

1.1 Population living within a radius of 20 km of the nearest hospital (% of the population) (A-18)

1.1.1 Documentation sheet

Description	Primary indicator Population living within a radius of 20 km of the nearest hospital (% of the population)
	Secondary indicator Women aged 15-49 years old living within 30 minutes (by car) of the nearest maternity service (only one year available: 2019)
Calculation	Primary indicator <u>Numerator</u> : Number of persons living within 20 km of the nearest hospital (with an emergency service) <u>Denominator</u> : Localised population in the concerned geographic entity
	Secondary indicator <u>Numerator</u> : the number of women aged 15-49 years old living within 30 minutes of the nearest maternity service. <u>Denominator</u> : total number of women aged 15-49 years old living in the same area.
Rationale	Primary indicator This indicator assesses the geographic accessibility of hospitals and therefore the possibility of timely access to emergency and hospital care. Assessing geographical accessibility of healthcare services is a way to evaluate whether health services distribution is adequate.
	Secondary indicator In the literature, effects of distance (or travel time) on the utilisation of maternity services have been extensively studied. An evidence review was published in 2015 ¹ and no clear conclusions have been made about the association between travel time or distance between the mother's place of residence and maternity services and adverse outcomes. Even if most of the studies found no significant influence of travel time/distance on perinatal mortality ^{2,3} or on stillbirth ² , higher distance could lead to an increase of stress and anxiety in pregnancy. ⁴ Other studies show an association with increased risks of foetal heart rate anomalies, meconium-stained amniotic fluid, and antenatal hospitalisations. ^{3,5} The likelihood of out-of-hospital delivery also increases with travel time. ^{3,5,6}
Data source	Primary indicator Statbel DataLab 2021:

<https://statbel.fgov.be/nl/open-data/geografische-indelingen-2021>

<https://statbel.fgov.be/nl/themas/datalab/geografische-indelingen#documents>

Secondary indicator

National Geographic Institute; FOD – SPF; Statbel

Technical definitions

Primary indicator

126 hospitals with emergency service are included in the dataset, including the institutions with first aid emergencies (21-12-2020) and the specialised emergency services (01-07-2021) of the FPS Health, Safety of the Food Chain and Environment (see excel files on <https://www.health.belgium.be/nl/gezondheid/organisatie-van-de-gezondheidszorg/delen-van-gezondheidsgegevens/gezondheidszorginstellingen>).⁷

Secondary indicator

This indicator calculates the travel time between a woman's place of residence and the nearest maternity service using a Geographic Information System (GIS). The geographical location of each maternity service is based on the official address of the maternity service as provided by the FOD – SPF in April 2019. A total of 104 different maternity services are geocoded to the latitude and longitude of the official site address.

For each maternity service, the area within an isochrone is calculated by the NGI – IGN using the Network Analysis module of ArcGIS. The area within an isochrone comprises all streets or street segments around a maternity service that can reach the maternity service within a specified time limit, taking into account traffic on the chosen time reference point. In ArcGIS, isochrones are constructed with a propriety solver, the network service area solver, based on an extension of Dijkstra's algorithm for finding shortest paths.⁸ TomTom historical traffic data speed profiles are used, representing the normal traffic situation in Belgium on an average weekday: times represent average travel time by car for a specific street segment for the last two years, taking into account possible distorting factors like outlier driver behaviour, exceptional weather conditions, road works or traffic accidents.⁹

From Statbel, the NGI – IGN received the number of Belgian women between 15 and 49 years old in 2016, per European Environment Agency (EEA) reference grid cell.¹⁰ The EEA reference grid subdivides Belgium geographically in cells with a resolution of 1 km². For each of these grid cells, it is determined per maternity service if they fell within the isochrone. For cells falling partly in and partly out of the isochrone, two scenarios are defined:

- Intersects area: the cell needs to be contained entirely or partially within the area to count. In this definition, the number of women that can reach a maternity service within the time limit can be overestimated because grid cells that fall partially outside of the isochrone are counted as well.
- Within area: the cell needs to be contained entirely within the area to count. In this definition, the number of women that can reach a maternity service within the time limit can be underestimated because grid cells that fall partially outside of the isochrone are not counted. This definition also creates artificial areas of unreachability at the borders when these coincide with the isochrones.

More details can be found in KCE report 323.¹¹

Regions are defined from the point of view of the women living in that region, i.e. all women between 15 and 49 years old in 2016 living in a reference grid cell that falls (at least partially) in the given region are considered. This implies that regional results slightly overlap, as a very limited number of reference grid cells can spread over two different regions. In addition, isochrones can spread over two different regions. A woman is considered to have access to a maternity service within 30 minutes as soon as such a maternity service falls within the isochrone, even if the maternity service is located in another region.

International comparability No international dataset available

Limitations

Primary indicator

It would be preferable to have an indicator which measures access time to a hospital instead of the radius (air distance) to a hospital. Furthermore, there is no evidence based maximum distance to a hospital.

Secondary indicator

This indicator gives the percentage of woman 15-49 with access to at least 1 maternity service within 30 minutes. However, the place of birth may be located further. In general, the choice of the hospital depends on women's preference and may differ from the nearest hospital of the mother's place of residence.

In recent health service research, distance is commonly measured as car travel time over a road rather than the Euclidian distance between two points.^{12, 13} There is, however, no guidance on what a reasonable distance or travel time is. Therefore, a coverage of maternity services in terms of (road) travel time within 30 minutes places to a certain extent an arbitrary limit on proximity. It is, however, in accordance with the travel time in studies for other countries, such as France, the Netherlands and England.¹⁴⁻¹⁶

The indicator is based on the scenario that women can reach a maternity service by car and does not account for emergency transport (such as ambulance) or public transport.

