Data Release Statement
GRID3 DRC Haut-Lomami and Tanganyika Health Catchment Area Boundaries Version 01 (Beta)

31 August 2020

Abstract

This document outlines the methodological approach and data sources used to construct the *GRID3 DRC Haut-Lomami and Tanganyika Health Catchment Area Boundaries Version 01 (Beta)* dataset. The dataset consists of health catchment area boundaries with names in the two provinces of Haut-Lomami and Tanganyika in the Democratic Republic of the Congo (DRC). Limitations and use constraints are provided.

Dataset citation:

Ministère de la Santé Publique, République Démocratique du Congo and Center for International Earth Science Information Network (CIESIN), Columbia University. 2020. GRID3 DRC Haut-Lomami and Tanganyika Health Catchment Area Boundaries Version 01 (Beta). Palisades NY: Geo-Referenced Infrastructure and Demographic Data for Development (GRID3). DOI: https://doi.org/10.7916/d8-v8vq-0p13. Accessed DAY MONTH YEAR

Data Use Constraints:

Users are free to use, copy, distribute, transmit, and adapt the work for commercial and non-commercial purposes, without restriction, as long as clear attribution of the source is provided.

Contacts and Data Queries

GRID3 appreciates feedback regarding this dataset, such as suggestions, discovery of errors, difficulties in using the data, and format preferences.

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Contents

1. Introduction

The *GRID3 DRC Haut-Lomami and Tanganyika: Health Catchment Area Boundaries Version 01 (Beta)* dataset consists of health catchment area boundaries with names in the two provinces of Haut-Lomami and Tanganyika, in the Democratic Republic of the Congo (DRC). The dataset is one of three included in the GRID3 DRC Haut-Lomani and Tanganyika Version 01 (Beta) data release. The other two datasets that are part of the release are *GRID3 DRC Haut-Lomami and Tanganyika Health Facilities Version 01 (Beta) and GRID3 DRC Haut-Lomami and Tanganyika Settlements Version 01 (Beta).*

This work was accomplished through engagement by the Center for International Earth Science Information Network (CIESIN) with the mandated authorities in the Ministry of Health in support of data collection and development for immunization planning. Local health care workers were directly involved in the mapping of the health catchment area boundaries at participatory events coordinated with in-country provincial coordinators and Geographic Information System technicians, and in the collection of data in the field from July to September 2019.

This work has been undertaken as part of the Geo-referenced Infrastructure and Demographic Data for Development (GRID3) programme in DRC. The programme is funded by the Bill & Melinda Gates Foundation and United Kingdom's Foreign, Commonwealth and Development Office. It is implemented by WorldPop/Flowminder (WPFM) and the United Nations Population Fund (UNFPA), and coordinated by the Center for International Earth Science Information Network (CIESIN) of Columbia University.

Input data

The health catchment area boundaries in this dataset were digitized based on knowledge of the local health workers and with the use of several reference data layers (Table 1).

Table 1. Input data layers

Data	*Source(s)*
GRID3 DRC Haut-Lomami and Tanganyika: Health Facilities, Version 01 (Beta)	(Ministère de la Santé Publique, République Démocratique du Congo and Center for International Earth Science Information Network (CIESIN), 2020)
GRID3 DRC Haut-Lomami and Tanganyika Settlements, Version 01 (Beta)	(Ministère de la Santé Publique and Bureau Central du Recensement (BCR), République Démocratique du Congo, 2020)
Satellite imagery basemaps	(Esri Bing Maps, accessed 2019); (Esri World Imagery, accessed 2019)

2. Methodological Approach

Summary

With the support of provincial and national health authorities, local health care workers and congolese GIS specialists engaged in a participatory mapping process in Haut-Lomami and Tanganyika during the months of July, August and September 2019. All reference data layers described in Table 1 were used during participatory mapping meetings where local health care workers discussed health catchment area boundaries within their corresponding zonal authority. GIS technicians (or GIS mappers) helped digitize these health catchment area boundaries, following directions from local health care workers and quality-control provisions designed by CIESIN. Once in agreement, the GIS mappers finalized a draft version to be further refined by correcting for topological and logic errors. Additional settlement place names, health facility locations, and point of interest (POI) data were collected in the field, processed by the Center for International Earth Science Information Network (CIESIN) and used to validate the health catchment area boundaries. Both health area and health zone boundaries are included in the dataset.

