International Journal of
Environmental Research and Public Health

MDPI

Editorial

Obesity and Urban Environments

Peter Congdon

School of Geography, Queen Mary University of London, Mile End Rd, London, E1 4NS, UK; p.congdon@qmul.ac.uk

Received: 22 January 2019; Accepted: 2 February 2019; Published: 5 February 2019

Abstract: Obesity is a major public health issue, affecting both developed and developing societies. Obesity increases the risk for heart disease, stroke, some cancers, and type II diabetes. While individual behaviours are important risk factors, impacts on obesity and overweight of the urban physical and social environment have figured large in the recent epidemiological literature, though evidence is incomplete and from a limited range of countries. Prominent among identified environmental influences are urban layout and sprawl, healthy food access, exercise access, and the neighbourhood social environment. This paper reviews the literature and highlights the special issue contributions within that literature.

Keywords: obesity; urban configuration; sprawl; food desert; fast food; exercise access; social environment

1. Background

Obesity is a major public health issue, affecting both developed and developing societies [1]. Obesity increases the risk for heart disease, stroke, some types of cancer, and type II diabetes. While individual behaviours are important risk factors, impacts on obesity and overweight of the urban physical and social environment have figured large in the recent epidemiological literature, though evidence is incomplete and from a limited range of countries.

2. Trends in Obesity

Although genetic factors affect susceptibility to obesity [2], they cannot account for the rapid increases in obesity in recent decades. Instead, changes in physical activity and diet are the focus in explaining this adverse trend [3]. Physical activity levels are declining, and sedentary behaviours increasing, not only in developed countries, such as the U.S., but also in low- and middle-income countries, such as China [4,5]. Dietary changes, such as the growth in fast food consumption and the "nutrition transition" [6,7] are also significant, and again affect both developed and less developed societies.

In turn, environmental factors are important influences on changing levels of physical activity and on changing dietary behaviours throughout the life course [8]. Variations in the impact of these factors according to socioeconomic level, ethnicity, and geographic location are a major focus in obesity research [9,10].

Regarding environmental influences on physical activity, one may distinguish [11] between proximal (home) and distal (neighbourhood) environmental and social factors. Proximal factors include influences on sedentary behaviour during childhood, and activity levels across the life course [12–15]. Prominent among identified distal environmental influences are urban layout, healthy food access, exercise access, and the neighbourhood social environment.

3. Urban Layout and Physical Activity

Especially in the US, Canada, and Australia, a large literature concerns urban configuration in terms of its impact on physical activity, framed especially in terms of neighbourhood walkability, and levels of active commuting [16–18].

Thus, sprawl has been defined as low density suburban development, with segregated land uses, low connectivity [19], high automobile dependence, and disincentives to physical activity [20,21]. By contrast, walkable neighbourhoods facilitate walking or bicycling to workplaces and to amenities such as shopping centres, parks, schools, and entertainment centres, rather than requiring automobile trips. Thus, [22] in a time series analysis of Ontario neighbourhoods, report no increase in obesity and overweight in more walkable neighbourhoods, whereas increases occurred in less walkable neighbourhoods.

A study of active commuting in a low- to middle-income country is exemplified by Adlakha et al. [23] with a focus on Chennai, India, where rapid growth in car ownership has reduced active commuting. They report that active commuting and use of public transport is associated with a greater mix of land uses, but not with street connectivity.

4. Environment and Diet

Regarding environmental influences on dietary patterns, the local food environment and access to healthy food outlets is a major research focus. Thus, food deserts have been defined as areas with diminished access to fresh fruit, vegetables, and other whole foods, and tending to be found in socio-economically deprived areas or ethnic minority neighbourhoods [24–26].

This is taken to reflect the location of supermarkets, grocery stores, and farmers' markets, as opposed to fast food outlets and convenience stores offering processed food with high sugar and fat content. In USA, the USDA estimates that 23.5 million people live in urban neighbourhoods and rural towns with limited access to fresh, affordable, healthy food. On the other hand, sceptical studies regarding the impact of the neighbourhood food environment have emphasized instead demand differences between income groups [27].

