



Transcript of Dr Howard Frumkin's lecture:
Thursday 20 April 2006

**URBAN VISION AND PUBLIC HEALTH: DESIGNING AND BUILDING
WHOLESOME PLACES**

Dr Howard Frumkin:

Thank you all for coming. I apologise for the delay in getting started. We are starting about 15 or 20 minutes later than you expected and that was intentional, that was to put us on the same emotional wavelength because I've been waiting for my luggage to arrive from the airport. *[Laughter]* It arrived about 20 minutes ago. So the feeling of apprehension and expectation is something we all share. I also want to thank Kevin *[Kane]* especially for the scheduling of today, the reception and drinks are after the talk and not before and given that I've just flew all night it's my great good luck that the drinks come after the talk and it's your great good luck too. *[Laughter]*

Having moved from academia to government I have to show you this disclaimer, you don't have to read it, but I've shown it to you now. *[Laughter]* I want to pose the question as Kevin foreshadowed about the link between urban planning and public health and I want to suggest that one way to think about that, initially, is to ask 'what are the major health challenges that we face'? A century ago or a century and a half ago the answer may have been infectious diseases and so the piped water that Kevin referred to would have been a planning and infrastructure response to that public health challenge. But now the challenges we face are very different and I think we probably share these on both sides of the ocean. So let me very briefly review a few of the major public health challenges that those of us in the health world worry about. Sedentary lifestyles; overweight; obesity – this complex of inactivity and the diseases that follow from it. Injuries are a major cause of morbidity and mortality; cardiovascular disease linked in part to the first bullet; asthma; problems with mental health and health disparities that distinguish some of us from others of us within populations. I'm going to go through these very quickly to survey them for those who are not in the health fields and I'm going to invite all of us to think as I do this about what would be the infrastructure and planning physical environment responses that might help us address these problems if we wanted to do that.

The overweight, sedentary lifestyle is very well known. This *[referring to slide]* was on the cover of Newsweek magazine, one of our popular news magazines. Very low levels of leisure time physical activity, very low levels of utilitarian physical activity characterised the States and I now understand that even with lower levels of car ownership and with better infrastructure for pedestrians, the same problem may plague Glasgow as well. This shows the percentage of people from various groups who have reported achieving recommended levels of leisure time physical activity. You can see that no group gets to above about 40% irrespective of social class. We are a sedentary society.

Partially in relation to that problem, overweight and obesity have increased in recent years. This is about the mid seventies. So during this post World War II 50 or 60 years the average level of weight rose slowly until about half way through that period and then began rising more rapidly. The CDC has developed maps that show the levels of obesity in each of our 50 states. Here's the first map from 1990. The colour code shows you the prevalence of obesity. Here is '91, '92, '93. The darker blue is 15-19% of the population obese. Now '96, '97 – the yellow is now over 20% – '98, '99, 2000. And we are now seeing states in the last years for which data are available with more than 25% of the population formally categorised as obese. So this is a very rapidly galloping epidemic. There are multiple causes for it, but one thing we can say is that genetic change doesn't happen this fast so we are looking at environmental and behavioural factors here.

Those showed you adult data; childhood data parallel the adult data. Here we see from the 60's to the 90's the increase in the prevalence of childhood overweight and this is especially worrisome because heavy children become heavy adults.

Injury is the second major public health problem that I want to flag for us. This is a cause of death chart. The red, blue and green boxes all represent acute injury deaths. Each column is an age group and you can see that among children the blue boxes which are unintentional injuries are the leading cause of death. The red boxes are homicide and the green boxes are suicide, fortunately less common, but if we just focus on the blue boxes there are enormously important causes of death and of suffering and of expense.

Cardiovascular disease is a third issue. I won't give a lecture on cardiovascular disease, but we all know that this is a common problem in developed countries and becoming much more common in developing countries as well. This slide shows the prevalence of various risk factors in men and women – hypertension, obesity, high cholesterol and the presence of multiple risk factors. You can see that these are very common problems to the point that a majority of people have at least one of these risk factors. Cardiovascular disease accounts for about 40% of US deaths; about a million deaths per year in our country. Stroke is very common, myocardial infarction and heart failure, other cardiovascular diseases. It's clear that if we wanted to design communities that would address this problem we would have to design ways to reduce and control risk factors and I'll come back to that in just a few minutes.

