Public Transit, Walking, and Health: Assessing the Magnitudes

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Abstract

Objective. This paper assesses the potential medical benefits of increased walking and reduced obesity associated with taking public transit.

Methods. I review relevant literature, focusing on the extra walking associated with public transit and the effects of walking on obesity. I conduct new analysis of a nationally representative U.S. transportation survey to gauge the net increase in walking associated with public transit usage.

Results. Taking public transit is associated with walking 11 more minutes per day on average, or an additional 34.1–51.7 kcal. In New York City, train travelers may take 2,000 more steps per day than car commuters, or an additional 70 kcal. If an increase in net expenditure of 100 kcal/day can stop the increase in obesity (Hill et al., 2003), then the additional walking associated with public transit might save $10,000 in health care costs per person. Savings in quality-adjusted life years through reduced disability may be even higher.

Conclusions. While no silver bullet, walking associated with public transit could have a large impact on obesity. Further research is warranted on the net impact of transit usage on all behaviors, including caloric intake and other types of exercise, and on whether policies can promote transit usage.

Keywords: obesity, walking, exercise, transportation

Introduction

A topic of much recent interest is the degree to which public transportation may increase exercise through walking. Other things equal, an increase in exercise could then improve health outcomes by lowering obesity, which many view as a looming but potentially manageable threat to public health (Hill et al., 2003; Olshansky et al., 2005; Preston, 2005). The "New Urbanism" movement of the 1990s called for development of denser, grid-based neighborhoods in order to increase walking, bicycling, and use of transit (Cervero and Radisch, 1996). More recently, the entire January 2007 issue of *Environment and Behavior* was devoted to examining how the built environment relates to diet and exercise, and thus to obesity. A recent joint study by the Transportation Research Board and the Institute of Medicine (2005) surveyed the state of knowledge regarding the built environment and physical activity.

Since residents typically select their communities, much remains unclear about the causal influence of environment on activity (Handy and Mokhtarian, 2005; Ogilvie et al., 2006). Longitudinal panel studies of relocated families and their behavior and outcomes, like the nascent RESIDE project in Perth, Australia, are designed to untangle this issue. Without a clear sense of how urban form and the availability of mass transit can actually produce more exercise, researchers are limited in advocating specific policy interventions. Still, it is worth assessing the potential magnitudes of the influences of public transit on health, in order to gauge the plausible scope for policy and motivate further research.

The amount of additional physical activity associated with public transportation appears potentially significant. Besser and Dannenberg (2005) report that half of the roughly 3% of adults in the 2001 U.S. National Household Travel Survey (NHTS) who walked to and from public transit spent 19 minutes or more in total walking time, and almost a third exceeded 30 minutes. Wener and Evans (2007) find that the average New York City train commuter walked about 9,500 steps per day, roughly 2,000 or 30% more steps than the average car commuter.

Several papers associate form of transit with obesity. Frank et al. (2004) report that obesity around Atlanta, as measured by body mass index (BMI), is associated positively with time spent in cars and negatively with mixed land-use and with walking. Gordon-Larsen et al. (2005) reveal that nonoverweight young adults in the Add Health survey were more likely to engage in active transportation like walking or bicycling, possibly in addition to taking public transit. Rundle et al. (2007) find BMI to be inversely associated with the density of bus stops, subway stops, and population around New York City.

But is the *additional* walking associated with mass transit large enough to reduce obesity and its associated health care costs? In this paper, I address this question by simply comparing estimates of steps taken or time spent walking between users and non-users of public transit and then translating those differences into extra net energy expenditure. I obtain one estimate directly from Wener and Evans (2007), who collected daily pedometer readings of New York City commuters. For a supplemental estimate that is nationally representative, I conduct a new analysis of the NHTS in order to measure the additional time spent walking associated with public transit.

To be sure, both of these cross-sectional comparisons merely provide upper-bound estimates of the causal relationship between public transit and walking, obesity, and outcomes. The true effect is a product of many other unobservable behaviors that may adapt, such as caloric intake and other forms of exercise, and we can draw no firm conclusions using cross-sectional data. But it is worth calculating this upper bound in order to assess the potential scope for policy.

