

## Data Release Notes

Name of the dataset	GRID3 COD - Health Areas v4.0
Name of the file	GRID3_COD_health_areas_v4_0.gpkg
Date of data release	February 25, 2025
File format	OGC Geopackage
Dataset version	4.0
Abstract	<p>This document outlines the methodology and data sources used during the production of the GRID3 COD - Health Areas v4.0 dataset. The dataset consists of health area boundaries with name, location, health zone, and other attributes for fourteen provinces in the Democratic Republic of the Congo (COD). Limitations and use constraints are provided.</p> <p>The current version supersedes the <a href="#">GRID3 COD - Health Areas v3.0</a>. The following changes were made:</p> <ul style="list-style-type: none"> <li>• Updated data for the provinces of Haut-Katanga, Kasai, Kasai-Oriental, Tshopo and Mongala.</li> <li>• Data for Sankuru Province have been added.</li> <li>• A data sources table has been included as part of the metadata.</li> </ul>
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Contacts and data queries	The authors of this dataset appreciate feedback regarding the data, including suggestions, discovery of errors, difficulties in using the data, and format preferences. For dataset-related questions, please send an email to: <a href="mailto:info@ciesin.columbia.edu">info@ciesin.columbia.edu</a>

# I. Data inputs / methodology

To create this dataset, CIESIN designed a consistent data schema and methodology to harmonize information from fourteen provinces, organized into seven groups. These groups are based on the order in which the original data were collected, though the sequencing may not be consistent across all groups.

- Province group 1: Haut-Katanga, Kasai, Kasai-Oriental, Kinshasa, and Lomami
- Province group 2: Haut-Lomami and Tanganyika
- Province group 3: Ituri and Kwilu
- Province group 4: Maniema
- Province group 5: Kasai-Central
- Province group 6: Tshopo and Mongala
- Province group 7: Haut-Katanga, Kasai, and Kasai-Oriental (updates); Sankuru

## Province Group 1: Haut-Katanga, Kasai, Kasai-Oriental, Kinshasa, and Lomami

From January to July 2021 with the support of provincial and national health authorities, local healthcare workers (“head nurses”, “health zone management staff”, and “head doctors of the health zones”) and GRID3 GIS specialists (“mappers” and “provincial coordinators”) engaged in a participatory mapping process in Haut-Katanga, Kasai, Kasai-Oriental, Kinshasa, and Lomami. This mapping process occurred at the level of the health zone (an operational unit made up of approximately 15-20 health areas).

Mappers were deployed to health zones in teams of two for approximately nine days where they trained the health area head nurses on data collection using the Geospatial Tracking System (GTS), an Open Data Kit (ODK)-based application. The head nurses routinely work in their respective areas and have a good understanding of the names and location of health facilities, settlements, and points of interest (POIs, such as schools and religious centers) within their health (or catchment) areas.

While the head nurses collected data in their health areas, the mappers worked with the health zone management team to validate and modify data from the field. After all data were collected, cleaned, and integrated into final geospatial layers, the health zone head doctor validated the preliminary data. From July 2021 through October 2022, the mappers and provincial coordinators worked with CIESIN staff to consolidate the data (i.e. spelling errors, gaps and overlaps, other inconsistencies). These data were used to produce basemaps at the health area-level and shared back with each health zone and province for a second round of validation.

From November 2022 through January 2023, the in-country GIS team worked with CIESIN staff to integrate these corrections into a final geodatabase. This work was done with the participation and supervision of the Direction du Système National d'Information Sanitaire (DSNIS). The Agence Nationale d'Ingénierie Clinique, de l'Information et de l'Informatique de Santé (ANICiS) also played an important role in the area of data governance. This work was part of the GRID3 Mapping for Health project.

## Province Group 2: Haut-Lomami and Tanganyika

The Haut-Lomami and Tanganyika health area data were originally created through an extensive fieldwork exercise from July to September 2019 with additional data added from the National Malaria Elimination Programme in the DRC (PNLP).

Table 1: Data sources

Source	Description
PNLP IMA	Programme National de Lutte Contre le Paludisme (PNLP) and IMA World Health.
ESPK UCLA	École de Santé Publique de Kinshasa (ESPK) and University of California, Los Angeles (UCLA).
CIESIN MSPHP	DRC's Ministry of Public Health (Ministère de Santé Publique) and the Center for International Earth Science Information Systems)
DSNIS	Division du Système National d'Informations Sanitaires

### Phase 1: 2019 Field data collection

With the support of provincial and national health authorities, local healthcare workers and GRID3 GIS specialists engaged in a participatory mapping process in Haut-Lomami and Tanganyika from July to September 2019. This mapping process occurred at the health zone level.

Mappers were deployed to the health zones, where they organized participatory mapping meetings with local healthcare workers. They also trained head nurses to collect data on settlements, health facilities, and other points of interest in their respective health areas using an ODK-based application. Mappers then used this information to delineate health area boundaries, using previously existing data to guide this effort. These data were then sent back to CIESIN for additional quality checks.

### Phase 2: Integration of data from the PNL

In October 2021, GRID3 received access to a large geospatial dataset collected during a bednet distribution campaign by IMA World Health (PNLP IMA). This dataset was combined and consolidated with previous GRID3 settlement data for Haut-Lomami and Tanganyika. The health zone and health area boundaries were then refined based on the health area and health zone attributes of PNL IMA and the GRID3 friction surface layer (non-published).