Diabetes is a common problem and a growing problem, if you pardon the pun. One of the risk factors for diabetes is overweight and so there is a link between this epidemic of overweight and the epidemic of diabetes that also rated the cover of Newsweek magazine.

Asthma is becoming more prevalent for reasons that aren't clear. The hygiene hypothesis holds that perhaps we don't have enough exposure to antigens and germs early in life when our immune system is being entrained: that really is not clear at this point. What is clear is that asthma is increasing in prevalence as you can see here. The discontinuity in the graph from 1980 to 2002 represents a change in the questions that we used in our national survey to assess the presence of asthma, but despite that break in the graph the overall trend is clear – asthma is a very common disease. The prevalence of lifetime asthma is shown here in various groups. Female and male are the top two. Mexican and Puerto Rican are minority populations within our country and the point of showing you this is to emphasize that asthma prevalence differs a great deal by ethnicity. I'll come back in just a minute to talking about health disparities as one of our major challenges. Nowhere is it more startling than it is for asthma.

We turn to mental health. Depression is a common mental health problem in a variety of surveys – from 15 to 20% of people suffer depression at some time in their lives. It's a treatable condition, but a condition that can be manipulated by changes in environmental, social and behavioural factors as well. Talking about mental health and talking about depression raises the question of happiness and I know this harkens back to Professor Layard's speech in this very seminar series last year. This has been a topic of keen interest for us in the States because during this last 50 or 60 years, a time of rapidly increasing per capita income and GNP shown by the red curve, levels of happiness have not increased. Now we all strive to get more stuff and to accumulate wealth as if that would make us happy, but it seems that it doesn't necessarily make us happy. One wonders about other factors that have been changing over the last 50 years that might have impeded the growth of happiness in parallel with the growth of resources that we've had. It turns out, as Layard's book tells us, for those who are at or near the poverty level more wealth does make people happier, but above that there seems to be very little correlation between more resources and more happiness inviting us, compelling us, to think about other social circumstances that might make all of us happier which after all is the goal of many of our social enterprises.

Let me talk about disparities briefly just to emphasise, as I mentioned before, that asthma varies greatly across social, ethnic and racial groups. Hypertension varies across racial and ethnic groups, as shown on this graph of white, African American and Mexican American prevalence: there and you can see differences in the hypertension prevalence. Coronary heart disease, stroke and cancer vary a great deal by ethnicity and by race, partially due to stress, partially due to environmental and behavioural circumstances. Housing, as one of the upstream determinants of health, varies greatly by ethnic and racial group as well. If we just look across the bottom row here, these are white people, black people, Hispanic people in the States. You can see here the proportions of families that were unable to pay rent, mortgage or utility bills during a one-year period. That proportion is about twice as high in minority populations as in white populations. So it's not only the health outcomes that we study, but the upstream determinants of health that we know are important, vary greatly. These disparities in health have to be a central concern of public health.

So a very partial list of current health challenges include sedentary lifestyles, injury, cardiovascular disease, asthma, mental health, health disparities and it is clear that if we think about those and if we think forward over the horizon, this poses a number of environmental design challenges. In the US the census bureau predicts that our population will double by the year 2100. I don't know that the projections are for Scotland, but presumably population is growing as well. Global temperature will be warmer by two or three degrees by 2050 or 2100, petroleum will become increasingly scarce and expensive, forcing us to look at different energy sources or different patterns of energy use. Water will become increasingly scarce in many areas. Health care costs will be rising. So a number of long term trends form the context into which we have to place current health patterns as well.

If we want to design communities to meet these challenges, to make people healthier and happier and more fulfilled, what are some of the design considerations that need to be on our minds? We need to have room for lots of people because populations are growing, but we have to use the available space wisely because we are running out of space in many cases. We need good places for old people because the population is aging, a very important demographic shift. We need to decrease greenhouse gas emissions and take other steps to control global climate change. We need to decrease petroleum dependence not only because of the political instability that that dependence denotes, but also because it is a finite resource. We need to promote active lifestyles because people are too sedentary and that's bad for their health. We need to prevent injuries, cardiovascular disease and asthma through safer infrastructure, through cleaner air, and so on. We need to promote mental health and wellbeing. Community design features that do those things would respond to current and future public health challenges. And we need to rectify health disparities. So that is the assignment for all the urban planners in the room, thank you very much!