Methods

The quantity of interest is the additional amount of physical activity associated with taking public transit as opposed to driving. Wener and Evans (2007) measure this directly by asking a sample of car and train commuters around New York City to wear pedometers, and then comparing total steps for each group. No comparable study exists at the national level, but the 2001 National Household Travel Survey (NHTS) contains similar data that is nationally representative. Besser and Dannenberg (2005) examine total walking by public transit users in the NHTS, but they neither construct nor compare to the counterfactual: walking among non-users.

Part of the NHTS survey included a daily travel diary in which respondents were asked to self-report all trips, their purposes, durations, and the means of transportation. The ICPSR version of the dataset contains a total of 140,915 individuals with at least partial travel diaries. Roughly 50,000 completed the entire survey and thus also have a sample weight. I construct total reported walking time for each individual in the NHTS, and then I compare simple cross-tabulations of walking time by use of public transit and other characteristics, both with and without sample weights. For comparability to Besser and Dannenberg (2005), I define covariates similarly and restrict my analysis to respondents 18 years old and over. Of the 105,942 individuals in the adult subsample, 35,495 filled out the entire survey and have a sample weight.

Results

Table 1 describes the NHTS sample with counts and percentage shares of subgroups cross-tabulated with self-reported use of public transit. Entries in the left panel are the raw data from the sample, while the right panel presents statistics calculated using sample weights, which restrict analysis to only those individuals who completed the survey. The first rows reveal that only about 3% of the entire sample reported using public transit during the travel day, and those who did were slightly more often female and on average 4–5 years younger. The middle rows reveal that Hispanics and nonwhites are more likely to use public transit, as are members of low-income households. Transit use is U-shaped with respect to education, with the lowest use among those with just a high-school degree, while it monotonically increases with population density.

In Table 2, I compare average total daily walking time among users and non-users of public transit and examine the difference. The top row displays the unconditional averages across all adults, first without and then with the sample weights. By the definition of public transit user I have chosen, namely the 3,764 people who used it in any form during their travel day, using public transit is associated with walking on average about 16–17 minutes per day. This is about 7 fewer than the 23–24 minutes reported by Besser and Dannenberg (2005), who examined the self-reports of 3,312 NHTS respondents who walked the entire way to and from public transit. Non-users averaged 5 minutes of walking per day, for a net increase in walking of about 11–12 minutes associated with public transit use.

As the rest of the table reveals, the net increase in walking of about 11 minutes remains fairly stable across age and sex but varies somewhat with race/ethnicity, education, income, and population density. Racial and ethnic differences appear in the unweighted statistics, with Hispanic and African-American users of transit walking relatively less than whites, but these differences are not significant in the weighted statistics. Differences in additional walking by education and income are significant, with transit users of low socioeconomic status walking less than their higher-SES counterparts. In the weighed statistics, transit users with less than a high school degree walk only 4.4 more minutes than comparable non-users. These results contrast with those of Besser and Dannenberg (2005), who find that low-SES and minority transit walkers walk more. These groups may be more likely to mix transportation modes to public transit, which would reduce their average walking and also make them ineligible for the Besser-Dannenberg sample.

The bottom of Table 2 reveals an interesting relationship between population density and additional walking. The unweighted statistics show that additional walking actually decreases with population density. The weighted statistics reveal a U-shape, with transit users in the densest areas again walking about 11 more minutes than non-users, but these users are a small minority. Both weighted and unweighted statistics identify walking among non-users, which increases with population density, as the reason why the additional walking associated with transit may actually decline with density. Except for those in the most dense MSAs, those who take public transit are already walking about 15 minutes a day.

Discussion

More walking, less obesity

Although there are differences in additional walking across subgroups, all subgroups who use transit walk more, and the average difference is 11 minutes. What is the potential impact of this additional walking on outcomes? I can translate minutes spent walking into energy expended using the basal metabolic rate (BMR) for Western adults and the conversion factors for walking cited by Morabia and Costanza (2004). The typical BMR is 4.2 kJ/min (1 kcal/min), and slow walking expends 3.1 times that, or 3.1 kcal per minute of walking. At this rate, the additional 11 minutes of daily walking that is associated on average with public transit will burn an additional 34.1 kcal per day. Walking those 11 extra minutes briskly, or at a 4.7 BMR, would burn 51.7 kcal.