## Province Group 3: Ituri and Kwilu

Between 2021 and 2022, GRID3 received PNL data covering the provinces of Ituri and Kwilu. These data consisted of household-level GPS points with village, health area, and health zone attributes; and

collected by IMA World Health, an implementing partner of the PNLN, during province-wide bed net distribution campaigns. In Ituri, over 1,165,000 household points were received from a bed net distribution campaign conducted in June 2021. In Kwilu, over 1,191,000 household points were received from a bed net distribution campaign conducted in July 2022. These household points were processed and mapped against the GRID3 settlement extents datasets as a way of validation. Further, settlement points were combined with other data sources in order to compile a geodatabase as complete as possible.

CIESIN used the following process to delineate preliminary health area boundaries:

- Assessment of already existing health area boundaries. Available point data available (settlements, health facilities, other points of interest available with health area attributes collected independently) with health area attributes were overlaid with the boundaries to determine the percent match and select the best layer available, in concert with the local health authorities. In Kwilu, the 2018 data produced by UCLA on behalf of the PNLTHA - and already integrated into the DSNIS national database - was considered the best available data. In Ituri, a combination of recent WHO and OSM boundary work was used as reference only.
- Creation of a friction surface layer. Several input datasets --e.g. elevation, slope, land cover, water bodies (rivers, streams, permanent bodies of water, lakes, etc.), and road infrastructure (primary, secondary, tertiary road networks) were combined to construct a surface (raster or grid, at ~100 m x 100m resolution) with a travel costs at the pixel level --which quantifies the amount of time that it takes to travel from one point to another. For example, rivers, permanent bodies of water, or cliffs were used as physical barriers and considered obstacles to be circumvented.
- Inclusion of the best available health areas to the friction layer. In addition to natural and man-made barriers, the best available health area boundaries were added to the friction surface to avoid modifying or redrawing existing boundaries. If extensive work had already been conducted and validated in an area, and only a few points fell outside of the original boundaries, no changes were made to the boundaries, as the amount of data available did not justify modifications. Conversely, if a sufficient quantity of recent and reliable data points fell outside current health area limits, these were adjusted accordingly.
- Creation of village catchment areas. The granularity of the data collected during the ITN distribution campaign of the PNLN (door-to-door distribution of bednets) at the provincial scale allowed us to create buffers around each survey location in order to generate village catchment areas (settlement contours).
- Creation of health areas. Each village catchment area was dissolved into health area boundaries, based on their health area attribute. An additional visual inspection identified and corrected minor issues and ensured the boundaries were topologically correct.
- Match health areas to the master list. The final step was to ensure that the data inputs from the geo-referenced household survey were in line with the official health area lists.
- Map the preliminary boundary data. Health zone boundaries along with other contextual data (settlements, health facilities, points of interest, etc) were then produced and printed in a large format (A0).

- Preliminary health area boundaries (pre-alpha) were presented to local health officials (Médecins Chefs de Zone, Infirmiers Superviseurs) to make sure all the settlements and health facilities fell within their respective boundaries - and/or to make the necessary adjustments to the boundaries when necessary.

In Kwilu, the data were verified through fieldwork organized in October 2022. Two GRID3 mappers traveled to Kikwit and Bandudu, respectively, to present the cartographic improvements driven by the use of the PNL data and to verify that the boundaries were correctly delineated. The majority of this work was carried out in collaboration with both antenna and provincial level staff.

In Ituri, the data were verified through fieldwork also in October 2022. Four GRID3 mappers traveled to Bunia and Aru, respectively, to validate the health area boundary data in all health zones. GRID3 mappers worked with local health teams, where boundary layers were validated and edited.

All data modifications from both provinces were sent back to CIESIN for final verification before publication. CIESIN ensured that the final layers were free of spelling and topological errors.

#### Province Group 4: Maniema

The Maniema data were created through an extensive fieldwork data collection conducted by the Kinshasa School of Public Health (Ecole de Santé Publique de Kinshasa, ESPK) and supplemented with additional data from the PLNP.

Table 2. Data sources

Name	Data type/ format	Input data year
Fieldwork data collected by the Kinshasa School of Public Health (ESPK) in collaboration with GRID3 and CIESIN.	Spatial points and qualitative feedback	2024
Pre-Distribution Registration Survey (PDRS) from the National Malaria Control Programme (PNLP) collected as part of the anti-malaria campaigns in the Democratic Republic of the Congo	Polygons produced from spatial points	2023

#### Phase 1: Integration of data from the PNL

In October 2021, CIESIN received access to a large settlement point dataset collected during a bednet distribution campaign by IMA World Health. This dataset was explored, cleaned, and matched against health area and health zone lists within DRC's DHIS2. This attribute information was used to produce a preliminary, draft boundary to be validated with the help of local and provincial health authorities.

## Phase 2: Field data collection and data processing

ESPK with the support of provincial and national health authorities, local healthcare workers and GRID3 GIS specialists engaged in data collection from October 2023 to January 2024. GRID3 GIS specialists were deployed to each health zone, and liaised with local authorities and health workers to validate the list of health areas within each health zone and validate (or make corrections) to the preliminary draft boundary produced in Phase 1. Corrections were sent back to CIESIN for processing and quality checks, and validated against point-data attributes collected as part of the same fieldwork.

