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Stemming the global obesity epidemic: What can we learn from data about social and economic trends?☆

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Summary

Although the policy debate is only slowly moving away from the focus on individual-level psychological and social factors, the research community has largely recognized that changes in dietary and physical activity patterns are driven by changes in the environment and by the incentives that people face. Many factors have been suggested as causes of the ‘obesity epidemic’. Putting a multitude of isolated data points into a coherent picture is a challenging, but necessary, task to assess whether proposed solutions are promising or likely to lead down a blind alley. Conventional wisdom is an unreliable guide and some widely held beliefs are incorrect.

Can one distinguish between important and less important behavioural changes and relate them to environmental incentives? People face trade-offs in allocating their scarce resources of time and money to best achieve their goals, including health. Studying what people are doing with their time and money is a good start towards understanding how economic incentives have altered energy intake and energy expenditure in a way that has led to weight gain.

A challenging task for policy will be finding the right levers. Both economic and public health/medical perspectives play an important role in the policy process, but often approach policy questions in an incompatible way. Economics and public health perspectives can complement each other, but harnessing any synergy requires an understanding of the other perspective. Arguably the most effective community intervention would be multi-faceted and would include several goals about diet and physical activity. In practice, however, it appears that much more effort is devoted to promoting increased fruit/vegetable consumption, and exhorting individuals to increase physical activity than to environmental intervention that would make it easier for people to reduce energy intake and sedentary entertainment. Politically, it may often be more expedient to promote an increase than a decrease, but it may be far less effective.

Keywords

Obesity; BMI; Discretionary calories; Dietary guidelines; Economics

Introduction

Researchers are recognizing increasingly that changes in dietary and physical activity patterns are driven by changes in the environment and by the incentives that people face.^{1,2} The policy debate moves more slowly and continues to emphasize individual choice. For example, the Charter of the European Union Platform on Diet, Physical Activity and Health begins with:

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'European Union citizens are moving too little and consuming too much: too much energy, too many calories, too much fat and sugar, and salt.'³ Many factors have been suggested as causes of the 'obesity epidemic', including snack food, cars, television, fast food, computer use, vending machines, suburban housing developments, portion sizes and female participation in the labour force. Putting a multitude of isolated data points into a coherent picture is a challenging, but necessary, task to assess whether proposed solutions are promising or likely to lead down a blind alley. Conventional wisdom is a very unreliable guide to guide policy.

Can one identify important and less important behavioural changes over past decades and relate them to changes in environmental incentives? People face trade-offs in allocating their scarce resources of time and money to best achieve their goals, including health. Studying what people are doing with their time and money is a good start towards understanding how economic incentives have altered energy intake and energy expenditure in a way that has led to weight gain.

Interventions to change diets or physical activity by altering economic or environmental incentives affect many dimensions of our lives. Economic analyses can quantify the trade-offs involved and assess how different stakeholders are affected. This information can improve the effectiveness, sustainability and political feasibility of proposed interventions. It is probably no exaggeration to say that the key issue in the world of political decisions is the distribution of costs and benefits; an issue at the centre of economics. As the focus of interventions to prevent obesity shifts away from traditional informational/educational to environmental and policy approaches, complementing a public health perspective with an economic perspective becomes increasingly important.

A recurring theme in this article is that both economic and public health perspectives play an important role in the policy process, and that interventions supported by both perspectives are most likely to be effective and politically acceptable. However, there is a wide gulf between these two research perspectives, and they often appear at odds with each other. Harnessing any synergy requires an understanding of both perspectives.

Trends versus cross-sectional differences in obesity

In spite of increased recognition and media attention to the problem, the obesity epidemic continues to worsen. Just between 2000 and 2005, the prevalence of obesity in the USA increased by 24%, while the number of severely obese [body mass index (BMI) > 40] cases increased by 50%, high-lighting the importance of change over time.⁴ When looking at trend data, changes in BMI appear to be very similar across all population groups, although the prevalence at any point is highest among groups with lower income and education, and some ethnic minorities.^{5,6} Fig. 1 shows US trends by educational status (similar results are obtained when stratifying by other variables), and the almost parallel increase in BMI is a striking finding. This suggests that in order to prevent obesity, interventions need to affect the whole population, not just selected subgroups.