Wener and Evans (2007) estimate that the average New York train commuter walks about 9,500 steps per day, or 2,000 more steps than the average car commuter. As discussed in a review by Tudor-Locke and Bassett, Jr. (2004), 10,000 steps per day is associated with burning about 300–400 kcal, depending on walking intensity and body mass. If each of those steps burns

0.035 kcal, then an extra 2,000 steps per day translates into about 70 kcal, or half again to twice as large as my national estimate. Hill et al. (2003) propose 2,000–2,500 extra steps to burn 100 kcal, implying a faster burn rate of 0.04–0.05 kcal/step.

Additional walking through public transit thus appears to get us close to expending the extra 100 kcal/day suggested by Hill et al. (2003) to be necessary for eliminating observed weight gain in 90% of the population. Based on their reported distribution of excess energy stored in the adult population and assuming normality, I estimate that burning an extra 34.1 kcal/day could eliminate weight gain in 53% of the population, while 51.7 kcal/day would cover 65%, and 70 kcal/day covers 77%.

How do these estimates translate into a change in the likelihood of obesity for an average American? The overall obesity rate, defined as a BMI above 30, increased from 23% to 31% between 1992 and 2000, and Hill et al. (2003) project it to continue growing at 1 percentage point per year. Census estimates suggest the median age in the U.S. is currently about 36, and a person of that age can expect to live about 46 more years (Bell and Miller, 2005). Then a simple baseline forecast of obesity prevalence over the average person's lifetime rises linearly from 38% at age 36 ultimately to 84% by age 82. Based on my results above, walking more with public transit might reduce the annual rate of growth in prevalence to between 0.47% and 0.23%, possibly eliminating it entirely. Figure 1 plots the simple baseline obesity projection and four transit intervention scenarios for the average American. I do not account for any negative impact of obesity on longevity, which could be around 1 year based on period rates (Olshansky et al., 2005). The expenditure estimates I cite in the next section do adjust for differential mortality.

Less obesity, less health expenditure

Sturm (2002) estimates that obese adults under 65 incurred about $395 more on average in health care costs in 1998 compared to the nonobese. Finkelstein et al. (2003) reveal that the costs are considerably higher when obese elderly are included, since obesity is associated with chronic disease. Lakdawalla et al. (2005) show that the average obese 70 year-old will incur $39,000 more in present value, of which $36,000 will be funded by Medicare.

Following Lakdawalla et al. (2005), I assume that real Medicare spending per capita grows at 3%, which is also the level of the real discount rate under standard assumptions. I also assume that other medical spending rises at the same rate. With an additional 2.7% per year in general price inflation, Sturm's estimate becomes about $650 when inflated to 2007 dollars, while that of Lakdawalla et al. is $46,000. For each obesity prevalence scenario depicted in Table 3, I calculate the present discounted value in 2007 dollars of additional lifetime medical expenditures for an average American by summing extra spending during remaining years of life.

Table 3 lists the characteristics of 5 future scenarios and displays estimates of the present value of health spending per person. The baseline scenario, listed along the top, consists of stable annual growth in obesity prevalence of 1% per year as envisioned by Hill et al. (2003). At baseline, I project obesity will generate an extra $48,000 in health costs per person, $35,200 of which will be borne by Medicare and other public sources. With 11 additional minutes daily of slow walking, the annual increase in the obesity prevalence rate will be 0.47%, and savings will reach $11,800 per person. As shown in the table, more strenuous or extensive walking may increase savings to $14,400 or $17,000 per person. Eliminating the entire 100 kcal/day surplus would save $22,100 per person; reducing obesity below current levels would save even more. The lion's share of the savings accrue to federal taxpayers and Medicare Part B beneficiaries, since most costs of obesity are likely to be borne by Medicare.

Less obesity, better quality of life

Aside from increased costs, obesity also threatens well-being, most notably later in life. Lakdawalla et al. (2005) and Reynolds et al. (2005) both agree that obese elderly can expect to live roughly the same number of remaining years as the non-obese, but that their quality of life will be eroded through obesity-related disability. Lakdawalla et al. expect obese 70 year olds to enjoy 4 years of disability-free life, or 2.8 fewer than the non-obese; Reynolds et al. estimate the obese will live more like 8 years free of disability, but still about 2 years less than the non-obese. Less is known about impacts earlier in life, so I do not consider them.

