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Improving Estimates of Injury Burden in Nepal: A Qualitative Study

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ABSTRACT

Background: Routinely collected injury data can help to identify populations at risk of injury, circumstances surrounding those injuries, and can be used to develop targeted interventions. However, routinely collected injury data in Nepal are at risk of being incomplete or poorly coded and are underutilised. Therefore, this study aimed to explore the strengths, and opportunities for improvement, of systems that routinely measure injury incidence in Nepal.

Methods: This study employed a qualitative design where data were collected through interviews with personnel working in four routine data systems; the Health Management Information System, the Road Accident Reporting System, the Daily Incident Reporting System, and the Civil Registration System. Interviews were conducted with front-line data collectors as well as strategic decision makers working in these data systems. Interviews were audio-recorded, transcribed, translated into English and analysed using framework analysis.

Results: A total of 32 interviews were completed, 19 interviews with front-line data collectors and 13 interviews with strategic decision makers. The data recording and reporting process of the four systems were identified and described. The analysis of data yielded 11 themes that described the strengths and limitations of the data collected through the four systems, challenges for effective data systems, and user recommendations for system improvement.

Conclusions: This study identified the strengths, limitations, system challenges, and opportunities to improve data quality of each of the four routine data collection systems. These findings may be useful in engaging stakeholders in strengthening existing routine injury data collection systems or implementing alternative systems.

Keywords: Injury data; Nepal; qualitative study; recording and reporting

INTRODUCTION

Routinely collected data are important to monitor health conditions and health outcomes, and may enhance the efficacy and efficiency of healthcare systems.[1] Routinely collected injury data can identify common injury types, causative factors, populations at risk of injury and the circumstances of injury events.[2, 3]

In Nepal, there are four routine data systems that report injuries: health data collected across the country through the Health Management Information System (HMIS), road traffic crash data collected through the Road Accident Reporting System (RARS), any incidents requiring police involvement collected through the Daily Incident Reporting System (DIRS), and all vital events, including deaths, collected through the Civil Registration System (CRS).

Strengthening the data collection systems may provide an opportunity to improve the completeness, accuracy, and timeliness of the injury data. Therefore, this study aimed to explore the strengths, and opportunities for improvement, of systems that routinely measure injury incidence in Nepal.

METHODS

A qualitative study design was used, employing one-to-one semi-structured interviews. Study participants were staff involved in the HMIS, the RARS, the DIRS, and the CRS. Initial interviews were conducted with front-line data collectors, data processors or clerks, or with their line managers. A second phase of interviews was conducted with the strategic decision makers in the organisations managing the data systems.

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Data were collected between November 2020 and January 2021, during the Covid19 pandemic. Participant recruitment complied with changing infection control restrictions over that period. Participants who were knowledgeable about the data systems of interest were identified purposively using a sampling framework.[4] Potential participants were provided with an information sheet either electronically or in person, and given time to have questions answered. Consent was either audio recorded, participants sent a scanned signed consent form electronically, or was written where face-to-face recruitment was possible.

A topic guide was developed based on the research question and informed by available literature,[5] and translated into Nepali (supplementary file 1). Initial questions clarified the data collection processes to enable a data flow diagram to be produced. The guide then facilitated exploration of the data recording and reporting process across four categories, (i) strengths and (ii) limitations of the data in the system, (iii) system challenges, and (iv) ways to improve the data recording and reporting or implement alternative systems. Interviews were conducted either via phone or face to face adhering to Covid19 safety protocols. All interviews were audio recorded with consent.

Interview recordings were transcribed verbatim, anonymised, and translated into English. We used NVivo Qualitative Data Analysis Software, Version 12[6] to apply codes to the data. Initial transcripts were coded by two researchers (SuB and SaB) and any disagreements in coding were discussed with a third researcher (JM).[7] A code book was produced, which was then applied to other transcripts. Codes were placed into clusters based on their similarities and developed into themes across the four categories of our framework analysis.[8] We used similarities and differences between the four data systems to identify cross-cutting themes.