Most existing data, and virtually all international comparisons, are cross-sectional and therefore can only show existing differences in obesity rates at a point in time. There are few data sets that allow direct comparisons across countries, and more international collaborations would be very desirable. The best-known international data come from the World Health Organization's MONICA study, although the latest country surveys from that study are now more than a decade old.⁷ The data collected by site collaborators were generally not nationally representative, but came from small geographic areas. For women, almost all sites in the MONICA project showed a statistically significant inverse association between educational level and BMI, although this was not the case for men.⁸ One other data source with comparable data for a larger group of countries is the Survey of Health, Ageing and Retirement in Europe

(SHARE), first collected in 2004. SHARE focused on adults aged 50 years and above, so while the data are nationally representative for that age group, it misses younger cohorts. Andreyeva compared BMI differences by education and income in 11 European countries and the USA.⁹ She found strong differences in obesity rates by educational level for both men and women, and by income for women (see Table 1). There are no trend data to day but I suspect that plotted against time, similarities in weight gain would outweigh differences in prevalence across countries. More research on trends may be more important than continuing to slice and dice cross-sectional differences in order to inform effective policies.

Time and money: Where did they go?

Many factors have been suggested as causes of the ‘obesity epidemic’ and, by implication, as key targets for obesity prevention interventions. While there is no shortage of point-in-time numbers, comparable data across several years, let alone several decades, are rare. This section summarizes what the author has found to date^{10–12} plus a few updates. There are several relevant insights, although more surprising is how little is known about societal changes affecting weight gain, even within recent decades. While not an economic or health research agenda per se, the empirical question ‘what has really changed?’ should receive more serious effort from researchers.

An economic perspective emphasizes that policy changes in one area lead to adjustments in others, and may have reverberating consequences throughout the economy that might eventually even counter the initial change. This dynamic general equilibrium view is less commonly employed by other social scientists and public health researchers, although it is relevant for dietary behaviours, physical activity and obesity. Some potential policy changes or societal trends already bear the seed for their own destruction and are therefore less (or more) important than they seem at a point in time. The recent fashion of ‘low carb’ diets, for example, stems from the widespread perception that these diets work. It is entirely plausible that the diets were effective because initial adopters were suddenly severely restricted in their choice of food. Entire aisles of supermarkets suddenly became off limits. However, markets adapted and within a few years, cereal aisles, bread and pasta aisles, and snack aisles had ‘low carb’ products. Introducing golf carts enabled some elderly and physically limited individuals to join in a sports activity. In a static world, this would have led to an increase in physical activity, yet the long-term equilibrium outcome may have been the opposite. There was demand by at least some previous players for using carts as well as supply because rentals provided an initial source of income. Golf carts also sped up play and soon the mismatch between walkers and drivers caused congestion and delays, such that many golf courses made renting carts mandatory.

Understanding feedback loops and dynamics is a long-term research goal, but looking at time use and industry growth data can be the first step towards understanding how economic incentives have altered lifestyles, affecting diet and physical activity. There have been some major changes in the lives of Americans, although quite different from common perceptions. The large increases in time use were in leisure or free time and time spent in transportation. Leisure time is the biggest winner and has increased substantially since 1965 (Fig. 2). Occupation and productive activities at home (cooking, cleaning, repairing things, childcare) have diminished to make room for this. Thus, increasing weight has been accompanied by increased, not decreased, leisure/free time. Women now spend more time in the labour force than before, but that is more than offset by declines in home production. Data for South Korea, Norway and Sweden show similar trends towards increased leisure time.

What are possible economic drivers behind this change? A reduction in relative prices for prepared meals has reduced home production (cooking and cleaning up), leaving more time

for leisure. Technological change also makes (largely sedentary) leisure activities (DVDs, cable TV, games, surround sound) more attractive relative to work or household production.

