OCHA centre for humdata

THE CENTRE FOR HUMANITARIAN DATA

GUIDANCE NOTE SERIES
DATA RESPONSIBILITY IN HUMANITARIAN ACTION

NOTE #1: STATISTICAL DISCLOSURE CONTROL

KEY TAKEAWAYS:

- Data from household surveys, needs assessments and other forms of microdata make up an increasingly significant volume of data in the humanitarian sector. This type of data is critical to determining the needs and perspectives of people affected by crises but it also presents unique risks.
- Even if an organization removes direct identifiers such as a person's name or phone number from microdata, combining key variables such as location or ethnicity can still allow for the re-identification of individuals and vulnerable groups.
- Statistical disclosure control (SDC) is a technique used to assess and lower the risk of a person or group being re-identified in the analysis of microdata. Applying SDC to microdata enables organizations to share the data more widely without exposing affected people to harm.
- SDC can be used to lower the risk of re-identification to an agreed threshold that may vary depending on the context where the humanitarian response is happening. The overall informational value or utility of a dataset will always be impacted when SDC is applied; striking an appropriate balance between re-identification risk and information loss key to ensuring safe, ethical and effective use of the data.
- To start using SDC, organizations should invest in (1) selecting the right tool, (2) integrating SDC into existing data management workflows and (3) improving practice through continuous learning.

WHAT IS HUMANITARIAN MICRODATA?

Data on the characteristics of units of a population (e.g. individuals, households or establishments) collected by a census, survey or experiment is referred to in statistics as 'microdata'.[1] In humanitarian response, this type of data is typically gathered through exercises such as household surveys and needs assessments. Microdata makes up an increasingly significant volume of data in the humanitarian sector and is critical to determining the needs and perspectives of people affected by crises.[2] Humanitarian organizations need to understand how to assess and manage the sensitivity of this type of data in order to ensure its responsible use in different response contexts.

Raw microdata can contain both personal data and non-personal data on a range of topics, including sensitive subjects such as gender-based violence, infectious disease and other issues that may be recorded in free text fields. Most humanitarian organizations acknowledge the sensitivity of personal data such as names, biometric data or ID numbers, and anonymize datasets accordingly as a matter of standard practice. However, it may be possible to re-identify individuals or disclose confidential information by combining different data points even after such anonymization is applied.

[1] Survey Design and Statistical Methodology Metadata, Software and Standards Management Branch, Systems Support Division, United States Bureau of the Census, Washington D.C., August 1998, Section 3.4.4, page 39.

[2] At the time of writing, a search for the word 'survey' on the Humanitarian Data Exchange returned 1198 results out of the 9805 datasets on the platform; a search for the word 'assessment' returned 1399 results.

RE-IDENTIFICATION AND DISCLOSURE RISK

A string of data points can allow for re-identification, either in isolation or when combined with basic contextual understanding. Advanced data analysis techniques can also extract more sensitive insights than may be visible through basic analysis, increasing the potential sensitivity of microdata in the humanitarian sector.

There are three commonly recognized forms[3] of disclosure risk, each of which could manifest in humanitarian microdata:

- **Identity disclosure:** when it is possible to associate a known individual with a released data record
- **Attribute disclosure:** when it is possible to determine some new characteristic of an individual based on the information available in the released data
- **Inferential disclosure:** when it is possible to determine the value of some characteristic of an individual more accurately with the released data than would otherwise have been possible

STATISTICAL DISCLOSURE CONTROL

Statistical Disclosure Control (SDC) is a technique used in statistics to assess and lower the risk[4] of a person or group being re-identified from the results of an analysis of survey or administrative data, or in the release of microdata. This technique has primarily been used by National Statistical Offices (NSOs) and other statistical organizations in relation to census data.

The application of SDC impacts the overall informational value or utility of a dataset and striking an appropriate balance between re-identification risk and information is key. Determining an appropriate risk-utility balance requires organizations to consider the various possible uses of a dataset and the context in which the data was collected.

There are three distinct stages involved in applying SDC to limit the risk of disclosure in microdata:

1. **Assessing the risk of re-identification**
   The first step is to conduct a disclosure risk assessment to determine the probability that disclosure could occur for individual respondents within a given dataset.[5] Whether this probability of disclosure (also referred to as a risk percentage) is acceptable for a dataset will depend on the context of the data. For example, in a conflict environment, the permissible risk percentage will typically be lower than in a natural disaster response.

2. **Reducing the risk of re-identification**
   The next step is to put the dataset through the actual SDC process, which lowers the re-identification risk by applying different anonymization methods. These methods fall into one of two categories: perturbative methods, which do not suppress values in the dataset but perturb (i.e., alter) values to limit disclosure risk by creating uncertainty around the true values, or non-perturbative methods, which reduce the detail in the data by generalization or suppression of certain values (i.e., masking) without distorting the data structure.

