

Original Article

Behavioural determinants of the obesity epidemic

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Obesity is a serious and growing public health problem affecting developed and developing countries. It is generally agreed that the causes of the current obesity epidemic are not genetic in origin, but are the result of changes in the environments in which we live. While acknowledging the importance of environmental factors, the central role of behaviour in the obesity epidemic cannot be ignored. It is our eating, physical activity and sedentary behaviours that form the interface between our biology and the environments to which we are exposed. However, a lack of understanding of the specific behaviours that are important in the aetiology of obesity poses a major constraint to preventing obesity. A better understanding of the behaviours that contribute to weight gain and obesity is critical in order to plan and implement effective obesity prevention initiatives. Theory-driven investigations of eating, physical activity and sedentary behaviours, their determinants, and their role in weight gain and obesity among different population groups are urgent research priorities. Without an understanding of the key behaviours that contribute to weight gain, and the influences on these behaviours, it will remain difficult to identify where to intervene in the environment and be confident that action will prevent obesity.

Key words: eating behaviour, epidemiology, physical activity.

The obesity pandemic and the case for prevention

In their recent review of the case for global action to prevent obesity, Kumanyika *et al.*¹ noted that the World Health Organization has recognized that 'overweight and obesity represent a rapidly growing threat to the health of populations and an increasing number of countries worldwide'.² The case for obesity prevention is a strong one. Obesity is a major contributor to disease and disability, the associated health costs are substantial, obesity has already reached epidemic proportions in many countries, and the incidence of overweight and obesity is continuing to increase in children and adults.¹ In Australia, for example, the available data suggest that among adults there was an increase in the prevalence of overweight and obesity from 48% to 63% for males, and 27% to 43% for females between 1980 and 1995.³ Among Australian children, almost one in five are overweight or obese, representing a two-fold increase over the past 15 years.⁴ Disturbingly, this epidemic is not confined to developed countries like Australia. Overweight and obesity are increasing throughout the world, with many developing countries and those in transition affected.¹ It is thus essential that steps be taken to prevent a further increase in obesity.

It is only in the last five years that obesity has become recognized as a population-wide phenomenon that warrants preventive action. At this point we have a poor understanding of the causes of this phenomenon and we are thus ill equipped to deal with it. The purpose of this paper is to examine the role of population eating and physical activity behaviours in the obesity epidemic, and to briefly consider

the theoretical models that allow us to understand these behaviours and that underpin interventions aimed at influencing behaviours to prevent obesity.

The role of genetics, environment and behaviour

While genetic factors determine an individual's susceptibility to weight gain, it is generally agreed that the increase in obesity that has been observed across whole populations is not attributable to genetic factors. The increases in global obesity rates observed over the past few decades have occurred over too short a period for there to have been significant changes in our genetic make-up.² Individual differences in metabolic efficiency are also insufficient to explain the recent increase in the prevalence of obesity.⁵ The obesity epidemic is recognized to be a result of changes in energy intake and/or energy expenditure that have led to energy imbalance in a large portion of the population. But what is driving this energy imbalance? According to Schmitz and Jeffery 'the fact that the obesity epidemic is being caused by environmental changes is virtually inescapable'.⁶ Indeed, in one of the earliest papers to draw attention to the obesity epidemic, Prentice and Jebb presented data in which they demonstrated that changes in average body mass index (BMI) occurred at the same time as changes in the environment

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(i.e. television ownership and car ownership).⁷ Some authors have even gone as far to describe the environment as 'toxic'⁸ or 'obesogenic'.⁹

Although there is consensus that environmental factors are likely to be important in influencing energy intake and expenditure, and ultimately body weight, empirical evidence of a relationship between specific environmental exposures and obesity is poor. It is therefore difficult to make specific recommendations for public health action.¹⁰ One of the major challenges in understanding the role of the environment in promoting obesity is that there is a huge range of environmental factors that potentially could increase the likelihood of weight gain and thus risk of obesity.^{11,12} Many environmental factors have not been investigated, and of those that have been studied, a number that we might intuitively consider to be important, surprisingly are not. For instance, in a recent review of empirical studies, Humpel *et al.*¹³ found no association between physical activity participation and the weather, heavy traffic in the neighbourhood, presence of sidewalks, various indices of safety, and certain aspects of neighbourhood aesthetics. The role of the environment therefore remains unclear, and further conceptual and empirical research is required. Whatever the environmental influences on the obesity epidemic, however, they must be mediated by the population's eating and physical activity behaviours (i.e. through energy intake and energy expenditure).