A persistent myth is that Americans are undertaking less exercise. In reality, there has been a consistent increase in active sports or walking/hiking, reflected both in time use data and the Centers for Disease Control Behavioral Risk Factor Surveillance Surveys. The Behavioral Risk Factor Surveillance Surveys show an increase of 20 min/ week from 1990 to 2000 and a consistent decline in sedentary behaviour.^{10,13} Obviously, only a rather small part of the increased free time went into active leisure activities, but it would be starting on the wrong foot to believe that the challenge is to reverse a decline in active leisure. The emphasis on individual choice and promoting exercise is a favorite line of food industry lobbyists. Leisure-time physical activity is only a component of total physical activity, and how total physical activity has changed also depends on labour force and home production as well as transportation patterns.

Transportation is part of everyday life, not only in order to get to work, but also to run (or drive) errands, go out for dinner or see friends. It could also be a key factor of changes in physical activity because small shifts in travel modes alter energy expenditure noticeably. Adults spend over 10 h/week travelling, more than ever before, split equally into transportation related to occupation (work commute), home activities (child care/shopping/personal care) and leisure-time activities.^{10,14} Transportation time, together with leisure time, has increased at the expense of occupation and home activities. Unfortunately, existing data cannot reveal much more about physical activity without returning to cross-sectional studies. Research on urban design and physical activity is emerging, although results are far from providing a conclusive picture. Some publications suggest that urban form that encourages individual motorized transportation also predicts obesity and chronic conditions related to inactivity.^{15,16}

In terms of industry output, the growth of industries associated with leisure time far exceeded growth in gross domestic product (GDP) in the USA. Between 1987 and 2001, GDP in constant 1996 dollars increased by approximately 50% (from 6113 billion to 9215 billion), whereas retail of sporting goods and bicycles more than doubled (from 4.7 to 11.4 billion dollars). Sports/fitness clubs also more than doubled, and similar growth rates exist in smaller 'active' industries, such as dance studios. However, this is dwarfed by the explosive growth of home entertainment retail; an industry that was smaller than sporting goods in 1987 and is now four times larger. Spectator sports, the sedentary counterpart to sports clubs and dance studios, also experienced a five-fold increase during the same time period. Television reigns supreme in absolute size, but its growth rate is actually lower than that of spectator sports, although this is due to stagnant traditional television; cable was a major growth industry. There is a complementarity between cable television and spectator sports, both private goods, as indicated by the popularity of sports channels. Thus, industry growth parallels time use; leisure-time industries are growing faster than other industries, but 'sedentary' industries are growing even faster than 'active' industries, just as most of the increase in leisure time has gone to sedentary activities.

In contrast to adults, who now have more free time than ever, children's free time has declined substantially as a consequence of increased time away from home, primarily in school, daycare and after-school programmes (this, of course, being a consequence of increased labour force participation among parents). Participation in organized activities (including sports) also increased. To make room for this, play time decreased, but so did time in some sedentary activities such as watching television, conversations or other passive leisure, which fell just when obesity became a major concern.^{11,12} As time away from home in structured settings increases, so does the importance of physical activity in those settings. For adolescents, there is no clear trend in physical education over the past decade (some variables show a decline and

these appear to be selectively cited, but other similar items show the opposite trend), and there are no data for after-school and daycare programmes.¹¹

For overall dietary changes, the US Department of Agriculture (USDA) food availability database¹⁷ provides a good macro perspective, but it cannot identify trends for particular subgroups. Calories per capita remained relatively constant from 1970 until the mid 1980s, but then increased. The energy increase comes almost exclusively from carbohydrates (Fig. 3), which increased more than necessary to explain the obesity epidemic (even if one tries to account for waste and spoilage). The availability of sugar-sweetened beverages and snack items has increased particularly quickly. Between 1970 and 2005, caloric sweeteners increased by 20 pounds per capita per year; sweets and confectionary goods increased by 3 pounds.¹⁷ The availability of sugar-sweetened beverages increased by 8.5 gallons per capita per year from 1985 to 2005; 40% of this increase was due to fruit-flavored drinks and sports drinks, and the remainder was due to carbonated soft drinks (data are not available prior to 1985).

