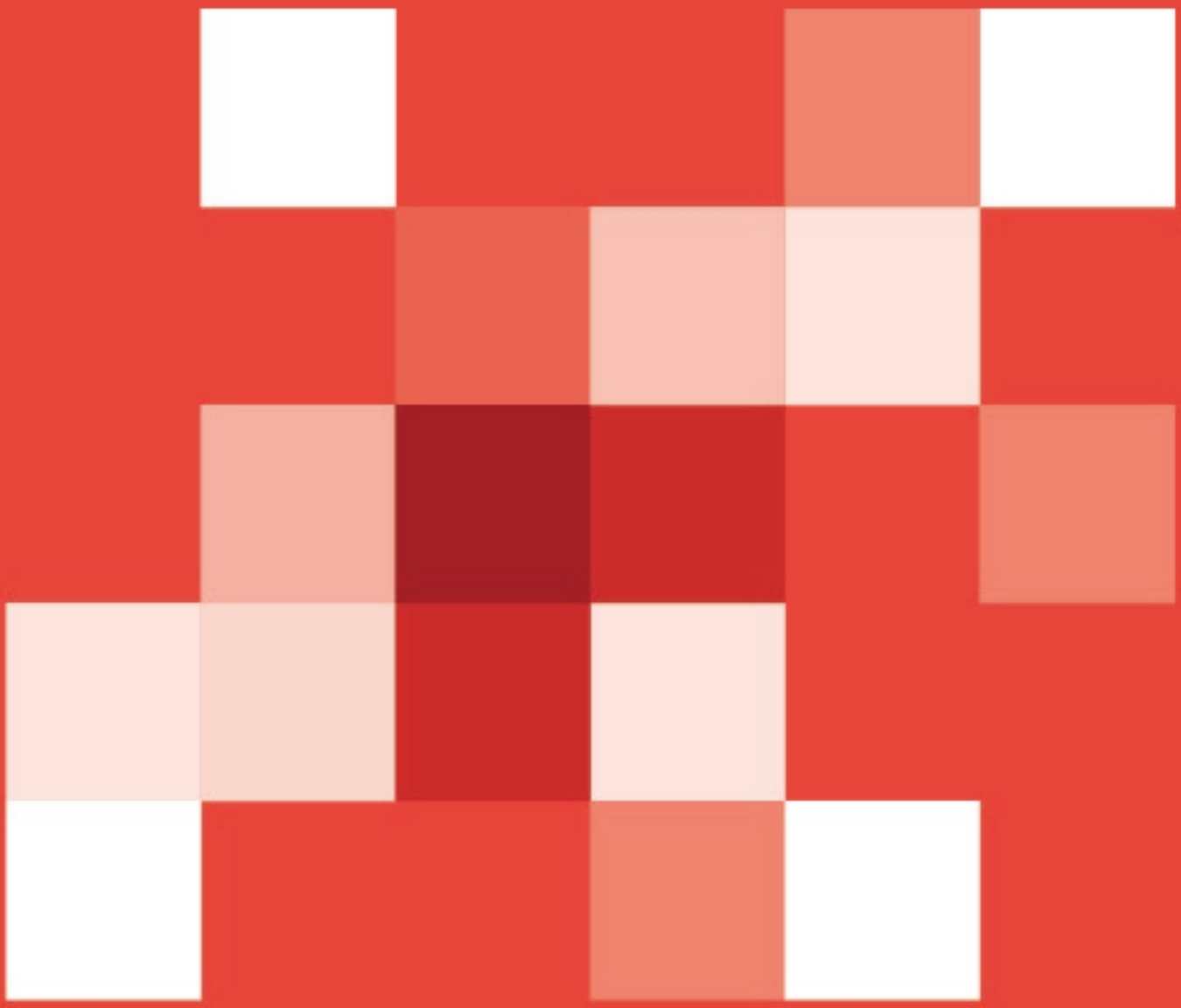
development initiatives



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Building a national statistical system with administrative data

A literature review of emerging lessons from around the world and their relevance for Nepal

Draft (v2)

Contents

Introduction

In April 2017, the Ghana Statistical Service (GSS) co-hosted a National Data Roadmap Forum in Accra. Attending were a team from Statistics Denmark who had been invited to talk about the benefits of administrative data. Their presentation was met with great enthusiasm[1] and a partnership between the two institutions has now been established[2]. GSS is now set on a course to, eventually, derive population-based statistics from administrative data.

