
Economics and Physical Activity

A Research Agenda

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Abstract: 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, although harnessing any synergy requires an understanding of the other perspective. This article contrasts the two perspectives and reviews existing economic research in physical activity. Much effort has gone into producing cost-of-illness numbers or cost-offset claims with limited value from an economic perspective, although some simple steps could make them more informative. A more notable advance for active living research would be the adoption of standardized cost-effectiveness analysis methods, even just as an add-on to ongoing intervention trials. Probably the most challenging and exciting area, however, is the emerging research on the interaction between environmental incentives and physical activity. An economic perspective with its explicit focus on market failures is an important complement to ongoing active living research as policymakers in the United States are more likely to rely on the market to solve policy problems than on regulation. It is imperative to understand how the market works in actuality, not in the abstract, an area wide open for empirical research. (Am J Prev Med 2005;28(2S2):141–149) © 2005 American Journal of Preventive Medicine

Introduction

Interventions to change physical activity or nutrition by altering economic or environmental incentives affect many dimensions of our life. Economic analyses can quantify 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 center of economics. As the focus of interventions to raise physical activity shifts away from traditional informational/educational to environmental and policy approaches, complementing a public health perspective with an economic perspective becomes increasingly important.

A key theme of this review 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. Yet there is a big gulf between these two research perspectives, and they often appear at odds. Economics and public health perspectives can complement each other, although harnessing any synergy requires an understanding of the other perspective. The next section contrasts the

two perspectives and introduces relevant economic concepts. The third section summarizes economic studies related to physical activity interventions. Existing data, few as there are, are often conceptually flawed from an economic perspective, but some simple steps could make future evaluations more informative. Finally, I summarize changes in recent decades in how people use their time and money, a preliminary start toward understanding how economic incentives alter lifestyles.

The Economic Versus Public Health Perspective

Both public health and economics are rich intellectual traditions. Although there is no inherent conflict between public health and economics, neither is there a natural congruence, because of very different philosophical underpinnings. The comparison of economic and public health perspectives relies on somewhat stylized descriptions of each field, some may even call them caricatures, but captures some of the inherent tensions. At first, differences appear to be only one of emphasis: A public health view focuses on improving health, and other outcomes (including the costs of an intervention) are of secondary importance; an economic view focuses on the value of resources. Resources are not only financial, but also include, for example, participants' time. Comparative economic analyses answer questions like: "Is this intervention the most effective use of those resources?" At this level, public

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health and economics appear to complement each other.

However, differences run deeper, and there is often little overlap in what economists and public health researchers consider the important questions. Economics has a libertarian streak centered on consumer sovereignty and individual choice. Public health has a technocratic bent that implicitly accepts a benevolent dictator, a notion that is fundamentally alien to many economists in the United States. At least partly as a consequence of the philosophical underpinning, true multidisciplinary research is still largely absent. Some economic tools, such as cost-effectiveness analysis (CEA), have been adopted by public health researchers, and economists also deal with issues related to health promotion, but there is little overlap or synergy between the two camps.

An economics approach emphasizes that individuals make choices, based on their preferences and circumstances. A central insight of economics, first articulated by Adam Smith in 1776, is that this individual pursuit of personal goals can be socially optimal in the narrow sense that all resources are used efficiently.¹ When resources are used efficiently, it is no longer possible to make anybody better off without making somebody else worse off. The economic definition of optimality is conditional on initial resource allocation and limited to efficiency, which is not necessarily the question that public health researchers find most interesting. Redistributing resources across people, for example, is a political decision, and economics cannot evaluate the merits of such redistributions.

People have divergent goals and, in some situations, may feel that present discomfort or personal costs associated with primary (or secondary) prevention outweigh future health benefits, resulting in different health behaviors across individuals. Thus, to economists, neither health-compromising behaviors by themselves (e.g., sedentary lifestyle or alcohol consumption), nor differences in such behaviors or ensuing health outcomes across subpopulations, are a cause of concern by themselves. However, when these behaviors are consequences of environmental incentives that are inefficient (a market failure, defined below), economists see a role for government and regulatory interventions. In those situations, public health and economic opinions may coincide, but the rationale is fundamentally different: A public health, medical, or clinical view, sees health risks as the immediate problem; an economic view is process oriented, and health risks are only a problem if they are a consequence of market failures.