As well as neighbourhood access to healthy food, access of schools to healthy food options is also a considerable research focus—given that increases in child and adolescent obesity have been a feature of the overall growth in obesity, and may be linked to deprivation [28]. A Dutch study [29] found that, in general, unhealthy options (e.g., fried snacks, sugar-sweetened beverages) were more often in close proximity to schools in comparison with healthy options. Moreover, fast food outlets were more often in the vicinity of secondary schools in lower SES neighbourhoods (28.6%) than in higher SES neighbourhoods (11.5%).

Studies such as that by Murphy et al. [30] in Melbourne consider the interplay between sprawl and food access. This study reports worse access to supermarkets, and higher BMI, in low-density residential development in contrast to compact higher density areas.

5. Environmental Justice and Access to Physical Activity

In general, studies predominantly from Australia, the UK, and the USA have demonstrated that living in closer proximity to public open space (POS) is associated with greater physical activity and improved health, for all age groups. However, access to POS varies by social group in line with a broader theme of environmental injustice, namely disproportionate exposure to adverse environmental conditions experienced by low-income and ethnic minority groups.

For example, there is evidence that the distribution of urban green space and parks [31] disproportionately benefits higher income and white ethnic groups. Both access and quality of parks may depend on the socio-economic level of neighbourhoods [32]. Methods for measuring access itself are important: a Mediterranean study [33] interrelates walkability and POS access, using three objective indicators of exposure to POS: "the distance of the walkable street network to the closest POS; the number of POS and the total area of POS within each network walkable street buffers (0.5

km, 1 km and 1.5 km) of participants residential addresses, using only the walking and/or cycling street network, ignoring routes restricted to pedestrians".

6. Neighbourhood Social Environment

While the neighbourhood built environment has been extensively studied in relation to obesity, the neighbourhood social environment is perhaps an equally important component of the neighbourhood environment that is relevant to obesity among both adults and children. This includes aspects such as social capital, collective efficacy, and crime [34]. Thus, Holtgrave and Crosby [35] report that multivariate linear regression showed social capital to be a predictor of both obesity and diabetes (explaining 10% of the variance in obesity and 44% of the variance in diabetes). A Scottish study [36] examined the effects on adiposity of cumulative exposures to adverse neighbourhood conditions (as reflected in adverse neighbourhood perceptions). They found stronger relationships for abdominal obesity and percentage body fat, and weaker relationships with BMI, in line with a mechanism in which prolonged stress activates the hypothalamic–pituitary–adrenal axis and in turn leads to increased abdominal obesity.

7. Analytic Approaches

Analytic approaches to studying environmental impacts may be best provided by multilevel frameworks accounting for contextual risk factors beyond the individual, including the home, parental characteristics (for child subjects), and the physical and social environment [37–39]. Thus, Yip et al. [40] found that after adjusting for age, sex, income, education, and urbanity, both individual-level and community-level social cohesion were positively associated with physical activity.

Studies with a primarily geographic focus are also relevant, for example, to assessing urban–rural contrasts [41] or the obesity epidemic in developing countries [42]. A study of US counties [43] considered aspects of urban settlement and commuting (namely car commuting), healthy food availability, and exercise access. These factors were able to explain over 50% of the variability in obesity, and accounted for much of the spatial clustering evident in the obesity maps. A Korean study [44] considered spatial variability in the impacts of area risk factors. It found environmental factors to have stronger effects on local obesity rates for women than for men (as also reported in [43]), and that environmental factors have more spatially varying effects on local obesity for women than for men.