Study approval was obtained from the Ethical Review Board of the Nepal Health Research Council (Registration no. 609/2020 P). Ratification of the NHRC ethical approval was sought from the Faculty Research Ethics Committee of the University of the West of England, Bristol (Reference no. HAS.20.09.019).

RESULTS

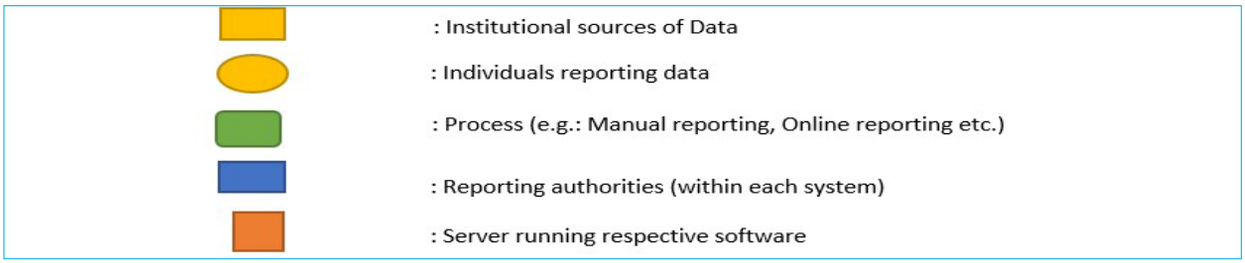
A total of 32 interviews were completed, 19 with front-line data collectors and processors, and 13 with strategic decision makers (Table 1). Interviews lasted between 10 and 36 minutes. Twenty-three interviews were conducted by phone, and nine face-to-face.

Table 1. Characteristics of participants interviewed.

Data Systems	Participants	Participants' ID	Designation	Age category (Years)	Sex
Health Management Information System (HMIS)	Front-line data collectors and processors	HMIS-P1-P1	Hospital Manager	20-30	Male
		HMIS-P1-P2	Outpatient Department In charge	20-30	Female
		HMIS-P1-P3	Emergency Department In charge	30-40	Male
		HMIS-P1-P4	Nursing In charge	30-40	Female
		HMIS-P1-P5	Health Post In charge	40-50	Male
		HMIS-P1-P6	Medical Recorder	20-30	Male
		HMIS-P1-P7	Health Coordinator	40-50	Male
		HMIS-P1-P8	Health Post In charge	40-50	Male
	Strategic Decision Makers	HMIS-P2-P1	Senior Position, Ministry of Health and Population	50-60	Male
		HMIS-P2-P2	Senior Position, Health Emergency Operation Centre	30-40	Male
		HMIS-P2-P3	Senior Position, Ministry of Health and Population	40-50	Male
		HMIS-P2-P4	Senior Position, Department of Health Services	40-50	Male
		HMIS-P2-P5	Senior Position, Department of Health Services	50-60	Male
		HMIS-P2-P6	Senior Position, Department of Health Services	50-60	Male
Civil Registration System (CRS)	Front-line data collectors and processors	CRS-P1-P1	Secretary	40-50	Male
		CRS-P1-P2	Ward Chairperson	40-50	Male
		CRS-P1-P3	Ward Secretary	40-50	Male
		CRS-P1-P4	Ward Secretary	40-50	Female
	Strategic Decision Makers	CRS-P2-P1	Communications Officer	30-40	Female
		CRS-P2-P2	System Analyst	20-30	Male

Road Accident Reporting System (RARS)	Front-line data collectors and processors	RARS-P1-P1	Sub Inspector	40-50	Male
		RARS-P1-P2	Police Constable	30-40	Male
		RARS-P1-P3	Sub Inspector	30-40	Male
		RARS-P1-P4	Sub Inspector	30-40	Male
	Strategic Decision Makers	RARS-P2-P1	Consultant/Advisor, Department of Transport Management	50-60	Male
		RARS-P2-P2	Consultant, Department of Transport Management	30-40	Male
		RARS-P2-P3	Deputy Superintendent of Police	40-50	Male
Daily Incident Reporting System (DIRS)	Front-line data collectors and processors	DIRS-P1-P1	Superintendent of Police	40-50	Male
		DIRS-P1-P2	Inspector	50-60	Male
		DIRS-P1-P3	Deputy Superintendent of Police	30-40	Male
	Strategic Decision Makers	DIRS-P2-P1	Deputy Superintendent of Police	30-40	Male
		DIRS-P2-P2	Senior Superintendent of Police	50-60	Male

Data from participants were used to construct data flow diagrams illustrating the four data systems (Figure 1 to 4).