Population eating and physical activity behaviours are critically important, since it is these behaviours that form the interface between our biology and the environments to which we are exposed. If we are to develop effective strategies to prevent obesity, it is important we better understand the population's eating and physical activity behaviours, the determinants of these behaviours, and how they might be influenced.¹⁴ In adopting such a behavioural epidemiology perspective, it is important to focus on the behaviours themselves, rather than on the disease or health condition¹⁵ and to examine their psycho-social and social-ecological antecedents.¹⁶ With regards to the obesity epidemic, it is therefore important to acknowledge that the environment is but one source of influence, albeit a potentially potent one.^{1,11,12}

Which behaviours increase risk of obesity?

The most fundamental level of behavioural epidemiology is concerned with the identification of behaviours that are causally linked to the disease or condition of interest.¹⁴ One of the major constraints in achieving behavioural change to prevent obesity is our lack of understanding of the specific behaviours that are important in its aetiology. There is even debate over the relative importance of energy intake (i.e. eating behaviours) versus energy expenditure (i.e. physical activity behaviours) in relation to the obesity epidemic.^{6,7} While it may be an interesting scientific debate, it is not particularly helpful in practical terms. It is noteworthy that this debate may have also confused the public about the causes of weight gain.¹⁷ Undoubtedly both sides of the

energy balance equation are important in the aetiology of obesity.² Further, evidence can be found to support both the case for increased energy intake and the case for decreased energy expenditure as causing the obesity epidemic.⁶ Given this, it is prudent to explore opportunities to influence both the population's eating and physical activity behaviours.

What then are the eating and physical activity behaviours that increase the risk of obesity? While it is obvious that obesity is a consequence of energy imbalance, the specific behaviours that are of concern are poorly described and understood. Most epidemiological research in this area has focused on assessing diet and physical activity to provide aggregate or 'bottom-line' estimates of energy intake and expenditure and to relate these to risk of weight gain or obesity. However, while important, such data tell us nothing about the behaviours that underlie a diet that is high in energy intake, or a lifestyle that involves low energy expenditure. For example, while a diet that is high in fat is likely to play a role in weight gain, fat intake is not a single behaviour, but the product of a multitude of eating and other food-related behaviours (e.g. eating cake, drinking milk, eating red meat, eating hamburgers, eating French fries, using margarine on bread, deep frying food, eating take-away and fast foods, etc.). However, few studies have assessed the eating behaviours underpinning a high fat diet. On the whole, there are few data regarding the role of dietary behaviours in the aetiology of weight gain, and consequently there are few clues as where to intervene to prevent obesity.

Physical activity too is a complex of numerous, disparate behaviours. A person is described as being physically active if they engage in one or more of a vast number of individual behaviours that together result in energy expenditure above a certain level (e.g. walking as a means of transportation, running for exercise, playing an organized sport, swimming for pleasure, lifting heavy items as part of one's employment, gardening and domestic chores etc.). In considering the risk of obesity, it is also important to recognize that from a behavioural perspective, physical inactivity is not simply the absence of physical activity. While an individual can be described as physically inactive when their energy expenditure approximates resting metabolic rate, physically inactive individuals engage in a range of sedentary behaviours that might include television viewing, driving a car, sitting and reading, and working on a computer.¹⁸ TV viewing is a behaviour that has received considerable research attention, and existing data suggest that it is likely to be a significant contributor to the obesity epidemic in countries like the USA and Australia.^{19,20} However, as with diet, current understanding of the specific physical activity and sedentary behaviours that are important in relation to risk of weight gain, and that should hence be targeted in attempting to prevent obesity, is poor.