As alien as this perspective may strike public health advocates, the economic approach parallels the broad ideologic orientation of U.S. society, which more highly values individual choice, whether it is consumer sovereignty, property rights, religion—or leading a seden-

tary lifestyle—than other Western democracies, say Germany or France. This principle of individual freedom, opportunity, and choice permeates existing laws and institutions, ranging back to the beginning of the United States and the Jeffersonian utopia free of government influences (or encroachments by churches for that matter). For example, a Presidential Executive Order requires federal agencies that want to impose new regulations to “determine whether there exists a market failure that is likely to be significant. In particular, the analysis should distinguish actual market failures from potential market failures that can be resolved at relatively low cost by market participants.”² An economic perspective is an important complement and, as exemplified by these guidelines for federal agencies, sometimes even a fundamental requirement for action. But how do we identify market failures? There are three broad types of situations where markets fail to optimally allocate resources: externalities, public goods, or information problems.

Externalities or external costs exist when the costs of actions or conditions are not borne by the same person or entity reaping the benefits. The external costs of excess alcohol consumption (through accidents) are not borne by heavy drinkers or reflected in alcohol prices.³

The economic policy response is to change incentives, such as through taxes (for activities imposing external costs on others) or subsidies (for external benefits), so that the person/entity undertaking an activity experiences its full social costs. Driving also creates external costs in terms of noise and pollution, and also endangers pedestrians and bicyclists. There are also large benefits from being able to drive, but the benefits accrue primarily to the motorist, who only bears a fraction of the total costs of driving.⁴ In the Bureau of Transportation Statistics Omnibus Survey,⁵ a large majority of respondents felt safe or very safe when asked about highways, commercial air, or intercity train. For bicycle travel, however, 58% indicated they felt “very unsafe” (30%) or “unsafe” (28%); and for pedestrian travel, 43% felt “very unsafe” (23%) or “unsafe” (20%). Ninety percent of bicycle fatalities involve a motor vehicle, not a collision with a fixed object or a fall, which characterizes most bicycle mishaps.⁵ Such external costs of driving make walking or biking less, and driving more, attractive than economically efficient and socially desirable.

A different externality arises from sedentary lifestyles through worse health.³ It is not worse health per se that matters from an economic perspective, only the costs borne by others (i.e., external costs). Most of the negative consequences of inactivity—reduced health-related quality of life, lost wages, or higher out-of-pocket medical expenditures—are borne by inactive persons themselves (i.e., internal costs), who presumably also received some benefits and enjoyment from

being inactive (again, the economic mind-set is that people have their own valid reasons for doing what they are doing). External costs include collectively financed expenditure, such as insured medical expenditures, transfer payments (e.g., disability), or paid sick leave. It is hard to imagine a “tax” on inactivity, but the economic argument can also be turned around: Increased physical activity could create positive externalities, which would argue for subsidies for activity. Quantifying externalities is an important item on an economic research agenda for active living.

Public goods, ranging from national defense and public safety to street lighting and graffiti removal, improve overall welfare. It is difficult to exclude people from using public goods once they exist and nobody therefore has an incentive to pay for them. Markets therefore underprovide public goods, which require collective action. Many of the most successful areas of public health involve public goods, like safe water supply or infectious disease control. Safety is also a public good: Nobody can be excluded from enjoying a safe neighborhood, a determinant in whether people want to go out or let their children play outside, and therefore important for physical activity. Other tangible public goods include streets, sidewalks, landscaping, and parks.

Information problems are another potential source of market failures that can lead to inefficient market outcomes. Information problems have resulted in regulations prohibiting individuals to exploit information advantages (e.g., insider trading) or requiring advance disclosure (e.g., written estimates by car repair shops). Governmental activities related to physical activity have been limited, although the Federal Trade Commission is concerned with information issues and has targeted exaggerated claims for fitness equipment by marketers of popular exercise equipment.⁶

While some societal trends toward sedentary time use reflect a market failure, not all do. Firms will provide products if there is demand, whether for physical activity or sedentary entertainment. Industry growth reflects demand and market reaction and markets can be successful for private goods, like gyms or exercise equipment or DVD players. Here is an area where economics and public health approaches may diverge. Nevertheless, there are many areas in physical activity where outcomes are not socially optimal from both economic and health perspectives, and these may turn out to be the most promising areas for change.