### Province Group 5: Kasai-Central

A comprehensive geospatial survey was conducted by ESPK between March and May 2024 in collaboration with GRID3 and partners. Similar as with Maniema, the survey team collected names, geospatial locations, and relevant attribute information of spatial points to create health zones and health areas.

Table 3 - Data sources

Source Name/ description	Data type/ format	Input data year
Data collected in the field between March - May 2024 by the Kinshasa School of Public Health (ESPK) in collaboration with GRID3 and CIESIN.	Polygons created from spatial points	2024

CIESIN delineated health area boundaries by clustering attribute information contained in the data collected in the field. Natural features such as rivers and ridges, as well as roads and railroad lines were considered as barriers to delimit boundaries, when applicable. GIS tools/ environments were used to clean topology and isolated attribute errors, harmonize and standardize data, and resolve other geometry discrepancies. Spatial polygons were matched against the national DHIS2 database to ensure full interoperability across databases.

Given the geographic composition of the landscape in the DRC it is possible to find health areas spread across various locations (i.e. small islands, or small polygons contained within larger polygons, etc). Therefore, the health area boundaries are released as single-part feature polygons even though more than one polygon may belong to a given health area.

A consistent data schema prioritizing information preservation was also developed to include data fields as per common use cases. A standardized data schema will enable seamless integration across subsequent versions of GRID3 health area datasets in the DRC.

### Province Group 6: Tshopo and Mongala

The Tshopo and Mongala data were added through an extensive fieldwork data collection conducted by ESPK and supplemented with additional data from the PLNP.

Table 4- Data sources

Source Name/ description	Data type/ format	Input data year
Fieldwork data collected by the Kinshasa School of Public Health (ESPK) in collaboration with GRID3 and CIESIN.	Spatial points and qualitative feedback	2024
Pre-Distribution Registration Survey (PDRS) from the National Malaria Control Programme (PNLP) collected as part of the anti-malaria campaigns in the Democratic Republic of the Congo	Polygons created from spatial points	2021 - Tshopo 2023 - Mongala

#### Phase 1: Integration of data from the PNLN

We delineated health boundaries by clustering attribute information about health areas and health zones contained within the Pre-Distribution Registration Survey (PDRS) data from the PNLN, collected in Tshopo and Mongala in 2021 and 2023 respectively. We utilized this preliminary dataset as the baseline during fieldwork.

#### Phase 2: Field data collection and data processing

ESPK, with the support of provincial and national health authorities, local healthcare workers (i.e. head nurses, health zone management staff, and head doctors of the health zones), and GRID3 GIS specialists engaged in data collection from March to May 2024. GRID3 GIS specialists were deployed to each health zone, and liaised with local authorities and local health workers to validate the list and geometry of health areas within each health zone. Corrections were sent back to CIESIN for processing.

CIESIN consolidated both PNLN and fieldwork data, giving priority to the latter. We considered natural features such as rivers and ridges, as well as roads and railroad lines as barriers to delimit borders, when applicable. We used GIS tools/ environment to clean topology and isolate attribute errors, harmonized and standardized data, and resolved other geometry discrepancies. We also matched the spatial polygons against the national DHIS2 database to ensure interoperability across databases.

Given the geographic composition of the landscape in the DRC, it is possible to find health areas spread across various locations (i.e. small islands, or small polygons contained within larger polygons, etc). However, the health area boundaries are released as single-part feature polygons even though more than one polygon may belong to a given health area.

#### Province Group 7: Haut-Katanga, Kasai, Kasai-Oriental, and Sankuru

A data gap analysis was conducted in Haut-Katanga, Kasai, and Kasai-Oriental to guide fieldwork plans in these three provinces using existing data from 2021–2022. The Sankuru data collection, completed by GRID3, was incorporated through extensive fieldwork and further supplemented with additional data from the PNLN.

Table 5- Data sources

Source Name/ description	Data Type/Format	Input Year
<a href="#">1- GRID3 COD - Health Areas v3.0</a>	OGC Geopackage	2022-2024
2- GRID3 COD - Haut-Katanga - Health Areas v1.1L	OGC Geopackage	2024
3- Field data collected between March and May 2024 by GRID3 mappers.	Polygons created from spatial points	2024
4 - Pre-Distribution Registration Survey (PDRS) from the National Malaria Control Programme (PNLP) collected as part of the anti-malaria campaigns in the Democratic Republic of the Congo in between 2022 and 2023 <sup>1</sup> .	Polygons created from spatial points	2022- 2023
5 - Field data collected as part of routine surveillance performed by the Elongated Programme of Immunization (EPI/PEV) with the support of Acasus. Includes instances of settlement names and points of interest (POI) data collected in hard-to-reach areas.	Polygons created from spatial points	2018- 2024
6- Health Areas database from DHIS2, downloaded in October 2024.	CSV	2024 <sup>2</sup>

### Phase 1: Data Preprocessing

The PNLN's pre-distribution registration data were used to update health areas in Kasai, Haut-Katanga, and Sankuru. For Kasai Province, PNLN data were processed and integrated to update health areas included in the [GRID3 COD - Health Areas v3.0](#). Likewise, PNLN data were used to update health areas included in the GRID3 COD - Haut-Katanga - Health Areas v1.1L. Finally, in Sankuru Province, health area polygons were produced using PNLN's pre-distribution registration data collected in 2022.