The value of a life year spent in disability, or a quality-adjusted life-year (QALY) weight, depends on the type and severity of disability. For impairments, Cutler and Richardson (1997) list a range of values averaging around 0.8, meaning the enjoyment of living a year while disabled might be about 80% of the enjoyment of a disability-free life year.

Table 4 presents estimates of QALYs lost and their value in each of the five future scenarios I have considered, assuming obesity reduces disability-free life by 2.5 years. The baseline case, in which obesity prevalence rises by 1% each year and averages 78% after age 70, depicts an expected loss of 0.39 QALY. That is worth $78,000 if a life-year spent in perfect health is worth $200,000, which is a standard estimate (Viscusi and Aldy, 2003). Economists believe the value of life grows over time (Costa and Kahn, 2004), at roughly the real discount rate. Relative to that baseline, even moderate decreases in obesity prevalence reduce QALYs lost and raise the value of life years enjoyed per person considerably. Even slow walking of 11 minutes saves $21,200 per person, a number that exceeds medical expenditure savings in all obesity reduction scenarios.

Other health benefits from public transit

Reductions in obesity through walking are only one of a number of potential gains from increased use of public transit. Air pollution is a health hazard that is reduced when public transit usage increases. Users of public transit face much lower rates of injury and death, and increased use should reduce the hazards faced by motorists and pedestrians. Since public transit is more affordable, its availability can improve access to care and outcomes for vulnerable groups such as low-income pregnant women (Evans and Lien, 2005). Substituting public transit for car commuting probably reduces stress (Wener et al., 2006). These separate pathways through which transit may influence health warrant further investigation, but I leave a broader treatment to future efforts.

Study limitations and strengths

This paper is a simple calibration exercise using cross-sectional comparisons of two very different types of individuals. My results are thus entirely hypothetical in nature. They are also incomplete. Although we can gain a sense for how much transit users walk in total relative to non-users, we cannot observe many other types of behavior that affect net energy expenditure, such as other exercise and diet. All that I have shown is that if public transit usage actually produces increased walking by the associated amounts, all else equal, then obesity prevalence, disability, and medical costs are likely to decline.

I leave for future efforts several questions that are much trickier to answer. We do not know how to entice an individual to switch from car commuting to public transit, how to extend public transportation into underserved areas, and how high the marginal costs of these activities are relative to these potential marginal benefits I have outlined.

A central unresolved issue is the direction of causality between obesity and public transit use. Do people become obese because they do not use public transit, or do they not use public transit because they are obese? Since the energy expended in walking a particular distance rises with an individual's BMI, obese people may benefit more from walking, but only because it is more work for them to do it. It seems unlikely that anyone rationally chooses to be obese (Cutler et al., 2003), so anti-obesity policies in general are unlikely to trigger offsetting behavior. But obesity may be an absorbing state out of which it is difficult to climb, or in this case walk. These issues are closely related to the issue of neighborhood self-selection in environmental studies, and much work remains to be done untangling them.

Conclusion

Use of public transit is associated with more walking, by about 11 extra minutes or perhaps 2,000 additional steps per day. Taken at face value, these amounts are probably not large enough to halt the spread of obesity, but they could reduce it, all else equal. Health expenditure savings per person could be $10,000, while the value of reduced disability could be even greater.

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Prècis

In a representative sample of 105,942 Americans, public transit users walked 11 more minutes per day. This could save $10,000 per person in health expenditures from reduced obesity.

Table 1: Sample characteristics of adults in the 2001 National Household Travel Survey

	Unweighted		Weighted	
	User of public transit	**Not a user**	**User of public transit**	**Not a user**
Count	3,764	102,178	2.9%	97.1%
Male	1,634	48,825	2.7%	97.3%
Female	2,130	53,353	3.1%	96.9%
Average age	43.7	48.0	43.4	48.5
Race/Ethnicity				
Hispanic	554	5,187	6.7%	93.3%
White	1,904	87,300	2.0%	98.0%
African American	872	3,904	10.4%	89.6%
Asian/Pacific Islander	279	3,785	8.0%	92.0%
Other	639	6,529	2.9%	97.1%
Education				
Less than HS	453	6,548	4.3%	95.7%
HS degree	1,806	61,311	2.4%	97.6%
College degree	813	20,513	3.2%	96.8%
Advanced degree	590	12,100	4.3%	95.7%
Household income				
< $15,000	799	6,982	7.6%	92.4%
$15,000-35,000	891	21,043	2.7%	97.3%
$35,000-70,000	864	38,857	1.9%	98.1%
$70,000+	916	28,112	2.8%	97.2%
Population density				
< 4,000 / mi^2	896	73,184	1.1%	98.9%
4,000-10,000 / mi^2	765	21,280	3.6%	96.4%
10,000-25,000 / mi^2	804	5,458	11.5%	88.5%
25,000+ / mi^2	1,299	2,220	35.3%	64.7%