How are we doing at designing communities to meet these needs? Now here I'm going to take the liberty to tell you about how we are doing in the US. You're doing much better than we are, but I think that the trends that the US exemplifies can be seen elsewhere. Australia and Canada followed this pattern fairly closely and many parts of Europe are beginning to display this pattern. So I come as an emissary from as bad as it gets to tell you what to watch out for. *[Laughter]*

This is the current prevailing pattern of urban growth in the United States. This is urban sprawl: the vast geographic expansion of cities over broad areas. This is Denver, Colorado. In the background is the Rocky Mountains which we think were placed by God in order to prevent the infinite expansion of Denver to the Pacific Ocean. *[Laughter]* On a smaller scale we see changes in traditional land use patterns from forest and farmland to residential land, as you see here. The conversion happens at the edge of every city on a regular basis. We see low density use of land, so that instead of having 10 or 20 families per acre you might have a family per one or two acres as you see here. Now, that low density has implications for transportation and the planners in the room know very well that land use and transportation are inextricably linked. The people who live in houses like this will never walk or bicycle to any destination because it's too far away. The low density land use signifies long trip distances and so for them the highway is the lifeline. They need access to a road system and they need to use automobiles because we have created an automobile dependant system of transportation as a consequence of land use decisions.

In order to support that mode of transportation we commit these ungodly acts of civil engineering as you see here. *[Laughter]* This was a recent newspaper headline in Atlanta. Now this is not a joke, this is actually a current plan in Atlanta because we have not enough road capacity so the existing north-south artery in Atlanta is contemplated to be expanded to 23 lanes. This will be longer or wider than an aircraft carrier is long. Despite this pattern of highway construction that prevails in the States, we don't have enough highway capacity in any major city and every morning rush hour and every afternoon rush hour looks like this in every major city. In fact the term rush hour is quaintly obsolete; it doesn't last an hour, it lasts two or three hours in most cases.

This is an artist's conception of the city of Baltimore in the year 2025 after the beltway around the city has been newly widened to 1,472 lanes *[laughter]*. For those who know the geography a little bit the state to the north of Maryland is New Jersey and up there you see the New York beltway which is even farther north than New Jersey, but the beltway has now expanded so that the state of New Jersey has now become the New York beltway. The human implications of this pattern are shown in this car where the child says "mummy when are we going to home?" and mummy says "we spend 60 hours a week in our car, honey, this is our home". Meanwhile as we expand cities outwards, converting greenspace to residential property, spending vast sums on transportation infrastructure and on all the other infrastructure – the sewage lines, the water lines, the electric lines – back in the central city we have perfectly good infrastructure like this that goes abandoned. So this is an inefficient use of public funds and a foregone opportunity to house people in perfectly good housing.

Now coming down to the neighbourhood scale, the predominant form of neighbourhood in suburban development is called the loop and lollipop neighbourhood for reasons that you can see here. Low connectivity is a hallmark of this kind of development. To get from this house to this house, a distance of maybe 50 or 100 feet, you need to take a trip like this. This is designed for cars more than for people. It may have an appeal for parents of young children because living on a cul-de-sac here obviates the danger of through traffic – traffic might endanger the children who are playing outside – but at a certain point this becomes dysfunctional as I will come back to in just a few minutes. The curvaceous streets on the other hand are not designed to slow traffic down, they're designed to move traffic efficiently and that's not a good thing for children who may be playing there.

Another feature of the residential development is low land use mix, so that in a picture like this you see nothing except housing. Anybody in one of these houses who wants to get a quart of milk or a loaf of bread or a newspaper has to take a journey by car because there is no retail space anywhere near here. Commutes have to be by car because there are no work places anywhere near here, this is purely residential. We have segregated the different land uses. Here it is schematically. On the bottom of the slide is a traditional grid like development, and at the top is a more conventional suburban development pattern that typifies the last 50 years. About 50% of our population now lives in suburban areas that look more like the upper panel than the lower panel. So here you've got a mixture of land uses: you've got single family housing, apartments, a retail mall, more apartments, the school is over here imbedded in the neighbourhood. Up here separate parcels of land were developed independently by developers in most cases – private efforts. Here is the single family housing development separated from the apartments, separated from the school and over there is the retail mall. So a child in this house who wants to go back to school to play sports one afternoon simply comes out of the house, travels along a sidewalk (these grid like streets typically have sidewalks) and arrives at the school. A child equidistant from his school who wants to go from here back to school has to travel out to the feeder road, along the feeder road and back into the school requiring an automobile trip, requiring in turn that mum or dad drives him or her – exactly what you don't want to have to happen when you're 13 or 14 years old and you want that independence.