In the case of Kasai-Oriental, the baseline dataset were taken from [GRID3 COD - Health Areas v3.0](#).

### Phase 2: Field Data Collection

Between March and May 2024, GRID3 mappers collaborated with Health Zone Central Offices in Haut-Katanga, Kasai, Kasai-Oriental, and Sankuru to validate the names and references of health areas in existing datasets and to delineate missing health area polygons. Data collected by EPI's local health teams between June and October 2024 were also included, with particular attention given to newly added

<sup>1</sup> In Haut-Katanga and Sankuru Provinces, PNLN's pre-registration data were collected by SANRU in 2022; in Kasai and Kasai-Oriental Provinces, PNLN's pre-registration data were collected by Chemonics between 2022 and 2023.

<sup>2</sup> The download date was used as the input date, although the data compiled in DHIS2 includes references spanning an extended period.



health areas. During this period, GRID3 consolidated all field data before sending it to CIESIN for final integration.

### Phase 3: Data Integration and Quality Checks

CIESIN performed rigorous quality checks to ensure consistency in the geometry and attributes of spatial data layers for all four provinces.

Notably, some health areas are represented as multi-part polygons, which may or may not be spatially adjacent. These cases were validated in the field and are not indicative of errors. They often represent special health areas managed by military or police authorities or areas separated by physical barriers, such as river inlets. Please see Appendix 3 for a list of health areas under this category.

## II. Dataset Description

The *GRID3 COD - Health Areas v4.0* dataset consists of spatial polygon data with attribute information (see table 6). The data are available for download in OGC Geopackage format contained in a zip file; a metadata file in XML format and a Data Sources table in CSV format are also included.

Table 6: Codebook

Variable Names	Type	Definition
OBJECTID	numeric	Software-generated unique code
pays	text	Country name: République démocratique du Congo
iso3	text	ISO3 code: COD
province	text	DHIS2 province name
prov_uid	text	DHIS2 province code
antenne	text	Antenne name
zonesante	text	DHIS2 health zone name
zs_uid	text	DHIS2 health zone code
airesante	text	DHIS2 health area name
as_uid	text	DHIS2 health area code
asnom_alt	text	Alternate name or spelling for the health area
date	text	Year of data collection or last edit/modification
source_acronym	text	Acronyms of the organizations, institutions or programs who were involved in the creation of the data input.
sourceid	text	Unique identifier referring to individual and/or groups of data inputs. The sourceid allows users to link each data record with the corresponding source reference in the Data Sources table (included as a separate file).

<b>Variable Names</b>	<b>Type</b>	<b>Definition</b>
edit_par	text	Editor of the original data
grid3id	text	GRID3 ID

### III. Known Data Limitations and Disclaimer

The spatial accuracy of the health areas data is dependent on both the accuracy of the input data as well as on the correctness of the edits made throughout the validation process. Temporal mismatches exist among the point datasets and the satellite imagery used to perform quality checks. Spelling mistakes and/or mismatches may have occurred due to colloquial variations on how data points are referred to in the field.

This dataset should be considered operational; it has not been fully validated by government officials.

CIESIN, Columbia University, and its co-authors follow procedures designed to ensure that data disseminated by the project are of reasonable quality. If, despite these procedures, users encounter apparent errors or misstatements in the data, they should contact CIESIN, [info@ciesin.columbia.edu](mailto:info@ciesin.columbia.edu)

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Note on Haut-Lomami: the current release includes 333 health areas in Haut-Lomami; though we acknowledge the existence of additional 51 units. These additions will be incorporated into the next data release, GRID3 COD - Health Areas v5.0

### IV. Acknowledgments

CIESIN and its co-authors thank the following institutions that provided input data and/or assistance with data production:

Acasus.

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Bluesquare.

Bureau Central du Recensement (BCR).

Caritas.

Centers for Disease Control and Prevention (CDC).

Direction d'Etudes et Planification (DEP).

Direction des Soins de Santé Primaires (DSSP).

Division du Système National d'Informations Sanitaires (DSNIS).  
Division Provinciale de la Santé (DPS) de Haut-Katanga, Haut-Lomami, Ituri, Kasai, Kasai-Central, Kasai-Oriental, Kinshasa, Kwilu, Lomami, Maniema, Mongala, Sankuru, Tanganyika, et Tshopo.  
Ecole de Santé Publique de Kinshasa (ESPK).  
Gavi, the Vaccine Alliance.  
Geospatial Evaluation and Observation Lab (geoLab), College of William & Mary.  
Global Affairs Canada (GAC).  
Global Good.  
IMA World Health,  
Initiative Régionale de Documentation et d'Accompagnement Communautaire au Développement (IDRAC Sarl).  
International Federation of Red Cross and Red Crescent Societies (IFRC).  
International Medical Corps (IMC).  
Médecins Sans Frontières (MSF).  
Ministère de l'Environnement et Développement Durable (MEDD).  
Ministère de la Santé publique, Hygiène et Prévention,  
Novel-T.  
Open Street Map (OSM).  
PATH.  
Programme Elargi de Vaccination (PEV).  
Programme National de Lutte contre le Paludisme (PNLP).  
Référentiel Géographique Commun (RGC).  
Soins de Santé Primaires en Milieu Rural (SANRU).  
The International Organization for Migration (IOM).  
United Nations Children Fund (UNICEF).  
United Nations Development Programme (UNDP).  
United Nations Office for Project Services (UNOPS). Denmark and CO  
United Nations Office for the Coordination of Humanitarian Affairs (OCHA).  
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## V. Appendix 1 - Data Sources Table