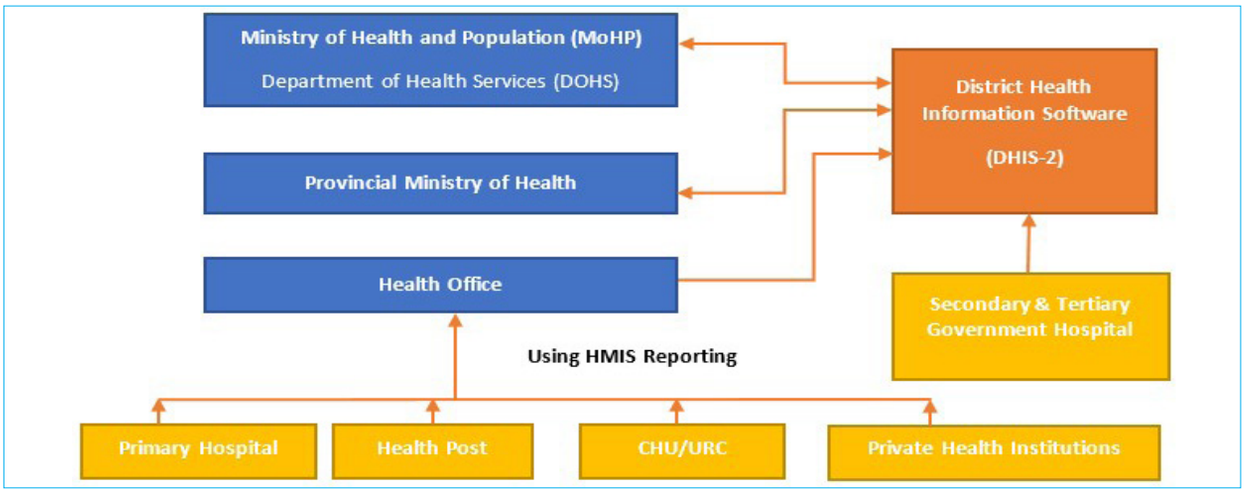


Figure 1. Process of data recording and reporting in the Health Management Information System.

Description: *HMIS is operated by the Department of Health Services (DOHS), under the Ministry of Health and Population (MoHP). All registered health institutions of Nepal are required to report their inpatient and outpatient health data to the HMIS. Data recording and reporting formats vary for each institution (e.g., Health Posts, Primary Hospitals, Community Health Units, Private Hospitals etc.).*

Each secondary/tertiary government hospital has a computer running District Health Information Software (DHIS-2). A medical recorder enters data from health records into DHIS-2. All other health institutions (Primary Hospitals, Health Posts, Community Health Units, Urban Health Centers, and Private Health Institutions) use a paper-based reporting format to send their data to the local Health Office. Each Rural Municipality/Municipality/Sub-metropolitan city/ Metropolitan city has a Health Office where there is access to the DHIS-2 software. Paper based data submitted to the Health Office are entered into the DHIS-2 by a data entry clerk.

Various levels of access to the DHIS-2 data are provided to different government authorities including wards, Provincial Ministries of Health, the Department of Health Services and the Ministry of Health and Population.

