Ethics Committees of the Cyprus International University, National University of science and technology Zimbabwe and the Medical research council of Zimbabwe provided approvals for the study (**MRCZ No MRCZ/A/2843**). All participants signed written informed consent forms.

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Table 1a. Socio-demographic characteristics of participants

Socio-demographic characteristics	Count (%)
Gender	
Male	113 (27.6%)
Female	296 (72.4%)
Category	
Doctors	125 (30.6%)
Nurses, Laboratory Technicians, & Health Records Officers	284 (69.4%)
Years of work experience	
1-5 years	112 (27.4%)
6-10 years	186 (45.5%)
11 and above years	111 (27.1%)
Received training on disease surveillance	
Yes	397 (97.1%)
No	12 (2.9%)
Province	
Bulawayo metropolitan	87 (21.3%)
Harare Metropolitan	165 (40.3%)
Matabeleland North	84 (20.6%)
Matabeleland South	55 (13.4%)
Midlands	18 (4.4%)

Table 1b. Professions and Gender Crosstabulation

	Doctors	Nurses and others	Total	p-value
Male	46 (40.7%)	67 (59.3)	113	0.006
Female	79 (26.7%)	217 (73.3%)	296	

Table 2. Perceptions of doctors, nurses, and other healthcare workers on IDSR attributes

Attribute	All Healthcare workers	Doctors	Nurses & Others	Mean Difference	p-value
	Mean (SD)	Mean (SD)	Mean (SD)		
Simplicity	6.26 (.74)	6.40 (.57)	6.19 (.80)	.21	.003
Acceptability	6.04 (.87)	6.01 (.87)	6.04 (.87)	-.03	.749
Timeliness	5.56 (.46)	5.57 (.46)	5.56 (.46)	.01	.777
Usefulness	5.77 (.56)	5.75 (.54)	5.78 (.57)	-.04	.564
Flexibility	4.05 (.44)	3.98 (.49)	4.08 (.42)	-.09	.048

Table 3. One-way Analysis of Variance of the attributes by years of experience

Attribute	1-5 years (n=112)	6-10 years (n=186)	At least 11 years (n=111)	p-value
	Mean (SD)	Mean (SD)	Mean (SD)	
Simplicity	6.30 (.59)	6.31 (.70)	6.12 (.91)	.07
Acceptability	5.90 (.87)	6.18 (.84)	5.94 (.88)	.01
Timeliness	5.61 (.52)	5.53 (.43)	5.55 (.45)	.31
Usefulness	5.74 (.51)	5.72 (.62)	5.89 (.48)	.04
Flexibility	4.10 (.41)	4.03 (.43)	4.05 (.50)	.42