A further issue complicating our understanding of the behavioural causes of the obesity epidemic is the fact that the specific physical activity and eating behaviours that contribute are likely to vary in significance and strength among

different population groups. For instance, the behaviours that contribute to energy expenditure among young children are unlikely to be the same as those that contribute among older children or adults. Even within one population subgroup there is evidence that the behaviours vary substantially. Among adults, for example, population-based studies show that physical activity and eating behaviours differ by age, sex, socioeconomic status, and a range of other socio-demographic factors.^{21–26} Further, differences in obesity-related behaviours are likely to be even greater between different cultural groups, and behavioural factors that are important in one country may be totally unimportant in another. For example, while fast food consumption may be an important issue in the United States, this will be irrelevant in a country where this behaviour is uncommon and likely to remain so.

The influences on obesity-risk behaviours

To understand population eating, physical activity and sedentary behaviours and intervene to improve them, it is essential that research and health promotion be based on a sound theoretical framework.¹⁴ A theoretically based approach is essential for guiding research since it defines the boundaries of research focus and provides a framework to build upon previous work. Theoretical models are also useful since they help to identify key factors influencing targeted behaviours, thus leading to the development of more effective and cost-efficient intervention strategies addressing these behaviours. There is evidence from the behavioural nutrition literature, for example, that the most effective interventions are those that were based on a theoretical framework.²⁷ A review of potential approaches to the promotion of physical activity also suggests that theoretically based interventions are more effective than atheoretical approaches.²⁸

Despite this, research on eating and physical activity behaviours is not always based on a sound theoretical framework. One review of almost 350 nutrition education studies published between 1980 and 1990 revealed that less than 25% reported the use of a theory or model of nutrition-related behaviours.²⁹ The application of theory in intervention studies specifically focused on obesity prevention has been examined by Hardeman *et al.*³⁰ They conducted a systematic review of five school-based and four community-based interventions aimed at preventing weight gain. That review showed that only two of the nine studies had drawn substantially on a theoretical model (social cognitive theory). Together these findings demonstrate that behavioural theory is often not being applied in population-based studies of physical activity and eating behaviours, or in controlled weight gain prevention trials.

When behavioural models are being applied, data suggest that the predictiveness of the most commonly used models is generally quite low, and none of the existing theoretical models is consistently effective in predicting physical activity or eating behaviour.^{31,32} This finding is perhaps not surprising, given that many theories of the determinants of physical activity and eating described in the literature have

been adapted from research into other health behaviours (e.g. cigarette smoking), rather than developed specifically to explain these behaviours. Many existing theoretical models have been drawn from clinical health psychology, which is focused on individuals rather than populations.¹⁴ More recent social cognitive and ecological theories, which posit that behaviour is shaped by the interaction of individual factors with the broader social and environmental context, appear to be more successful for predicting physical activity and eating behaviours.^{31,32}

While social cognitive and ecological models show promise when applied to eating and physical activity behaviours, it will be important to continue to develop behavioural theory to underpin our efforts to intervene to prevent obesity. In doing so, it must be recognized that, just as obesity risk behaviours vary between different population groups, the determinants of eating, physical activity and sedentary behaviours are likely to differ among subgroups. For example, the determinants that are important for women are likely to be different from those for men, due to key environmental, social, and life stage contexts that are important influences on their lives. In addition, in developing interventions it will be important to take into account the feasibility for individuals to make the kind of behavioural changes that are advocated. This is an issue that appears to have been overlooked in behaviour change interventions, but which should be a key priority for future research. It may well be that the types of strategies that have been promoted to prevent weight gain are not feasible for, nor salient to, people in the context of their daily lives.

Conclusions

Given the recognition worldwide of the substantial threat to population health posed by obesity, we might ask why it is that there has not been greater effort to address the epidemic. Two factors combine to overwhelm efforts to initiate preventive action – the sheer size of the epidemic and a lack of understanding of its behavioural determinants. As we have outlined, we have relatively poor evidence upon which to develop interventions to modify eating, physical activity and sedentary behaviours to prevent weight gain and obesity. In order to redress this, further research is required to elucidate the behavioural determinants of weight gain and obesity, and the influences on these behaviours among different populations. While environmental changes may be necessary to reverse the obesity epidemic, it is critical that any efforts to bring about change focus on those exposures that influence important obesity risk behaviours. Additionally, it will be important for environmental interventions to be integrated with educational and behaviour change programs to enable people to take advantage of supportive physical activity and eating environments.

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