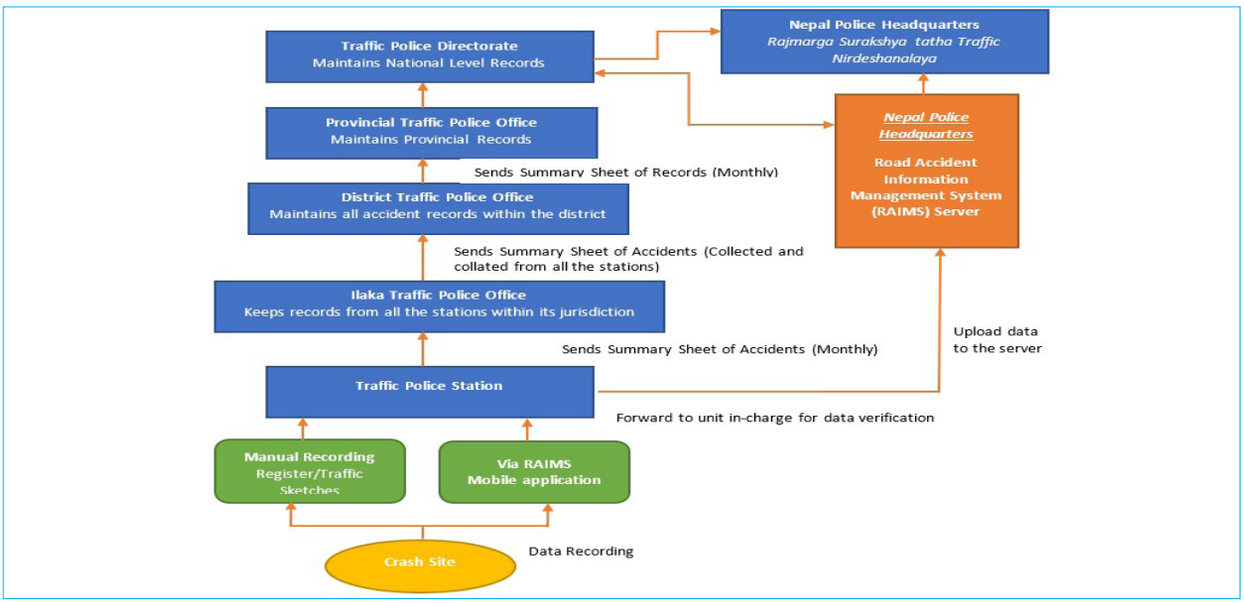


Figure 2. Process of data recording and reporting in the Road Accident Reporting System.

Description: *RARS is a data recording and reporting system used by the Nepal Traffic Police. After rescuing the crash victims and clearing traffic flow at the crash site, they make a sketch of the crash site or take a photo of the crash site using a camera or a mobile phone. Other details about the crash (e.g., registration number of the involved vehicle, vehicle travel direction, number of passengers in each vehicle, number of injured, their age, details about the injury, name of the hospital where they have been sent for treatment etc.) are noted and entered into a paper register at the Traffic Police Station.*

Serious crash cases are immediately reported to the District Traffic Police Office (DTPO), and/or the Provincial Traffic Police Office (PTPO) through verbal communication channels. Both minor and major crashes are categorized according to type of vehicles involved (e.g., how many trucks, motorbikes, tempos, buses etc.) and reported monthly to the DTPO via email.

An electronic data collection system (the Road Accident Information Management System, RAIMS) has been initiated by the Department of Transport Management (DoTM) with the funding from the World Bank. This system collects crash data via 65 data fields. RAIMS has an android application in which data collection can be done offline. The traffic police, at the crash site can use this mobile application for data recording. RAIMS also has a web-based application which is used by the unit in charge to verify the data, make corrections if there are any mistakes and upload it to the server. The RAIMS server has been set up at the Nepal Police Headquarters. The ambition is for RAIMS to replace the existing paper based RARS over time.