Now coming down to an even smaller scale, here is a particular interest of mine. I'll give you a multiple choice quiz question now. A medium security prison, a UFO that has just landed, a warehouse, or a school? When I present this in the States everybody always says "oh yeah, it's a school". More and more of our schools look like this now. A typical pattern for schools in suburban communities is to buy a large parcel of land out at the edge because that's where the land is affordable and available and to build the school on that large parcel of land. That triggered a cover story in *Governing Magazine*, a magazine that goes to state and local elected officials. The cover story as you can see is called 'Edge-ucation: the compulsion to build schools in the middle of nowhere'. This is a corollary of the land used and transportation patterns that I have been describing. Here is an example. This is the Marshall High School in Marshall, Minnesota built truly on a greenspace. This is the Hubbard Lake Elementary School in a suburban area in Michigan. Its motto is, I kid you not, "outstanding in its field". *[Laughter]* No child for the useful life of this school will ever walk or bike to school. We do know how to do the alternative; we build, and built for many decades, neighbourhood schools that were imbedded in residential communities to which children can walk and bike. Such schools could also function of centres of social activity after school hours and be sites of social capital for the community, but that is a disappearing pattern.

Coming down to the street level, streets typically look like this large street of roads designed to move a lot of traffic; very hostile to pedestrians. Build really for one use. The main virtue of streets like this other than moving traffic is that they allow us to play a fun game called 'find the victim'. If you look carefully you can see the victim back there, the intrepid pedestrian who takes his or her life in hand by crossing the street.

Coming down finally to the smallest scale I want to talk about: sidewalks and paths. I have made a careful study of sidewalks and paths across my country, off the record, and I have discovered that there is a clandestine national "Never Walk" campaign. So I've studied the features of that campaign and I'm here to tell you about them today. Thirteen different strategies.

- The first is not to build sidewalks. This is a very typical look for a suburban road in the States. You can see by looking at the side that some people insist on walking anyway. These are people who probably don't have cars, in this case this is a feeder road called Buford Highway which happens to be where my office of CDC is located. It's also a heavily Hispanic area, so these are members of minority groups who can't afford cars and they have to walk. Well the fact that that happens requires 12 more strategies to prevent people effectively from walking.
- The second is to build repellent sidewalks. A sidewalk that looks like this has nothing interesting to look at along the way, it has no shelter from the sun, there is no buffer between the pedestrian and the sidewalk and the traffic on the roads so it's a very unappealing place to walk and it's no wonder that nobody is walking there.
- The third strategy is to allow sidewalks to disintegrate. They look like this. This is a statement of public will about the role of walking.
- You can also build treacherous sidewalks. This is a sidewalk that inclines down directly into traffic. This is useful in the Never Walk campaign because if a mother or father is pushing a carriage with a baby in it and loses hold for just a second, the carriage will roll into traffic removing from the gene pool people who might grow up to become walkers if they were to survive.

