Sport accommodation point and neighborhood density 2017

Spatial scale / resolution: PC6 Address / point coordinates

Spatial coverage: Netherlands

Temporal range: 2017 (data collection 2011 – 2017)

Data format input data: xlsx –format

Data format output data: Points / ESRI File Geodatabase (FileGDB)

Data source input data: Databestand SportAanbod (DSA) Mulier instituut

Dara storage outputdata:

..\Source_data\Sportaccomodaties\Sport_accommodaties.shp

Data description:

The dataset 'Sport accommodation point and neighborhood density 2017' is derived from the dataset 'Databestand SportAanbod (DSA)' which is a national dataset with data from approximately 22.000 sport accommodations in the Netherlands managed by the Mulier Instituut. The DSA includes from all sport accommodations the address data, the XY coordinates, the type of sport accommodation and the distinction between indoor- or outdoor accommodation. Depending on the type of accommodation additional data can be recorded, e.g. physical facilities such as accommodation buildings and their accessibility for e.g. wheel chairs, the number of dressing rooms, but also the number of holes on a golf track or the number of football fields on a sport complex.

The data is organized on the basis of sport type and location. This means that one sport accommodation at a certain location can have multiple records in the database if more than one sport can be practiced, e.g. a single sport complex that combines volleyball indoors and football and tennis on outdoor fields contains 3 records in the database.

Prior to the calculation of sport accommodation densities, a selection was made of sports involving significant physical activity. This means that sports such as chess playing, bridge, dog sport and car sport, were removed from the database.

The sport accommodation point density 2017 per neighborhood gives for each neighborhood the average 1000 meter radius density of sport accommodations.

Data processing:

Conversion of XY data to GIS layer

The input table was saved to a Excel workbook 97-2003 (*.xls) format and imported as XY data (Add XY data (Menu: File / Add Data / Add XY data) into ArcGIS. Next the resulting XY event layer is exported to a point layer file in ESRI Shape file format (*. Shp).

Selection of relevant sport accommodation types

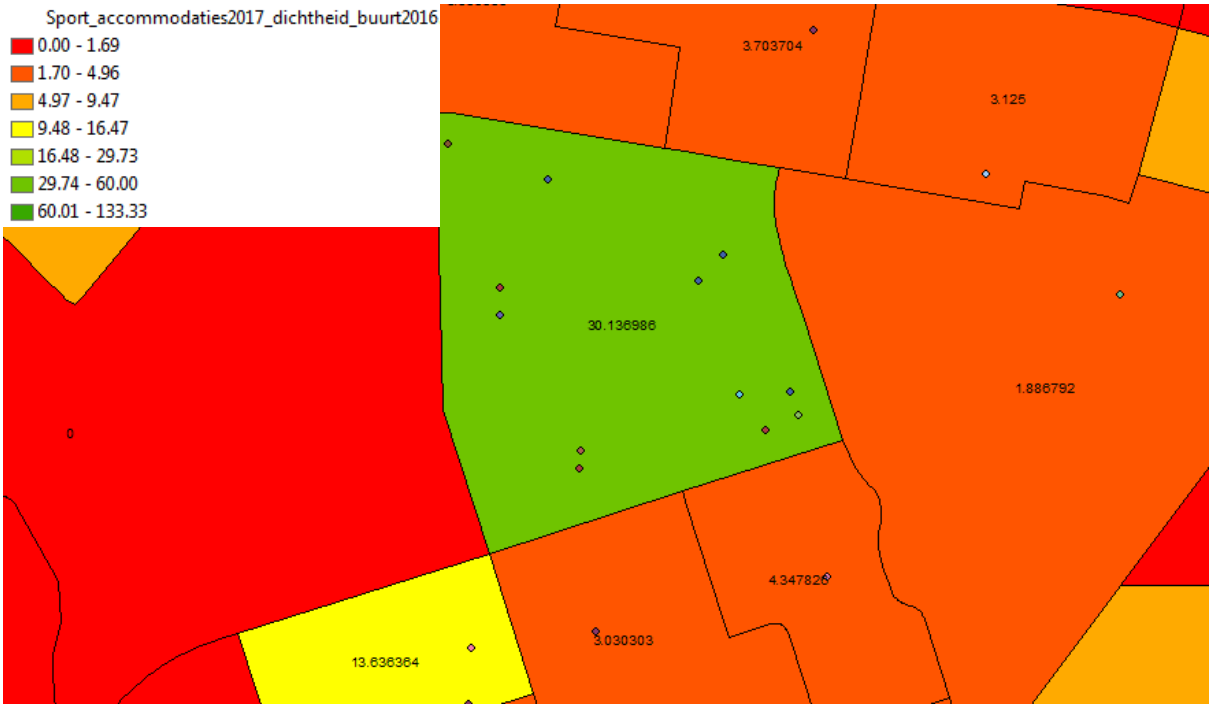
The purpose of this dataset is to apply it for the creation of an Obesogenic Environment Index. To this end we only want to incorporate sport accommodations that can be expected to have a significant positive health impact in relation to obesity. The hinter lying assumption is that the most significant health contribution from sports follows from the physical activity that characterize these sports. We define sport in this sense as 'a game, competition, or activity needing physical effort and skill that is played or done according to rules, for enjoyment and/or as a job' (Cambridge Dictionary definition, 2019). Following these considerations we excluded the following specific sport accommodation categories and named the resulting selection: Sport_accommodaties2017_selection.