Price and income data may be important because they shed light on underlying economic trends. The percentage of disposable income spent on food has declined continuously since the end of World War II, even as it bought more calories. Almost all the decline came from food at home; the share of disposable income for food away from home stayed relatively constant. In 1970, Americans spent one-third of their food dollars on food away from home, which grew to 39% in 1980, 45% in 1990 and 47% in 2001. Away-from-home foods tend to be denser in energy and contain more fats and sugars than foods at home. USDA researchers have calculated that if food away from home had the same average nutritional densities as food at home in 1995, Americans would have consumed 197 fewer calories per day, and reduced their fat intake to 31.5% of calories from fat (instead of 33.6%).¹⁸

What is not clear is why the location of consumption should alter nutritional content so dramatically. Information problems at the point of consumption are probably part of the reason, although the information argument would only apply to adults who are presumed to be able to make rational decisions. If adults lack information about nutritional content at the point of consumption, it is not surprising that competition is on the dimensions that consumers can evaluate easily, i.e. price, amount and taste, at least with repeat purchases. This type of market failure is well known to economists since Nobel Laureate George Akerlof's 'lemon paper'.¹⁹ Akerlof argued that if quality is an important dimension but cannot be assessed by a buyer, competition will be on price and other observed characteristics (e.g. larger portion size), and will drive out higher quality products even if they would be preferred by buyers with more complete information. When informational problems are sufficiently severe, regulation is needed for an efficient working market.

Another economic trend also shifts incentives in a direction that is not conducive to healthier eating patterns. Fig. 4 shows relative price changes, using the period 1982–1984 as the baseline (index = 100) for each series. While the consumer price index increased to 180 by 2002, the price index for fresh fruit and vegetables increased to 258. In contrast, sugar, sweets, fats and oils all became relatively cheaper than other goods, and their prices increased less than the consumer price index. Soft drinks were among the items that became (relatively) the cheapest: the price index in 2002 was 126.

Do these trends show up in current behaviour patterns in a way that suggests intervention targets? New data follow, but first the idea of 'discretionary calories' needs to be explained. The concept of 'discretionary calories' was introduced in the 2005 US Dietary Guidelines, developed by the Department of Health and Human Services and USDA, to address two dietary goals simultaneously: energy balance and the need for essential nutrients.²⁰ The amount of calories for each goal differs and depends upon age, levels of physical activity and diet quality.

In contrast, the previous 2000 guidelines told consumers to ‘moderate your intake of sugar’, which was a questionable recommendation in isolation and therefore dropped in the 2005 guidelines. There is no question that the more sugary drinks people consume, the more calories they will consume. However, more consumption/more calories is true for any food and there is no solid evidence that sugar per se would cause obesity, making a specific sugar recommendation vulnerable to criticism.

The amount of discretionary calories is what is left over once individuals have satisfied essential nutrients through intake of recommended food items, and can range from 130 calories for older sedentary women to over 500 calories for very physically active individuals. People who exceed their discretionary calories either have an energy imbalance or are at risk of malnutrition or both. Two RAND projects collected data on physical activity and diet in several recent projects, focusing on snacks (sweets, biscuits, crisps) and sugar-sweetened beverages, which are unambiguously items that should only be consumed as part of discretionary calories. Discretionary calories should not be understood as the amount of junk food that can be consumed. The relationship between reduction in cancer risk and intake of fresh fruits/vegetables is continuous, so discretionary calories could also be used to increase fruit/vegetable consumption beyond guideline recommendations. However, if sweets and soft drinks become part of the diet, it is better to keep those calories under the threshold amount for discretionary calories. Unfortunately, that is not what is happening, and Fig. 5 shows obesity rates and the average number of excess calories from snacks and soft drinks beyond total discretionary calories in Southern California (Los Angeles County), three lower-income and high-minority communities in Northern California, and Southern Louisiana (urban areas near New Orleans). There are many differences across demographic groups, and excess snack calories parallel cross-sectional differences in obesity rates by income, education or race/ethnicity. However, more importantly, calories from snacks and sugar-sweetened beverages are higher, on average, than the recommended discretionary calories in every population subgroup, even among people who say that they try to eat less to lose/maintain weight. Thus, the trends about carbohydrates (Fig. 3), sweets and sugar-sweetened beverages have reached a level that manifest in clear conflict with dietary guidelines across the population. Discretionary calories are more important predictors of BMI than fruit/vegetable consumption or levels of physical activity at population level in this new data. Increased physical activity reduced excess discretionary calories, although not to zero; increased fruit/vegetable consumption reduced snack calories slightly, but by less than the additional calories that come with the fruit.