8. Debated Questions

A range of issues are still open to research and debate. For example, there is much discussion over the relative importance of exercise and diet in the development of obesity. Some reviews [45,46] stress dietary changes, others stress the role of physical activity [47,48]. Similarly, the concept of food deserts, and of diminished food choices in lower income areas, has been questioned in some studies [27,49,50]. The appropriate focus in obesity interventions is also currently being discussed. For example, a Spanish study [51] emphasizes food access and improved access to POS and sports facilities, while other studies [52] put focus on health-promoting urban design and improved walkability.

References

1. Prentice, A. The emerging epidemic of obesity in developing countries. *Int. J. Epidemiol*. **2005**, *35*, 93–99.
2. Maes, H.; Neale, M.; Eaves, L. Genetic and environmental factors in relative body weight and human adiposity. *Behav. Genet.* **1997**, *27*, 325–351.
3. Popkin, B. Using research on the obesity pandemic as a guide to a unified vision of nutrition. *Public Health Nutr.* **2005**, *8*, 724–729.
4. Brownson, R.; Boehmer, T.; Luke, D. Declining rates of physical activity in the United States: What are the contributors? *Annu. Rev. Public Health* **2005**, *26*, 421–443.

5. Ng, S.; Popkin, B. Time use and physical activity: A shift away from movement across the globe. *Obesity Rev.* **2012**, *13*, 659–680.
6. Kearney, J. Food consumption trends and drivers. *Philos. Trans. R. Soc. Lond. B Biol. Sci.* **2010**, *365*, 2793–2807.
7. Rosenheck, R. Fast food consumption and increased caloric intake: A systematic review of a trajectory towards weight gain and obesity risk. *Obesity Rev.* **2008**, *9*, 535–547.
8. Dunton, G.; Kaplan, J.; Wolch, J.; Jerrett, M.; Reynolds, K. Physical environmental correlates of childhood obesity: A systematic review. *Obes. Rev.* **2009**, *10*, 393–402.
9. Wen, M.; Kowaleski-Jones, L. The built environment and risk of obesity in the United States: Racial–ethnic disparities. *Health Place* **2012**, *18*, 1314–1322.
10. Hill, J.; You, W.; Zoellner, J. Disparities in obesity among rural and urban residents in a health disparate region. *BMC Public Health*. **2014**, *14*, 1051.
11. Nesbit, K.; Kolobe, T.; Arnold, S.; Sisson, S.; Anderson, M. Proximal and distal environmental correlates of adolescent obesity. *J. Phys. Act. Health* **2014**, *11*, 1179–1186.
12. Sallis, J.; Prochaska, J.; Taylor, W. A review of correlates of physical activity of children and adolescents. *Med. Sci. Sports Exerc.* **2000**, *32*, 963–975.
13. Maitland, C.; Stratton, G.; Foster, S.; Braham, R.; Rosenberg, M. A place for play? The influence of the home physical environment on children's physical activity and sedentary behaviour. *Int. J. Behav. Nutr. Phys. Act.* **2013**, *10*, 99.