Table 7: Data Sources

Source Acronym	Sourceid	Citation
BLSQ	BLSQ_001	Bluesquare (compiled by). Health facilities. 2022. Bluesquare - IASO. Accessed in 2022.
CIESIN MSPHP	CIESIN_MSPHP_001	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Haut-Katanga. 2021. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed on July 2021.
CIESIN MSPHP	CIESIN_MSPHP_002	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Lualaba. 2021. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed on July 2021.
CIESIN MSPHP	CIESIN_MSPHP_003	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Kasai-Oriental. 2021. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed on July 2021.
CIESIN MSPHP	CIESIN_MSPHP_004	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Kasai. 2021. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed on July 2021.
CIESIN MSPHP	CIESIN_MSPHP_005	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Kinshasa. 2021. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed on July 2021.
CIESIN MSPHP	CIESIN_MSPHP_006	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Lomami. 2021. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed on July 2021.
CIESIN MSPHP	CIESIN_MSPHP_007	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Kwilu. 2021. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed in 2022.
CIESIN MSPHP	CIESIN_MSPHP_008	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlement names and health facilities - Ituri. 2022. GRID3 - Cartographie pour la Santé/ Mapping for Health (M4H). Accessed in 2022.
CIESIN MSPHP	CIESIN_MSPHP_009	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: health facilities - Haut-Lomami and Tanganyika. 2019. GRID3 - Mapping Portfolio Accessed on August 9, 2019

Source Acronym	Sourceid	Citation
CIESIN MSPHP	CIESIN_MSPHP_010	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlements - Haut-Lomami. 2019. GRID3 - Mapping Portfolio Accessed on 2019.
CIESIN MSPHP	CIESIN_MSPHP_011	Center for International Earth Science Information Network (CIESIN) and Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Fieldwork data: settlements - Tanganyika. 2019. GRID3 - Mapping Portfolio Accessed on 2019.
DSNIS	DSNIS_001	Direction du Système National d'Information Sanitaire (DSNIS). Health facilities. n.d. Bluesquare - IASO. Accessed on March 16, 2022.
DSNIS	DSNIS_002	Direction du Système National d'Information Sanitaire (DSNIS). District Health Information System 2 (DHIS2) - Health facilities. 2024. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on November 11, 2024.
ESPK	ESPK_001	École de Santé Publique de Kinshasa (ESPK). Enquête de la Couverture Vaccinale (ECV) Chez les Enfants de 6-23 mois - Liste des établissements de santé (2020). 2020. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed in 2022.
ESPK	ESPK_002	Ecole de Santé Publique de Kinshasa (ESPK). Enquête de la Couverture Nationale de Vaccination (2021-2022). 2021-2022 Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on 2023.
ESPK	ESPK_003	École de Santé Publique de Kinshasa (ESPK). Fieldwork data: settlement names, health facilities, and points of interest - Maniema. 2024. GRID3 - Phase 2 Accessed in February 2024.
ESPK	ESPK_004	École de Santé Publique de Kinshasa (ESPK). Fieldwork data: settlement names, health facilities, and points of interest - Mongala. 2024. GRID3 - Fonds Accélérateur d'Equité (FAE) en RDC. Accessed on November 2024.
ESPK	ESPK_005	École de Santé Publique de Kinshasa (ESPK). Fieldwork data: settlement names, health facilities, and points of interest - Tshopo. 2024. GRID3 - Fonds Accélérateur d'Equité (FAE) en RDC. Accessed on November 2024.
ESPK	ESPK_006	École de Santé Publique de Kinshasa (ESPK). Fieldwork data: settlement names, health facilities, and points of interest - Kasai-Central. 2024. GRID3 - Phase 2 Accessed on July 2024.
ESPK GRID3 CIESIN	ESPK_GRID3_CIESIN_001	École de Santé Publique de Kinshasa (ESPK), GRID3, and Center for Integrated Earth Science Information (CIESIN). Fieldwork data: settlement names, health facilities, and points of interest - Kasai-Central. 2024. GRID3 - Phase 2 Accessed on July 2024.
ESPK GRID3 CIESIN	ESPK_GRID3_CIESIN_002	École de Santé Publique de Kinshasa (ESPK), GRID3, and Center for Integrated Earth Science Information (CIESIN). Fieldwork data: settlement names, health facilities, and points of interest - Maniema. 2024. GRID3 - Phase 2 Accessed on January 2024.
ESPK GRID3 CIESIN	ESPK_GRID3_CIESIN_003	École de Santé Publique de Kinshasa (ESPK), GRID3, and Center for Integrated Earth Science Information (CIESIN). Fieldwork data: settlement names, health facilities, and points of interest - Mongala. 2024. GRID3 - Fonds Accélérateur d'Equité (FAE) en RDC. Accessed on June 2022.