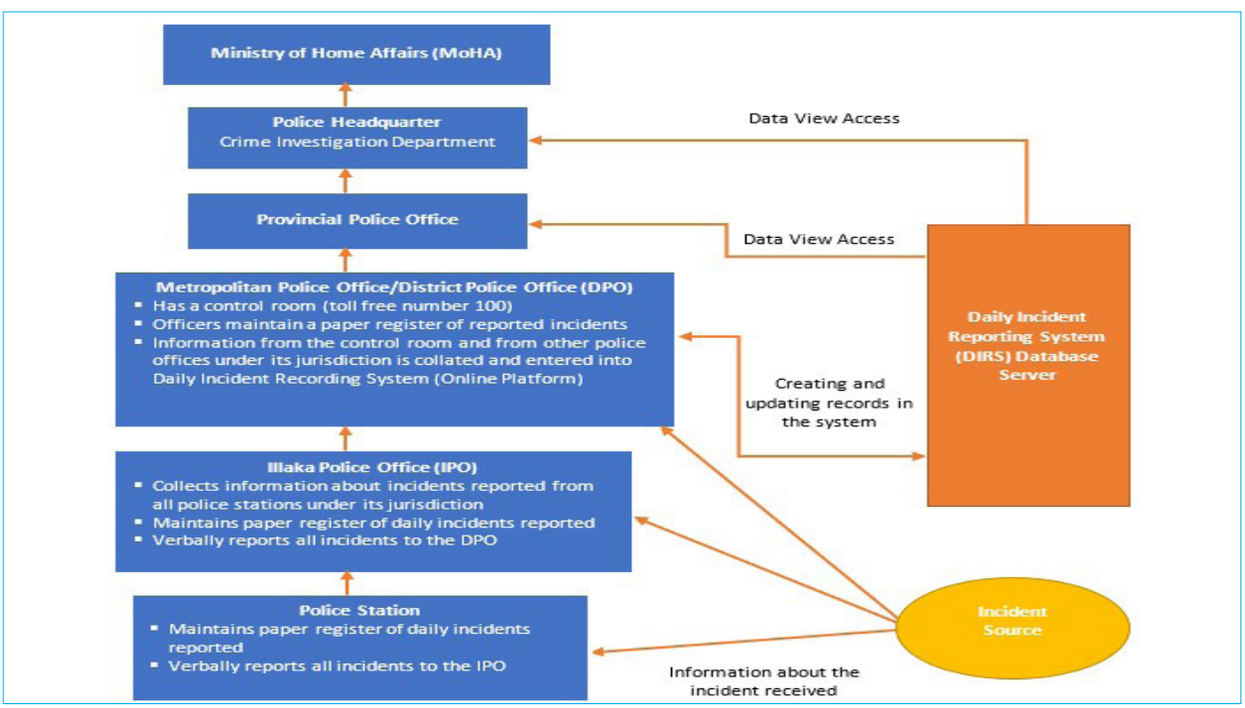


Figure 3. Process of data recording and reporting in the Daily Incident Reporting System.

Description: *The DIRS is an electronic data recording and reporting system operated by the Nepal Police (Crime Investigation Department) for recording and reporting of all incidents that are reported to the Nepal Police (including cases of suspected intentional harm (e.g., suicide or homicide and drowning).*
The DIRS is a webpage only accessible through the internal intranet network of the Nepal police. All District Police Offices have access to DIRS. A DPO has a control room and a duty officer, who are available 24 hours. Any incident reported is immediately entered into the DIRS system as a record, the record can later be updated with details as the investigation progresses. Local police stations and IPO's use verbal communication channels (e.g., police walkie-talkies, mobile phones, social media) for immediate reporting of the events to DPOs. An office register is maintained for institutional memory.
Data entry access to the DIRS is only available at the MPO/DPOs, while viewing access is available to all police units where the intranet has been set up and is available. The Provincial Police Office and Police Headquarters monitor the incidents reported through DIRS and may ask for further clarification and investigation in certain cases where needed. Variables including the date, details, and place of incident are recorded in the system. Other variables change according to the nature of the incident.