Details

Phase 1: Participatory Mapping Meetings

Provincial coordinators helped organize teams of GIS mappers and local health care workers at participatory mapping meetings held at each health zone's headquarters in Haut-Lomami and Tanganyika provinces. A health zone is an administrative health unit that contains several health areas. Each health care worker at the meeting was responsible for providing health services to one health area. The purpose of these 3-day meetings was to bring together the empirical knowledge of local health personnel and the technical knowledge of GIS mappers to visualize, standardize, digitize, and validate health area boundaries. Participants ensured all settlements listed in the microplans[1], as well as any additional settlements known by the local health care workers, were included in the correct health catchment area boundaries. Satellite imagery, hand drawn maps, and narrative descriptions of boundaries were also used in this process.

Phase 2: Field Data Collection

As part of the participatory meetings, local health care workers were trained to collect settlement place names, health facility locations, and points of interest (POI) (e.g., schools, rivers, health boundary limits, etc.) using an Open Data Kit (ODK)-based

[1] Microplans were shared by the local Ministry of Health offices (Division Provincial de Sante (DPS)) and the vaccination program (Programme Elargi de Vaccination (PEV))

data collection app preloaded on tablets. Following the meetings, each health care worker returned to their health area to collect data using the tablets. The goals of the field data collection effort were to add missing settlements and health facilities identified during the participatory mapping meetings and to resolve ambiguities such as the correct name of a village. The GIS mappers and provincial coordinators then reviewed and cleaned the data.

Phase 3: Data Validation

During the collection of data in the field, health care workers specified which health area each point belonged to as it was collected. These points were used to refine the digitized health area boundaries and to further validate and supplement the settlement and health facility layers. For example, if a settlement fell outside of the health area boundary to which it belonged, the health area boundary was adjusted to include the settlement. As the preliminary health area boundaries for each health zone were completed by the field team, the data were sent back to CIESIN to undergo a series of quality checks at the health zone level, including:

1. Checking for geometry errors (e.g., duplicate/coincident points)
2. Checking for topology errors and automatically resolving errors smaller than 500 square metres
3. Checking for adherence to the schema
4. Checking the data against the master list of health facilities extracted from the District Health Information Software (DHIS2) for completeness of coverage
5. Checking the data against the cleaned field data and flagging issues for the field team to address
6. Checking the internal integrity of the dataset (attribute accuracy and completeness, consistency of spelling, etc.)

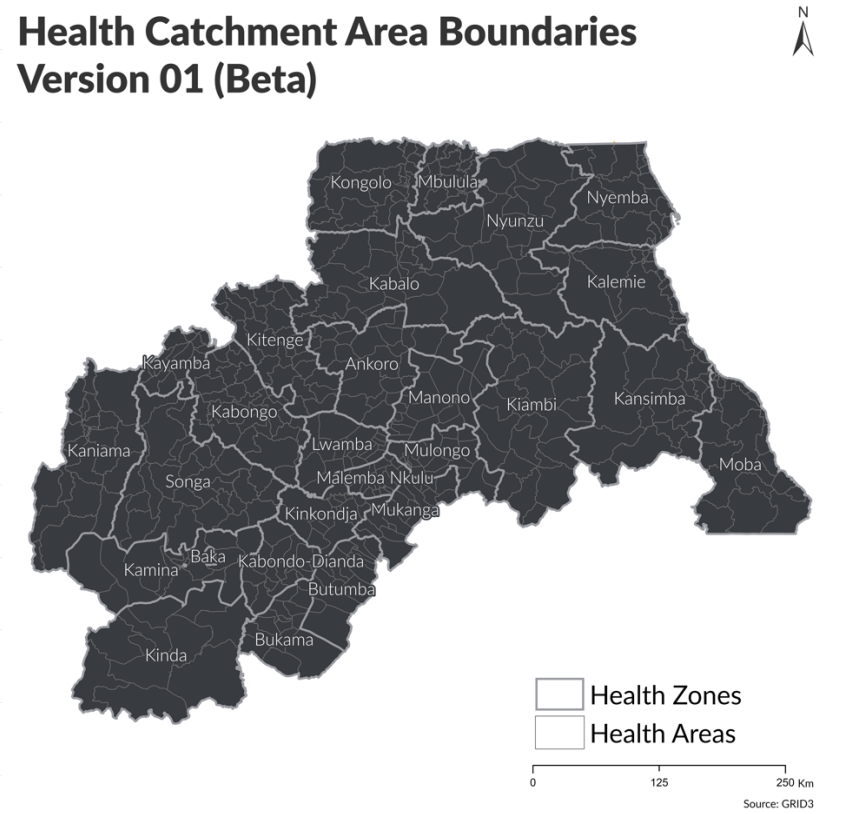
GRID3 partner, Geospatial Evaluation and Observation Lab (geoLab) at the College of William & Mary, assisted with visual validation of the boundaries against field data, correction of obvious attribute errors, and correction of overlaps and gaps larger than 500 square metres. Any gaps and overlaps that could not be addressed by geoLab, due to their large size and the need for local knowledge, were flagged for the field team to address. In addition, geoLab made minor adjustments to health area boundaries to reflect current operational areas based on the data collected in the field. Any uncertainties or ambiguities were relayed back to the field team to address.