Moreover, we cannot identify the risk level of the pregnancy. Thus, we cannot calculate the percentage of high-risk pregnancies in women aged 15-49 years old living within 30 minutes' of the nearest hospital site with a maternity intensive care service.

Finally, only Belgian maternity services are taken into account so that the number of maternity services that can be reached in 30 minutes is likely to be underestimated for women living close to the national border.

Dimension Accessibility – Health services distribution

Related indicators

Reviewers Stephan Devriese (KCE)

1.1.2 Results

Population living within 20 km of the nearest hospital (% of the population)

Belgium

Overall, 99.25% of the Belgian population lives within 20 km from the nearest hospital (in 2021).

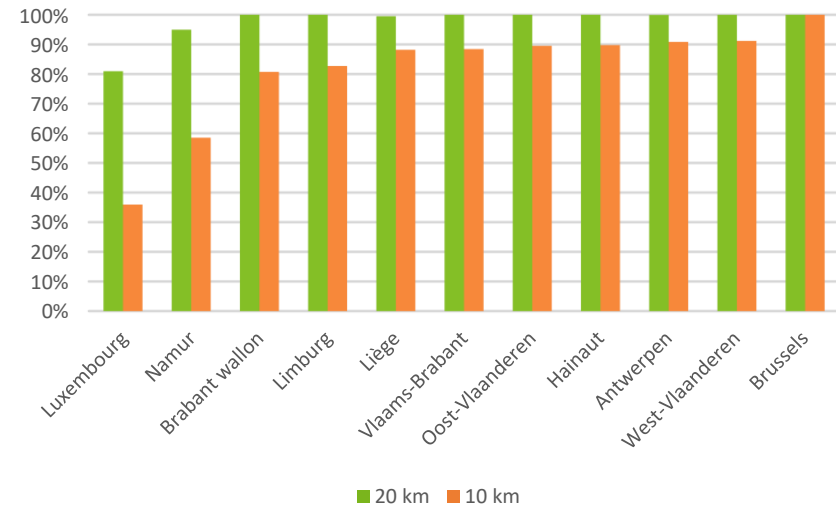
Regional comparison

In the Brussels region, 100% of the population lives within 20 km from the nearest hospital. In the Flanders region the percentage is 99.98%. In the Walloon region, it is 97.65%.

There are only four provinces where not 100 percent of the population lives within 20 km of a hospital: Luxembourg (81%), Namur (95%), Liège (99.5%) and Antwerpen (99.9%) (See Figure 1).

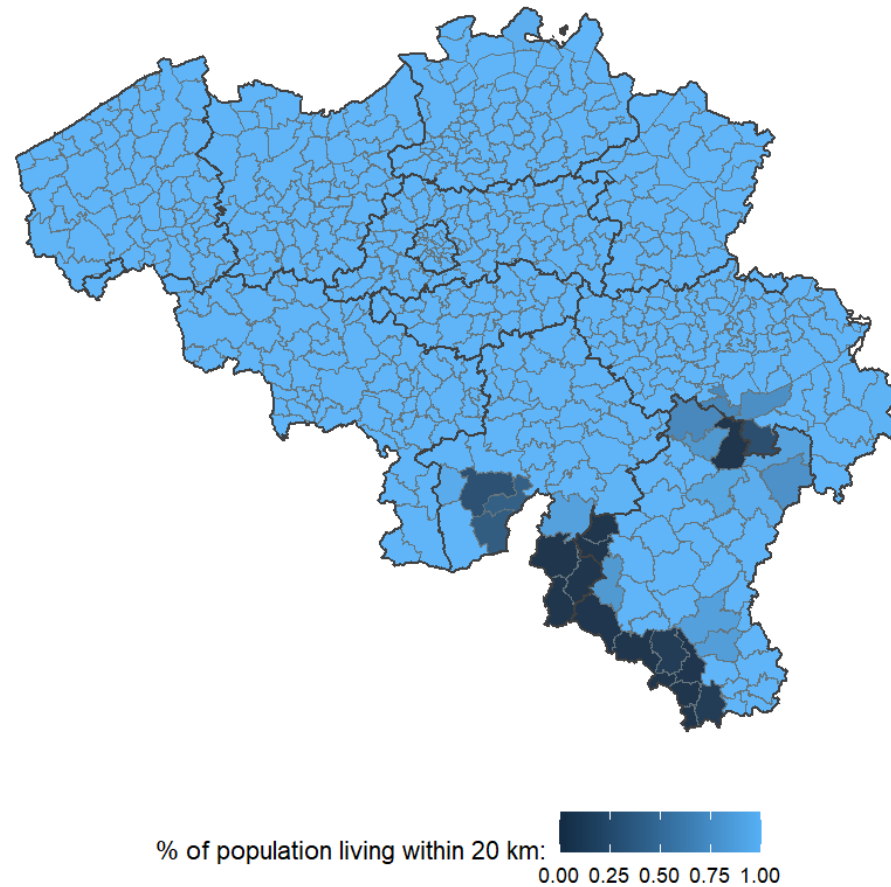
When we look at the threshold of 10 km, then there are two provinces where the percentage of people living within this distance from a hospital is particularly low: Luxembourg (36.0%) and Namur (58.5%). In Brabant wallon and Limburg it is roughly around 80%. In Liège, Vlaams-Brabant, Oost-Vlaanderen, Hainaut, Antwerpen and West-Vlaanderen it is roughly around 90%. In Brussels, 100% of the population lives within 10 km from the nearest hospital.

