N°14 POLICY NOTES

MAPPING CARE: INNOVATIVE TOOLS FOR GEOREFERENCING CARE SUPPLY AND DEMAND IN LATIN AMERICA AND THE CARIBBEAN

Author: Daniela de los Santos*

Abstract

This document provides an overview of the main applications of the Care Georeferencing Tool developed by the Gender Team of the United Nations Development Programme (UNDP) Regional Hub for Latin America and the Caribbean. The objective of this tool is to facilitate the construction of care maps—a key step during the design of comprehensive care policies and systems at the national and local level.

This tool has three main objectives: systematize and generate updated, real-time information about the care supply within a city or area; study the territorial distribution of the population that needs or may need care, such as children, persons with disabilities or older persons; and analyze whether the care supply is sufficient when compared to the care demands of the population in that territory. It combines the more traditional approaches of gender and urban analysis with innovative methodologies based on web scraping and data mining, collaborative mapping and crowd mapping, providing valuable insights in scenarios where data is scarce.

Key Messages

» The Care Georeferencing Tool seeks to be a practical instrument that can be used during the construction of assessments on the social organization of care which are sensitive to territorial specificities.

» It addresses the mapping of the supply of care (from the public, private, family and community spheres), the demand for care (identifying the location of those who require care) and the gaps between supply and demand at the territorial level.

» It incorporates traditional data sources (administrative records, census data, surveys) with innovative data sources (big data, crowd mapping, collaborative mapping).

» It uses open software and demands user-level computational power throughout all the stages of its application.

» After obtaining results, data visualization exercises are proposed which can be oriented towards dissemination as well as building intermediate interactive platforms to be used by decision makers.

» The tool is flexible and adapts to the needs of the project. Users can select the stages they want to execute (e.g., they can choose to only map care supply) and limit the care providers (e.g., to the private sector or the community sector).

* Programme Associate Officer Inclusive Growth and Social Protection, Gender Team, UNDP Regional Hub for Latin America and the Caribbean.

Recommendations

» The planning process to apply the Care Georeferencing Tool must consider an updated baseline of administrative records that have georeferenced data on care supply and demand.

» Data mining and web scraping techniques are recommended to generate databases on private care centers, containing basic data such as location, type of center, contact information, website and opening hours, and more.

» Collaborative and crowdsourced mapping are valuable techniques for tracking community-based care in the territory. Likewise, they are practical tools to carry out in-depth characterization of services already mapped using other techniques, and to track care services in rural areas with low connectivity.

» Using algorithms that allow users to distinguish accessibility of care centers through different modes of transport (transit, private transport, bicycle, walking) is highly recommended to map gaps.

1. Introduction

Despite substantive progress towards gender equality, gender gaps in different economic and social dimensions are still large in Latin America and the Caribbean (LAC). Evidence shows there is an unbalanced distribution of responsibilities and time between social actors (states, private sector, communities, and families), where families and particularly women bear the highest burden of care and domestic responsibilities (Moos, 2021). In fact, in LAC countries, women allocate on average three times more time to unpaid domestic and care work when compared to men, and these gaps are higher in the poorest income quintiles (UNDP, 2021; ECLAC, 2021).

Inequalities derived from traditional gender roles and the sexual division of labor limit women's economic autonomy, as they reduce women's chances to participate in the labor market and penalize them when they do participate (Folbre, 2018; Jee et al. 2019). Thus, women have become over-represented in informal employment, unemployment, underemployment, part-time work, self-employment, and smaller firms (Otobe, 2017; Espino, 2012; Duffy, 2011). Women also earn less than men on average and face more restrictions to access financial and digital assets (UNDP, 2019). In line with this, women unpaid caregivers, who depend on other household members to access income and other resources, have been shown to be in a subordinate position when it comes to intra-household bargaining and decision-making processes (Doss, 2021; Folbre 2018). In consequence, economic autonomy is intertwined with bodily and decision-making autonomy, i.e., women's ability to make decisions regarding their home, their community, and even their own lives and bodies (ECLAC, 2016).

In this context, the 2030 Agenda and the Sustainable Development Goals (SDGs) highlight that gender equality and women's empowerment are essential for the achievement of sustainable development. The 2030 Agenda aspires to a world in which respect for human rights and the dignity of persons is universal, and in which "every woman and girl enjoys full gender equality and all legal, social and economic barriers to their empowerment have been removed." Gender equality is an essential aspect to "leave no one behind", as women are over-represented among the furthest behind.

Aligned with these global and regional agendas,[1] LAC countries are taking action to address the structural causes of gender inequality and its consequences. Many countries are advancing not only in care policies that recognize, reduce and redistribute care work, but in comprehensive care systems.

The notion of **comprehensive care systems** refers to the integration of novel and existing policies and regulations on care issues (ranging from parental leave to care centers, professionalization of paid domestic workers, cultural transformation policies, among others), and their articulated expansion to universalize access to services and guarantee the right to give and receive care. The creation of comprehensive care systems can also be considered as an engine for a socioeconomic recovery that leaves no one behind, since they have the potential to generate employment directly and indirectly, as well as to facilitate other sectors of the economy to function properly.

Designing a comprehensive care system is complex and requires gathering exhaustive evidence about different issues: time use, care supply and demand, the labor market and macroeconomic indicators and projections, demographic indicators and projections, and more. Collecting and systematizing georeferenced indicators is key to prevent implementation gaps.

This document describes a UNDP tool that has been designed to facilitate the process of building territory-oriented assessments of care, hereinafter *care maps*: the **Care Georeferencing Tool**. It focuses on measuring and georeferencing supply of and demand for care in the territory, as well as how well they connect to each other, through multiple strategies.

The following section delves into the concept of mapping care and its implications. Section 3 is the core of the document, describing the objectives of the Care Georeferencing Tool, its different stages, detailing methodologies and data sources, and providing real examples. Finally, a summary is provided in the last section.

1 The Regional Agenda on Gender Equality goes back 45 years, with the celebration of the First Regional Conference on the Integration of Women in Economic and Social Development of Latin America (Havana, 1977), which opened a space for regional exchange after the World Conference of the International Women's Year (Mexico City, 1975). Fourteen regional women's conferences have been held since then, identifying the key issues and drivers of inequality, as well as establishing strategies and action plans to forward gender equality in LAC countries (see ECLAC 2017).

2. What does mapping care mean?

During the process of designing a comprehensive care system, it is necessary to have concrete evidence about where caregiver institutions are located, as well as how the people that need care are distributed in the territory, in order to efficiently connect the two. In that sense, *mapping care* implies **building a diagnosis about the social organization of care that is sensitive to territorial specificities**. Some of the key questions to address in the process are: where is the demand for care located? What are the specific needs of the care-dependent population? Which care-provider actors are present in the local social fabric? And how well are they connected to the population that need care? This will allow users to pinpoint where the most crucial care deficits are, and to plan accordingly.

A *care map* can help researchers observe how an extensive number of indicators behave in the territory, whether they are related to the demand for care (i.e., indicators about dependency, sociodemographic trends and distributions, etc.) the supply of care (private, public, community-based, family-based), or other dimensions indicative of social characteristics of the territory, mobility patterns of the population, or employment and education opportunities (Scuro, 2021). For this reason, care maps are pivotal not only during the design stage of a care policy's comprehensive care system, but they also provide valuable information during the implementation process and the monitoring and evaluation stages.

Some of the main challenges of building a care map are related to the scarcity of data with sufficient geospatial disaggregation. Most data gathered at the national level lack representativeness in small geographic units; census data might in many cases be outdated, and administrative records are often dispersed, kept in different formats and by different levels of government.

In order to face some of those challenges, the Care Georeferencing Tool presented below provides a set of tools to georeference and measure spatial distance between supply of and demand for care by combining traditional and innovative approaches that can adapt very well to scenarios where data is scarce.

3. Care Georeferencing Tool: mapping the supply of and demand for care

This chapter presents the highlights of UNDP's Care Georeferencing Tool. The first section states its objectives and stages. The second section provides an overview of each stage, discussing the advantages and limitations of the potential data sources in a care mapping process.

3.1. Tool objectives

The Care Georeferencing Tool has three main objectives:

1) Systematize and generate updated, real-time information about the care supply within a city or area.

2) Study the territorial distribution of the population that needs or may need care, such as children, persons with disabilities or older persons.

3) Analyze whether the care supply is sufficient when compared to the care demands of the population in that territory.

Therefore, this strategy aims to georeference the provision of care by the four main providers of care: the public sector, the private sector, the community, and families.

The following sections propose and explain a combination of methodologies to accomplish this. While some of the data required to further the analysis will come from traditional data sources, such as censuses and household surveys, other publicly available data will be processed through innovative techniques based on data scraping, data mining, crowdsourcing, and others (see Box 1).

Box 1. Checklist of potential data sources

This strategy builds on different data sources.
The availability of each one must be checked and considered before designing a workplan.

Administrative Records:
» Shapefiles/Databases with the geolocation of care centers by type and target population
» Care centers' enrollment data or capacity data
» Business directories
» Georeferenced birth statistics
» Georeferenced registries of beneficiaries/participants of different social policies

Data from the Statistical Institutes:
» Census data and Household Surveys data
» Business Census

Data mining and Web Scraping:
» Google Application Programming Interface (APIs): Places, Distance Matrix, Geocoding, Directions, among others.
» Overpass API (OpenStreetMap data)
» Facebook Data for Good High Resolution Population Density + Demographic Estimates
» OSRM API (routing service based on OpenStreetMap data)

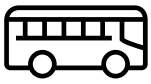
Crowdsourcing mapping:
» Field or virtual surveys
» Coordinated mapping events (Mapathons)
» Social cartography initiatives

There are three basic stages in the Care Georeferencing Tool (Figure 1), which will be described in the following sections alongside practical examples of real cases where the tools have been applied. Each stage relates to each objective of the strategy listed above: mapping care supply, mapping care demand and mapping gaps between the two. The entirety of the process can be performed with open software and user-level computational capacity (see Box 2).

Figure 1. Stages of the Care Georeferencing Tool.

Stage 1: Mapping Care Supply
Mapping care services in a celected city/area through multiple strategies

Stage 2: Estimating Care Demand
Through census data, georeferenced population projections, and other sources



Stage 3: Estimating Accessibility
Modelling accessibility and spatial mismatch between care services and those who need them

3.2. A stage-by-stage overview

3.2.1. First stage: Mapping Care Supply

In order to have updated, centralized data about the care supply from the four main providers of care, different data sources and methodologies are combined through the workflow specified in Figure 2. Generally, care provided by families will be tracked and mapped through census or household survey data. On the other hand, mapping the public care supply will imply, in most cases, formally requesting (when open data are not available), gathering, systematizing, and combining administrative records. However, it should be noted that administrative records might be incomplete or outdated in some cases.

Box 2. Using open software to map care

The following table provides a summary of the software packages recommended for the Care Georeferencing Tool.

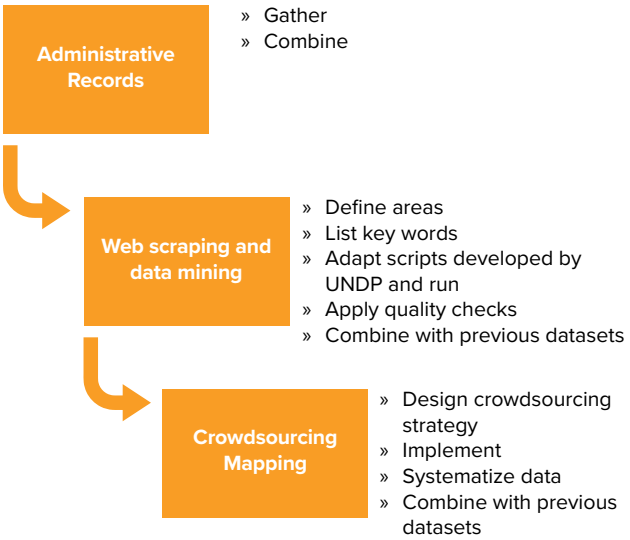
Software*	Stage of the strategy where its use is recommended
R | Python	» Data mining and web scraping » Statistical and geospatial analysis » Data visualization
QGIS	» Statistical and geospatial analysis » Data visualization
QField	» Crowdsourcing mapping events and field work
KoboToolbox	» Crowdsourcing mapping: field or virtual surveys
Tableau Public (alternative: PowerBI)	» Data visualization
Spreadsheet software (e.g., Google Sheets, Excel, or other alternatives)	» Simple data management and storage
SQL (optional)**	» Complex data management and storage

* This is a primary list. The final choices should be adapted to the project.
** This might be necessary when large datasets are being built, for instance, for country-level projects.

In terms of mapping private and community-based care services, the first step should be to track any available official records, coordinating with different levels of government. However, it is more common for these records to be scarce and incomplete in the LAC region. For this reason, it is suggested that researchers combine innovative techniques of web scraping,[2] data mining,[3] collaborative mapping[4] and crowdmapping[5] to obtain a detailed picture.

2 Web scraping is a process used to extract data from websites.
3 Data mining refers to statistical and computational analysis that aims to discover patterns in large volumes of data.
4 Collaborative mapping refers to the development of web-based maps generated and maintained by a user or a community of users.
5 Crowdmapping refers to the aggregation of crowd-generated posts combined with geographic data. It is a form of crowdsourcing, where tasks that were usually carried out by officials or consultants are outsourced, leaving them in the hands of a large group of people.

Figure 2. Workflow to map care supply with a combination of data sources.



Potential data sources to map care: uses and implications

Requesting, gathering and combining existing administrative records

Administrative records from sectoral institutions (such as Ministries of Education, Social Development, Health, Women, and others) are key, to obtaining first-hand information on the public supply, and also on the private supply of care. Two aspects must be considered. First, administrative records made available as open data may not suffice for the proposed mapping exercise, so it might be necessary to make timely official information requests. Secondly, it should be considered that occasionally it will be necessary to request administrative records that are decentralized at different levels of administration, including the municipal level.

Those records should contain information on names and addresses of different kinds of care centers (depending on the target population considered in each case), as well as geographical coordinates, phone numbers and any other relevant information. Some of that information will be especially relevant for later stages. For instance, enrollment data from public centers (e.g., daycare centers) can be used as a proxy of the centers' capacity, thus, it can be used to compare coverage with demand. Business censuses can also be very useful, if they were conducted recently. All the available records should be gathered, compared, cleaned (checking for duplicated information), and homogenized into a similar format.

Web scraping care services data

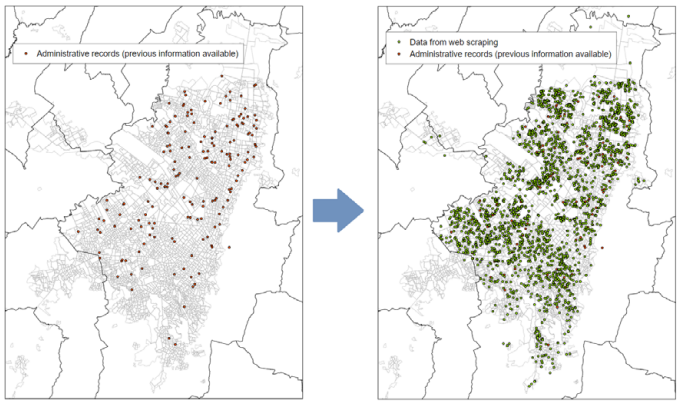
Data scraping and data mining are innovative tools that can provide accurate and novel information during a mapping exercise and are especially useful for mapping services that are not included in the available administrative records. In general terms, they imply extracting, parsing and cleaning data from websites that contain georeferenced, open data.

Multiple data sources can be web scraped for this purpose. The Care Georeferencing Tool outlined in this document recommends one particular API service: the Google Places API, which supports location-based services and business (and other institutions and places) searches from Google Maps data. Google Maps contains billions of publicly available points of georeferenced data at the global level, which allows the researcher to extract updated information on care centers with different target populations both in urban and rural areas (for further technical details, see Box 3).

In addition to this, the Care Georeferencing Tool also provides the possibility to apply web scraping using other open data sources. For example, it can exploit the Overpass API, which allows massive data downloads from OpenStreetMap. However, after extensive testing, it has been found that the main advantage of using Google services has to do with the large amount of information available regarding care services provided by different providers, and in different modalities. To date, it is the most complete data source in this regard. An example of results obtained through exploiting the Google Places API can be found in Figure 3.

Consider that the web scraping and data mining strategy can be tailored to the project needs and expanded to other sources if necessary.

Figure 3. Private childcare services in the city of Bogota, obtained through administrative records (left), and scraping and data mining results (right).



Source: Results obtained during the application of the Care Georeferencing Tool in the city of Bogota. Some of the keywords used in this web scraping exercise were, in English: childcare, kindergarten, daycare; in Spanish: jardín infantil, preescolar, guardería.

Box 3. Practical applications of Google Places API to scrape care services data

Google Places API is a Google product which supports location-based business (and other institutions and places) searches from the Google Map data. It runs in JavaScript but can be accessed through other programming languages like R or Python. Using a georeferenced or text-based query, Google Places API generates a response from Google's geospatial query model.

Using this API, it is possible to fetch information about points of interest in a circumferential area for a given radius. The format of results is either JSON or XML, filetypes which are easy to parse and convert into structured datasets. The output contains, for each point matching the query, geographic coordinates, place name, address, type of place, permanently closed status, and other relevant information such as international phone number, photos, opening hours, reviews and user ratings (see Figure 4). Accessing the Google Places API and making text queries can be most useful for mapping specific kinds of services.

As a first step to scrape care-related data, a list of keywords must be created. As a second step, those keywords are inputted in a script that is programmed to run queries looping through the neighborhoods of the selected city, searching for places that match the provided description. Finally, extensive, semi-automated data cleaning and quality checks are necessary to filter false positives and duplicates.

Some drawbacks of using Google API data and ways to minimize them

» Google Places API limits the number of results per request to 60. These results are fetched in groups of 20, so the results must be handled in iterations. Since the maximum number of objects for each item is restricted, a small area should be selected to prevent the effects of censored data (Saltman & Altunbey, 2014). UNDP has developed a function using the R package *googleway* that iterates queries neighborhood by neighborhood within a city, so this drawback is resolved. However, two things must be taken into consideration: 1) in large cities, these iterations take some time to run, and 2) when a certain monthly query-limit is hit, Google will charge the researcher or institution running the code for the next queries.

» All data used in the computation are maintained by Google, and thus a user has neither control over its quality nor any editing rights. While the Google Maps data has a reputation for good quality, it is not completely free of errors. However, this can be resolved by incorporating crowdsourcing initiatives into the strategy.

» Without administrative records, census records or a direct contact with care services owners or managers, the capacity of the care centers will remain unknown. However, extra information gathered from the Google Places API (for instance, telephone number, website, opening hours) can be used to try and recover the missing data through other means (e.g., brief telephone surveys, crowdsourced mapping initiatives).

Figura 4. List of variables obtained from Google Places API

Variable	Value (example from the first result in text query: "daycare Montevideo")
business_status	OPERATIONAL
formatted_address	Av Dr Carlos Nery, 12200 Montevideo, Departamento de Montevideo, Uruguay
geometry.location.lat	-3.483.950
geometry.location.lng	-5.613.037
geometry.viewport.northeast.lat	-3.483.817
geometry.viewport.northeast.lng	-5.612.903
geometry.viewport.southwest.lat	-3.484.087
geometry.viewport.southwest.lng	-5.613.173
icon	maps.gstatic.com/mapfiles/place_api/icons/school-71.png
id	b2e6473a2daa90398804c-c0793ec300034cdb1f4
name	Jardín La Tortuguita
opening_hours	TRUE
place_id	ChIJbz5ycA4qoJURebpnYD3541o
plus_code.compound_code	5V69+6V Montevideo, Montevideo Department
plus_code.global_code	48Q55V69+6V
rating	4.0
reference	ChIJbz5ycA4qoJURebpnYD3541o
types	c("point_of_interest", "establishment")
user_ratings_total	4
photos	NULL
permanently_closed	NA
international_phone_number	+598 2514 6592
[["opening_hours"]][["weekday_text"]]	"Monday: 12:00 – 6:00 PM" "Tuesday: 12:00 – 6:00 PM" "Wednesday: 12:00 – 6:00 PM" "Thursday: 12:00 – 6:00 PM" "Friday: 12:00 – 6:00 PM" "Saturday: Closed" "Sunday: Closed"
reviews	(list of every review)
url	maps.google.com/?-cid=6549352325132565113
vicinity	Avenida Doctor Carlos Nery, Montevideo

Crowdsourced mapping

It is likely that neither official data sources nor data scraping techniques will obtain a complete overview of the care centers in a city or area. Specifically, community-based care centers and small neighborhood-level care centers could be harder to identify. Collaborative real-time mapping by volunteers, government officials, grass-root organizations or specific hires can be an important strategy to complete the georeferencing process.

Crowdsourced mapping can be used to complete information on the centers already identified through other techniques, to carry out field searches in neighborhoods where other tools did not identify a critical number of services, or to identify and characterize a specific type of care supply. This methodology can prove useful, for example, in remote, rural areas or small towns, where business owners do not regularly use ICT tools to update their data on online platforms. Moreover, it can gather information about community-oriented care initiatives.

The methodology for collaborative mapping should be discussed and tailored to the project needs. For instance, mapathon events (collaborative mapping 'marathons') can be organized in selected areas to identify, map and characterize care facilities, with the participation of volunteers (e.g., university students, government officials, members of the community, etc.) or hired staff. These participants can map new centers they come across in the field and validate the results obtained in previous stages of the georeferencing strategy.[6] Similar methodologies can be implemented over longer periods of time with a smaller team of mappers or enumerators.

Taking advantage of ICT tools and conducting online crowdsourced mapping initiatives is another option. Moreover, social cartography workshops are yet another valuable exercise that can be conducted during mapping initiatives. A practical example of a combined crowdsourced mapping initiative deployed by UNDP (in the context of mapping care services) is explained in Box 4.

There are several ICT tools that can prove useful when designing and leading crowdsourcing mapping initiatives. One of the tools recommended for conducting fieldwork is QField, an app that is optimized for handheld touch devices such as mobile phones and tablets, with fieldwork tasks in mind. QField is built on top of the QGIS open-source project, allowing users to set up maps and forms in QGIS on their workstation, and deploy those in the field through QField, using an Android phone. QField software allows users (enumerators) to browse through the georeferenced centers, access their characteristics, make edits, add new geospatial points and more (Figure 6).

UNDP's Care Georeferencing Tool also relies on KoBoToolbox software to conduct online and field surveys. KoBoToolbox is a powerful, open-software tool for data collection that allows users to build forms, collect and analyze information. It has a strong georeferencing capacity and can be used on computers, mobile phones and tablets both online and offline (especially relevant to gather information in areas with low connectivity), and it can produce paper-based forms if necessary. Figure 5 shows an example of a form for crowdsourced mapping uploaded in KoBoToolbox.

Thus, crowdsourcing can easily be used to improve the accuracy of existing records, complete missing data and gather new information directly in the field. Engaging in crowdsourcing activities is highly recommended to have a complete panorama of the care supply within the city or area studied. Likewise, it can be used to characterize gaps in care with a participatory methodology.

Box 4. Crowdsourced Mapping during the pandemic: the case of Bogota

Durante la aplicación de la Herramienta de Georreferenciación de Cuidados en la ciudad de Bogotá (2021), el PNUD y la Secretaría Distrital de la Mujer rastrearon iniciativas de cuidado comunitario a través de dos estrategias diferentes de mapeo colaborativo. Estas estrategias se adaptaron a la situación cambiante de las políticas de restricción de movilidad aplicadas durante la pandemia de COVID-19.

1) Se realizó una encuesta georreferenciada en línea, dirigida a ONGs y organizaciones de base que están presentes en el territorio. Estas organizaciones recibieron un correo electrónico explicativo con el enlace a una encuesta de KoboToolbox, donde pudieron identificar los servicios de cuidado en el área donde trabajan, caracterizarlos según su conocimiento y cargar datos de posibles referentes e informantes calificados sobre el tema. Esto generó una bola de nieve de informantes idóneos que brindaron información valiosa y novedosa sobre los servicios de cuidado ofrecidos por y para la comunidad en la ciudad, en su mayoría gratuitos, y gestionados por organizaciones de la sociedad civil, redes vecinales, organizaciones religiosas, sindicales y de mujeres.

2) Se realizó además una encuesta mixta (presencial/telefónica), dirigida a mujeres que son cuidadoras no remuneradas en sus hogares, y que actualmente se encontraban involucradas en alguna de las actividades que ofrece el Sistema Distrital de Cuidados. Apelando al conocimiento de primera mano de sus propios barrios, estas mujeres fueron actores clave en el mapeo de los servicios de cuidado desconocidos para los registros oficiales, de base comunitaria, muchas veces liderados por un grupo autoorganizado de vecinos como respuesta a la falta de oferta de atención en la zona.

6 There are similar experiences promoted by UNICEF School Mapping project.

Figure 5. Survey for crowdsourced mapping, based on KoBoToolbox software.

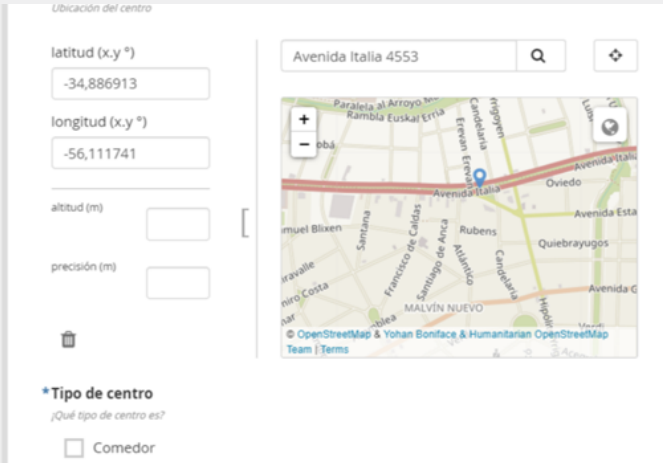
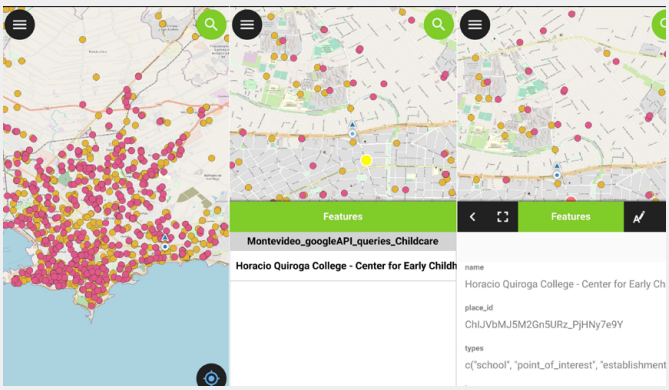


Figure 6. Pilot Crowdsourcing Mapping Project of Montevideo's childcare centers using QField. Browse mode.



Note: In this case, different colors represent the different data sources where the data point was retrieved from (yellow=administrative records; red=Google Places API scrapping).

3.2.2. Stage 2: Estimating Care Services Demand

Identifying potential demand for care services relies on traditional demand estimation-methods and is a straightforward process when the data sources are available and complete. In this stage, households with members that qualify as target population (e.g., children, older persons, persons with disabilities, etc.) are identified and georeferenced as accurately as the data allow.

This process can rely on administrative records, censuses, georeferenced population projections and/or (less preferably) representative household survey data. Also, when relatively up-to-date official data is not available, it is possible to access high-resolution estimates of population density calculated by the Facebook Data for Good project.

Figure 7. Population from 0 to 14 years old in Bogotá.

Source: DANE.

3.2.3. Stage 3: Modelling Accessibility and Spatial Mismatch Between Care Services and Those Who Need Them

To measure accessibility is to measure the relative ease of reaching an activity or opportunity. With the data gathered in previous stages of the Care Georeferencing Tool application, several methodologies of different levels of complexity can be applied to model accessibility to care services (e.g., computation of average travel time applying thresholds, distance decay effect, gravity models, etc.).

That is, it is possible to compute which care centers are available to a target population at a walking distance, or at a car-ride or transit-ride distance. Time or distance thresholds are established, and clusters of target population with less accessibility are geolocated. Figures 8 and 9 show examples of data visualizations that allow to contrast supply and demand of care, as well as identify areas where there are accessibility gaps, considering two transport modes: walking and transit.

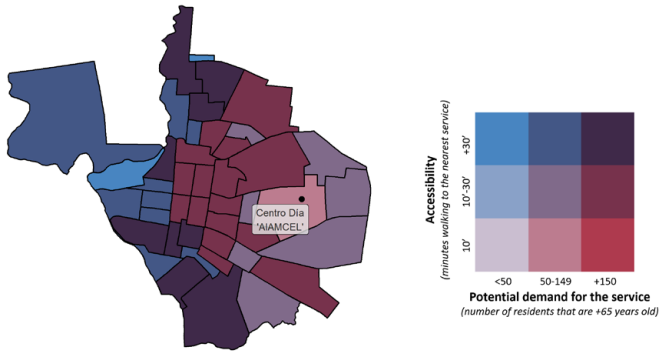
In addition to this, if the capacity of the care centers was successfully gathered in the previous stages (through administrative records, surveys, crowdsourcing initiatives or other techniques), it is possible to compute how many people/families have unmet care needs.

Different data sources can be used at this stage to complete the mapping process:

» Data gathered in Stage 1 (Mapping Care Supply)
» Data gathered in Stage 2 (Mapping Care Demand)
» Origin-destination matrices and travel times in different transport modes, computed using big data through Google APIs (Google Distance Matrix) or OpenStreetMap APIs (Overpass).
» Public transport origin-destination matrices and travel times, if they are available as open data from government institutions, academic studies, among others.

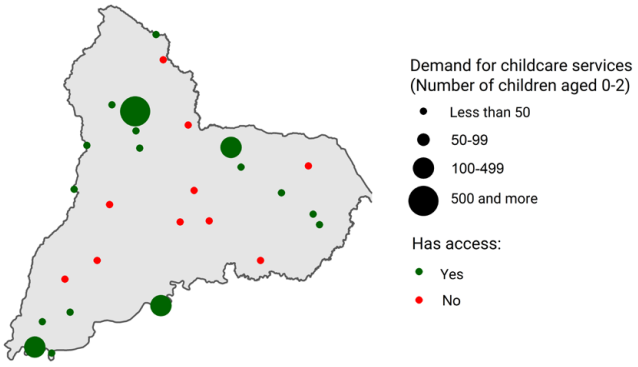
» Georeferenced data of public transport stations and stops.
» Georeferenced data of routes and schedules of public transport.

Figure 8. Accessibility via walking to day care centers for older persons, at census tract level, according to the potential demand for the service. Locality of Melo (Uruguay).



Source: De los Santos (2022)

Figure 9. Localities in the department of Tacuarembó (Uruguay) that access care services for children between 0 and 2 years old traveling 30 minutes or less on intercity public transport, according to the demand for the service.