CIESIN then merged the health area boundaries for all health zones into a single data layer, completed a final topology check, and fixed errors in coordination with the field team. The health area layer was aggregated to health zones to generate health zone boundaries for Haut-Lomami and Tanganyika Provinces.

The final step was to present the dataset to the Zone Chief Medical Officers (MCZ) for their review and approval.

3. Dataset Description

GRID3 DRC Haut-Lomami and Tanganyika Health Catchment Area Boundaries Version 01 (Beta) dataset consists of two layers: health area boundaries and health zone boundaries. The data are available for download in shapefile or Esri file geodatabase formats packaged in zip files. See Appendix for a summary of the features in this dataset.



Extent: Democratic Republic of the Congo: Haut-Lomami and Tanganyika Provinces

North: -4.95721649999996
West: 23.634325162
East: 30.592749525
South: -10.12403361

Coordinate system: GCS WGS 1984

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Codebook

Note: fields in bold are only present in the health area boundaries layer.

Field Name	Field Description
OBJECTID	Unique sequential numeric identifier maintained by the database.
province	The name of the province within which the health boundary is located
zs_uid	Alphanumeric health zone (zone de santé) identifier as defined by the DHIS2 (Pyramide avec code INS)
zone_sante	The name of the health zone (zone de santé)
as_uid	Alphanumeric health area (aire de santé) identifier as defined by the DHIS2 (Pyramide avec code INS)
aire_sante	The name of the health area (aire de santé)
nom_alt	Alternative name of the health area at the local level, if different from the central level
note	Notes on the health area.
source	The source of the health boundary feature
edite_date	Date of edition/creation of the health area feature: YYYY-MM-DD
area_sqkm	Area of the health boundary feature in square kilometres.
Shape_Length	Perimeter of the health boundary feature maintained by the geodatabase in coordinate system units. (This field is not maintained in shapefiles.)
Shape_Area	Area of the health boundary feature maintained by the geodatabase in coordinate system units. (This field is not maintained in shapefiles.)

4. Known Data Limitations

The spatial accuracy of the health area boundaries is dependent on both the accuracy of the point data used to guide the digitization (e.g. settlement place names, other points of interest), as well as on the quality of the satellite imagery used to identify natural or manmade features known to represent a health area boundary. Temporal mismatches exist among the point datasets, the settlement model layers, and the satellite imagery used to perform digitization and quality checks. In revising the boundaries, data collected in the field were considered more accurate than any other previously compiled settlement and health facility point data. Likewise, the team used the most up-to-date DHIS2 master list of health facilities and corresponding 2018 microplans.

