

Deprivation found to be a decisive factor in obesity

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This is an image of a weight scale. Credit: CDC/Debora Cartagena

People with a predisposition to obesity will be more likely to develop the condition if they are faced with disadvantageous socioeconomic conditions. In Lausanne, the probability of being overweight is therefore higher in the west than the east of the city, because levels of deprivation are higher in the west. Nutrition, lifestyle and the environment interact with an individual's genes and are likely to influence their body mass

index (BMI). The level of deprivation is therefore a decisive factor.

These are the conclusions of the study published jointly by the University of Exeter Medical School, Lausanne University Hospital (CHUV) and the Ecole polytechnique fédérale de Lausanne (EPFL) in the *International Journal of Epidemiology*. The researchers were able to confirm the initial results found by analysing 120,000 individuals drawn from the UK's biobank. Around 6,000 inhabitants of the capital of Vaud (the CoLaus study) were used to test and confirm the findings.

Among the study's co-authors are Zoltán Kutalik (Institute of Social and Preventive Medicine, IUMSP), Idris Guessous (Policlinique médicale universitaire, PMU), researchers at CHUV and Stéphane Joost, from the Geographic Information Systems Laboratory (LASIG) at EPFL. They have been working to identify the causes of [obesity](#) for several years. In 2014, an initial study on the geographical distribution of BMI in the city of Geneva revealed that a difference in income was not enough to explain the spatial distribution of people who were overweight. In 2016, an additional study in the city of Lausanne found that, even adjusting BMI values for other socio-economic criteria such as educational level, age, state of health, ethnic origin, gender and alcohol consumption, overweight people were clearly concentrated in the west of Lausanne.

Four deprivation factors tested

Stéphane Joost used the same indicator – the Townsend Deprivation Index (TDI) – for this study as the British research. The index was developed in 1987 and can be used to create a map of a city based on four factors: unemployment rate, household overcrowding (i.e. the relationship between the number of inhabitants and the number of rooms per dwelling), and the proportion of car owners and home owners. These last two factors are now questionable, since the fact of not owning a car in a city centre is not necessarily an indicator of [deprivation](#). In the map

of Lausanne, for example, the TDI is overestimated in central districts of the city. Nonetheless, the capital of Vaud appears divided, with a higher deprivation index in the west than the east.

Stéphane Joost then sent these data to researchers at the CHUV. The researchers calculated the degree of interaction between the TDI and a genetic risk score (GRS) influencing [body mass index](#). The GRS is a combination of 69 genetic variants creating a predisposition to obesity. The result that emerged was a disparity between the east and west of the city. This is difficult to quantify precisely, however, because of the small cohort size (6,000 individuals). By comparison, the participants in the British study, which included 10 additional genetic variants predisposing an individual to obesity, put on an average of one additional kilo (3.6 kilos compared with 2.8 kilos for a person of average height) when they lived in an environment at high risk of deprivation.

Better targeting prevention measures

"Our study shows that it is not enough to target prevention measures for weight gain on specific factors such as consuming sugary drinks or fried foods, when disadvantageous socioeconomic conditions accentuate a genetic predisposition to obesity. We therefore need to ask to what extent changing spatial planning could be a means of containing the current obesity epidemic," explains Stéphane Joost. There is no shortage of hypotheses in this area. As well as having more green space and wooded areas than the west of the city, districts in the east are thought to be less affected by night-time noise, mainly linked to road and rail traffic.

The analysis from the CHUV is the same: "Obesity is caused by multiple factors. We focused here on calculating the impact of the deprivation factor on the genetic predisposition to obesity. Our study shows that it is very difficult to specify which environmental and lifestyle factors are the

most critical, but that there is an interaction between the risk of becoming overweight for people who have a genetic predisposition to it and the socio-economic conditions reflected by the type of district they live in. From our perspective, it's quite an unfair factor," comments Zoltán Kutalik, a statistician specialising in genetics.

Multiple solutions

What solutions would the researchers suggest to address this inequality? "Improve the level of education among the population, encourage the award of study grants and offer gym memberships... These measures would have an impact on residents' [genetic predisposition](#) to obesity," suggests Zoltán Kutalik. According to Stéphane Joost, work on urban planning is another avenue to explore. "Limiting night-time traffic on busy roads, better sound insulation for buildings, making certain districts less cut-off than they currently are, more direct access to sociocultural and sporting facilities and developing environmentally friendly transport could also reduce exposure to obesity and limit the divide between the west of Lausanne and the rest of the city." The next stage of the CHUV and EPFL research will focus on examining these hypotheses.

More information: Jessica Tyrrell et al. Gene–obesogenic environment interactions in the UK Biobank study, *International Journal of Epidemiology* (2017). [DOI: 10.1093/ije/dyw337](https://doi.org/10.1093/ije/dyw337)

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