Source Acronym	Sourceid	Citation
ESPK GRID3 CIESIN	ESPK_GRID3_CIESIN_004	École de Santé Publique de Kinshasa (ESPK), GRID3, and Center for Integrated Earth Science Information (CIESIN). Fieldwork data: settlement names, health facilities, and points of interest - Tshopo. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on June 2022.
ESPK UCLA	ESPK_UCLA_001	École de Santé Publique de Kinshasa (ESPK) and University of California, Los Angeles. Villages - Kwilu. 2017. Accessed in 2018.
ESPK UCLA	ESPK_UCLA_002	École de Santé Publique de Kinshasa (ESPK) and University of California, Los Angeles. Boundaries - Vaccination Health Areas 2018. Accessed on October 2018.
GRID3 PEV Acasus	GRID3_PEV_Acasus_001	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: health facilities - Haut-Katanga. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on August 28, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_002	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: health facilities - Kasai-Oriental. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on July 11, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_003	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: health facilities - Kasai. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on July 30, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_004	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: health facilities - Sankuru. 2024. GRID3 - Phase 2. Accessed on October 3, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_005	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: health facilities - Mongala. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on November 25, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_006	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: settlement names - Haut-Katanga. 2024. Accessed on August 28, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_007	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: settlement names - Kasai-Oriental. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on July 30, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_008	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: settlement names - Kasai. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on July 11, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_009	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: settlement names - Sankuru. 2024. GRID3 - Phase 2. Accessed on October 3, 2024.
GRID3 PEV Acasus	GRID3_PEV_Acasus_010	GRID3, Programme Elargi de Vaccination (PEV) and Acasus. Fieldwork data: settlement names - Mongala. 2024. GRID3 - Fonds Accélérateur d'Équité (FAE) en RDC. Accessed on November 25, 2024.
IOM	IOM_001	International Organization of Migration (IOM). Displacement Tracking Matrix: Settlements n.d. IOM - Global Data Institute Accessed on July 2020.
MONUC GNS	MONUC_GNS_001	Mission de l'Organisation des Nations Unies en République démocratique du Congo (MONUC GNS) Settlements n.d. Accessed on November 14, 2024.
OMS DSNIS	OMS_DSNIS_001	Organisation Mondiale de la Santé (OMS) and Direction du Système National

Source Acronym	Sourceid	Citation
		d'Information Sanitaire (DSNIS). Health facilities. n.d. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed in 2020.
OMS DSNIS	OMS_DSNIS_002	Organisation Mondiale de la Santé (OMS) and Direction du Système National d'Information Sanitaire (DSNIS). Health facilities. n.d. Bluesquare - IASO. Accessed on March 16, 2022.
OMS GPEI	OMS_GPEI_001	World Health Organization (WHO) and Global Polio Eradication Initiative (GPEI) Settlements 2018. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed in 2022.
OMS ISS	OMS_ISS_001	Organisation Mondiale de la Santé (OMS). Health Center Supervision data. 2017-2021. OMS - Integrated Supportive Supervision (ISS). Accessed on March 19, 2021.
PATH GRID3	PATH_GRID3_001	PATH. Health facilities. n.d. Accessed on August 28, 2024.
PEV Acasus	PEV_Acasus_001	Programme Elargi de Vaccination (PEV) and Acasus. Health Center Supervision data. 2019-2024. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Last accessed on December 2024.
PEV Acasus	PEV_Acasus_002	Programme Elargi de Vaccination (PEV) and Acasus. High risk communities - Haut-Katanga and Tanganyika. 2023-2024 Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on May 2, 2024.
PEV CDC CIESIN	PEV_CDC_CIESIN_001	Programme Elargi de Vaccination (PEV), United States Centers for Disease Control and Prevention (CDC), and Center for Integrated Earth System Information (CIESIN). Fieldwork data: health facilities - Maniema. 2022. GRID3 - Mapping Portfolio Accessed on October 10, 2022.
PNLP IMA	PNLP_IMA_001	Programme National de Lutte Contre le Paludisme (PNLP) and IMA World Health. Pre-Registration Distribution Survey - Haut-Lomami. 2021. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on January 2022.
PNLP IMA	PNLP_IMA_002	Programme National de Lutte Contre le Paludisme (PNLP) and IMA World Health. Pre-Registration Distribution Survey - Ituri. 2021. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on June 2021.
PNLP IMA	PNLP_IMA_003	Programme National de Lutte Contre le Paludisme (PNLP) and IMA World Health. Pre-Registration Distribution Survey - Kwilu. 2022. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on July 2022.
PNLP IMA	PNLP_IMA_004	Programme National de Lutte Contre le Paludisme (PNLP) and IMA World Health. Pre-Registration Distribution Survey - Maniema. 2022. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on May 2022.
PNLP IMA	PNLP_IMA_005	Programme National de Lutte Contre le Paludisme (PNLP) and IMA World Health. Pre-Registration Distribution Survey - Tanganyika. 2020. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on March 7, 2024
PNLP IMA	PNLP_IMA_006	Programme National de Lutte Contre le Paludisme (PNLP) and IMA World Health. Pre-Registration Distribution Survey - Kwilu. 2022. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on August 2022.
PNLP SANRU	PNLP_SANRU_001	Programme National de Lutte Contre le Paludisme (PNLP) and SANRU. Pre-Registration Distribution Survey - Lomami. 2022. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on June 2023.