The scope of this project included boundary delineation and validation for the health areas of 20 health zones in Haut-Lomami and Tanganyika Provinces. Existing data collected by the University of California Los Angeles for an additional 7 health zones[2] (Lwamba, Mulongo, Mukanga, Malemba Nkula, Kikondja, Butumba and Manono) was incorporated into the final product but has not been directly validated with local health teams under GRID3 supervision. The health zones that fall along the provincial border that separates Haut-Lomami and Tanganyika have been validated, but the health zones that straddle surrounding provincial boundaries may have misalignments. Additionally, misalignments exist between the health zone boundaries and the current administrative boundaries.

Known boundary issues

A comparison of the health area boundaries dataset with the master list of health facilities extracted from DHIS2 indicates:

- Fourteen (14) health areas present in the DHIS2 master list do not have a corresponding boundary in this dataset: 9 in Kinkondja health zone, 2 in Manono health zone, and 1 each in Kitenge, Lwamba, and Kongolo health zones.
- Two (2) polygons in this dataset do not have a corresponding health area in the DHIS2 master list: Kyabombo health area in Mulongo health zone, and an unnamed polygon in Kinkondja health zone.

5. Disclaimer

The data is provided "as-is". These data are part of ongoing work and are not guaranteed to be accurate and clean. If users encounter apparent errors or misstatements in the data, they should contact GRID3 at data.queries@grid3.org.

CIESIN, Columbia University, and their sponsors do not guarantee the accuracy, reliability, or completeness of any data provided. We provide these data without warranty of any kind whatsoever, either expressed or implied and shall not be liable for incidental, consequential, or special damages arising out of the use of any data provided.

6. Acknowledgements

GRID3 thanks the following institutions that provided input data and/or assistance with data production.

Ministère de la Santé Publique, DRC
Division du Système National d'Informations. Sanitaires (DSNIS), DRC

[2] These data were collected by UCLA as part of the GIS layer used for the polio response in early 2018. Participatory mapping and high-resolution satellite imagery were used to delineate the boundaries.

Division Provinciale de la Santé (DPS), DRC
Programme Elargi de Vaccination (PEV), DRC
Bureau Central du Recensement (BCR), DRC
Geospatial Evaluation and Observation Lab (geoLab), College of William & Mary, USA
CartONG, France
Centers for Disease Control and Prevention (CDC), USA
DigitalGlobe, USA
Initiative Régionale de Documentation et d'Accompagnement Communautaire au Développement (IDRAC Sarl), DRC
Médecins Sans Frontières (MSF)
Novel-T, Swizterland
Référentiel Géographique Commun (RGC), DRC
The International Organization for Migration (IOM), DRC
United Nations Office for the Coordination of Humanitarian Affairs (OCHA)
University of California, Los Angeles (UCLA) DRC Health Research and Training Program, USA
World Health Organization (WHO)
The consortium of the Bill & Melinda Gates Foundation and partners: PATH, VillageReach, Global Good, SANRU, Caritas, the International Medical Corps (IMC)

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Esri. "World Imagery" [basemap]. Varying scale. "World Imagery Map". Various dates. https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9. (December 2018-July 2019).

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Bureau Central du Recensement (BCR), République Démocratique du Congo and Center for International Earth Science Information Network (CIESIN), Columbia University. 2020. GRID3 DRC Haut-Lomami and Tanganyika Settlements, Version 01 (Beta). Palisades NY: Geo-Referenced Infrastructure and Demographic Data for Development (GRID3). DOI: https://doi.org/10.7916/d8-zysy-qk80. Accessed DAY MONTH YEAR

8. Appendix

Distribution of health areas by health zone and province

Province	Health Zone	Count of Health Areas
Haut-Lomami	Baka	4
	Bukama	19
	Butumba	16
	Kabondo-Dianda	19
	Kabongo	32
	Kamina	24
	Kaniama	25
	Kayamba	15
	Kinda	11
	Kinkondja	18
	Kitenge	28
	Lwamba	19
	Malemba Nkulu	23
	Mukanga	19
	Mulongo	24
	Songa	29

Appendix *(cont.)*

Province	Health Zone	Count of Health Areas
Tanganyika	Ankoro	25
	Kabalo	24
	Kalemie	27
	Kansimba	21
	Kiambi	26
	Kongolo	24
	Manono	25
	Mbulula	21
	Moba	25
	Nyemba	21
	Nyunzu	25