Notes: The sample is adults age 18 and over. The sample weights adjust for representativeness and incomplete survey response. A user of public transit is defined as anyone who reported using public transit at any time during his or her travel day. "Hispanic" derives from a separate ethnicity question. The "Other" racial group includes those not listed and all those self-identifying as mixed-race. "College degree" includes the bachelor but not the associate. "Advanced degree" includes any graduate or professional degree. Household income is measured over the previous 12 months. Population density is population per square mile measured in Census 2000 block groups.

Table 2: Average total daily walking in minutes by sample characteristic, 2001 National Household Transport Survey

	Unweighted			Weighted		
	User of public transit	Not a user	Difference	User of public transit	Not a user	Difference
Total minutes of walking	16.0 (0.5)	5.0 (0.1)	11.0 (0.5)	16.8 (1.0)	5.0 (0.1)	11.8 (1.0)
Sex						
Male	16.1 (0.7)	4.7 (0.1)	11.4 (0.7)	15.8 (1.5)	4.6 (0.1)	11.2 (1.5)
Female	15.9 (0.6)	5.3 (0.1)	10.6 (0.6)	17.6 (1.4)	5.3 (0.1)	12.3 (1.4)
Age group						
18-29	15.3 (0.9)	4.6 (0.2)	10.7 (0.9)	15.0 (1.9)	4.4 (0.2)	10.6 (1.9)
30-39	16.5 (1.0)	4.4 (0.1)	12.1 (1.0)	16.9 (2.3)	4.2 (0.2)	12.7 (2.3)
40-49	16.0 (1.0)	4.7 (0.1)	11.3 (1.0)	15.9 (1.9)	4.7 (0.2)	11.2 (1.9)
50+	16.2 (0.9)	5.6 (0.1)	10.6 (0.9)	18.5 (1.9)	5.5 (0.1)	13.0 (1.9)
Race/Ethnicity						
Hispanic	13.3 (1.0)	5.1 (0.3)	8.2 (1.0)	13.0 (2.2)	5.3 (0.4)	7.7 (2.2)
White	17.3 (0.7)	5.0 (0.1)	12.3 (0.7)	17.7 (1.3)	5.0 (0.1)	12.7 (1.3)
African American	14.1 (1.0)	5.8 (0.3)	8.3 (1.0)	15.9 (2.7)	4.5 (0.4)	11.4 (2.7)
Asian/Pacific Islander	15.5 (1.6)	4.3 (0.3)	11.2 (1.6)	14.0 (3.0)	4.8 (0.6)	9.2 (3.1)
Other	14.5 (1.0)	5.3 (0.3)	9.2 (1.0)	14.1 (2.1)	6.2 (0.4)	7.9 (2.1)
Education						
Less than HS	11.7 (1.1)	4.7 (0.2)	7.0 (1.1)	8.7 (1.6)	4.3 (0.3)	4.4 (1.6)
HS degree	15.5 (0.7)	4.4 (0.1)	11.1 (0.7)	16.8 (1.5)	4.4 (0.1)	12.4 (1.5)
College degree	16.9 (1.1)	5.5 (0.1)	11.4 (1.1)	17.1 (2.3)	5.5 (0.2)	11.6 (2.3)
Advanced degree	19.5 (1.2)	7.6 (0.2)	11.9 (1.2)	21.3 (2.3)	7.3 (0.4)	14.0 (2.3)
Household income						
< $15,000	14.6 (0.9)	7.9 (0.3)	6.7 (0.9)	14.6 (1.7)	6.9 (0.4)	7.7 (1.7)
$15,000-35,000	16.8	4.6	12.2	15.9	4.4	11.5