Figure 1: Population living within 20 or 10 km from the nearest hospital (% of the population) (2021)



Source: Based on Statbel

Figure 2: Population living within 20 km from the nearest hospital (% of the population) (2021)



Source: Based on Statbel

Women aged 15-49 years old living within 30 minutes of the nearest maternity service (2019)

Based on the 2016 population, more than 99% of women between 15 and 49 years old can reach one or more maternity services within 30 minutes, given normal traffic conditions on an average weekday (see Table 1 and Figure 2 for intersects area definition, Table 2 and Figure 6 for within area definition). The ones who cannot reach such a service in 30 minutes live mostly near the border and in the south of the country (no information is available on women living in these areas actually traveling across the borders to deliver). In the Brussels Capital Region, all women between 15 and 49 years old can reach one or more maternity services within 30 minutes. In Flanders, this proportion is very close to 100% (99.9% or 99.7% depending on the definition, see Table 1 and Table 2), and in Wallonia it is slightly lower (99.5% or 98.9% depending on the definition, see Table 1 and Table 2).

The 30 minutes limit represents an average traffic situation on a weekday. A 15 minutes limit can be used as a conservative limit to assess the current reachability in heavy traffic. A 15 minutes isochrone average weekday traffic is therefore considered as a stand-in for a hypothesised 30 minutes isochrone heavy traffic. In other words, we assume that the distances that can be reached within 15 minutes in average weekday traffic, take 30 minutes in heavy traffic. As heavy traffic is mostly problematic in large cities, this method clearly underestimates the distance that can be reached outside these large more congested cities. Still, globally, in Belgium, a large part of the considered population (84% to 92% depending on the definition, see Table 1 and Table 2) can reach one or more maternity services within 15 minutes, given normal traffic conditions. More importantly, this proportion is close to 100% in the Brussels Capital Region (see Table 1 and Table 2), as well as in and around large cities (see Figure 4 and Figure 7). Women who cannot reach such a service in 15 minutes live mostly away from large cities, where congestion is less an issue (see Figure 4 and Figure 7).

Finally, within 45 minutes, given normal traffic conditions on an average weekday, almost all women between 15 and 49 years old can reach one or more maternity services, in the three regions of the country (see Table 1 and

Figure 5 for intersects area definition, Table 2 and Figure 8 for within area definition).

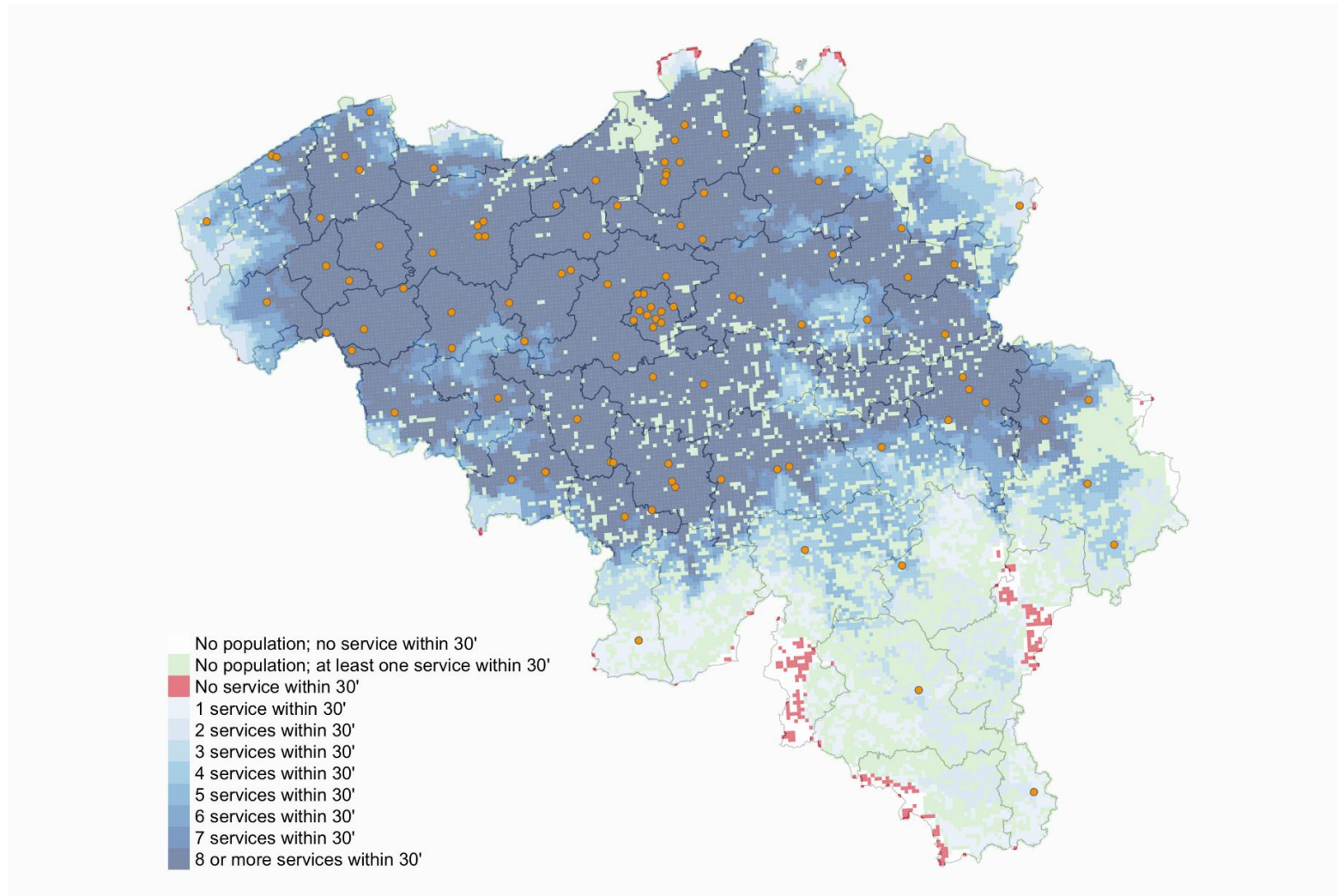
The median number of maternity services that can be reached by a woman between 15 and 49 years within 30 minutes in average traffic conditions is 11 or 13 depending on the definition used. That means that half of the population can reach at least 11 different maternity services within 30 minutes. This number is the highest in Brussels (22 or 28), the lowest in Wallonia (8 or 9) and close to the Belgian one in Flanders (12 or 14) (see Table 1 and Table 2). A large part of Flanders, Brussels and the northern part of Wallonia have access to eight or more maternity services within 30 minutes, given normal traffic conditions on an average weekday (see Figure 2 and Figure 6).¹¹ Using a time limit of 15 minutes, the median number of maternity services that can be reached by a woman between 15 and 49 years is still 11 or 12 in the Brussels Capital Region. It is considerably lower, but still above 1 in Wallonia and Flanders (2 in Wallonia and 2 or 3 in Flanders, depending on the definition) (see Table 1 and Table 2).