Summary

A decade ago, a study published in the *British Medical Journal* entitled ‘Obesity in the UK: gluttony or sloth?’ energized the debate whether the obesity epidemic is caused by declining physical activity or increased energy intake.²¹ In that case, the authors came down on the ‘sloth’ side for adults in the UK. Even if one could meaningfully separate energy intake and expenditure, the data are too limited to support a conclusive analysis because the energy imbalances responsible for the secular weight gain were very small. However, there are very large changes in food consumption patterns, whereas there seem to be no similar dramatic changes in physical activity. In fact, the data generally show fewer changes that affect physical activity than commonly thought, and leisure-time physical activity even increased. This does not exclude the possibility that there has been an overall decline in physical activity.

If one looks at trends, what jumps out are changes in food availability, in particular the increase in caloric sweeteners and carbohydrates, which now manifest in problems seen in new cross-sectional data. In all areas and population groups surveyed, the average daily discretionary calories from salted snacks, biscuits, sweets and soft drinks exceed the discretionary calories recommended in the Dietary Guidelines for energy balance and essential nutrients, by over

60% in Los Angeles to over 120% in Louisiana. The ratio of consumed to recommended discretionary calories is a significant predictor of BMI in the population, in contrast to fruit/vegetable consumption and physical activity.

Many policy interventions are focusing on ‘positive’ messages, such as increasing fruit/vegetable consumption and physical activity. However, an emphasis on reducing discretionary calorie consumption, particularly sugar-sweetened beverages and salted snacks, may be a promising lever to reduce overweight and obesity and should receive more attention. The majority of adults exceed the amount of recommended discretionary calories for energy balance. While increasing fruit/vegetable consumption may be a laudable goal for other health reasons, it is unlikely to be an effective tool for obesity prevention.

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Fig. 1. Trends in average body mass index (BMI) by education. Source: Author's calculation and Truong and Sturm [6].

Fig. 2. Trends in time use among US adults. Source: 1965–1985: Robinson and Godbey (1999)²²; present author’s calculation using FISCT 1999 and 2003–2005: ATUS.

Fig. 3.
US food supply for macronutrients. Source: USDA [17], Economic Research Service.

Fig. 4.
Price indices. Source: USDA [17], Economic Research Service.

Fig. 5. Obesity rates and excess of snack calories over recommended discretionary calories in California and Louisiana. So Cal, Southern California; No Cal, Northern California. Source: Author's calculations based on data from 2 RAND projects.

Table 1

Socio-economic status and obesity rates across countries (%).

	Percentage point difference in obesity rates among individuals from			
	Lowest and highest income quartile		Lowest and highest education level	
	Men	Women	Men	Women
USA	2.5***	16.9**	7.5**	11.6**
Spain	5.0	3.8	11.3**	20.5**
Greece	1.7	3.4	8.9**	-1.1
Austria	2.6	6.3***	7.8***	8.7*
Germany	7.9*	9.3**	13.1*	8.9**
Italy	-0.2	8.3*	10.3*	13.7**
France	14.2**	9.1**	8.8**	8.3**
Netherlands	1.3	6.1*	11.1**	7.4**
Denmark	4.2	3.9	10.1*	7.3*
Sweden	-1.1	10.5**	7.5**	6.2**
Switzerland	5.2	5.3	1.9	4.6
All SHARE	5.6**	7.7**	8.0**	10.7**

SHARE, Survey of Health, Ageing and Retirement in Europe.

Data weighted to be nationally representative. The table is ranked by obesity prevalence among women.

Group differences are significant at **1% level, *5% level and ***10% level.

Source: Andreyeva.⁹