3. **Quantifying information loss**
   The final step is to measure the information loss resulting from the application of SDC to the dataset. The goal here is to compare the information value of the original dataset with the final information value.

By using SDC to assess and reduce the disclosure risk in microdata, humanitarian organizations can more responsibly share data from surveys and needs assessments to inform the overall response effort.

[3] For more information on disclosure risk and related technical considerations for the assessment and management of such risk through SDC, see the **Statistical Disclosure Control for Microdata: A Practice Guide**.

[4] Note: SDC is intended to prevent identity and attribute disclosure but is not specifically designed to prevent inferential disclosure.

[5] Learn how to conduct a disclosure risk assessment through the Centre's learning path on the subject: **https://centre.humdata.org/learning-path/disclosure-risk-assessment-overview/**.

Applying SDC to data shared on HDX[6]

Since the beginning of 2018, the Centre for Humanitarian Data ('the Centre') has conducted a risk assessment of 59 datasets uploaded to the Humanitarian Data Exchange (HDX) platform. The risk of disclosure of respondents' identities in 38 of those datasets was considered too high for publication on HDX. The contributors of 14 of these datasets agreed to the application of SDC to their data to lower the risk level. The HDX team applied SDC to these 14 datasets, for which the risk level was lowered to an acceptable level (i.e. 5% or lower[7]). For 5 of these 14 datasets, this meant that they could be made public after anonymization. The remaining 9 datasets were either removed or shared privately on HDX, as were the 24 high-risk datasets for which the contributor did not agree to conduct SDC. For those 24 datasets, many organizations took measures of their own to lower the risk of re-identification, sometimes including the removal of non-essential sensitive variables altogether.

APPLICATIONS OF SDC IN HUMANITARIAN DATA MANAGEMENT

In early 2019, the Centre interviewed colleagues from seven humanitarian organizations that conduct surveys and needs assessments to understand existing practices for microdata management. Some organizations such as UNHCR (see case study below) have relatively advanced approaches and considerable in-house expertise for conducting SDC on different forms of microdata. However, most of the organizations interviewed require additional support to do this work.

Responsible Curation and Management of Microdata about Refugees

Experience from UNHCR

UNHCR routinely collects data on refugees and other populations under its mandate. This data is used to assess needs and vulnerabilities, inform programming and better target assistance. Although this data has not traditionally been retained in formats and locations that would make it easily retrievable for future use, UNHCR is now in the process of creating an internal and an external microdata library. By creating these online repositories that will allow public access to microdata for internal and external users, UNHCR aims to enable more extensive use of the data by a variety of stakeholders and prevent duplication in data collection efforts moving forward.

Public dissemination of microdata has many potential benefits, but it also comes with potential risks. Dissemination without appropriate disclosure control measures can enable intruders to identify the entities (individuals or households) whose data is being shared, even if direct identifiers like names and addresses have been removed. In accordance with UNHCR's data protection policy, the identity of persons of concern must be protected and therefore datasets must be properly anonymized before they can be shared. UNHCR data is especially sensitive, as it concerns particularly vulnerable groups of people, whose protection is of the utmost importance.

To ensure protection and responsible dissemination of microdata, UNHCR utilizes the sdcMicro app in R to calculate the re-identification risks of such data before they are published. The process is managed by UNHCR's data curation team, which works together with the data owners to identify key variables, assess the sensitivity of the data, and set an acceptable risk level for a particular dataset. After anonymization, the modified data is compared to the original and assessed for information loss. If the data owner judges that certain modified variables are essential for consumers of the data, the disclosure control methods can be adjusted accordingly. For example, in the case of the

[6] Learn more about the Centre's use of SDC and overall Quality Assurance (QA) process for data shared on HDX here: **https://data.humdata.org/about/hdx-qa-process**.

[7] The Centre recently adjusted its default threshold of acceptable reidentification risk from 5% to 3%. The exact threshold for a particular dataset is always contextual and is determined together with the organization contributing the dataset.

Standardized Expanded Nutrition Surveys (SENS), the curation team decided not to apply aggregation in age brackets that would normally be applied because these brackets were key to characterizing malnutrition by age in years and months for children. The team maintained the age variable but excluded the date of birth and the survey date. This led to an acceptable risk scenario while keeping the data useful for nutritionists.

UNHCR continues to invest in this process by growing its curation team and increasing the technical expertise in anonymization techniques within the organization. Under the current plan, the UNHCR Microdata Library will be fully operational and populated with forced displacement microdata at the end of 2019.