This anecdote is no longer an uncommon one. The global institutions curating SDG statistics acknowledge that, while household survey data remains a primary source of data for many indicators, preferred sources are registries and management information systems. Household surveys are increasingly being regarded as a necessary sticking plaster to cover gaps in the short term. They will also continue to play an important quality assurance role for years to come. However, the days of a digital and moral divide - between the rich North that relies on administrative data and the poor South that makes do with small sample surveys – are numbered.

The World Bank and others have, over the past decade, invested heavily in CRVS and national identity systems. DHIS2 is a health management information system now operational in 60 countries.[3] UNICEF has developed an administrative data maturity model.[4] The UN Statistics Division and the Global Partnership for Sustainable Development Data have jointly convened an Administrative Data Collaborative aimed at strengthening the capacity of countries to use administrative data sources for statistical purposes.[5] They are curating an inventory of resources that aims to make materials on the use administrative data for statistical purposes more readily available and easy to find.[6]

Some further examples of progress:

- In Brazil municipal business registration and taxation records have been used to analyse local government reforms.[7]
- In India data from insurance claims has been used to monitor the quality of healthcare.[8]
- In the past five years epidemiologists in Indonesia, Malaysia and the Philippines have begun using hospital records to analyse diseases.[9]
- Rwanda's land administration information system is being used to assess the effectiveness of land ownership regulations.[10]
- Also in Rwanda, researchers have been given access to anonymised taxpayer records in Rwanda to analyse the extent of tax compliance.[11]
- A 2018 study in Tanzania concluded that data on maternal mortality can now be collected more accurately from administrative data than from household surveys.[12]

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[1] GPSDD (2017)
[2] Ministry of Foreign Affairs of Denmark (2019)
[3] DHIS2 (n.d.)
[4] Carter (2019)
[5] GPSDD (n.d.)
[6] UNSD & GPSDD (2020)
[7] Bruhn & Mackenzie (2013)
[8] Morton et al (2016)
[9] For example, Asmi et al (2016)
[10] Ali et al (2016)
[11] Mascagni et al (2016)
[12] Makuwani et al (2020)

If this paper were to have been written ten years ago it would have had to focus on persuading the statistical and international development communities that administrative data is a viable source of official statistics. This is no longer necessary. The challenge now is how developing countries can build a robust, sustainable roadmap from their current data ecosystem towards a situation such as Denmark's where statistics flow dynamically from their data. There are no shortcuts to this process. In Denmark it took 15 years to derive a reliable census from administrative data.[13] It is, however, a necessary journey that is worth taking.

This paper provides a review of literature that distils evidence from around the world on the steps necessary for building mature systems and applies these lessons to Nepal's new federal data ecosystem.

Defining administrative data

Principle Five of the Fundamental Principles of Official Statistics states that:

> *Data for statistical purposes may be drawn from all types of sources, be they statistical surveys or administrative records. Statistical agencies are to choose the source with regard to quality, timeliness, costs and the burden on respondents.*[14]

The UN Statistics Division defines administrative data as

> *"data collected by a government ministry, department or agency primarily for administrative (not research or statistical) purposes. These administrative purposes are related to the corresponding executive or lawful functions such as authorisations, registrations, permits, payments, sanctions, control etc. Administrative data may include both data in administrative registers and data in other administrative sources."*[15]

The UN Economic Commission for Europe has broadened its definition to:

> *Administrative sources are data holdings containing information which is not primarily collected for statistical purposes.*[16]

UNECE provides a useful list of examples, which includes data from the private sector.

[13] Thygesen (2015)
[14] UNSD (2014)
[15] UNSD (2021)
[16] UNECE (2011)

Types of administrative data[17]

- Tax data
  - Personal income tax; Value Added Tax (VAT); Business / profits tax; Property taxes; Import / export duties
- Social security data
  - Contributions; Benefits; Pensions
- Health / education records
- Registration systems for persons / businesses / property / vehicles
- Identity cards / passports / driving licenses
- Electoral registers
- Register of farms
- Local council registers
- Building permits
- Licensing systems e.g. television, sale of restricted goods
- Published business accounts
- Internal accounting data held by businesses
- Private businesses with data holdings:
  - Credit agencies; Business analysts; Utility companies; Telephone directories; Retailers with store cards etc.