Standard economics has limitations in the scope of questions that it can answer, and some important policy areas may simply fall outside its purview. Economics is solely concerned with efficient use of resources and finding mechanisms that do not waste resources, but many public health decisions are primarily about redistribution, not about efficiency. Because it falls outside the scope of economics, American economists typically

appear not as concerned as public health advocates about issues of justice and solidarity (although there may be real political, not just methodologic, differences in opinions). Redistribution of resources is a political not an economic decision, but when political decisions about redistribution have been made, economics can determine the most efficient way to achieve such a redistribution.

There are also some limitations that do not apply to all of economics, although they characterize the mainstream. Arguably, the most serious one would be the assumption that personal preferences are fixed, and not affected by social influences to any important extent. This may be a fair approximation for some preferences (e.g. the innate preference for sweet and dislike of bitter tastes), but it is a poor model for many other activities that are “acquired” tastes such as certain musical styles or physical activities. Economists are therefore likely to overlook the impact of commercial advertising on molding tastes (especially for children) in ways that may be considered undesirable.

Existing Economic Evaluations Economic Costs of Inactivity

There have been several attempts to quantify the social cost of sedentary lifestyles, known as cost-of-illness studies. Most cost-of-illness studies of sedentary lifestyles so far are limited to medical costs, take a point-in-time rather than life-cycle approach, and do not distinguish external versus internal costs.⁷⁻⁹ The only exception is Manning et al.³

Cost-of-illness studies have a long tradition in medicine and have been conducted for seemingly any imaginable medical condition. Physical activity lags behind other areas and a fairly sophisticated technical literature has been developed for other complex social problems (alcohol abuse, illegal drugs, or mental health), to a large extent funded by the corresponding National Institutes of Health (NIAAA, NIDA, and NIMH). Their websites are a good first stop for learning more about cost-of-illness studies.

Typical cost-of-illness studies have been criticized for not providing decision makers with information to improve health policy, but only being props for policy arguments that are unaffected by the actual estimates.¹⁰ In an eloquent criticism of the ongoing program at NIDA and NIAAA, P. Reuter, a drug abuse researcher at the University of Maryland, summarized the limitations of the literature:

In an era which takes numbers seriously, indeed denigrates any other form of evidence, no senior political figure can afford not to have a number to offer as an indicator of the seriousness of the problem with which her agency deals. The number should be current and have a scientific basis

to be credible; that it may have basic conceptual flaws is probably not relevant because there is little organized interest in discrediting it. We have the statistical equivalent of an armaments race; once one health agency has estimates of the economic costs of its problem, then all need to be armed . . .¹⁰

As a consequence, there has been a surprising rate of inflation in cost-of-illness estimates. For alcohol problems, estimates of social costs published in 2000 were >2.5 times higher than estimates published in 1991 (\$180 billion compared to \$70 billion).^{11,12} Although there have been methodologic improvements that could explain some of that increase, the fundamental empirical database for crucial components has changed little (especially in the area of lost productivity, which remains largely assumption based, yet dominates overall estimates). The strong upward trends in cost-of-illness estimates gives some credence to Reuter's characterization of cost-of-illness studies as an "arms race" between agencies.

A few simple steps could make cost-of-illness estimates more informative. The first would be to express findings in a more interpretable way, such as calculating costs per patient or person. Total cost numbers tend to be meaningless to most people (including the decision makers that they are ostensibly produced for), and are often misquoted by orders of magnitude. Second, results can be more intuitive or generalizable across time or settings when expressed in relative terms, such as the percent increase in medical costs for a sedentary versus an active person. Finally, comparisons to establish a benchmark can be helpful; for example, comparing the effects of inactivity or obesity to the effects of smoking or problem drinking or aging.^{3,13} Many of these more interpretable presentations are common in epidemiologic studies, which makes their absence in the cost-of-illness literature surprising.

