



INDIA

Haryana: Geographic Information System



Haryana Health GIS: Leveraging Technology to Strengthen Evidence-based Decision Making in Public Health

Use of information technology has increasingly become an important part of the public health landscape. Geographical Information System (GIS) is being seen as a key innovative approach that can enable health managers and decision makers to better manage, monitor, and plan health programs and activities.

Geographic Information System (GIS) is a computer system designed to capture, store, manage, analyze, and display all types of spatial or geographical information. GIS maps and mapping tools can help transform the raw data collected by health information systems into easily accessible, meaningful, and timely information that equips health managers with compelling evidence to make decisions that are both robust and agile.

Enhancing Data Use for Decision Making is a Key Thrust of the USAID-funded Health Finance and Governance (HFG) Project in India

The Government of Haryana has partnered with the HFG project to launch several initiatives to enhance the quality and use of data to improve the public health system's practice and performance. The need is imperative for Haryana, which paradoxically continues to lag on child and maternal health indicators despite being a fast-growing, economically strong state of India. Plugging service delivery gaps and better targeting priority health services urgently demands greater emphasis on evidence-based decision making, which in turn necessitates consistent improvements in use of public health data to monitor, evaluate, and initiate course correction. National Health Mission (NHM), Haryana, has been focusing on the adoption of innovative measures to strengthen data quality and data use for improved decision making. The development and launch of the innovative Haryana Health GIS (HHGIS) application is a strategic step in this direction.

Haryana Health GIS (HHGIS)

The HFG project, working in close partnership with NHM Haryana, has developed Haryana Health GIS (HHGIS) — an interoperable real-time GIS application that pulls together data from different health information systems and brings it onto one interactive, visually rich interface, enabling its users to easily access and analyze a major quantum of data. By presenting data in a visual format, GIS maps make the information more accessible, meaningful, and actionable.

The launch of HHGIS application marks a major improvement over the previous process the state used, wherein the large volumes of data routinely produced by numerous program-specific standalone health information applications lay in individual silos. Difficulty in cohesively accessing and analyzing much of this data impeded its systematic use to inform and improve program activities. The interoperable HHGIS application addresses this gap by fetching data from the disparate health information applications through Simple Object Access Protocol (SOAP) web service and displaying it onto a single screen as interactive digital maps. HHGIS has already been **linked with 12 existing applications**: Supportive Supervision (SS), Concurrent Evaluation (CE), Civil Registration System (CRS), Anaemia Tracking Module (ATM), Maternal and Infant Death Reporting System (MIDRS), Rashtriya Bal Swasthya Karyakram (RBSK), Referral Transport (RT), District Health Information System-2 (DHIS-2), District Level Household and Facility Survey-3 (DLHS-3), District Level Household and Facility Survey-4 (DLHS-4), Home-Based Post Natal Care (HBPNC), and Medical Mobile Unit (MMU).

HHGIS: Key features and functionalities

Open source software: HHGIS has been built using Leaflet, a popular open source JavaScript mapping library. Leaflet uses FreeBSD license, which is also compatible with GNU GPL, and makes the library available for use, modification, and updates. HHGIS has been programmed in JavaScript, HTML, JQuery, and Cascading Style Sheet (CSS). The shape files have been converted from shp format to GeoJSON format, as it is simpler, lighter, and handled well by Leaflet.

Plugin free: Being plugin free, HHGIS can work on any modern browser in any operating system.

Interoperability: HHGIS is an interoperable application linked to different existing health information applications through a master key to avoid ambiguity, toponyms resolution, and disambiguation. It currently uses Mother Child Tracking System (MCTS) ID as the master key from district to sub-center (SC) level. Twelve source applications are linked with HHGIS as of now but there is possibility of adding 'n' number of applications.

Real-time visualization: HHGIS enables real-time visualization, analysis, and understanding of the data fed into the different source applications linked with it. Non-spatial data from different information applications is converted into spatial format in real time. Any authorized person can access the web-based HHGIS application from anywhere at any time.

Interactive, flexible user interface: HHGIS user interface provides the user the flexibility to view a data element, indicator, or combination of choice. The user can also decide on the number of classes into which the data is divided and the range thereof.

Custom indicators: HHGIS allows the user to create one's own provisional indicators to meet specific programmatic needs. Custom indicators can be created by using data from the same or different linked source applications.

Drill-down facility: This feature allows the user to click on a particular district to drill down to its community health center (CHC), primary health center (PHC), or SC service area. The feature is useful for root cause analysis to generate facility-level insights about where successes and challenges lie.

Other useful functionalities: HHGIS allows layering of dataset, where the user can compare two datasets for any hypothesis or result. Functionalities like pop-up (display of information when the mouse hovers on a particular polygon), pan (facility to drag a map), and zoom (facility for zooming in/out) are also included.

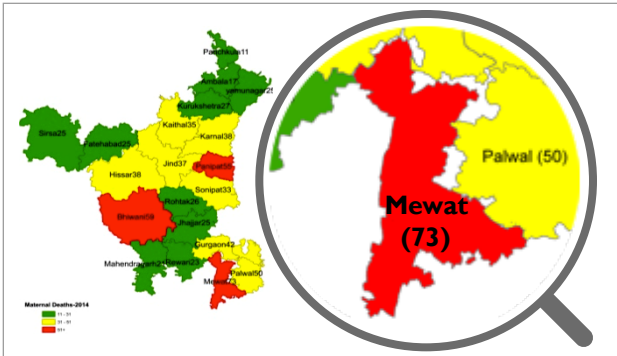
HHGIS: A Robust Analytical and Monitoring Tool

Over the last few years, Haryana has seen a proliferation of standalone health information applications for various national and state health programs and schemes. Accessing, maneuvering, and using the sheer quantity of raw data captured by these independent information applications has proved tedious and difficult. HHGIS seeks to address this challenge by making the data easily accessible and usable for analysis and monitoring. Most importantly, in line with the state's health priorities, HHGIS can bolster data use for analyzing the variations in RMNCH+A-related health outcomes between districts, blocks, and facilities right up to the SC level. Four crucial ways in which HHGIS enables greater data use are: visual display of data in the geographical context, drill down to facility-level data, data comparisons, and the flexibility to create custom indicators. How these HHGIS attributes play out for data analysis and monitoring has been briefly explained below through actual data and screenshots from the HHGIS application.

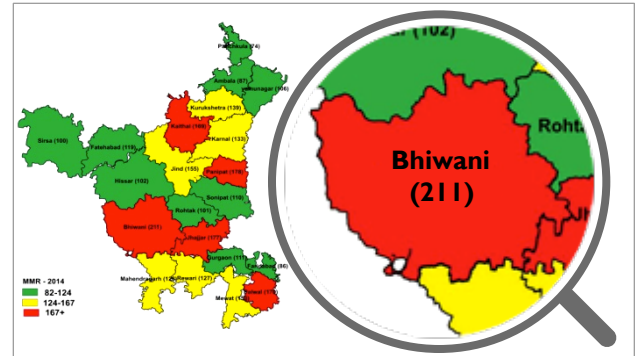
Making data accessible and meaningful

Among the key advantages of the geo-spatial technology used by HHGIS is the ability to display data in the geographical context of choice. HHGIS allows the user to view on a map the data for all the health facilities operating at a level, that is, CHC, PHC, or SC. Further, the user can display data elements (raw recorded data on health events, for example, number of maternal deaths) as well as indicators (data elements placed in context, for example, maternal mortality rate [MMR]). Interesting insights emerge when these displays are examined closely. For example, in HHGIS Screenshot 1, while the highest number of maternal deaths is reported by district Mewat (73), the MMR, as seen in Screenshot 2, is highest for district Bhiwani (211), calling attention to the need for further exploration.

Screenshot 1: Number of Maternal Deaths in Districts of Haryana



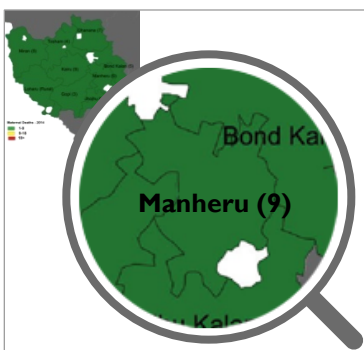
Screenshot 2: Maternal Mortality Rate in Districts of Haryana



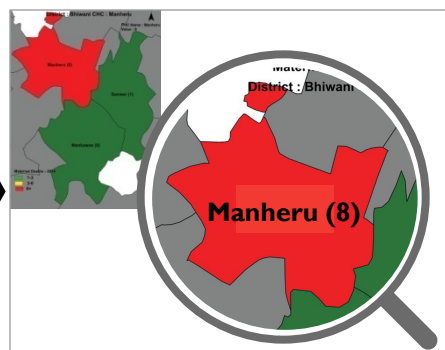
Enabling deep-dive analysis

Incorporation of the drill-down facility enables the HHGIS user to explore to the lowest facility level for deep-dive analysis, allowing a better understanding of where the challenges lie vis-à-vis a certain data element/indicator. Using the same example as above, drill-down for district Bhiwani reveals a disproportionately high number of maternal deaths being reported by CHC Manheru (Screenshot 3), within which it is PHC Manheru (Screenshot 4) that is skewing the numbers. Further drill-down identifies Kaunt as the SC (Screenshot 5) reporting the highest number of maternal deaths. Such root cause analysis is critical for design and deployment of area-specific strategies.

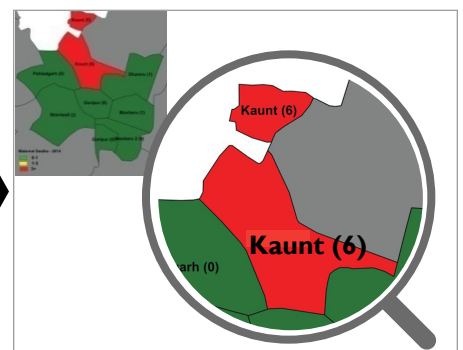
Screenshot 3: Maternal Deaths at CHC Level in Bhiwani District, Haryana



Screenshot 4: Maternal Deaths at PHC Level under CHC Manheru



Screenshot 5: Maternal Deaths at SC Level under PHC Manheru



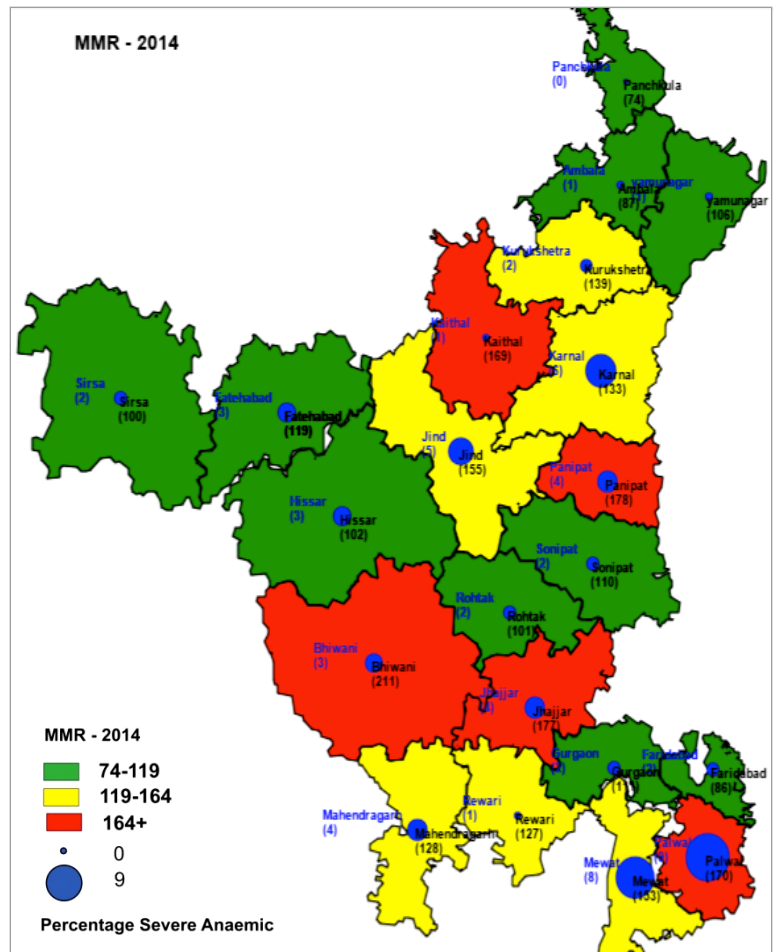
Generating new insights

The ability to make data comparisons is another useful analytical feature of the HHGIS application. The user can compare two data elements/ indicators from the same or different linked source applications. Although clear and direct causal relationships between service delivery events and health outcomes are difficult to establish, data comparisons can certainly help point to areas that need further exploration. Some new insights about a program's performance can emerge, for example, when a comparison is made between MMR and percentage of severely anemic women. Here, Screenshot 6 shows that districts with MMR less than 119 have low severe anemia rate (less than 3 percent). As the map indicates, in districts like Palwal and Mewat, where both MMR and severe anemia rates are high, there may be a need to accelerate activities related to anemia reduction.

Meeting unique programmatic needs

HHGIS allows the user to create one's own provisional custom indicators, enabling the analysis to go beyond the constraints of existing data frames. Using two parameters from two different sources, a unique provisional indicator can be created to meet specific needs. For example, the RBSK application carries data about childhood deficiencies and disabilities, etc., but has no indicators. Using HHGIS, the user can create indicators as per need to put raw data into more insightful contexts.

Screenshot 6: Comparison of Data on Percentage of Severely Anemic Women and MMR



The Way Forward

A strong first-phase build of the HHGIS application is ready for use and being integrated by the state NHM. The application is currently linked with 12 existing health information applications. Subsequently, the state IT team will link it with numerous other health applications through web service. The robust framework of the HHGIS application also lends itself to flexible function expansion. The next phase could, thus, look at adding functionalities like real-time tracking of referral transport vehicles; inclusion of urban health data in terms of point data and coverage area; buffering and spatial analysis for point data in terms of nearest facility center; and a module for rationalization of service area and health facility point. However, mainstreaming the innovative application's use and fully leveraging its potential as an analytical and monitoring tool will most crucially require intensive focus on capacity building of state and district staff, like program officers and project management staff.

The Health Finance and Governance (HFG) project works with partner countries to increase their domestic resources for health, manage those precious resources more effectively, and make wise purchasing decisions. Designed to fundamentally strengthen health systems, the HFG project improves health outcomes in partner countries by expanding people's access to health care, especially to priority health services. The HFG project is a five-year (2012-2017), \$209 million global project funded by the U.S. Agency for International Development under Cooperative Agreement No. AID-OAA-A-12-00080.

The HFG project is led by Abt Associates in collaboration with Avenir Health, Broad Branch Associates, Development Alternatives Inc., Johns Hopkins Bloomberg School of Public Health, Results for Development Institute, RTI International, Training Resources Group, Inc. For more information visit www.hfgproject.org/

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