Registers are a sub-set of administrative data. They can be defined as "*a systematic collection of unit-level data organized in such a way that updating is possible."*[18] The unit can be a person, a building, a business, a car. For example, a health management information system that handles patients' medical records would ideally rely on a protected register to identify the patient. This would be kept separate from the treatment record itself, thus allowing the de-identified medical data to be used statistically.

Nepal's Local Government Operations Act defines responsibilities for the maintenance of population (civil registration), household, building, business and land registers.[19] These will, over time, lead to a solid foundation for the development of all other administrative systems.

[17] UNECE (2011)
[18] UNECE (2019)
[19] Development Initiaves (2021), Appendix 3

The current state of administrative data

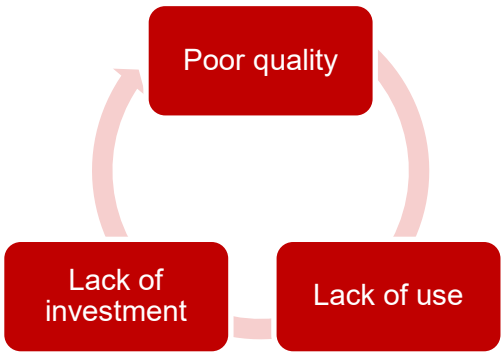
Many European countries have, for some time, explored the use of admin data for official statistics. Registry-based censuses, for example, are operational or under development in Austria[20], Estonia[21], Netherlands[22], the Nordic countries[23], Slovenia[24] and the UK[25].

In most developing countries, including Nepal,[26] you will find the following:

- A register of births: largely paper-based and incomplete
- An electoral register: full of gaps and duplicates
- Steps towards the issuance of national identity numbers and cards
- A health management information system that provides monthly summaries of the activities of health facilities
- An annual census of schools that provides an inventory of facilities
- One or more PFM systems tracking revenue, budgeting and expenditure

While the foundations for these systems have been laid, the buildings are far from complete. There are three stumbling blocks. The first lies in a lack of comprehensiveness and poor geographic coverage, particularly in rural areas. The second relates to the frequency and timeliness of data updates. The third is the quality of the data that does exist. (A study covering a number of African countries showed that administrative data from primary schools consistently exaggerated enrolment figures – no doubt in the hope of attracting a larger budget.[27])

These deficiencies feed into an even more vicious cycle of neglect. Administrative data isn't used; those needing data rely on other sources (household surveys); donors continue to fund household surveys and laissez faire governments fail to invest in the administrative systems; administrative data remains poor.



[20] Berka et al (2012)
[21] Statistics Estonia (2019)
[22] Schulte Nordholt (2018)
[23] Nordbotten (2010)
[24] Slovenia Statistics Office (2021)
[25] UK ONS (2020)
[26] DI data landscaping exercises carried out in Zimbabwe, Uganda, Nigeria, West Africa, UAE, Bangladesh and Nepal
[27] Sandefur & Glassman (2014)

Six conditions for a mature statistical system

While deriving official statistics from administrative data is, in the long-term, a highly efficient and cost-effective alternative to expensive, small-scale, sporadic surveys, it is an undertaking that involves a number of steps, all of which are critical to a successful outcome. These are:

- Well-functioning and accountable public administration at all levels of government.
- An ICT infrastructure that allows for appropriate technologies to be deployed for data capture.
- Legislation and policy frameworks that both empower government to manage the development of registries while at the same time ensuring that the privacy and confidentially of the population are properly protected.
- Consensus across government on a set of priorities for the order in which systems are developed and connected to each other.
- Establishing the appropriate technologies, statistical standards and methodologies to produce credible statistics from the data
- Ensuring that data is accessible and used in a way that stimulates demand and drives improvements to data quality.

Administration

The most important precondition for producing good data, has little to do with either data or technology. It has to do with the people who are responsible for managing and delivering public administration and services. Without the capacity, commitment and integrity of civil servants to perform their duties at all levels of government, data will lack any credibility.