- Obstructing sidewalks is a very effective way of sending a message to would-be pedestrians about how we feel about their walking. *[Laughter]* This is very close to the university where I taught for 15 years. There was a storm that came through... we are in the Southern United States so the warm weather over the Caribbean generates hurricanes that then come up overland and they periodically sweep through and knock down trees. So this tree came down and the highway department, which is terrific, came out within hours with chainsaws. Now they could have sawed off the tree at this point, but because they are part of the national Never Walk campaign they sawed the tree off here to prevent anybody from walking there.
- Using creative design is a very effective method. Based on my medical perspective, I call this sidewalkus interruptis. This one is just dislocation. *[Laughter]*
- Crosswalks are what we build to guide pedestrians across streets. The best thing to do with crosswalks is to make them go nowhere because if the crosswalks go nowhere as these ones do, then no-one ever has any incentive to walk on a crosswalk.
- Combining multiple strategies at a time of economic shortages is very efficient. Here you have disintegration and obstruction. Here you have sidewalkus interruptis and obstruction.
- It's important for the planners to remember never to place an interesting or useful destination within walking distance of where anybody lives. If you live in a place like this, then there is no reason you would ever walk even if there were sidewalks because there is no destination to get to.
- Being explicit is a good idea. This is the entrance to a gated community. I don't know if you have gated communities here. This is the fastest growing residential configuration in the US. It's an interesting sociological phenomenon reflecting a free flowing sense of menace out there. It may be 9/11 related or related to competitiveness in the world, or the declining fortunes of our country in other ways, but many people are moving into gated communities. This is an entrance to one and if you look carefully at the side it says "No Pedestrians" so you're not allowed to arrive here on foot. You have to arrive here by motor vehicle. That is a very explicit way to discourage walking.
- Zealous law enforcement helps. This woman in Los Angeles received a ticket for \$114 for talking too long to cross a street. She began shuffling with her cane across a particular road in the San Fernando Valley when the light was green, but was unable to make it to the other side before it turned red and got a ticket for that. The intrepid reporter went out on Friday to observe for him or herself. The light changed too quickly even for high school students to make it across without running. It went from green to red in 20 seconds. So here is a legal support for the national never walk campaign.
- Enshrining the labour saving device is a useful strategy. This is the lobby of the Hyatt Regency Hotel in Bethesda, Maryland. I picked the Hyatt Regency because it's one of the signature hotel chains worldwide and I picked Bethesda because that's where our National Institutes of Health are so all of us who go in to serve on advisory committees are familiar with this hotel. We care a lot about health. In the main lobby, this is the concierge desk, this is the beautiful setting with ferns and balconies. The main shrine in the middle of the lobby is the elevator. If you try to find staircases they are a clandestine affair hidden behind a concrete block wall that are difficult to get to and to which the doors may be locked. So this really bespeaks social values--contrast to traditional architectural devices like these that not only invite you but seduce you into walking up stairs working physical activity into your daily life.

- The 13th strategy is to make everything car accessible, this is to make it appealing never to get out of your car. We are the land of the drive-through. We have drive-through pharmacies; we have drive-through dry cleaners; we have drive-through liquor stores. Now notice that drive-through is always spelled 'thru' in recognition of the fact that busy drivers have better things to do than contend with complicated constructions like 'ough' *[laughter]*. We have drive-through bakeries; we have drive-through grocery stores; we have drive-through auto service establishments, that's appropriate; we have drive-through dining, fast food, all the food you want and you can wash it down with coffee bought at drive-through windows. I think you recognise that Starbucks is now ubiquitous and we have... most Starbucks in the States, with very few exceptions, has a drive-through window. We have drive-through banking opportunities – do you have those here? Beware, they're coming! This one is an especially thoughtful drive-through facility because if you look closely at the key panel on the ATM it has Braille buttons for blind drivers *[laughter]*. We have drive-through opportunities to mail our letters; we have drive-through opportunities to pay utility bills. In Las Vegas... I believe this is the only place in the country you can actually drive-through the tunnel of vows and get married as these two people are doing while driving *[laughter]*. Now, if it doesn't work out and the marriage breaks up and you have to make child support payments this court house and these two nice ladies will gratefully accept your child support payments as you drive-through - you never have to get out of the car. We have drive-through funeral homes *[laughter]* completing the life cycle. This is my favourite for those who love irony. If anybody can explain drive-through parking to me *[laughter]* I'd love to hear the explanation. We even have drive-through trees for those who have been out to the Western US.

Well the result of all of these strategies is that it really is as if there were a deliberate campaign. USA Today, the national newspaper of our country, ran a story a couple of years ago saying 'Walk, Can't Walk: the way cities and suburbs are developed could be bad for your health'. It's as if we intentionally engineered out physical activity. Well this pattern of urban sprawl from the expansion of cities over large areas to the low density use of land, conversion of traditional land use patterns from forest and farm land to residential, low land use mix, low density – put that pattern all together is this an automobile dependent method of development. How might it affect health? Let me mention a few ways here. I'm going to run through these quite quickly and then finish by talking about the nexus of public health and planning in confronting this growing pattern and restoring health as one of the central pillars of urban planning.

We start with the air pollution. Air pollution as you know is a complex mixture of ingredients. What's relevant in this context is that all of the components of air pollutants, picture on the left in yellow, result directly or indirectly from motor vehicle emissions. And so all things being equal, the more we drive the higher the VMT (the vehicle miles travelled) in a particular air shed the higher will be the level of air pollutants there.