Other advances involve some deeper methodologic changes. The distinction between external and internal costs is important because it identifies market failures (i.e., outcomes are inefficient in that at least in principle, it is possible to improve the welfare of some people without making others worse off) and provides an economic rationale for government intervention, regardless of other political and ethical considerations. Life-cycle approaches (in contrast to costs incurred within a year) are important because exposure to a risk factor affects health over a time period, with the exception of acute hazards (e.g., injury risk factors). The effects of reducing the prevalence of smoking or obesity by half in a population are markedly different if the change takes place immediately, gradually over a 20-year period, or after 20 years.

At this point, the only real economic study of the social costs of inactivity is the work by Manning et al.,³

and Keeler et al.¹⁴ This work is notable for several reasons, including its conceptual approach that distinguishes internal and external costs and the attempt to model life-cycle effects. Manning et al.³ contrasted the external costs (costs borne by others) of several health habits, including smoking, drinking, and physical inactivity. External costs of inactivity stem from additional payments that sedentary individuals receive from collectively financed programs such as health insurance, sick-leave coverage, disability insurance, and group life insurance. Those with sedentary lifestyles primarily incur higher medical costs, but collect less public and private pensions because of lower life expectancy. Many effects come late in life, and so the estimate of the external cost is sensitive to the discount rate used, as well as to the effect of inactivity on life expectancy. At a 5% rate of discount and a 10-month reduction in life expectancy at age 20, the lifetime subsidy from others to those with a sedentary lifestyle was \$1900, although these numbers are now more than a decade old. This externality provides an economic rationale for public support of active living interventions. There is no question that data were limited, and the authors emphasized results for smoking and problem drinking that had a stronger empirical base. Nevertheless, the conceptual approach of Manning et al.³ remains unsurpassed, and now much better data are available.

Cost-Offset Studies

Providers of health promotion and healthcare services often believe that increased use of their services will lead to savings elsewhere, primarily through reduced medical costs. This idea, known as the cost-offset hypothesis, has been proposed in virtually every domain of health care and health promotion. Methodologically, cost-offset studies appear related to cost-benefit analysis, except that cost-offset studies focus on a small subset of costs and benefits. The problem is not really with cost-benefit approaches per se, but with the way that cost-offset studies are conducted and the somewhat unrealistic goal of finding cost-savings.

There are scientifically credible and replicable interventions targeted at selected patients or population groups that can indeed noticeably reduce their medical costs (and such interventions exist across a broad range of medical and health promotion services). Extrapolating from clinical interventions targeted at a special subgroup to policies affecting broader populations, however, is not valid, and cost-offsets found in narrow clinical interventions rarely materialize on a larger scale.¹⁵

Carefully conducted community or clinical trials account for only a small fraction of the cost-offset literature. A recent systematic review on physical activity interventions identified only two cost-offset studies for worksite health promotion programs that satisfied the

quality criteria for inclusion, neither being a controlled trial.¹⁶ Golaszewski et al.¹⁷ reported that savings from reduced health care, absenteeism, and life insurance claims exceeded the health promotion program's costs by a ratio of 3.4. Bowne et al.¹⁸ followed a group of participants in an industrial physical fitness program and found a 45.7% reduction in major medical costs in the post-entry year. To put these numbers into perspective, this effect is roughly equivalent to the difference in medical costs between a 60-year-old and a 30-year-old, which makes such estimates not very credible. To advance the research in health promotion, changes in all types of costs and health outcomes need to be documented, which takes us to cost-effectiveness analyses.

Cost-Effectiveness Analyses of Traditional Interventions to Increase Physical Activity

Cost-effectiveness analysis and cost-utility analysis are key methods to assess policy interventions in health. CEA evaluates an intervention by calculating a cost-effectiveness ratio. In this ratio, all health effects of the intervention are captured in the denominator (measured in terms of changes in health-related quality of life), and the changes in resource use are captured in the numerator and valued in monetary units. Much effort in recent years went into developing standard methods for cost-effectiveness analysis.^{19,20} A "reference case analysis," recommended to enhance comparability across studies, was developed by the Panel on Cost-Effectiveness in Health and Medicine, and has been used in many evaluations, but not yet for physical activity interventions.¹⁹ Every application poses new practical issues, but at least the principle is now clear, although guidelines for CEA were developed primarily with clinical interventions in mind. The distinction between internal and external costs is secondary when comparing clinical interventions, but becomes paramount for determining economic policies or when studying the political acceptability and sustainability of larger societal changes.

Some of the key characteristics of a "reference case" analysis are a societal perspective that includes all health effects and changes in resource use, and a time horizon long enough to capture relevant future health effects (which for changes in health behaviors usually means a life-cycle approach). The major categories of resource use should be reflected in the numerator of a cost-effectiveness ratio and include health care costs, patient time, costs associated with caregiving, costs associated with the nonhealth impacts of the intervention, and effects of lost productivity borne by others. The change in use of resources should be valued at their opportunity cost (the time of persons engaged in uncompensated activities should not be valued at zero). All health effects should be captured in the denomina-

tor, ideally in a way that implicitly incorporates the effects of morbidity on productivity and leisure (health-related quality of life). When long-term effects are important, both costs and health outcomes should be discounted to present values.¹⁹

A systematic review of interventions to increase physical activity found a number of effective interventions, but without economic evaluation.¹⁶ No study comes close to satisfying the "reference case" criteria for a cost-effectiveness analysis.¹⁹ In fact, only one study had economic data that satisfied the reviewers' quality criteria. That study evaluated an individually adapted health behavior change program, and calculated some direct program costs per average unit of outcomes.²¹ But the outcomes were intervention specific (such as minutes on a treadmill), and did not capture all health outcomes nor convert them to a common metric (e.g. changes in health-related quality of life); costs did not include key components, such as the value of participants' time. Economic active living research could quickly advance in this area by following the guidelines for cost-effectiveness analysis.

Economic Evaluations of Urban Form and Land-Use Planning Strategies and Changes to Transportation Infrastructure

Cost-effectiveness analysis becomes most relevant when comparing specific interventions, and it is not surprising that the development of CEA guidelines were influenced by clinical applications. In the field of health promotion in general—and active living research in particular—research questions often center less around choosing between well-defined interventions, but around understanding determinants of healthy living and the factors behind environmental and policy trends affecting physical activity. The first review of environmental and policy correlates was published only a few years ago,²² and while this is a quickly growing area,^{23,24} it is not surprising that there are no economic evaluations. There are numerous policy changes that could be evaluated, such as road versus mass transit expenditures across areas or almost natural experiments, such as gentrification/street redesign. Applied economists tend to be quite good at evaluating such changes. A very typical doctoral dissertation in economics, for example, uses state differences in passing legislation and corresponding pre-post differences to evaluate a policy change and how markets react and adjust to the policy changes. Of course, few economists would have the substantive experience to identify relevant environmental changes at a smaller scale—that is, changes that are not driven by state or federal legislation—and they would be even more dependent on guidance for measuring physical activity. This is where interdisciplinary collaboration with substantively oriented researchers can have high payoffs and an impor-

tant research area that is outside cost-effectiveness analysis.

An economic perspective can also identify areas where there is a mismatch between the costs and benefits of activities. Economists, for example, have analyzed the distribution of costs and benefits due to employment deconcentration,²⁵ a key feature of urban sprawl and mismatch between housing and employment locations. When a company chooses a green-field site at the fringes of a metropolis for a new plant, it does so because the private benefits are higher for that location. But the private benefits (less regulation, cheaper land) may be smaller than the social costs, which include traffic congestion and loss of space.²⁵ Physical activity or health effects other than accidents have not yet been considered in such analyses.

Other economic research has focused on how public policies affect housing prices and zoning rules, which in turn affects residential development.²⁶ Tax subsidies from mortgage and property tax deductions reduce the user cost of capital for owner-occupied housing by about 15%.²⁷ Even if some of those federal subsidies are capitalized in housing prices, the relatively high price elasticity for land guarantees that the preferential tax treatment makes metropolitan areas substantially more sprawling and less dense than they would be otherwise.²⁶ In addition, the tax subsidy, which benefits primarily high-income homeowners, creates incentives that make exclusionary zoning more attractive to local communities.²⁶

The reduction of individual transportation costs is also a primary cause of sprawling development, and may have made today's combination of sprawl and individualized transportation more attractive than traditional public transportation cities.²⁸ Whether including the physical activity and health effects of sprawl (some negative, but there may also be positive effects) changes those conclusions remains to be seen. It is a promising area to integrate economics into active living research, although these issues are sufficiently complex that we need to leave a discussion for a separate paper. There are also methodologic issues that need to be addressed, including the valuation of nonmarket goods²⁹; for example, what is the value of less traffic to pedestrians and bicyclists?

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 physical activity interventions. While there is no shortage of point-in-time numbers, comparable data across several years, let alone several decades, are rare. Putting a multitude of isolated data points into a coherent picture is a challenging but necessary task to assess whether proposed targets are promising or likely to lead us down a blind alley. This section summarizes

the findings of two reports.^{30,31} There are several relevant insights, but even more striking is how little we actually know about societal changes affecting physical activity even during our own lifetime. While not an economic research agenda per se, the empirical question "what has really changed?" should receive a more serious effort from active living researchers.

An economic perspective also 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 may be relevant for physical activity. Some potential policy changes or societal trends may already bear the seed for their own destruction and therefore be less (or more) important than it seems. 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 the choice of food. Entire aisles of supermarkets became suddenly off limits. Yet markets adapted and by now the cereal aisles, bread and pasta aisles, and snack aisles have "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 of physical activity, yet the long-run equilibrium outcome may have been the opposite. There was both a 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 the play, and soon the mismatch between walkers and drivers caused congestion and delays, with the result that many golf courses made renting carts mandatory.

Understanding feedback loops and dynamics is a long-run research project, but looking at time use and industry growth data can be a first start toward understanding how economic incentives have altered lifestyle, which in turn affects physical activity. There have been some major changes in the life of Americans, although they are quite different from common perception. The big 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—by more than 4 hours per week.^{30,32} 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 reduced, leisure/free time. Free time between 1965 and 1985 increased by 4.9 hours for women (to a total of 39), despite increasing labor force participation, and by 4.7 hours (to a total of 40) for men.³² Women spend more time in the labor force than before, but that is more than offset by declines in home production.

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

Another persistent myth is that Americans are exercising less. In reality, there has been a consistent increase in active sports or walking/hiking. Between 1985 and 1999, active sports increased by 20 minutes a week based on two time-use surveys³⁰; median leisure-time physical activity in the Behavioral Risk Factor Surveillance Surveys from 1990 to 2000 increased by 20 minutes a week.³⁰ The analysis by the Centers for Disease Control and Prevention also shows a consistent decline in sedentary behavior.³³ Obviously, only a rather small part of the increased free time went into active leisure activities, but we would be starting on the wrong foot if we were to believe (many apparently do) that the challenge is to reverse a decline in active leisure because of excessive work hours. Leisure-time physical activity is only a component of total physical activity, and how total physical activity has changed depends also on labor force and home production as well as transportation patterns.

In terms of industry output, the growth of industries associated with leisure time far exceeded GDP growth. Between 1987 and 2001, GDP in constant 1996 dollars increased by about 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 now is four times as big. Spectator sports, the sedentary counterpart to sport clubs and dance studios, also experienced a fivefold 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 the popularity of sports channels indicates. 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 substantially declined as a consequence of increased time away from home, primarily in school, daycare, and after-school

programs (this, of course, being a consequence of increased labor 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 TV, conversations, or other passive leisure, which fell just when obesity became a major concern.³¹ Increased homework burdens and time studying at home, contradicting a common belief in education circles, was not a cause of the decrease in free time. 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 in the past decade (some variables show a decline and these appear to be selectively cited, but other similar items show the opposite trend), but there are no data for after-school and daycare programs.³¹

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 noticeably alter energy expenditure. Adults spend >10 hours a week traveling, more than ever before, about equally split into transportation related to occupation (work commute), home activities (child care/shopping/personal care), and leisure-time activities.^{30,32,34} Transportation time, together with leisure time, has increased at the expense of occupation and household activities.

Unfortunately, existing data cannot tell us much more about physical activity. The Nationwide Personal Transportation Surveys have shown a consistent shift from walking or biking to driving as a percentage of trips taken, but the number of trips has also increased. Since 1969, commuting to and from work reduced its share of total trips from about 1 in 3 to 1 in 6 trips.³⁴ The biggest growth for adults has been in trips for social or recreational purposes. Trips for these purposes increased by about 100 more trips per person per year between 1990 and 2001.³⁴ The problem, however, is with calculating active travel time because the survey design has changed to make it very difficult to calculate trend numbers on physical activity.

For youth, there has been a substantial decline in walking as a percentage of trips to and from school, falling from 20.2% in 1977 to 12.5% in 2001.³¹ So, we know that there has been a decrease in active travel to school. However, while these numbers are often cited as evidence for declining active travel, there has been a substantial increase in the total number of daily trips that could offset declines in the share of walking and biking. Again, there are comparability problems across years that make trend calculations questionable, but making the data as comparable as possible, daily active travel time for youth appears to have increased from 1977 to 2001, rather than declined, but much less than

the increase in total travel time.³¹ Absolute levels are important. Even the highest numbers for active travel for youth (in 2001) only sum to 8 minutes per day.³¹ Active transportation is not a major source of physical activity for youth, and may not have been one for the last quarter century.

Even if one agrees on the goal of making transportation a more important part of physical activity, the incentives must be so that individuals prefer making this choice themselves. That is where the environment and economic incentives matter and no educational campaign can counter their effects.

Summary

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, although harnessing any synergy requires an understanding of the other perspective. Existing work in physical activity has been concerned with producing cost-of-illness numbers or cost-offset claims, often to buttress predetermined policy positions. While this research tradition has been harshly criticized by some, a few simple steps could make cost-of-illness evaluations more informative, such as distinguishing internal versus external costs or providing comparative data across health conditions. A more notable advance for active living research would be the adoption of standardized CEA methods, even just as an add-on to ongoing intervention trials.

Probably the most challenging and exciting area, however, is the emerging research on the interaction between environmental incentives and physical activity. An economic perspective with its explicit focus on market failures is an important complement to ongoing active living research as policymakers in the United States are more likely to rely on the market to solve policy problems than on command-and-control regulation. It is imperative to understand how the market works in actuality, not in the abstract, an area wide open for empirical research. In fact, probably a first more immediate need is for active living researchers to get a better understanding of broad societal trends.

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References

1. Smith A. *An inquiry into the nature and causes of the wealth of nations*, 1776. Bantam Classics edition. New York: Bantam, 2003.
2. Office of Management and Budget, Executive Office of the President. *Economic analysis of federal regulations under executive order 12866*.

Available at: www.whitehouse.gov/omb/inforeg/riaguide.html. Accessed July 31, 2003.

3. Manning WG, Keeler EB, Newhouse JP. *The costs of poor health habits*. Cambridge MA: Harvard University Press, 1991.
4. Porter RC. *Economics at the wheel: the costs of cars and drivers*. San Diego: Academic Press, 1999.
5. Department of Transportation. *Transportation statistics annual report, 2000*. Washington DC: Bureau of Transportation Statistics, 2000.
6. Federal Trade Commission. *FTC Commission actions*, June 17, 1997. Available at: www.ftc.gov/os/1997/06/index.htm. Accessed January 21, 2004.
7. Colditz G. Economic costs of obesity and inactivity. *Med Sci Sports Exerc* 1999;31:S663-7.
8. Pratt M, Macera C, Wang G. Higher direct medical costs associated with physical inactivity. *Phys Sportsmed* 2000;28:63-70.
9. Katzmarzyk PT, Gledhill N, Shephard RJ. The economic burden of physical inactivity in Canada. *CMAJ* 2000;163:1435-40.
10. Reuter P. Are calculations of the economic costs of drug abuse either possible or useful? *Addiction* 1999;94:635-8.
11. National Institute on Alcohol Abuse and Alcoholism. *Updating estimates of the economic costs of alcohol abuse in the United States: estimates, update methods, and data*, December 2000. Available at: www.niaaa.nih.gov/publications/economic-2000/alcoholcost.PDF. Accessed February 19, 2004.
12. Rice DP, Kelman S, Miller LS, Dunmeyer S. *The economic costs of alcohol and drug abuse and mental illness: 1985*. Rockville MD: National Institute on Drug Abuse, 1991.
13. Sturm R. The effects of obesity, smoking, and drinking on medical problems and costs. *Health Aff* 2002;21:245-53.
14. Keeler EB, Manning WG, Newhouse JP, Sloss EM, Wasserman J. The external cost of a sedentary life style. *Am J Public Health* 1989;79:975-81.
15. Sturm R. The myth of medical cost-offset. *Psychiatric Services* 2001;52:738-40.
16. Kahn EB, Ramsey LT, Brownson RC, et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am J Prev Med* 2002;22(suppl 4):S73-107.
17. Golaszewski T, Snow D, Lynch W, Yen L, Solomita D. A benefit-to-cost analysis of a work-site health promotion program. *J Occup Med* 1992;34:1164-72.
18. Bowne DW, Russell ML, Morgan JL, Optenberg SA, Clarke AE. Reduced disability and health care costs in an industrial fitness program. *J Occup Med* 1984;26:809-16.
19. Gold MR, Siegel JE, Russell LB, Weinstein MC, eds. *Cost-effectiveness in health and medicine*. New York: Oxford University Press, 1996.
20. Haddix AC, Teutsch SM, Corso PS, eds. *Prevention effectiveness, a guide to decision analysis and economic evaluations*. 2nd ed. Oxford University Press, Oxford, 2002.
21. Sevick MA, Dunn AL, Morrow MS, Marcus BH, Chen GJ, Blair SN. Cost-effectiveness of lifestyle and structured exercise interventions in sedentary adults. Results of project ACTIVE. *Am J Prev Med* 2000;19:1-8.
22. Sallis JF, Bauman A, Pratt M. Environmental and policy interventions to promote physical activity. *Am J Prev Med* 1998;15:379-97.
23. Humpel N, Owen N, Leslie E. Environmental factors associated with adults' participation in physical activity: a review. *Am J Prev Med* 2002;22:188-99.
24. Saelens BE, Sallis, JF, Frank LD. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Ann Behav Med* 2003;25:80-91.
25. Persky J, Wiewel W. When corporations leave town: the costs and benefits of metropolitan job sprawl. Detroit MI: Wayne State University Press, 2000.
26. Voith R. The determinants of metropolitan development patterns. In: Greenstein R, Wiewel W, eds. *Urban-suburban interdependencies*. Cambridge MA: Lincoln Institute of Land Policy, 2000:71-82.
27. Poterba J. House price dynamics: the role of tax policy and demography. *Brookings Papers Econ Activity* 1991;2:143-203.
28. Glaeser EL, Kahn ME. *Sprawl and urban growth*. Harvard Institute of Economic Research. Discussion paper number 2004, May 2003. Available at: <http://post.economics.harvard.edu/hier/2003papers/HIER2004.pdf>. Accessed February 17, 2004.
29. Haab TCY, McConnell KE. *Valuing environmental and natural resources: the econometrics of non-market valuation*. Cheltenham: Edward Elgar Publications, 2003.
30. Sturm R. The economics of physical activity: societal trends and rationales for interventions. *Am J Prev Med* 2004;27(suppl 3):126-35.

31. Sturm R. Childhood obesity—what we can learn from existing data on societal trends. Part 1 and Part 2, Preventing Chronic Disease. In press. Available at: www.cdc.gov/pcd (accessible after December 15, 2004 [Part 1]. and March 15, 2005 [Part 2]).
32. Robinson JP, Godbey GG. Time for life: the surprising ways Americans use their time. 2nd ed. University Park: Pennsylvania State University Press, 1999.
33. Centers for Disease Control and Prevention. Prevalence of no leisure-time physical activity—35 states and the District of Columbia, 1988–2002. *MMWR Morb Mortal Wkly Rep* 2004;53:82–6.
34. U.S. Department of Transportation. National Household Transportation Survey: changes in the purpose of travel over time. Available at: http://nhts.ornl.gov/2001/html_files/Changes_in_Purpose_of_Travel.htm. Accessed July 21, 2003.