Table 1 – Intersects area definition

(ID) Indicator	Belgium	Year	Flanders	Wallonia	Brussels
Percentage of women aged 15-49 years old living within 30 minutes of the nearest maternity service	99.8%	2019	99.9%	99.5%	100%
Percentage of women aged 15-49 years old living within 15 minutes of the nearest maternity service	92.3%	2019	94.4%	85.8%	100%
Percentage of women aged 15-49 years old living within 45 minutes of the nearest maternity service	100%	2019	99.9%	99.9%	100%
Median (Q1-Q3) number of maternity services that can be reached within 30 minutes by women aged 15-49 years old	13 (8-22)	2019	14 (9-21)	9 (6-13)	28 (24-29)
Median (Q1-Q3) number of maternity services that can be reached within 15 minutes by women aged 15-49 years old	3 (2-7)	2019	3 (2-5)	2 (1-4)	12 (11-13)
Median (Q1-Q3) number of maternity services that can be reached within 45 minutes by women aged 15-49 years old	34 (22-47)	2019	37 (24-46)	23 (15-33)	55 (54-57)

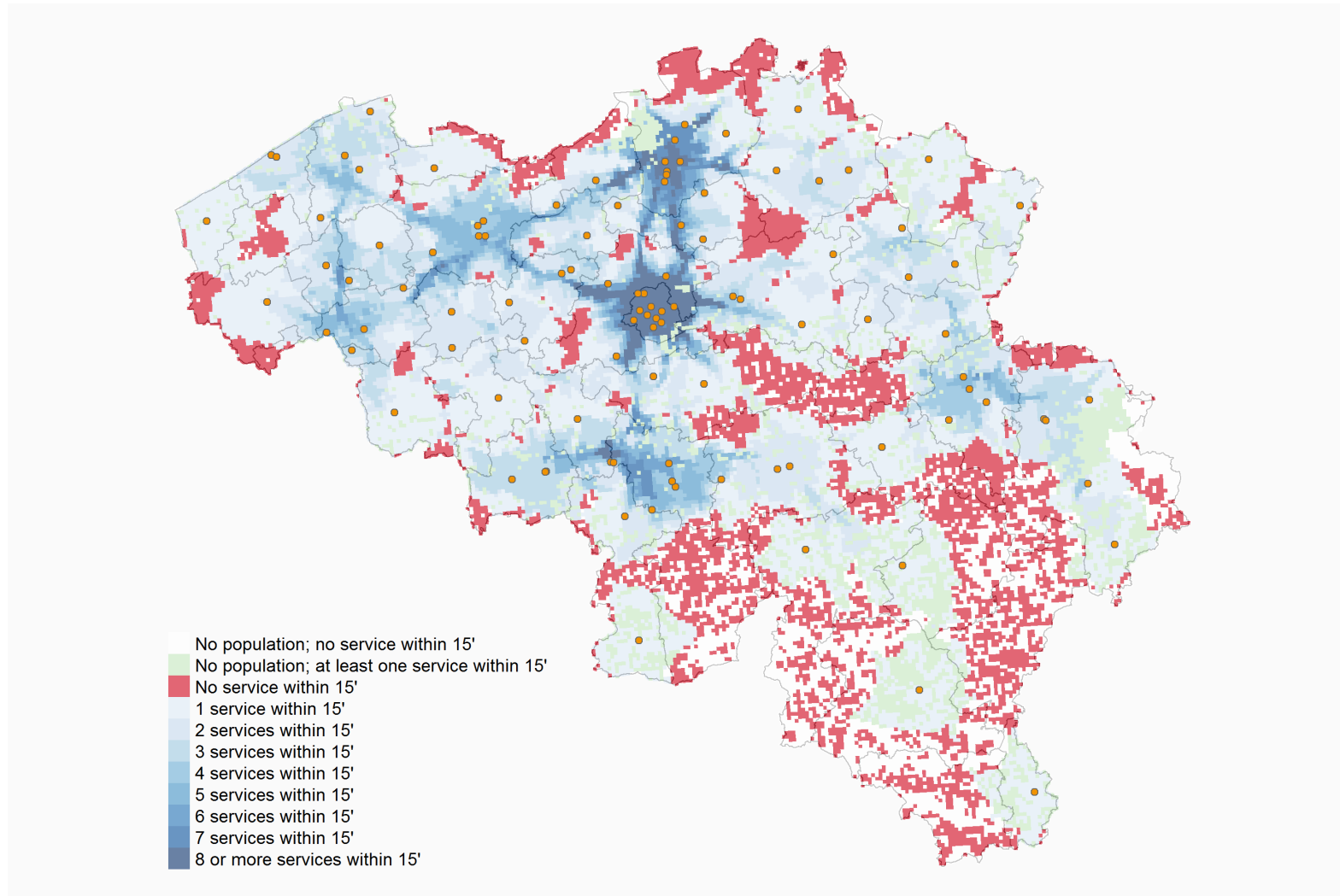
Time represents average travel time by car in normal traffic situation on an average weekday. Intersects area definition implies that the cell needs to be contained entirely or partially within the area to count in the isochrone. Q1 and Q3 stand for first and third quartile.