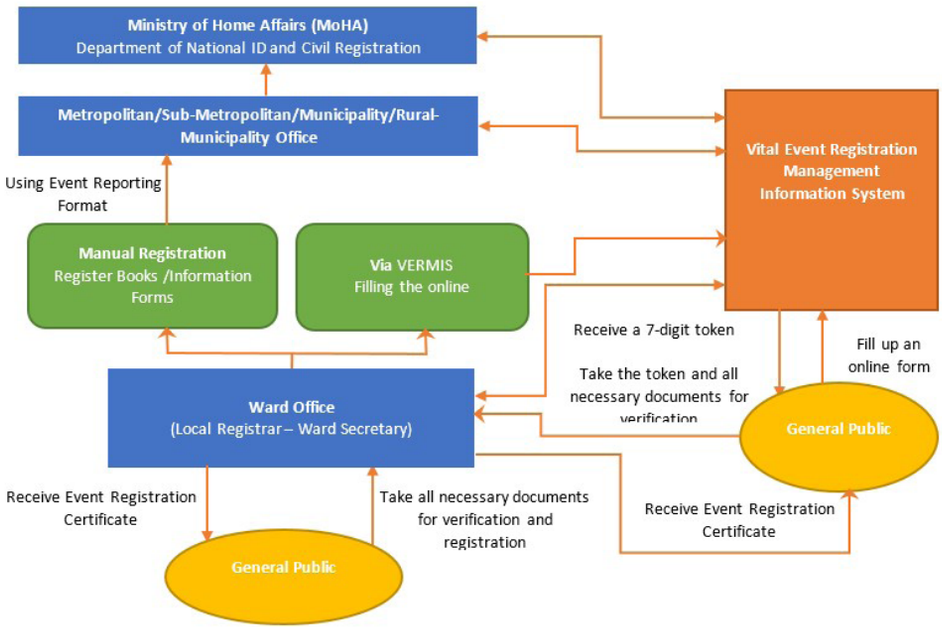


Figure 4. Process of data recording and reporting in the Civil Registration System

Description: *The Civil Registration System (CRS) is operated by the Department of National ID and Civil Registration (DoNIDCR), under Ministry of Home Affairs (MoHA), Nepal. The system is responsible for registering the five vital events (Birth, Death, Migration, Marriage, and Divorce) for all citizens of Nepal. The ward offices are the local point of contact for registering any vital events and the respective ward secretaries are the local registrars who are responsible for verifying the event and providing the public with an event registration certificate.*
The Vital Event Registration Management Information System (VERMIS) is an online system, operated by DoNIDCR for the registration process. The online form can be accessed from the official webpage of DoNIDCR (https://donidcr.gov.np/). Members of the public can complete the form online and receive a 7-digit-token number, which they need to take to their respective ward office along with other necessary documents (such as citizenship, proof of relationship etc. depending upon the event which needs to be registered) for verification. The local registrar (ward secretary) accesses all information filled using the token number, verifies all necessary information and issues an event registration certificate accordingly. The data are securely stored in a database server which is accessible to all responsible authorities. For the public who do not fill up the forms themselves, they can take all the necessary documents to the ward office for verification and registration. The ward secretary fills up the form for them, verifies all necessary information and issues an event registration certificate.
In the wards where the online system has not yet been setup, vital registration is done manually using register books and information forms. There is an Event Reporting Format, which the ward secretaries use for monthly reporting of the data. The softcopy of the Event Report is sent via email and the hardcopy is later delivered in the regular meetings. The municipality collects reports from all the wards and sends it to DoNIDCR.

Eleven themes were identified under the four framework categories. Quotes from participants to illustrate each theme are provided in supplementary file 2.

Strengths of the data collected through the four systems are presented in three themes below.

Efficiencies arising from the use of electronic software: All four systems used software to facilitate collation and reporting of their data. HMIS uses DHIS-2 to record healthcare service use. The Police DIRS has a feature that automatically changes variable fields based on the type of incident. Participants valued features of RAIMS, such as its ability to allow offline data collection, capture 65 parameters relating to the crash, and the presence of auto-fill variables (e.g.: date, location, etc.). VERMIS used for civil registration, allows the public to register event details on their own, digitises data recording and thus makes the system efficient.

Regular data reporting provides the potential for routine monitoring: All four systems have a provision for reporting collected data to their respective higher authorities monthly. The software provides various levels of data access to its reporting authorities, making the data internally available in real-time, daily, weekly, or monthly. The opportunity to publish summarised collated data regularly, provides the opportunity to monitor trends.

Designated person for data reporting supports improved data quality: CRS, DIRS, and HMIS have a designated person to enter data to the system. The secretary of each ward is responsible for entering records and verifying data entered by the public in VERMIS. A designated medical recorder in each hospital, and in the health office of each palika, enters HMIS data into the DHIS-2 software. The Nepal Police have designated officials in each District Police Office (DPO) to enter data into the DIRS. These named individuals can receive training to maintain skills and knowledge and improve data quality.

Two themes were developed in terms of limitations of the data collected through the four systems.

Manual data recording leads to incomplete and inconsistently coded data: DIRS, RARS, and HMIS do not have electronic data recording facilities, and the CRS electronic data recording facility is not available in all wards. Data are collected manually and uploaded later in DIRS, RARS, and HMIS. Copying data from paper forms to electronic systems may result in transcribing errors, and manual data are more likely to contain missing data.

Lack of a system to ensure data validity: There is no specific data verification mechanism in three of the systems; CRS, RARS, and DIRS, which could limit the validity of the collected data, and therefore its potential usefulness. In DIRS and CRS (Death Registration), there could be social desirability bias (e.g., the reporting of a more acceptable cause of death, rather than the true cause of death), particularly for sensitive cases such as suicide and sexual assault. In the RARS, details about the crash may be misreported in the absence of traffic police at the crash site. In the HMIS, ICD codes are only applied by hospital / health office medical recorders and are not being used consistently.

The challenges for effective data systems included the following two themes.

Limited human resources for data recording: Except for CRS, a lack of human resources was a common issue across all systems. There is no designated human resource for data recording in the HMIS in most healthcare settings. Data collection is the responsibility of clinicians and medical staff who are typically busy with patient care. In RARS, the limited number of traffic police officers, means that not all crash sites are attended. There are no designated officials for data recording in RARS and DIRS, with the responsibility falling to any officer on duty. Furthermore, officers trained in data recording may be transferred, resulting in a shortage of trained staff.

Insufficient logistic and technological infrastructure: Insufficient logistic and technological infrastructure were reported across all systems. The DHIS-2 software used for HMIS data reporting is not available in private hospitals, health posts, Primary Health Centres, Community Health Units and other health facilities. DIRS operates on the Nepal Police intranet and is currently only set up at the DPO level. Expansion to other levels is costly and takes time. Insufficient numbers of police vehicles mean not all traffic crashes are reported in RARS as officers cannot reach the scene. Participants observed that CCTV cameras in areas at high-risk of crashes could be helpful but are not currently available. Computers, walkie-talkies, mobile phones, and internet access are all needed to roll out RAIMS across the country. Similarly, server capacity, computers and internet access limit the number of wards where VERMIS is established for death registration.

User made four recommendations to improve the systems included the following four themes.

Maximising the benefits of technology for better data quality: Electronic data recording facilities could help improve all four systems by reducing the risk of transcription errors or data misinterpretation. The electronic data recording facilities offered by RAIMS, and VERMIS illustrate the potential value of using technology. Participants also suggested: increasing the server capacity of VERMIS and installing CCTV cameras at high-risk crash locations.

Supporting data collectors through regular training: Participants across all four systems strongly requested regular training. Officers trained in data recording for RARS and DIRS were reported to be frequently transferred, so aligning periodic training with the arrival of new officers would be helpful. For the HMIS, participants reported the need for training for clinicians and medical recorders on the appropriate allocation of ICD codes.

Raising community awareness: Participants reported that when the public report fatal injury cases to DIRS and CRS they may give inaccurate information for sensitive cases such as suicide, murder, or sexual assault etc., due to a fear of becoming involved in legal procedures. Improving public awareness about the importance of providing accurate and timely information regarding the

cause of death is necessary for these systems.

Development and strengthening of the existing systems: Initiating death registration at hospitals (as already occurs for birth registration) could improve the timeliness of recording deaths in hospitalised patients for the CRS. Participants also suggested that enforcing a higher penalty charge could motivate timely event registration. The successful implementation of RAIMS across the country could be a significant step forward for RARS to generate more accurate estimates of traffic crashes but will require cross-governmental collaboration. Certain HMIS codes are vague, therefore providing greater clarity of how and when these codes should be applied would be helpful. A reward/punishment scheme was suggested to motivate data recording and reporting in HMIS.

DISCUSSION

To our knowledge, this is the first study conducted in Nepal that explored stakeholders' views on routine injury data recording systems and the potential for improvements. The four systems explored in this study are the main routine data collection systems for injury data in Nepal. Our study has highlighted issues with these routinely collected injury data. A research team exploring the prevalence of burn injuries reported similar findings; their statistics on self-reported major burn injuries requiring secondary or tertiary treatment were much higher compared to the HMIS annual report.[9] An analysis of drivers of policy change in Nepal recommended identifying feasible actions where the government has already shown interest, and engaging bodies mandated to implement change.[10]

The annual report of the Department of Health Services (DoHS) prepared using the data collected through the HMIS is the primary source of national-level data estimating the burden of diseases in Nepal.[11] If policy decisions are made based on this evidence, it is essential that the data are accurate and representative. At present not all health services report to HMIS and participants highlighted challenges in data capture that require addressing. The RARS of Traffic Police and DIRS of Nepal Police data systems are designed for forensic investigations or assessment of criminality. Whilst not primarily designed for healthcare planning or research, they may be highly valuable for that purpose.[12-14] Similarly, many deaths are unregistered on the vital registration system in Nepal.[15, 16] Lack of such vital statistics at population level is one of the major barriers to planning and implementing health services for injury prevention.[17] In this regard, the findings of our study support the argument for investment in health data systems.

Nepal is slowly but steadily integrating technology into its routine health data collection systems. Each of the four data systems discussed in this paper, have adapted an electronic data reporting mechanism. Concerns were raised by participants across all systems regarding current data recording and reporting methods; no structured format for recording data in DIRS and RARS, inconsistent use of ICD codes in HMIS, and incomplete or inaccurate death information in the CRS. Furthermore, these systems lack methods for verifying the information provided. Participants described how expansion of technology has the potential to strengthen all four systems and improve data quality.

Although there is a progressive shift toward using electronic data reporting systems, there is still a significant reliance on manual (paper-based) recording. This reliance is not just by a lack of equipment and software, but also by a shortage of trained human resources. Implementing electronic data recording mechanisms at the point of data collection could be an effective step. Regular training to front-line data collectors and increasing awareness about the significance of the data they gather may be a method to enhance these systems. Raising community awareness about reporting actual events may aid in improving the validity of data collected. Establishing new systems and enforcing the implementation of existing ones, such as initiating death registration at hospitals for CRS, enforcing the use of ICD codes while data recording in the HMIS, and rolling out RAIMS across the country, could significantly improve these systems.

We recruited people with expertise in their part of the data system, whether that be at the frontline where data is collected and entered, or at a strategic level where data are analysed, interpreted, and applied. The perspectives from a range of stakeholders helped to ascertain each system's strengths, limitations, challenges, and opportunities for improvement.

We purposively selected groups of participants and compared data from front-line practitioners with that from data managers. This approach improved the validity and reliability of our findings. Issues raised were similar across different data systems, strengthening the validity of suggestions to improve the systems. The consequence of conducting this study during the Covid-19 pandemic meant that not all the interviews could be conducted face-to-face, and it was not possible for the researchers to observe the data systems in action.

CONCLUSIONS

Through engagement with staff working across four health data systems that capture injury events, we have

been able to identify the strengths of current routine data systems and identify opportunities for improvement of those systems. The findings of this study may be useful for stakeholders to develop existing routine injury data collection systems and thereby improve data quality. These data can then better inform healthcare planning and health improvement interventions, including injury prevention. Further research to explore ownership of these issues and ways forward is warranted.

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CONFLICTS OF INTEREST

None

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