<b>Source Acronym</b>	<b>Sourceid</b>	<b>Citation</b>
PNLP SANRU	PNLP_SANRU_002	Programme National de Lutte Contre le Paludisme (PNLP) and SANRU. Pre-Registration Distribution Survey - Sankuru. 2022. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on May 2023.
PNLTHA UCLA	PNLTHA_UCLA_001	Programme National de Lutte contre la Trypanosomiase Humaine Africaine (PNLTHA) and University of California, Los Angeles (UCLA). Health facilities. 2018. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed in 2018.
PROSANI USAID	PROSANI_USAID_001	Programme de Santé Intégré de l'USAID en la République Démocratique du Congo (PROSANI USAID). Health facilities - Haut-Lomami. 2018-2020. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on February 5, 2020.
PROSANI USAID	PROSANI_USAID_002	Programme de Santé Intégré de l'USAID en la République Démocratique du Congo (PROSANI USAID). Health facilities - Tanganyika. 2018-2020. Ministère de la Santé Publique, Hygiène et Prévention (MSPHP). Accessed on February 5, 2020.
RGC	RGC_001	Reférentiel Geographique Commun (RGC) Localité 1994-2010. Accessed on 2018.



## VI. Appendix 2 - Data Sources Used by Province.

Table 8: Province Level Data Sources

province	sourceid	Source_ acronym_list	sourceid_list
Haut-Katanga	Haut-Katanga_001	CIESIN MSPHP, GRID3 PEV Acasus , PEV Acasus, GRID3 PEV Acasus , PATH GRID3	CIESIN_MSPHP_001, GRID3_PEV_Acasus_006, PEV_Acasus_002, GRID3_PEV_Acasus_001, PATH_GRID3_001
Haut-Lomami	Haut-Lomami_001	CIESIN MSPHP, PNLP IMA, OMS DSNIS, PROSANI USAID, PEV Acasus, CIESIN MSPHP, ESPK UCLA	CIESIN_MSPHP_010, PNLPI_MAI_001, OMS_DSNIS_002, PROSANI_USAID_001, PEV_Acasus_001, CIESIN_MSPHP_009, ESPK_UCLA_002
Ituri	Ituri_001	CIESIN MSPHP, ESPK, OMS GPEI, PNLP IMA, RGC, DSNIS, ESPK, OMS DSNIS, PEV Acasus	CIESIN_MSPHP_008, ESPK_002, OMS_GPEI_001, PNLP_IMA_002, RGC_001, DSNIS_001, ESPK_001, OMS_DSNIS_001, PEV_Acasus_001
Kasai	Kasai_001	CIESIN MSPHP, GRID3 PEV Acasus , PEV Acasus, GRID3 PEV Acasus	CIESIN_MSPHP_004, GRID3_PEV_Acasus_008, PEV_Acasus_001, GRID3_PEV_Acasus_003
Kasai-Central	Kasai-Central_001	ESPK GRID3 CIESIN	ESPK_GRID3_CIESIN_001
Kasai-Oriental	Kasai-Oriental_001	CIESIN MSPHP, GRID3 PEV Acasus , PEV Acasus, GRID3 PEV Acasus	CIESIN_MSPHP_003, GRID3_PEV_Acasus_007, PEV_Acasus_001, GRID3_PEV_Acasus_002
Kinshasa	Kinshasa_001	CIESIN MSPHP	CIESIN_MSPHP_005

province	sourceid	Source_ acronym_list	sourceid_list
Kwilu	Kwilu_001	ESPK, OMS GPEI, PNLP IMA, ESPK UCLA, RGC, BLSQ, DSNIS, PEV Acasus, PNLTHA UCLA, PNLP IMA, OMS ISS, CIESIN MSPHP	ESPK_002, OMS_GPEI_001, PNLP_IMA_003, ESPK_UCLA_001, RGC_001, BLSQ_001, DSNIS_001, PEV_Acasus_001, PNLTHA_UCLA_001, PNLP_IMA_006, OMS_ISS_001, CIESIN_MSPHP_007
Lomami	Lomami_001	CIESIN MSPHP, PNLP SANRU	CIESIN_MSPHP_006, PNLP_SANRU_001
Lualaba	Lualaba_001	CIESIN MSPHP, CIESIN MSPHP	CIESIN_MSPHP_001, CIESIN_MSPHP_002
Maniema	Maniema_001	PNLP IMA, PEV Acasus, ESPK GRID3 CIESIN, PEV CDC CIESIN	PNLP_IMA_004, PEV_Acasus_001, ESPK_GRID3_CIESIN_002, PEV_CDC_CIESIN_001
Mongala	Mongala_001	GRID3 PEV Acasus , ESPK GRID3 CIESIN, GRID3 PEV Acasus	GRID3_PEV_Acasus_010, ESPK_GRID3_CIESIN_003, GRID3_PEV_Acasus_005
Sankuru	Sankuru_001	GRID3 PEV Acasus , IOM, OMS GPEI, PNLP SANRU, DSNIS, PEV Acasus, OMS ISS, CIESIN MSPHP, GRID3 PEV Acasus	GRID3_PEV_Acasus_009, IOM_001, OMS_GPEI_001, PNLP_SANRU_002, DSNIS_002, PEV_Acasus_001, OMS_ISS_001, CIESIN_MSPHP_006, GRID3_PEV_Acasus_004
Tanganyika	Tanganyika_001	CIESIN MSPHP, PEV Acasus, PNLP IMA, OMS DSNIS, PROSANI USAID, PEV Acasus, CIESIN MSPHP, ESPK UCLA, DSNIS	CIESIN_MSPHP_011, PEV_Acasus_002, PNLP_IMA_005, OMS_DSNIS_002, PROSANI_USAID_002, PEV_Acasus_001, CIESIN_MSPHP_009, ESPK_UCLA_002, DSNIS_003
Tshopo	Tshopo_001	MONUC GNS, DSNIS, PEV Acasus, ESPK GRID3 CIESIN	MONUC_GNS_001, DSNIS_002, PEV_Acasus_001, ESPK_GRID3_CIESIN_004

## VII. Appendix 3 - Registry of irregular health areas.

### Definitions:

Special multipart health areas      Special health area units such as military, refugee camps, and governmental units, confirmed by the health authorities.