Figure 3 – Maternity services reachable within 30 minutes (intersects area definition)



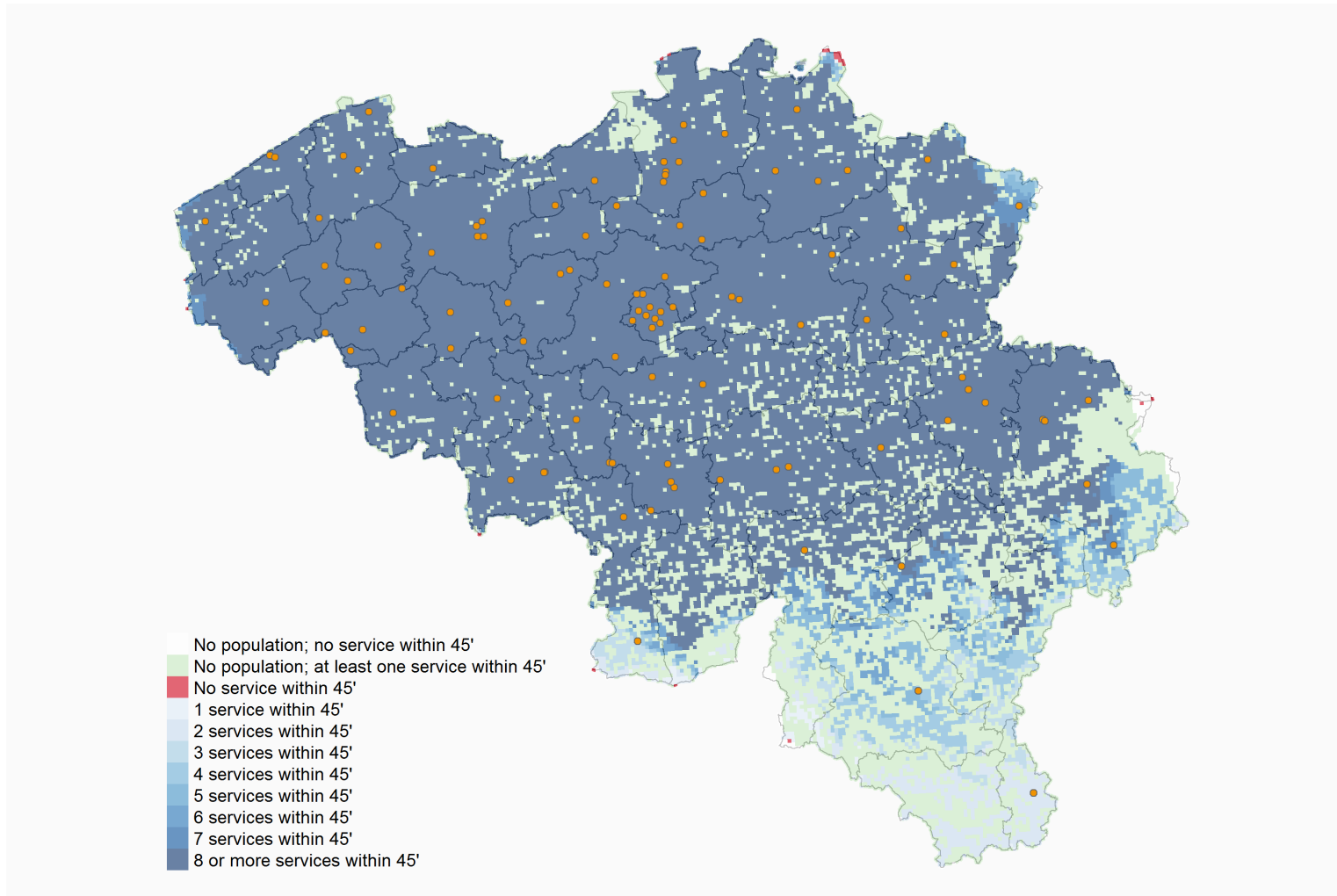
Orange dots represent maternity services April 2019. Time represents average travel time by car in normal traffic situation on an average weekday. Intersects area definition implies that the cell needs to be contained entirely or partially within the area to count in the isochrone.

Figure 4 – Maternity services reachable within 15 minutes (intersects area definition)



Orange dots represent maternity services April 2019. Time represents average travel time by car in normal traffic situation on an average weekday. Intersects area definition implies that the cell needs to be contained entirely or partially within the area to count in the isochrone.