Sport accommodation category	Main reason for exclusion
'Biljart',	Bar sport not involving significant physical activity, possibly accompanied with unhealthy food and alcohol consumption
'Bridge',	Mental sport not involving significant physical activity
'Darten',	Bar sport not involving significant physical activity, possibly accompanied with unhealthy food and alcohol consumption
'Denksport',	Mental sport not involving significant physical activity
'Evenementen',	Location for occasional sportive events that lack regularity to be considered a sport accommodation
'Schaken',	Mental sport not involving significant physical activity
'Snooker'	Bar sport not involving significant physical activity, possibly accompanied with unhealthy food and alcohol consumption
'Schaatsen-natuurijs'	Location for occasional ice-skating on natural ice. Frequency, is usually very low, at max a couple of days in winter to be considered a sport accommodation

Exploration of possible MAUP issues

The simplest and most straightforward way of producing a neighborhood sport accommodation density map is by counting and assigning the number of sport accommodations per neighborhood in a spatial join operation. However, such a map is bound to suffer from the Modifiable Areal Unit

Problem (MAUP), which is the problem / bias that occurs when point-based measures of spatial phenomena are aggregated into administrative units in which summary values (e.g., totals, rates, proportions, densities) are influenced by both the shape and scale of the aggregation unit. To illustrate this problem with our dataset see in the map below the neighborhood 'Ookmeer' in Amsterdam with a high concentration of sport accommodations (30 accommodations per km2, see the label in each neighborhood) displayed in the color green with displayed on top the sport accommodations as colored dots. This neighborhood has only 5 inhabitants, while surrounding neighborhoods which are very near to this concentrated sport area with much more inhabitants get much lower sport densities of less than 5 accommodations per km2 which is not very representative of the real situation. Also calculating different density types such as number of sport accommodations per 1000 inhabitants doesn't solve this situation.



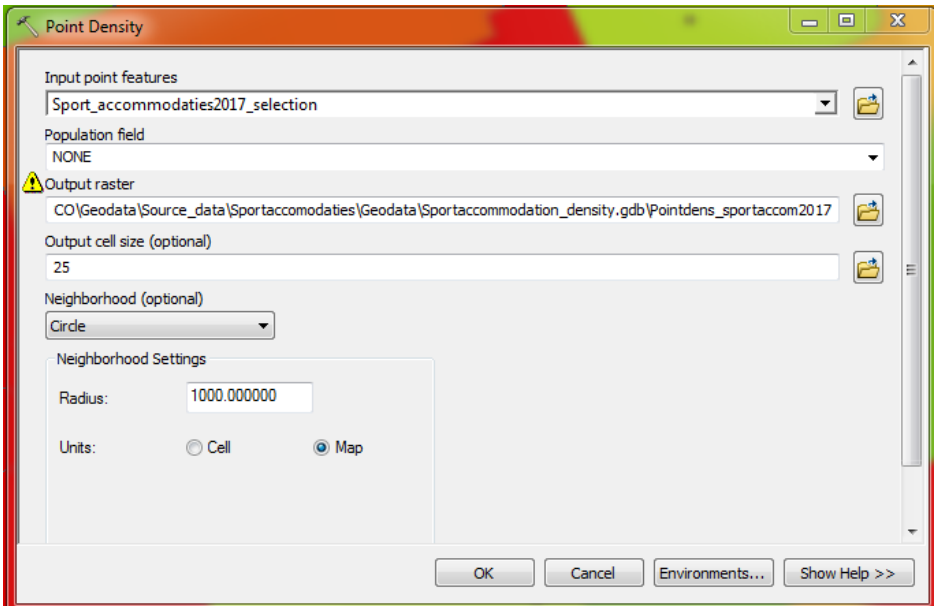
The solution for this problem is therefore to calculate uniform densities of sport accommodations for each location on the map, prior to summarizing the average densities to the different neighborhoods. Such an approach takes care that also information from adjacent neighborhoods is incorporated in the different neighborhood values. We use the point density function in combination with zonal statistics to apply this method as explained in the following section.