	(1.1)	(0.1)	(1.1)	(2.5)	(0.2)	(2.5)
$35,000-70,000	15.5	4.5	11.0	17.8	4.4	13.4
	(1.0)	(0.1)	(1.0)	(2.3)	(0.1)	(2.3)
$70,000+	17.3	5.3	12.0	18.0	5.4	12.6
	(1.0)	(0.1)	(1.0)	(2.0)	(0.2)	(2.0)
Population density						
< 4,000 / mi^2	13.7	4.2	9.5	14.4	4.4	10.0
	(0.9)	(0.1)	(0.9)	(1.7)	(0.1)	(1.7)
4,000-10,000 / mi^2	14.4	5.8	8.6	14.6	5.6	9.0
	(1.0)	(0.2)	(1.0)	(1.9)	(0.2)	(1.9)
10,000-25,000 / mi^2	14.0	8.4	5.6	14.3	8.1	6.2
	(1.0)	(0.3)	(1.0)	(2.2)	(0.5)	(2.3)
25,000+ / mi^2	19.8	16.0	3.8	23.8	12.8	11.0
	(0.9)	(0.7)	(1.1)	(2.4)	(1.3)	(2.7)

Notes: Standard errors in parentheses. The sample is adults age 18 and over. The sample weights adjust for representativeness and incomplete survey response. A user of public transit is defined as anyone who reported using public transit at any time during his or her travel day. "Hispanic" derives from a separate ethnicity question. The "Other" racial group includes those not listed and all those self-identifying as mixed-race. "College degree" includes the bachelor but not the associate. "Advanced degree" includes any graduate or professional degree. Household income is measured over the previous 12 months. Population density is population per square mile measured in Census 2000 block groups.

Table 3: The effect of additional walking due to public transit on the present value of additional health care spending for an average American adult by rate of future increase in obesity, 2007 dollars

	Additional energy expenditure per day	Annual growth in obesity prevalence	Present value of extra health spending per person	Present value of savings per person	Present value of extra public health spending per person	Present value of public savings per person
Baseline	0 kcal	1.00%	$48,000	$0	$35,200	$0
11 additional minutes of walking						
slowly (BMR = 3.1)	34.1 kcal	0.47%	$36,200	$11,800	$25,700	$9,500
briskly (BMR = 4.7)	51.7 kcal	0.35%	$33,600	$14,400	$23,500	$11,700
2,000 additional steps of walking	70 kcal	0.23%	$31,000	$17,000	$21,400	$13,800
No additional weight gain	100 kcal	0.00%	$25,900	$22,100	$17,300	$17,900