By working with data contributors like REACH (see case study below) to develop a reliable and secure SDC service model, the Centre aims to support responsible sharing of this data and demonstrate the value of more robust techniques for disclosure risk assessment and data anonymization. Exposure to these techniques also helps humanitarian organizations identify tools and methods that they can incorporate into their own data management processes, while contributing to the broader body of knowledge within the sector on how to more responsibly manage and share microdata in humanitarian settings.

Opportunities and challenges to incorporating SDC into an organization's workflow

Experience from REACH

REACH began exploring the potential of SDC in June 2018, when the HDX team first applied the sdcMicro R package to a dataset that REACH uploaded to the platform. The types of data for which the HDX team have applied SDC for REACH include household surveys and key informant interviews (and associated metadata). REACH has not yet applied SDC directly but are looking into the requirements for doing so.

Based on experience to-date, REACH suggests that organizations interested in incorporating SDC into their workflow consider the following questions:

- Is this the right methodology for your existing microdata management processes?
- To what extent does application of SDC lower the validity and utility of the data?
- How does the application of SDC affect transparency?
- How can you ensure that personnel do not rely too much on the outcomes of an SDC disclosure risk assessment and ensure that they keep thinking critically about potential risks of different data types?

REACH has determined that it would be operationally feasible to roll out the technical aspects of SDC relatively easily both at HQ and field level. At HQ this would mean running a script on all datasets produced or published by REACH. At the field level, this would mean getting country teams to use sdcMicro or a similar tool on all datasets produced in country.

Beyond the technical aspects of SDC, REACH sees the potential challenge or bottleneck in the manual component of the process whereby staff must decide whether a particular disclosure control technique is appropriate, which variables to remove or otherwise obfuscate and how to interpret and communicate the results of the process. These decisions take time and require an understanding of the context to which the data relates.

In the near-term, REACH will continue collaborating with the HDX team to conduct SDC on survey and assessment data before publication on HDX. This experience will enable REACH to determine how best to incorporate SDC into its own workflows at the global and country level in the future.

RECOMMENDATIONS FOR INCREASING THE USE OF SDC IN HUMANITARIAN SETTINGS

The Centre and its collaborators on this guidance note recommend that organizations invest in the following three areas for successful adoption of SDC:

1. **Selecting the right tool**
   There are a variety of tools to conduct SDC available for free online. The Centre and other humanitarian organizations consulted during the Centre's research currently use sdcMicro. The Centre chose sdcMicro for its scalability and because it is free and open source. Other free and open source tools include µArgus and ARX. In selecting the appropriate tool for conducting SDC, organizations should consider the flexibility of the tool in the selecting key variables, the capacity of the tool to handle large datasets, the built in risk-utility trade off functionality and the ease with which staff would be able to navigate the tool's user interface.

2. **Integrating SDC into existing data management workflows**
   Establishing a process for the application of SDC within existing data management workflows is key to sustainable adoption of the method. SDC requires engagement of staff with different knowledge and skills, including a technical specialist to apply the statistical methods and a programme specialist with an understanding of the context of the data to determine the acceptable risk-utility balance. A well-organized workflow will help improve efficiency of the process and help prevent misinterpretation of or overreliance on the outcomes of SDC.

3. **Improving practice through continuous learning**
   As organizations apply SDC, they will learn about the sensitivity of different key variables, the appropriate risk level to strive for, the acceptable level of information loss and other considerations that must be balanced in the process. Keeping a record of each application of SDC and documenting lessons learned will help refine the process over time. Sharing these insights internally and, as appropriate, with the broader humanitarian community can support more consistent and responsible management of microdata in the sector.

As part of its efforts to support more responsible management and sharing of sensitive humanitarian data, the Centre is enhancing its service model[8] for conducting SDC. This work includes the introduction of an automated risk detection process for all data shared through HDX, which — when done manually — can take several hours for large spreadsheets. Through this process, a script will run on all data uploaded to the platform to identify microdata and other forms of potentially sensitive data. High-risk data will be sent into a dedicated workflow to be assessed and, if necessary, modified through SDC to reduce re-identification risk before the data is shared more widely.

To learn more about the Centre's work on SDC, contact centrehumdata@un.org.

COLLABORATORS: **UNHCR** AND **REACH INITIATIVE**.

The Centre for Humanitarian Data ('the Centre')together with key partners, is publishing a series of eight guidance notes on Data Responsibility in Humanitarian Action over the course of 2019 and 2020. The Guidance Note series follows the publication of the working draft OCHA Data Responsibility Guidelines in March 2019. Through the series, the Centre aims to provide additional guidance on specific issues, processes and tools for data responsibility in practice. This series is made possible with the generous support of the Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO).

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[8] Learn more about the Centre's approach to SDC here: **https://humanitarian.atlassian.net/wiki/spaces/HDXKB/pages/1381498881/**.