In 2004 Kentaro Toyama travelled to India to co-found Microsoft's research centre there, seeking to determine how technology could contribute to the social upliftment of some of the world's poorest communities. The experience fundamentally changed his thinking on how technology works. He concluded that technology can only amplify something that already exists. It cannot create something out of nothing.

The challenge of international development, though, is that whatever the ultimate potential of poor communities, well intentioned capability is actually in scarce supply. If technology requires a substrate of well-intentioned, capable people to work, then there is a limit to how much technology can support global development in the absence of that human substrate. The theory of technology-as-amplifier leads further to a pessimistic irony for ICT4D: Exactly in those

contexts where human and institutional forces are stuck in the status quo or working against development, technology will not produce positive change.[28]

The Government of Nepal's Provincial and Local Governance Support Programme (PLGSP)[29] is exactly the kind of approach that lays a solid foundation upon which better information systems can be built, as reflected in its intended outcomes:

1. *Government institutions and inter-governmental mechanisms at all levels are fully functioning in support of federal governance as per the Constitution.*
2. *Provincial and local governments have efficient, effective, inclusive and accountable institutions.*
3. *Elected representatives and civil servants at provincial and local governments have the capacity and serve citizens to their satisfaction.*[30]

A recent study of health care in 10 African countries found that the lack of health provision knowledge among health workers was the overriding challenge facing the system and that these shortcomings far outweighed any logisitical or technological solutions.[31] This is a problem facing public services and administrations in many countries.

In Nepal the responsibilities of municipalities within the new constitution sets new challenges for local governments where administrative capacity doesn't necessarily match the political experience of elected officials.