This is the tracing of ozone levels in the air during a typical summer day in Atlanta. Atlanta is a very automobile dependent sprawling city and happens to have an ozone problem. So what you see is that in the early morning ozone levels are low. Ozone doesn't come directly from tail pipes – ozone is a secondary pollutant that forms in the atmosphere from the interaction of oxides of nitrogen and hydrocarbons under the influence of sunlight and heat. So this is a summer day, it's warm. We load the air shed with ozone precursors during the morning rush hour and the ozone levels begin to rise. We do it again in the afternoon rush hour, the ozone levels rise further, they cross the threshold that's considered to be healthy at about mid-afternoon. That's precisely the time of day when kids need to go outside after school and practice sports or play, when you may want to finish work and take a jog, when you may just want to sit outside behind your house and have dinner, but air levels are high at that point. This causes us as physicians a real challenge. What do I advise my patients in a city like Atlanta about how to handle the ozone problem, especially those who have asthma and who suffer the most from ozone? Well I could advise them to get out of their car and walk or bike rather than drive because if everybody did that ozone levels would come down. In fact during the Olympic Games in 1996 we saw about a 25% decrease in motor vehicle traffic volumes in Atlanta, ozone levels came down accordingly and emergency room visits for asthma decreased by up to 40%. So we know this can be done, but unless that's going to be a matter of social policy widely adopted it's unwise for me to advise a patient to walk or bike. That increases respiration and it increases the exposure to high ozone levels, so it's not good advice. It's a terrible dilemma for us.

The second health impact of sprawl is contribution to climate change. I won't review the mechanisms of the greenhouse effect – I think everybody here knows that climate change is occurring and it occurs in part, if not completely, due to the accumulation of greenhouse gases in the stratosphere--gases that retain heat the same way a windshield does in your car on a hot day. We are adding to those greenhouse gases through carbon compound combustion; burning gasoline, coal and others. Global temperature continues to rise and it's projected to keep on rising in coming years. Well the reason this is relevant in a discussion of land use and transportation is two-fold. First when we clear forests in order to expand cities we remove an important carbon dioxide sink. The trees would otherwise be absorbing carbon dioxide. Secondly by driving the vast distances that sprawling development requires we burn lots of gasoline and contribute to the carbon dioxide that is one of the main greenhouse gases. The transportation sector accounts for just over a quarter, by some accounts up to 40%, of greenhouse gases. So that if we could design places to decrease our need to burn fossil fuels in transportation we could help mitigate climate change trends. Why do we care about that from a public health point of view? Because we expect climate change will increase direct heat related morbidity and mortality due to heat waves, increase infectious disease due to ecological changes in vector biology, increase respiratory disease by promoting the formation of some air pollutants, and so on. There is a broad portfolio of public health threats related to climate change that we can help address through urban design now.

Car crashes are a third health implication of development patterns. I mentioned earlier and showed you a graphic that flew past quickly that car crashes are the major cause of death among young people in our country. I don't know how they rank here. Nationally we lose about 40,000 Americans every year to car crashes – nearly as many as we lost in the entire Vietnam War. This is a huge public health burden rarely talked about to the extent that it ought to be. What I've done in this slide is to take a number of cities in the country and array them according to their motor vehicle fatality rate. It turns out that the older pre-automobile cities with pedestrian infrastructure and transit rise to the top of the list, and the newer, more recent, post-automobile, sun-belt cities – the quintessential sprawling cities – show up at the bottom. So we have large numbers of presumably preventable deaths. If we had traditional urban pedestrian and transit infrastructure in modern, automobile-oriented cities, we would probably be preventing some of those deaths. This reflects a simple epidemiologic principle: the more time you spend at risk, the higher the probability that a bad thing will happen.

The story of pedestrians is a bit more complicated. Pedestrian fatalities are declining worldwide; they are declining in Britain, they're declining in the US. This is a good thing. But pedestrian fatalities are declining because fewer and fewer people are walking. That's not exactly the way we want to achieve safety and health – at a time when people are too sedentary we want them to walk. Well, is it necessary to trade off pedestrian safety and physical activity? These are actually British data. What they show is that during the 1970 to 1990 interval pedestrian fatalities came down as traffic volume went up. It seems that there is a trade off between the two. Get people off the sidewalks and streets into their cars and they won't become the victims of pedestrian injuries. Is there a way to get people back on foot, which we need to do for public health reasons, to get them more physically active, but to protect them? Well we have very interesting international comparative data that help answer that question. It's a little bit complicated to look at these pictures so let me walk you through it. What you have here is the proportion of urban journeys that are made on foot and on bicycle. So here we are the losers, this is the US: 6% of trips made on foot, 1% made on bicycle. At this end we have the Netherlands: 18% of trips made on foot, 28% made on bicycle, so more than half of urban journeys are made by non-motorised means. Denmark, Sweden, Austria, Germany, and so on. What do we know about pedestrian fatality rates in the countries to the right where pedestrian travel is far more prevalent than in the US or Canada? What we know is that by any measure—fatalities per trip, fatalities per distance travelled, fatalities per unit time—pedestrian fatalities are far lower in Holland, and in other countries in Europe where this has been carefully counted than they are in the US and Canada. So apparently this is not a necessary trade off: By building adequate pedestrian infrastructure and by developing a culture in which drivers share public spaces with walkers and bicyclists, one can protect the safety of walkers and bicyclists and also to get people to be more physically active. So this is an important design principle that comes from the transportation world to the public health world.