Source: De los Santos (2022)

4. In summary

Building care maps is a key step during the design of a comprehensive care system. Some of the questions to address during the process include: where is the demand for care located? What are the specific needs of the care-dependent population? Which care-provider actors are present in the local social fabric? And how well are they connected to the population that needs care? This will allow users to pinpoint where the most crucial care deficits are, and to plan accordingly.

The Care Georeferencing Tool led by UNDP aims to systematize and generate updated, real-time information about the care supply within a city or area from the four main providers of care (families, state, markets and community); study the territorial distribution of populations that need or may need care, such as children, persons with disabilities or older persons; and analyze whether the care supply is sufficient when compared to the care demands of the population in that territory. To do this, a combination of traditional and innovative techniques is proposed.

Data sources range from administrative records, censuses and household surveys to data obtained via web scraping, data mining and crowdsourced mapping. The implementation of the Care Georeferencing tool relies on open software almost exclusively and does not require high-level computational capacity. Finally, it is worth noting that the tool is flexible enough to be implemented entirely or in part, accommodating the informational needs and goals of each project.

References

De los Santos, D. (2022). “Brechas de accesibilidad en las políticas de autonomía de las mujeres en cuatro territorios del interior del Uruguay”. Project: Fortalecimiento de la respuesta socioeconómica con una perspectiva generacional y de género a partir de la promoción y análisis de políticas basadas en evidencia (MPTF), UNDP Uruguay.

Doss, C. (2021). “Intrahousehold decision-making and resource allocation”. In: Berik, G. & Kongar, E. The Routledge Handbook of Feminist Economics. London: Routledge-Taylor & Francis Group.

Duffy, M.C. (2011). Making Care Count: A Century of Gender, Race, and Paid Care Work. Piscataway, NJ: Rutgers University Press.

ECLAC (2016). Autonomía de las mujeres e igualdad en la agenda de desarrollo sostenible. Santiago de Chile: ECLAC. Retrieved from: www.cepal.org/es/publicaciones/40633-autonomia-mujeres-igualdad-la-agenda-desarrollo-sostenible

ECLAC (2017). 40 años de Agenda Regional de Género. Santiago de Chile: ECLAC. Retrieved from: repositorio.cepal.org/bitstream/handle/11362/40333/7/S1700760_es.pdf

ECLAC (2021). “Time-use measurements in Latin America and the Caribbean. Information systems: transforming data into information, information into knowledge and knowledge into political decisions”. Retrieved from: oig.cepal.org/sites/default/files/c2100830_web.pdf

Espino, A. (2012). “Perspectivas teóricas sobre género, trabajo y situación del mercado laboral latinoamericano”. In Esquivel, V. La economía feminista desde América Latina: Una hoja de ruta sobre los debates actuales en la región. Santo Domingo: ONU Mujeres

Folbre, N. (2018). “Gender and the Care Penalty.” In Argys, L. Averett, S., and Hoffman, S. Oxford Handbook of Women in the Economy. New York: Oxford University Press

Jee, E., Misra, J., & Marta Murray-Close, M. (2019). “Motherhood Penalties in the U.S., 1986– 2014.” Journal of Marriage and Family 81 (2): 434–49.

Moos, K. (2021). “Care Work”. In: Berik, G. & Kongar, E. The Routledge Handbook of Feminist Economics. London: Routledge-Taylor & Francis Group.

Otobe, N. (2017). “Gender and the Informal Economy: Key Challenges and Policy Response.” Employment Policy Department, Employment Working Paper No. 236, International Labour Organization, Geneva, Switzerland.

Saltman, M. & Altunbey, A. (2014). “Selecting Location of Retail Stores Using Artificial Neural Networks and Google Places API”. International Journal of Statistics and Probability, 3 (1).

Scuro, L. (2021). “Los mapas del cuidado para América Latina y El Caribe: Conceptos y herramientas”. (Gender Affairs, ECLAC). Presentation in “Clinics to advance towards comprehensive care systems” (UNDP-ILO-UN Women). Second Session: Mapping Care. 10 de junio de 2021.

UNDP (2019). El mercado laboral femenino en América Latina: Análisis de sus características por estrato social y desafíos en materia de política pública. New York: UNDP. Retrieved from: www.latinamerica.undp.org/content/rblac/es/home/library/womens_empowerment/el-mercado-laboral-en-america-latina--analisis-de-sus-caracteris.html

UNDP (2021). Regional Human Development Report 2021. Trapped: High Inequality and Low Growth in Latin America and the Caribbean. Retrieved from: www.latinamerica.undp.org/content/rblac/en/home/library/human_development/regional-human-development-report-2021.html

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