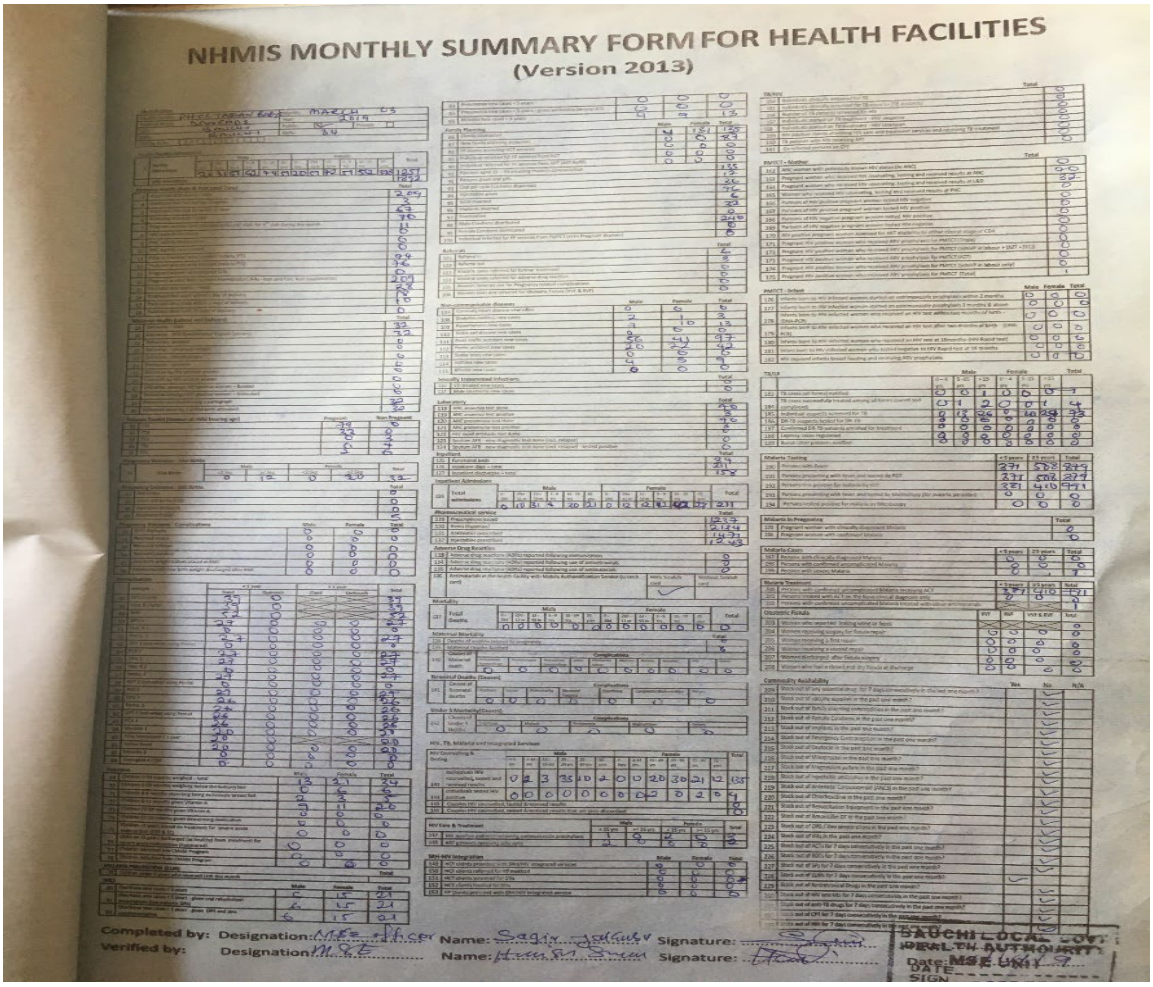
ICT Infrastructures

In most developing countries existing management information systems rely on paper-based data collection at the point of service delivery, whether this is a local government office, a primary healthcare clinic, a school or a registry office. The photograph below shows a typical reporting form[32] used by a primary healthcare clinic to report its monthly performance data.

The form has been filled in manually by an administrator who compiles the data from a range of paper registers maintained by the clinic. The form is sent to a district office where it is keyed into the national database of the health management information system. The double rekeying, by non-clinical staff, is prone to both typing errors and clinical misunderstandings. It would of course be quicker and more accurate if the clinician who dealt with the patient in the first instance could key the data into an electronic device (phone, tablet or computer).

[28] Toyama (2011)
[29] MOFAGA (n.d.)
[30] MOFAGA (2018)
[31] Giorgio et al (2020)
[32] This example is from a primary healthcare clinic in Nigeria.

Good administrative data thus relies on electricity, internet connectivity and appropriate equipment. Such systems do not require cutting-edge technology. Robust, well-designed databases that manage remote digital data collection employing both internet and sms technologies – such as the DHIS2[33] health management information system – are well established: infrastructure and data collection skills are the two stumbling blocks.



Governance

Most administrative systems involve the recording of individual human transactions such as registering a birth, recording medical treatment or learning outcomes, and paying tax. Government agencies need a legal framework which both empowers and regulates their activities. MDAs need the legal right to collect the data, and the national statistics office requires both political and legal authority to access the data. In Nepal the new draft Statistics Bill falls short in the authority it provides to the

[33] https://dhis2.org/overview/

Central Bureau of Statistics. A disempowered national statistics office that continually needs to seek approval from a large and unwieldy National Statistics Council is not the most agile solution for meeting the challenges it faces in maximising the usefulness of administrative data.

More importantly, the privacy of citizens needs to be given full respect through the protection of their personal data: there is more to the anonymisation of data that stripping out names. Research in the USA has shown that 87 per cent of individuals can be uniquely identified by just three pieces of data: postcode, date of birth and sex.[34] Protecting the privacy of citizens does not only require legal safeguarding. It is dependent on robust anonymisation methodologies that are correctly understood and implemented by the developers and data managers responsible for any processing of personal data for the purpose of sharing. The Information Commissioner's Office in the UK has produced a useful guide - *Anonymisation: managing data protection risk code of practice*[35] – that outlines these responsibilities.

Ensuring that both legal and policy frameworks are fit for purpose can take time as legislators and policy makers need to be informed and persuaded of the required rights and responsibilities. In Denmark it took 15 years (between 1966 and 1981) to lay this groundwork.[36]

Beyond law and politics, a healthy national statistical system that increasingly relies on administrative data requires a suite of standards, methodologies and guidelines that ensure that the integrity of systems and the quality of data they produce is maintained. A good example of sectoral data governance has been produced by the UN's Food and Agriculture Organisation. Its *Guidelines on improving and using administrative data in agricultural statistics*[37] covers both the assessment of data quality as well as guidelines for improving the quality, access and use of data.