Just a word on physical activity. The theory here is that non-walk-able environments promote sedentary lifestyles; walking is the major form of physical activity for most adults. The sedentary lifestyles are directly predictive of adverse health outcomes and indirectly by promoting overweight, which is in itself bad for health. There is an algebra to weight change. People have talked about the fact that caloric intake is rising and it certainly is – the mega meals and so on are bad for us. The other half of the algebraic equation is calories out, calories expended by combustion. So on the left is the food side and the right is the physical activity side and both, it turns out, play a role in the modern epidemic of overweight. There was a wonderful paper in the British Medical Journal about a decade ago called ‘Obesity in Britain: Gluttony or Sloth?’ asking which of those seven sins was the culprit. So this is both sides; this is the gluttony side, this is the sloth side. Both sides show overweight in Britain and here it is rising, the exact same curve. Superimposed on the overweight curve on the left is gluttony as measured by energy intake and fat intake and interestingly it seems to have peaked at about 1970 and was then declining by 1990. This side shows sloth as measured in these two overlying curves by cars per household, and television viewing in hours per week. The sloth curve overlies the overweight curve perfectly suggesting, at least in this ecological sense, that that caloric intake must play a role but so must the sedentary lifestyles.

We know from the transportation literature that there is a close relationship between residential density and travel mode. This is residential density in households per acre. Very low density here in a rural area. This is a suburban area here and this is a central city urban density area here. The curve shows driving, measured as annual vehicle miles travelled per household. As you can see the driving comes way down as you move toward denser places, exactly the phenomenon that Glasgow makes feasible, but that as the city expands outward will become more difficult to maintain.

Physical activity is good for health, being sedentary is bad for health. Being sedentary predicts higher mortality, higher chance of cardiovascular disease, a whole range of other diseases, a number of the cancers, depression and so on. Being overweight poses many of the very same risks. The two of them are in fact sometimes difficult to disentangle because there aren’t very many people who are overweight but physically active, but it is possible to disentangle them and, independent of being sedentary, being overweight is a risk factor for mortality, for cardiovascular disease, gall bladder disease, depression, cancers, so on. This is very well known. These are witches who are talking and one witch says to the other: “Remember when we use to have to fatten the kids up first?.” They no longer have to do that.

There are marketing issues that are emerging now. This was a story in the New York Times a couple of years ago about the emergence of triple wide coffins. Too many Americans can no longer fit into a conventional coffin when they go to meet their maker and so some enterprising manufacturers here have begun making coffins that look like swimming pools because those are necessary to bury Americans. In the workplace this has become a major concern. We have a much more dysfunctional system of health insurance than you do. Private employers pay for health insurance in the States as you know, and they have therefore begun paying a lot of attention to the consequences of obesity because that has direct implications for their expenses. I would assume that a government payer would have the same concern. I’m running a little late so I think I’m going to skip the detailed review of recent research on the links between the built environment, physical activity and health and I’ll take you directly to the bottom line.

Given the sequence that hypothesized sprawl leading to decreased physical activity leading to adverse health outcomes, the emerging research is incomplete and not entirely consistent, but is beginning to converge on the notion that sprawl does lead to decreased physical activity, physical environment is a determinant of physical activity and at the decreased physical activity, specifically in the context of sprawl, is associated with bad health outcomes. So that the magazine cover story that I showed you before of a young man eating an ice cream cone might better be replaced by this iconic image of the young man committing what we call 'dietary indiscretion' but also being physically sedentary sitting and watching the TV when he could be out playing sports or walking with his friends.

I'm going to skip talking about water balance. