CALI HOSPITAL COVERAGE

TEAM 33

Catherine Cabrera, Daniel Cuervo, Darío Mogollón, Juan Pablo Morales, Stephanie Rojas, Rafael Ropero and Santiago Tovar

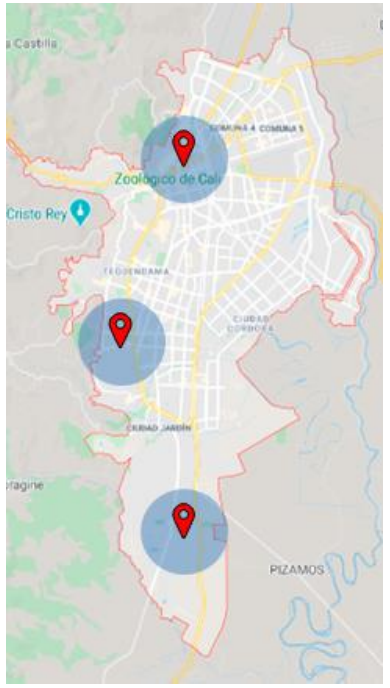
Highlights

- A new, cost effective and swift method to establish hospitals coverage was implemented. It uses more accurate data, is sensitive to traffic changes, and can be used to plan for other services, taking into consideration socio-economic information and equity (e.g. schools, entertainment venues, fire stations…).
- Similar applications can be built for end users, for example to find the hospital that will attend them in the shortest time.
- Coverage is of 48.2% for high traffic hours with a 20-minute arrival time. Lower wealth stratums having a coverage of 24.6%. There are several areas of Cali that are poorly covered for high complexity health procedures.
- With one additional high complexity hospital, coverage can increase to 73% (65.7% for low wealth stratums).
- Upgrading an existing hospital increases coverage to 68.4% (56.6 for low wealth stratums)

Background

You've been involved in a big car accident! The injured are in bad shape and bleeding profusely. You need to reach a hospital in less than 20 minutes. Will you make it?

Accessibility to health services in Colombia is assessed using the averages obtained from quinquennial surveys, origin-destiny matrices and indirect assessments. This has drawbacks that new technologies address: being insensitive to traffic variations, are expensive and take long. Geospatial analysis with bigdata offers novel and cost-effective alternatives being faster, accurate, and sensitive to changes.



The Data

We used three main sources of information:

- Travel times and distances from the Google Maps Api.
- Socio-demographic information (population, stratums, gender, age…) of Cali, obtained from Colombia's Department of Statistics (DANE).
- Health systems official data from Colombia's Ministry of Health and Social Protection (MSPS).

Confidential

The Models

Two analytical models were created:

- Predictive model to estimate travel times.
- Optimization model to establish which hospital(s) should the upgraded or where to place new ones

Results

Using clustering methodologies we identified time bands of hours having similar travel times, during the days of a week

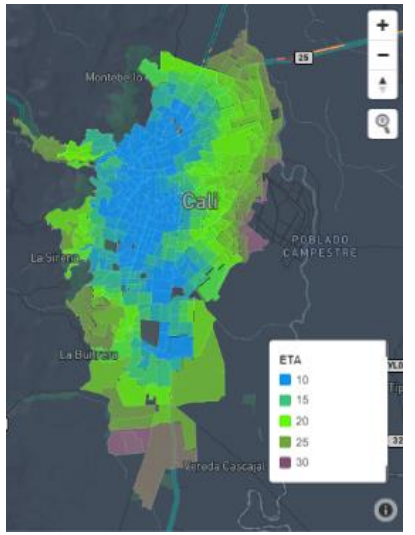
Clusters	Hours of the day (starting on)																							
Day of the Week	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Monday	1	1	0	0	0	2	4	5	5	5	6	7	7	7	7	7	6	7	8	7	5	4	3	2
Tuesday	1	0	0	0	0	2	5	6	6	6	7	7	7	7	7	7	7	7	8	7	5	4	3	2
Wednesday	1	0	0	0	0	2	4	6	6	5	7	7	7	7	7	7	7	7	8	7	6	4	3	2
Thursday	1	0	0	0	0	2	5	6	6	5	7	7	7	7	7	7	7	7	8	7	6	5	3	2
Friday	1	1	0	0	0	2	4	5	5	5	6	7	7	7	7	7	7	7	8	7	6	5	4	3
Saturday	2	1	1	0	0	1	3	4	5	5	6	7	8	8	8	7	7	7	6	6	6	5	4	3
Sunday	2	2	1	1	1	1	2	3	3	3	4	5	5	5	5	4	4	4	5	5	5	4	3	2

Coverage at high traffic hours

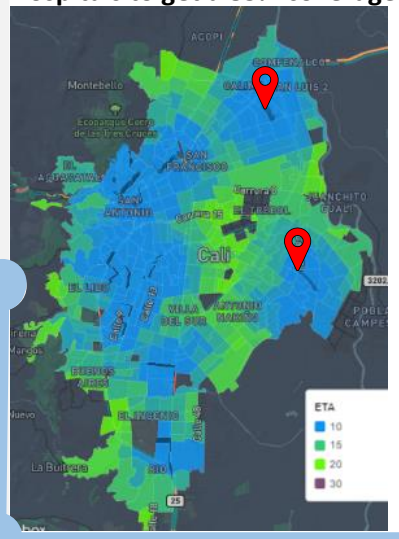
48.2%
20 min arrival

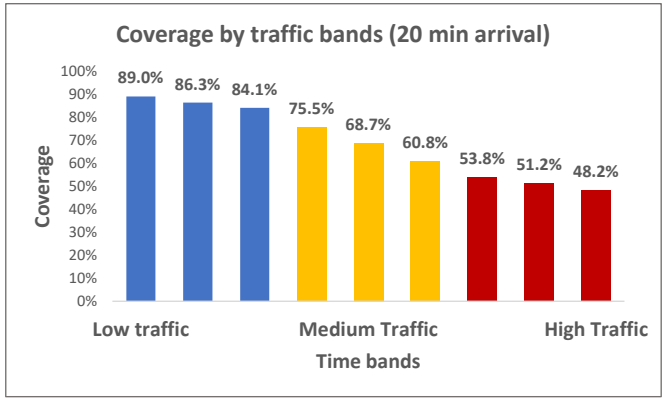
24.6%
Stratums 1 and 2

Coverage of high complexity hospitals



Proposed location of two new hospitals to get a 85% coverage





Raising the complexity of two existing hospitals increases coverage to nearly 80%

If you were fortunate to have the accident at low traffic hours or near a high complexity hospital, you survived!

A striking inequity in accessibility to high complexity hospitals can be addressed locating hospitals closer to where the low wealth population lives

DS4A COLOMBIA