Calculate point densities sport accommodations

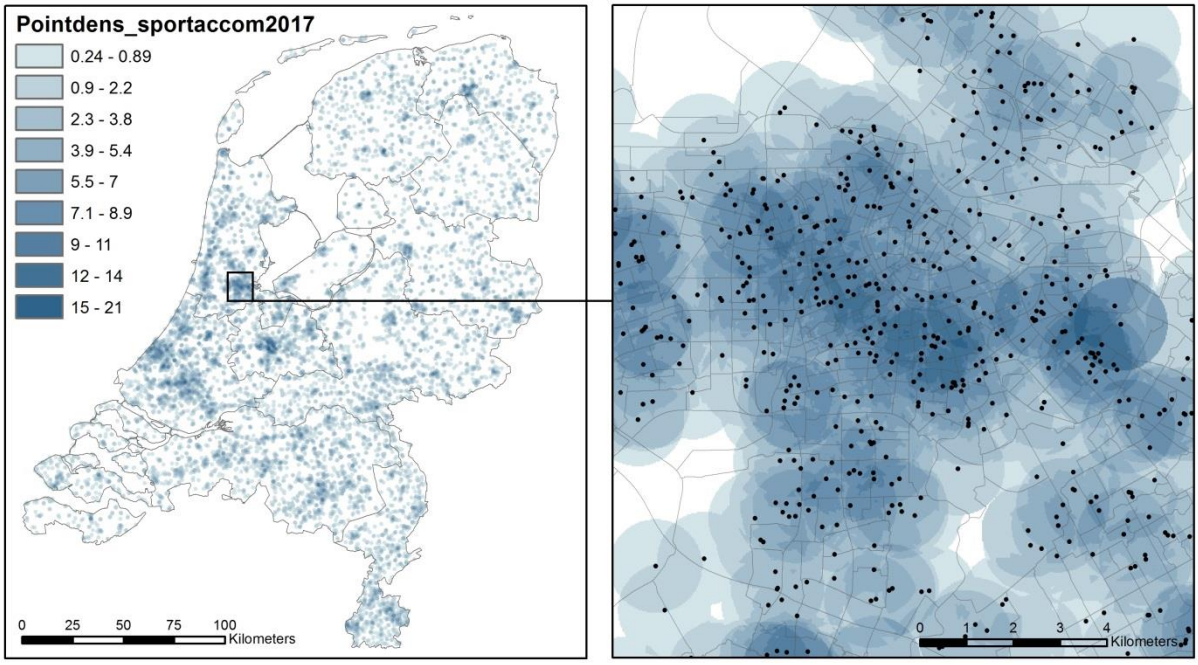
As explained here above, to overcome the mentioned MAUP effect as much as possible, we have calculated point densities within a search radius of 500, 1000, 3000 and 5000 meters prior to the data aggregation to neighborhoods (only the 1000 meter radius was used to calculate the

neighborhood density). Doing this takes care that for each location on the map environment information is gathered and summed up in a regular spaced raster and subsequently averaged over the corresponding neighborhoods. We did not choose for the option of calculating a kernel point density as we consider the presence of different sport types within an acceptable travel distance more important than the exact distances to these different sports (a shorter distance should not get more weight if it is about different sports).

For the point density calculation of the selected sport accommodations we used the following settings in the point density analysis (see figure below).



The map underneath shows the result of this point density analysis for the two scale levels.



Aggregate point density of sport accommodations to neighborhoods

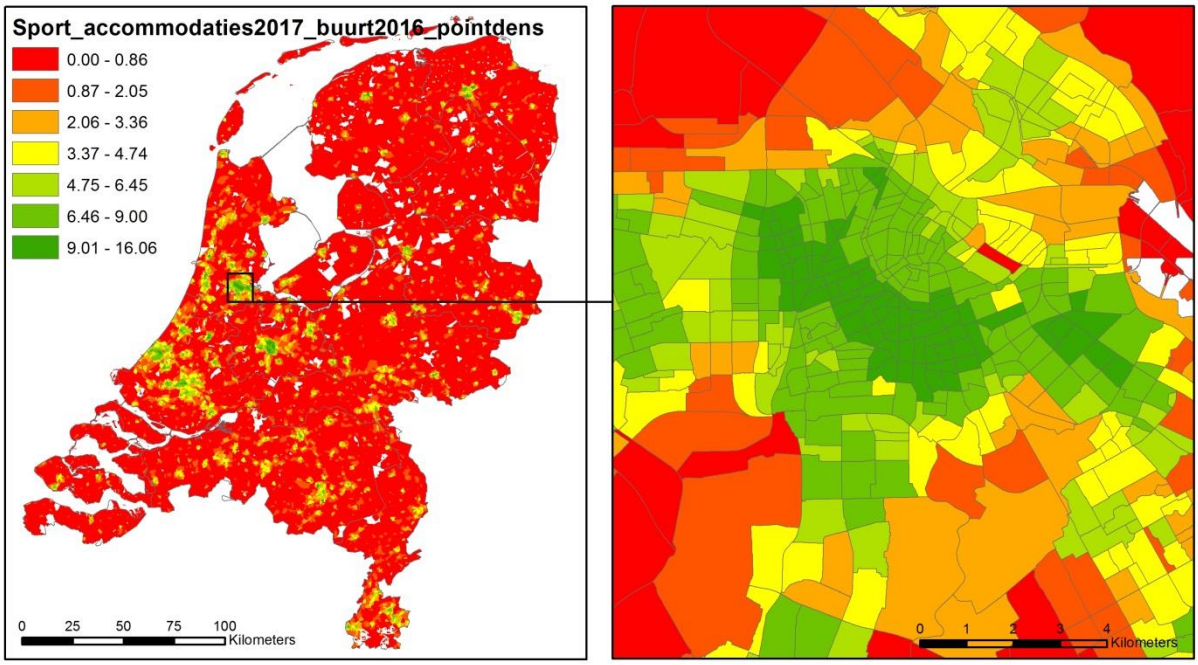
In the last steps average point density values are assigned to all neighborhoods.