14. Kaushal, N.; Rhodes, R. The home physical environment and its relationship with physical activity and sedentary behavior: A systematic review. *Prev. Med.* **2014**, *67*, 221–237.
15. Strauss, R.; Knight, J. Influence of the home environment on the development of obesity in children. *Pediatrics* **1999**, *103*, e85.
16. Brace, O.; Garrido Cumbrera, M.; Galvez Ruiz, D.; Lopez Lara, E. Assessing the Influence of Urban Sprawl on Commuting Mode Choice. *Boletin de la Asociacion de Geografos Espanoles* **2017**, *75*, 687–690.
17. Lee, I.M.; Ewing, R.; Sesso, H.D. The built environment and physical activity levels: The Harvard Alumni Health Study. *Am. J. Prev. Med.* **2009**, *37*, 293–298.
18. Chiu, M.; Shah, B.; Rezai, M.R.; Austin, P.; Tu, J. Neighbourhood Walkability and Risk of Obesity. *Can. J. Diabetes* **2014**, *38*, S39.
19. Ellis, G.; Hunter, R.; Tully, M.; Donnelly, M.; Kelleher, L.; Kee, F. Connectivity and physical activity: Using footpath networks to measure the walkability of built environments. *Environ. Plan. B* **2016**, *43*, 130–151.
20. Lopez, R. Urban sprawl and risk for being overweight or obese. *Am. J. Public Health* **2004**, *94*, 1574–1579.
21. Garden, F.; Jalaludin, B. Impact of urban sprawl on overweight, obesity, and physical activity in Sydney, Australia. *J. Urban Health* **2009**, *86*, 19–30.
22. Creatore, M.; Glazier, R.; Moineddin, R.; Fazli, G.; Johns, A.; Gozdyra, P.; Booth, G. Association of neighborhood walkability with change in overweight, obesity, and diabetes. *JAMA* **2016**, *315*, 2211–2222.
23. Adlakha, D.; Hipp, J.; Sallis, J.; Brownson, R. Exploring neighborhood environments and active commuting in Chennai, India. *Int. J. Environ. Res. Public Health* **2018**, *15*, 184.
24. Hendrickson, D.; Smith, C.; Eikenberry, N. Fruit and vegetable access in four low-income food deserts communities in Minnesota. *Agric. Hum. Values* **2006**, *23*, 371–383.
25. Walker, R.; Keane, C.; Burke, J. Disparities and access to healthy food in the United States: A review of food deserts literature. *Health Place* **2010**, *16*, 876–884.
26. Jiao, J.; Moudon, A.; Ulmer, J.; Hurvitz, P.; Drewnowski, A. How to identify food deserts: Measuring physical and economic access to supermarkets in King County, Washington. *Am. J. Public Health* **2012**, *102*, e32–e39.
27. Allcott, H.; Diamond, R.; Dubé, J. *The Geography of Poverty and Nutrition: Food Deserts and Food Choices Across the United States*; NBER Working Paper Series; National Bureau of Economic Research, Cambridge, MA, USA, 2018
28. Abarca-Gómez, L.; Abdeen, Z.A.; Hamid, Z.A.; Abu-Rmeileh, N.M.; Acosta-Cazares, B.; Acuin, C.; Agyemang, C. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128· 9 million children, adolescents, and adults. *Lancet* **2017**, *390*, 2627–2642.
29. Timmermans, J.; Dijkstra, C.; Kamphuis, C.; Huitink, M.; van der Zee, E.; Poelman, M. 'Obesogenic'School Food Environments? An Urban Case Study in The Netherlands. *Int. J. Environ. Res. Public Health* **2018**, *15*, 619.