Multipart health area      Local administrative multipart health areas. They may exist due to administrative reasons, and are not yet confirmed by health authorities.

Multipart with islands      Health areas that extend over multiple islands and will appear as duplicates in the single part polygon layer. Those are artifacts due to geographical reasons.

province	province_id	antenne	zonesante	zs_uid	airesante	as_uid	date	note
Kasaï-Oriental	fgHCmGhaP2X	Mbuji-Mayi	Bibanga	pzMw9DUQ6An	Bibanga	YbttFa8aftt	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Kowe	sAsXOxBdrE	Dilala Kolwezi	wEOz5epOVfB	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Vangu	uluYpiQm6m8	Kimbeimbe	utC1Fm0pB7j	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Kowe	sAsXOxBdrE	Kamalondo	yAH9S9fuKFR	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Kowe	sAsXOxBdrE	Préfabriqué	gpg0YaSRoxB	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Kowe	sAsXOxBdrE	DAC Kipushi	taSZWgVQbti	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Vangu	uluYpiQm6m8	Maréchal	fkkeLx3SXw	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Vangu	uluYpiQm6m8	Flotte	zN6xmj6W8fx	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Kowe	sAsXOxBdrE	GMI	iWBPXnbvLDh	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Vangu	uluYpiQm6m8	Vangu	zudkXcmk6nh	2024	special multipart health areas
Haut-Katanga	F9w3VW1cQmb	Lubumbashi	Ruashi	YFSLTWHFIOk	Luwowoshi	RNVnLCvkEOV	2024	special multipart health areas
Haut-Lomami	fEKDiQluqeE	Kamina	Kamina	TOYXktZkPCF	Centre Urbain	MMtNuNNYq91	2024	special multipart health areas

province	province_id	antenne	zonesante	zs_uid	airesante	as_uid	date	note
Haut-Lomami	fEKDiQluqeE	Kamina	Kaniama	guov7iiEM6c	Kaniama 2	q6IFKDrptQl	2024	special multipart health areas
Tanganyika	hyvduSNKvfe	Kalemie	Nyemba	SpDmHrCCVal	Bilila	KUC2fK4lzyt	2024	multipart with islands
Tanganyika	hyvduSNKvfe	Kalemie	Nyemba	SpDmHrCCVal	Kabimba	zKd2sOafAEX	2024	multipart with islands
Tanganyika	hyvduSNKvfe	Kalemie	Kiambi	pCawLGK8jaD	Kiambi	i7xBPacuUGUG	2024	multipart health area
Lualaba	dJ3v8xc6ZIK	Lubumbashi	Kowe	sAsX0xkBdrE	Dilala Kolwezi	wEOz5epOVfB	2024	special multipart health areas
Kinshasa	TwSa8zUu09Q	Kinshasa-Ouest	Police	kyBo3gA8qoh	PIR Kimbondo	PGFtLEa7pnj	2024	special multipart health areas
Kinshasa	TwSa8zUu09Q	Kinshasa-Ouest	Kokolo	Ab6jrKWO5EZ	Meteo	AVK2Nfft1dQ	2024	special multipart health areas
Kinshasa	TwSa8zUu09Q	Kinshasa-Est	Nsele	m0D9iUAjJ1G	Fleuve	yuX6qXQKOr4	2024	multipart with islands
Ituri	Q4cbnIAo10f	Bunia	Fataki	FDNwbfrJhkA	Duvire	e1md3ia84ui	2024	special multipart health areas
Ituri	Q4cbnIAo10f	Bunia	Gety	X8zFJ7DJIRD	Kagoro	T2S585l7FfC	2024	multipart with islands
Ituri	Q4cbnIAo10f	Bunia	Fataki	FDNwbfrJhkA	Lenga	DrK5cxm5AYN	2024	special multipart health areas
Kasaï-Central	I8CuQpdBQfP	Kananga	Bobozo	MIE1k08houk	Camp Kamayi	A4ynIXwXoQp	2024	special multipart health areas
Kasaï-Central	I8CuQpdBQfP	Kananga	Bobozo	MIE1k08houk	District PNC Ouest	VKkcchihfZ	2024	special multipart health areas
Kasaï-Central	I8CuQpdBQfP	Kananga	Bobozo	MIE1k08houk	Mine Et Hydrocarbure	Ze3feyxvRJO	2024	special multipart health areas
Kasaï-Central	I8CuQpdBQfP	Kananga	Bobozo	MIE1k08houk	Ville	AKqeV5YZomu	2024	special multipart health areas
Mongala	krWZMdwGDIf	Bumba	Yamaluka	Yo6u0UIHrfc	Mbamba	RVFKPIbaH1X	2024	multipart health area