- First a zonal statistics operation (with statistic type: MEAN) is carried out with the neighborhood map as the feature zone data and the point density map as the input value raster. The result is a raster with 25 meter cells with values corresponding to the mean point density value per neighborhood.
- Next, the raster is resampled to 100 meter cells to avoid long processing times in the next step
- Next, the raster with floating values is multiplied by 1000 (to avoid loss of accuracy) and converted to an integer raster as the subsequent operations only work with integer values: Int(("Zonalstat_Pointdens_sportaccom2017" * 1000))
- Subsequently, a raster to polygon operation is carried out (which needs integers as input)
- A table field is added and the integer values are divided by 1000 to get back the original point densities: [gridcode]/1000
- Polygons are converted to points (this step is necessary to guarantee a correct spatial join operation in the next step, as the raster based polygons have different polygon borders than the original neighborhood polygons)
- Carry out a spatial join (match option: Intersect, merge rule: first) between the original neighborhood polygons of 2016 (target features) and the point density values (Zonalstat_Pointdens_sportaccom2017_poly2point) with the average point density values per neighborhood

The resulting map of these steps is displayed here below.

Map example Sport accommodation point density 2017 per neighborhood

..\Geodata\Source_data\Sportaccomodaties\Map overview 4 metadata sheet sportaccommodations.mxd



Variables

Tables 1 and 2 provides an overview of variables that are available in these datasets.

Table 1: Overview of attribute data in dataset Spdens_2017.csv

Variable name	Description	Original dataset
r500m	Pointdensity sportaccommodations in 500m radius	PD500m_sportaccom2017 (FGDB raster)
r1000m	Pointdensity sportaccommodations in 500m radius	PD1000m_sportaccom2017 (FGDB raster)
r3000m	Pointdensity sportaccommodations in 500m radius	PD3000m_sportaccom2017 (FGDB raster)
r5000m	Pointdensity sportaccommodations in 500m radius	PD5000m_sportaccom2017 (FGDB raster)

Table 2: Overview of attribute data in dataset Sport_accommodaties2017_buurt2016_pointdens

Variable name	Description	Original dataset
BU_CODE	Neighborhood code	Sport_accommodaties2017_buurt2016_pointdens
BU_NAAM	Neighborhood name	Sport_accommodaties2017_buurt2016_pointdens
Pntdns1000	Average 1000 meter radius point density sport accommodations 2017 per neighborhood	Sport_accommodaties2017_buurt2016_pointdens

Data provider

The Mulier Institute was founded in 2002 and is the only independent, non-profit, scientific sport-research institute in the Netherlands. As such, it is engaged in fundamental, practice-focused and policy relevant social-scientific sport research. It monitors the developments within the Dutch sports sector. It builds its own databases and trend series to this end, in close cooperation with academic

and professional universities both in the Netherlands and abroad as well as with other research organisations and statistical administrative bodies, such as CBS Statistics Netherlands and Eurostat. The institute aspires to enhance the quality of sport research and sport policy in the Netherlands.

Data quality

The database contains a separate column 'Methode' that contains information about the data collection method, while the field 'bron' lists the source of the information. At the moment of writing it is not yet clear if the field 'Datum' contains the date of data collection (which we assume now) or something else and if this field will be updated to the current datum when it is edited with new information.

Additional information

https://www.mulierinstituut.nl/producten-diensten/dataverzameling/database-sportaanbod/
https://www.volksgezondheidenzorg.info/sport/sportopdekaart/sportaccommodaties#node-sportaccommodaties-gemeente

Contact information

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Specific information DSA - Databestand SportAanbod

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Terms and conditions

No terms and conditions have been provided.

Suggested or required way of data referencing

No indications for referencing have been provided.

List of references

n.a.