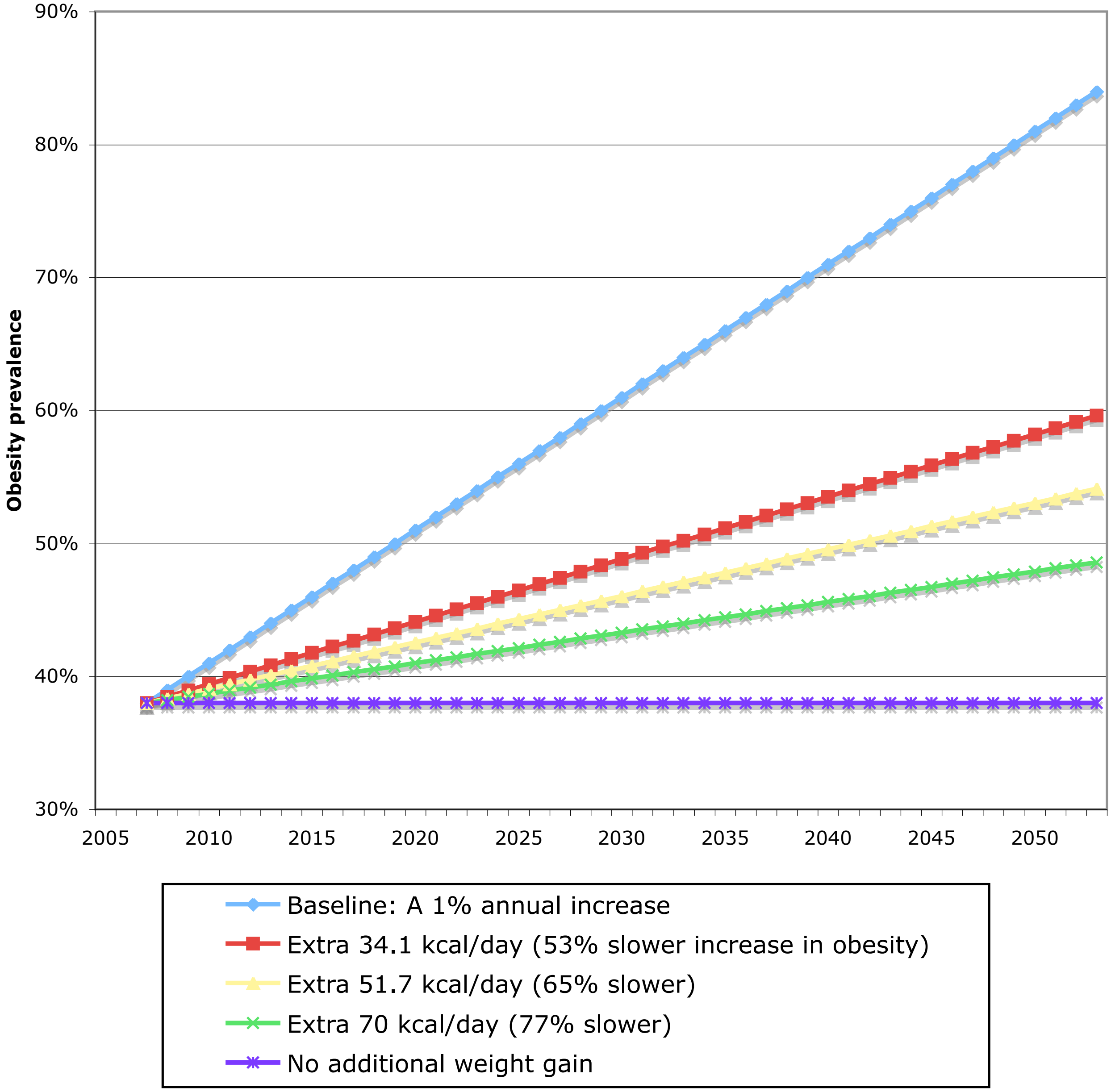
Notes: Forecasts assume a 36 year old who lives another 46 years. Savings are presented per person, not per obese person. The obesity prevalence rate is assumed to be 38% in 2007, per Hill et al. (2003). From age 36 to 69, obese individuals incur $650 extra each year in medical expenditures, inflated from Sturm (2002) per the text. Individuals 70 and over incur $46,000 extra in present value, inflated from Lakdawalla et al. (2005) per the text, 93% of which is paid by Medicare. Spending between age 65 and 70 is also categorized as public. All real medical spending grows at 3% per year. The real discount rate is also 3% per year.

Table 4: The effect of additional walking due to public transit on health status and its value by rate of future increase in obesity

	Average obesity prevalence over age 70	Expected QALYs lost due to obesity	Expected value of QALYs lost due to obesity	Savings per person
Baseline	78%	0.39	$78,000	$0
11 additional minutes of walking				
slowly (BMR = 3.1)	57%	0.28	$56,800	$21,200
briskly (BMR = 4.7)	52%	0.26	$52,000	$26,000
2,000 additional steps of walking	47%	0.24	$47,200	$30,800
No additional weight gain	38%	0.19	$38,000	$40,000

Notes: Forecasts assume a 36 year old who lives another 46 years. Savings are presented per person, not per obese person. The obesity prevalence rate is assumed to be 38% in 2007, per Hill et al. (2003). Per Lakdawalla et al. (2005) and Reynolds et al. (2005), the 2.5 disability-free life years are lost due to obesity. The assumed QALY weight of a life-year spent disabled is 0.8. The present value of a life-year in perfect health is assumed to be $200,000.

Figure 1: Forecasts of obesity prevalence over the remaining lifetime of an average American based on public transit utilization



Notes: Forecasts assume a 36 year old who lives another 46 years. The obesity prevalence rate is assumed to be 38% in 2007. The baseline is a 1 percentage point annual increase in prevalence, per Hill et al. (2003). No additional weight gain means the obesity rate remains stable at 38%.