30. Murphy, M.; Badland, H.; Jordan, H.; Koohsari, M.; Giles-Corti, B. Local Food Environments, Suburban Development, and BMI: A Mixed Methods Study. *Int. J. Environ. Res. Public Health* **2018**, *15*, 1392.
31. Wolch, J.; Byrne, J.; Newell, J. Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'. *Landsc. Urban Plan.* **2014**, *125*, 234–244.
32. Hobbs, M.; Green, M.; Griffiths, C.; Jordan, H.; Saunders, J.; Grimmer, H.; McKenna, J. Access and quality of parks and associations with obesity: A cross-sectional study. *SSM Popul. Health* **2017**, *3*, 722–729.
33. Colom, A.; Fiol, M.; Ruiz, M.; Compa, M.; Morey, M.; Moñino, M.; Romaguera, D. Association between access to public open spaces and physical activity in a mediterranean population at high cardiovascular risk. *Int. J. Environ. Res. Public Health* **2018**, *15*, 1285.
34. Suglia, S.; Shelton, R.; Hsiao, A.; Wang, Y.; Rundle, A.; Link, B. Why the neighborhood social environment is critical in obesity prevention. *J. Urban Health* **2016**, *93*, 206–212.
35. Holtgrave, D.; Crosby, R. Is social capital a protective factor against obesity and diabetes? Findings from an exploratory study. *Ann. Epidemiol.* **2006**, *16*, 406–408.
36. Ellaway, A.; Dundas, R.; Olsen, J.; Shiels, P. Perceived neighbourhood problems over time and associations with adiposity. *Int. J. Environ. Res. Public Health* **2018**, *15*, 1854.
37. Boonpleng, W.; Park, C.; Gallo, A.; Corte, C.; McCreary, L.; Bergren, M. Ecological influences of early childhood obesity: A multilevel analysis. *West. J. Nurs. Res.* **2013**, *35*, 742–759.
38. Huang, R.; Moudon, A.; Cook, A.; Drewnowski, A. The spatial clustering of obesity: Does the built environment matter? *J. Hum. Nutr. Diet.* **2015**, *28*, 604–612.
39. Matozinhos, F; Gomes, C; de Souza Andrade, A.; Mendes, L.; Pessoa, M; de Lima Friche, A; Velasquez-Melendez, G. Neighbourhood environments and obesity among adults: a multilevel analysis of an urban Brazilian context. *Preventive Medicine Reports*, **2015,** 2, 337–341.
40. Yip, C.; Sarma, S.; Wilk, P. The association between social cohesion and physical activity in Canada: A multilevel analysis. *SSM Popul. Health* **2016**, *2*, 718–723.
41. Ajayi, I.; Adebamowo, C.; Adami, H.; Dalal, S.; Diamond, M.; Bajunirwe, F.; Guwatudde, D.; Njelekela, M.; Nankya-Mutyoba, J.; Chiwanga, F.; et al. Urban-rural and geographic differences in overweight and obesity in four sub-Saharan African adult populations: A multi-country cross-sectional study. *BMC Public Health* **2016**, *16*, 1126.
42. Kandala, N-B; Stranges, S. Geographic variation of overweight and obesity among women in Nigeria: a case for nutritional transition in Sub-Saharan Africa. *PLoS ONE* **2014**, *9*, e101103.
43. Congdon, P. Variations in obesity rates between US counties: Impacts of activity access, food environments, and settlement patterns. *Int. J. Environ. Res. Public Health* **2017**, *14*, 1023.
44. Jun, H.; Namgung, M. Gender Difference and Spatial Heterogeneity in Local Obesity. *Int. J. Environ. Res. Public Health* **2018**, *15*, 311.
45. Malhotra, A.; Noakes, T.; Phinney, S. It is time to bust the myth of physical inactivity and obesity: You cannot outrun a bad diet. *Br. J. Sports Med.* **2015**, *49*, 967–968.
46. Luke, A.; Cooper, R. Physical activity does not influence obesity risk: Time to clarify the public health message. *Int. J. Epidemiol.* **2013**, *42*, 1831–1836.
47. Fisher, G.; Hunter, G.; Allison, D. Commentary: Physical activity does influence obesity risk when it actually occurs in sufficient amount. *Int. J. Epidemiol.* **2013**, *42*, 1845–1848.
48. Blair, S.; Archer, E.; Hand, G. Commentary: Luke and Cooper are wrong: Physical activity has a crucial role in weight management and determinants of obesity. *Int. J. Epidemiol.* **2013**, *42*, 1836–1838.
49. Lee, H. The role of local food availability in explaining obesity risk among young school-aged children. *Soc. Sci. Med.* **2012**, *74*, 1193–1203.
50. An, R.; Sturm, R. School and residential neighborhood food environment and diet among California youth. *Am. J. Prev. Med.* **2012**, *42*, 129–135.
51. Díez, J.; Gullón, P.; Sandín Vázquez, M.; Álvarez, B.; Martín MD, P.; Urtasun, M.; Franco, M. A Community-Driven Approach to Generate Urban Policy Recommendations for Obesity Prevention. *Int. J. Environ. Res. Public Health* **2018**, *15*, 635.
52. Tran, M. Healthy cities—Walkability as a component of health-promoting urban planning and design. *J. Sustain. Urban.* **2016**, *1*, doi:10.18063/JSUPP.2016.01.006.