2.3 Sustainability Development Goals

2.3.1 Tier 1

#	Unique Reference Id	Indicators Title	Reported	Frequency
2.1.2	ID_124	Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)		N / A
2.2.1	ID_031	Prevalence of stunting among children under 5 years of age		3 – 5 years
2.2.2	ID_032	Prevalence of wasting and overweight among children under 5 years of age		3 – 5 years
3.1.2	ID_052	Births attended by skilled health personnel		Annual
3.2.1	ID_003	Under 5 mortality (per 1,000 live births)		Annual
3.2.2	ID_005	Neonatal mortality (per 1,000 live births)		Annual
3.3.2	ID_022	Tuberculosis incidence per 100,000 population		Annual
3.3.3	ID_026	Malaria incidence per 1000 population		Annual
3.3.5	ID_073	Number of people requiring interventions against neglected tropical diseases		N / A
3.5.2	ID_040	Alcohol Consumption		3 – 5 years
3.6.1	ID_013	Death rate due to road traffic injuries		Annual
3.7.1	ID_049	Demand for family planning satisfied with modern methods		3 – 5 years
3.9.1	ID_125	Mortality rate attributed to household and ambient air pollution		Annual

A cornerstone of good data governance is a unified indicator framework which should map the statistics required for all monitoring frameworks (national development plans, SDGs, etc) against available data sources. The example above is taken from the UAE Ministry of Health's central data dictionary[38]. This catalogue links to a page of metadata for each indicator describing the primary data

[34] Anderson (2009)
[35] UK Information Commissioner's Office (2012)
[36] Thygesen (2015)
[37] FAO (2018)
[38] Unpublished draft.document, UAE Ministry of Health, 2019

sources, methods of calculation and quality assessments. Compiled at a national rather than sector level, a national indicator framework can highlight both duplications and gaps as well as expose quantities of data that are collected but in fact never used.

Priorities

The biggest challenge facing countries that have committed to developing administrative infrastructures is the enormity of the task. Today Denmark has a wealth of systems – as illustrated by this partial list of health registers[39]. This did not, however, happen over night, but through a series of graduated steps.

Table I. Examples of Danish registers on health-related issues and clinical quality databases.

Danish register	Content	Start year of registration	Data administrator
The Register of Causes of Death	Information on causes of death based upon the death certificates	1875	National Board of Health[a]
The National Patient Register	Information on diagnoses and operations performed at a hospital	1977	National Board of Health[a]
The National Health Service Register	Data from health contractors in primary health care about providers, health services and citizens receiving treatment	1990	National Board of Health
The National Prescription Registry	Information on dispensed prescription drugs	1994	Danish Medicines Agency[a]
The Danish Cancer Registry	Information on incidence of all malignant diseases	1943	National Board of Health
The Psychiatric Central Research Register	Information on all psychiatric patients treated at a hospital	1970	Centre for Psychiatric Research
The National Diabetes Register	Information on persons with diabetes diagnosis	1995	National Board of Health
The Multiple Sclerosis Registry	Information on incidence of all patients with multiple sclerosis.	1949	National Institute of Public Health
The Cytogenetic Register	Information on persons who have undergone prenatal chromosomal diagnostic procedures	1968	Århus Universitetshospital
The Pathology Register	Information on patient, pathology and workload data; the register is updated daily	1997	National Board of Health
The Breast Cancer Cooperative Group	Detailed information on diagnostic, treatment and follow-up of breast cancer patients	1977	Rigshospitalet, Copenhagen University Hospital

In 1966 the Danish Statistics Act foresaw that administrative registers should be used for statistical purposes and gave the national statistics office the right of access to any data kept by public agencies.[40] In 1968 one common, unambiguous identifier, the Person Number was introduced, to be used by every branch of the public administration. Denmark conducted its first register-based population census in 1976 (made possible with the establishment of the Central Population Register in 1968). It conducted its first register-based housing census in 1980 (made possible with the establishment of the Central Register of Buildings and Dwellings in 1977).[41] The population and housing censuses have been based solely on registers since 1981.[42] In addition a Central Business Register was created in 1975.[43] In the early years extraction of statistical results from the

[39] Thygesen et al (2011).
[40] Thygesen (1995)
[41] Statistics Denmark (n.d.)
[42] Thygesen (1995)
[43] Ibid

administrative registers was a manual exercise requiring a high amount of resources in Denmark Statistics. Over time this was automated.

Pragmatic prioritisation is thus an essential element of infrastructure development. A common strand in most country case studies is the importance attached to building a robust population register. Over time this can be automatically fed by civil registration and legal identity processes, but a multi-pronged approach is necessary in those countries where birth registration coverage is low.

In the case of Nepal, simultaneously meeting all the responsibilities laid out in the Local Government Operations Act will be a tall order for many municipalities. Similarly, for both central government and its development partners, finding the resources to deliver on all systems at the same time is unrealistic. By concentrating on just five systems – public financial management; health facility operations; school administration; birth registration and disaster risk reduction - through focused investment and support it should be possible to build a solid foundation for local data infrastructures to grow and for local democracy to become accustomed to evidence-informed decision-making.[44]

Use and Quality

Administrative data in many developing countries gets a very bad press, for good reason. A few examples:

- " …misrepresentation of national statistics in education and health does not occur merely by accident or because of a lack of analytical capacity — at least not always — but rather that systematic bias in administrative data systems stems from incentives of data producers to overstate development progress."[45]
- "There are two main issues that create problems in more extensive use of administrative records in the Indian context. The first is that there is often a divergence between the nature of data required for administrative purposes, especially when the objective is to monitor programmes, and the nature of the data that would be required for statistical purposes…. The second problem relates to the accuracy of the data…. By and large, it has been found that in situations where the data is collected for monitoring programmes, the quality of the data becomes highly questionable. This is a particular problem in the social sectors and also in data that is collected by the taxation authorities."[46]
- "While recognizing the different uses and timing of administrative and survey data, our analyses of the discrepancies between administrative data and household survey-based estimates in education and health suggest that - in some African countries – there are significant inaccuracies in the data being published by national and international agencies. These inaccuracies appear to be due in part to perverse incentives created by connecting data to financial incentives without checks and balances, and to competing priorities and differential funding associated with donor support."[47]
- "Another barrier, particularly for government generated admin data, is its usability in terms of appropriate formats, standardization of collection process and quality. Digitized data in PDF

[44] Development Initiatives (2020) Strategic Action Plan, D4D Nepal. (unpublished)
[45] Glassman & Sandefur (2014)
[46] Sen (n.d.)
[47] Sandefur & Glassman (2014)

> formats or at an aggregated level are not very useful for research purposes. Often, codes are not standardized even for basic geographical units (such as districts, villages) across datasets in India which makes combining datasets difficult. Another challenge is ascertaining data quality in regard to its reliability and accuracy."[48]

There are a number of technical approaches that have been developed to assess the quality of administrative data. Statistics Netherlands, for example, has developed a checklist for the quality evaluation of the source and governing metadata as well as the data itself.[49]

A more pragmatic approach is available. Much data currently captured in developing countries goes unused. Local facilities collect data on instructions from upstream offices and most data flows up into central servers where it may, or may not, be used to compile and annual statistics. Most ministries and statistics offices do not have the capacity to process this data flow. If the data was, in the first instance, used by those collecting and compiling it, and, in the second instance, by local governments who are looking at all facilities and sectors within in their domain, there is a far greater likelihood that the data would be sense-checked at source. This does not yet guarantee good statistics, but it does lay the foundation for a more accurate data flow.

The compounding of problems – where poor quality data leads to it not being used, and under utilisation leads to under-investment – can be reversed. If data is used locally, it creates immediate pressure for its quality to be improved: the users have real-world experience of what the data in their locality should look like. This feedback loop creates a virtuous cycle that makes the case for better investments to ensure that the process continues and data quality reaches the a state that is operationally acceptable.

[48] Mookherjee & Gupta (2020)
[49] Daas (2009)

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Contact
Bernard Sabiti
Lead Analyst
bernard.sabiti@Devinit.org

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Email: info@devinit.org

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UK OFFICE
Development Initiatives
North Quay House
Quay Side, Temple Back
Bristol, BS1 6FL, UK
+44 (0) 1179 272 505

AFRICA OFFICE
Development Initiatives
Shelter Afrique Building
4th Floor, Mamlaka Road
Nairobi, Kenya
PO Box 102802-00101
+254 (0) 20 272 5346

US OFFICE
Development Initiatives
1110 Vermont Ave NW,
Suite 500, Washington DC
20005, US