Figure 5 – Maternity services reachable within 45 minutes (intersects area definition)



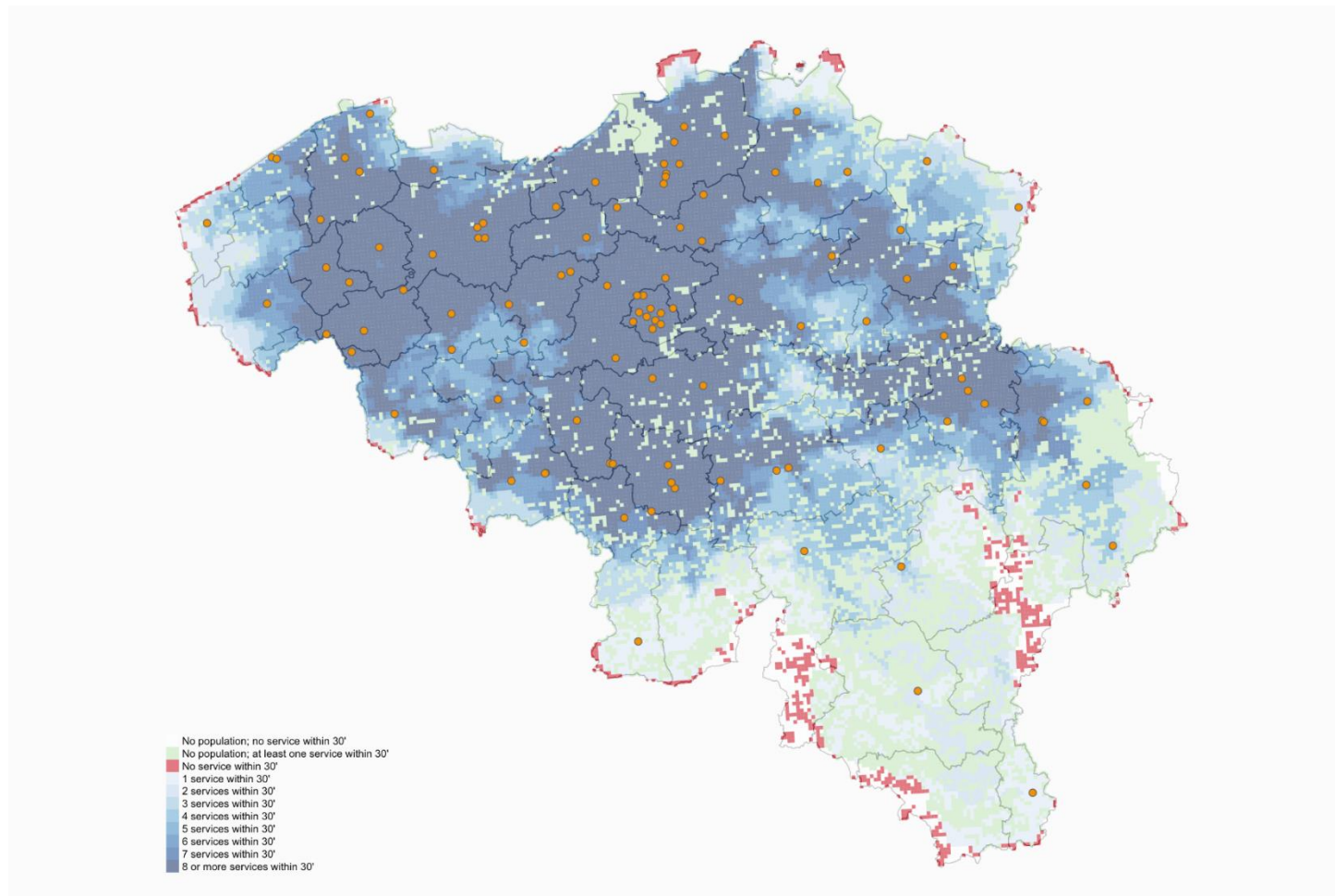
Orange dots represent maternity services April 2019. Time represents average travel time by car in normal traffic situation on an average weekday. Intersects area definition implies that the cell needs to be contained entirely or partially within the area to count in the isochrone.

Table 2 – Within area definition

(ID) Indicator	Belgium	Year	Flanders	Wallonia	Brussels
Percentage of women aged 15-49 years old living within 30 minutes of the nearest maternity service	99.4%	2019	99.7%	98.9%	100%
Percentage of women aged 15-49 years old living within 15 minutes of the nearest maternity service	84.0%	2019	84.9%	76.8%	99.9%
Percentage of women aged 15-49 years old living within 45 minutes of the nearest maternity service	99.8%	2019	99.8%	99.8%	100%
Median (Q1-Q3) number of maternity services that can be reached within 30 minutes by women aged 15-49 years old	11 (7-18)	2019	12 (7-17)	8 (5-11)	22 (20-25)
Median (Q1-Q3) number of maternity services that can be reached within 15 minutes by women aged 15-49 years old	2 (1-5)	2019	2 (1-4)	2 (1-3)	11 (10-11)
Median (Q1-Q3) number of maternity services that can be reached within 45 minutes by women aged 15-49 years old	30 (19-44)	2019	32 (22-42)	20 (13-30)	52 (51-53)

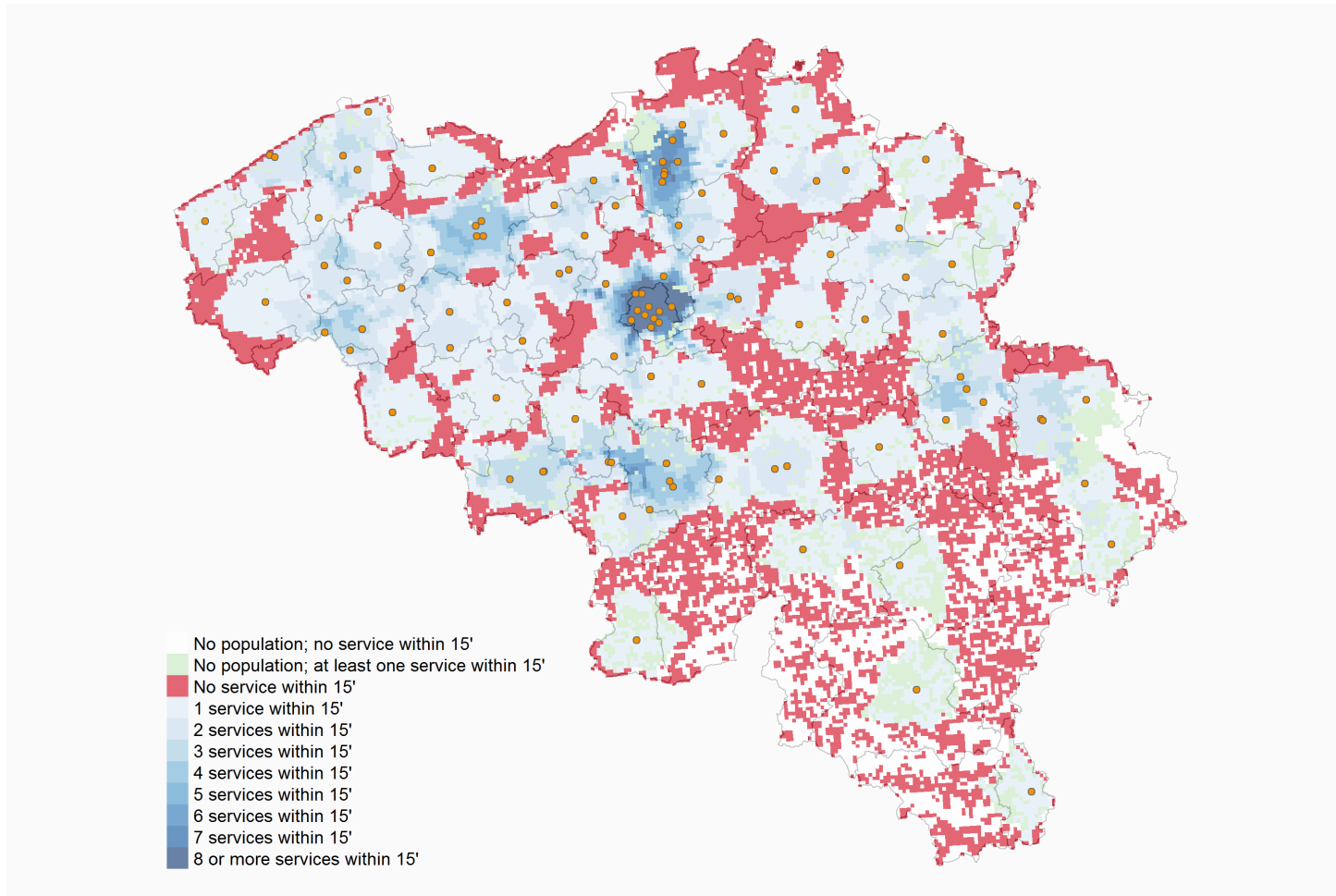
Time represents average travel time by car in normal traffic situation on an average weekday. Within area definition implies that the cell needs to be contained entirely within the area to count in the isochrone. Q1 and Q3 stand for first and third quartile.

Figure 6 – Maternity services reachable within 30 minutes (within area definition)



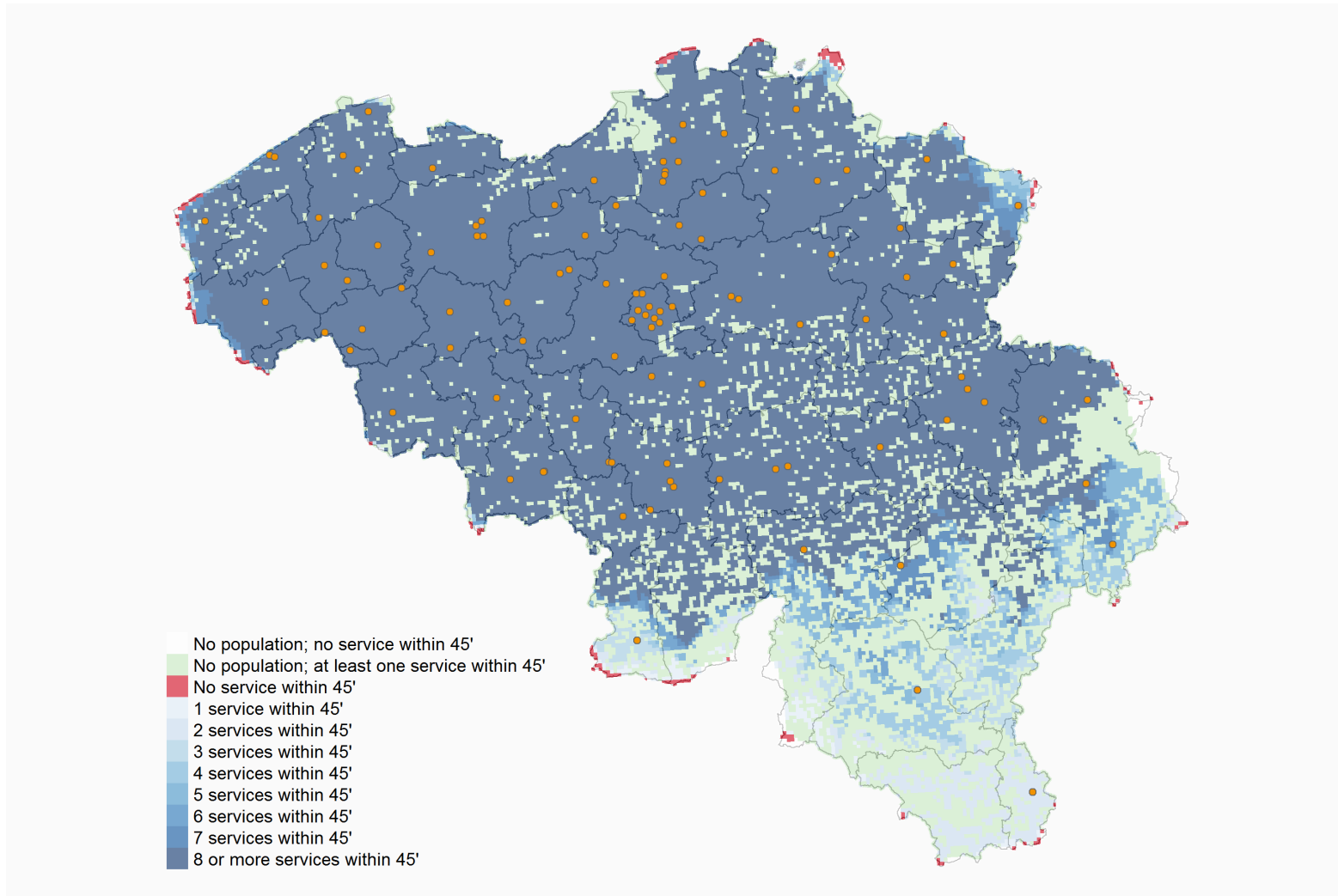
Orange dots represent maternity services April 2019. Time represents average travel time by car in normal traffic situation on an average weekday. Within area definition implies that the cell needs to be contained entirely within the area to count in the isochrone.

Figure 7 – Maternity services reachable within 15 minutes (within area definition)



Orange dots represent maternity services April 2019. Time represents average travel time by car in normal traffic situation on an average weekday. Within area definition implies that the cell needs to be contained entirely within the area to count in the isochrone.

Figure 8 – Maternity services reachable within 45 minutes (within area definition)



Orange dots represent maternity services April 2019. Time represents average travel time by car in normal traffic situation on an average weekday. Within area definition implies that the cell needs to be contained entirely within the area to count in the isochrone.



Key points

- **In 2021, 99.25% of the Belgian population lives within 20 km from the nearest hospital with emergency service (data for 2021) and 87.3% of the population lives within 10 km from the nearest hospital with emergency service.**
- **There are four provinces where not 100 percent of the population lives within 20 km of a hospital: Luxembourg (81%), Namur (95%), Liège (99.5%) and Antwerpen (99.9%)**

References

1. Price S, Little K. Research evidence review - impact of distance/travel time to maternity services on birth outcomes Public Health Wales NHS Trust; 2015. Available from: www.publichealthwales.org/maternityreview
2. Dummer TJB, Parker L. Hospital accessibility and infant death risk. Archives of Disease in Childhood. 2004;(89):232-4.
3. Combier E, Charreire H, Le Vaillant M, Michaut F, Ferdynus C, Amat-Roze JM, et al. Perinatal health inequalities and accessibility of maternity services in a rural French region: closing maternity units in Burgundy. Health Place. 2013;24:225-33.(doi):10.1016/j.healthplace.2013.09.006. Epub Oct 3.
4. Centre for Rural Health Research. Access to Maternity Care: Distance Matters. Policy Brief - Monitoring and Maintaining Quality of Care. 2012.
5. Combier E, Charreire H, LeVaillant M, Michaut F, Ferdynus C, Amat-Roze J-M, et al. Temps d'accès aux maternités Bourguignonnes et indicateurs de santé périnatale. Journal de gestion et d'économie médicale. 2013;31(6):348-68.
6. Blondel B, Drewniak N, Pilkington H, Zeitlin J. Out-of-hospital births and the supply of maternity units in France. Health Place. 2011;17(5):1170-3. doi: 10.016/j.healthplace.2011.06.002. Epub Jun 21.
7. Statbel. Geografische indelingen. Documentatie - de gebruikte gegevens [Web page]. Available from: <https://statbel.fgov.be/nl/themas/datalab/geografische-indelingen#documents>
8. ESRI. ArcGIS Service Area Analysis. 2019.
9. TomTom Maps. TomTom Maps Historical Traffic; 2019.
10. European Environment Agency. Reference Grid [Web page].2011. Available from: https://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2/about-the-eea-reference-grid/eea_reference_grid_v1.pdf
11. Lefèvre M, Bouckaert N, Camberlin C, Devriese S, Pincé H, de Meester C, et al. Organisation of maternity services in Belgium. Health Services Research (HSR). Brussels: Belgian Health Care Knowledge Centre (KCE); 2019 01/2020. KCE Reports 323 Available from: https://kce.fgov.be/sites/default/files/atoms/files/KCE_323_Maternit_y_services_Belgium_Report.pdf
12. Higgs G. A literature review of the use of GIS-based measures of access to health care services. Health Services and Outcomes Research Methodology. 2004;5(2):119-39.
13. Delamater PL, Messina JP, Shortridge AM, Grady SC. Measuring geographic access to health care: raster and network-based methods. International Journal of Health Geographics. 2012.
14. Rijksinstituut voor Volksgezondheid en Milieu. Zorgbalans 2014. De prestaties van de Nederlandse gezondheidszorg. RIVM; 2014. 2014-0038
15. National Audit Office. Maternity services in England. 2013.
16. Coldefy M, Com-Ruelle L, Lucas-Gabrielli V. Distances et temps d'accès aux soins en France métropolitaine. Questions d'économie de la santé. 2011;164.

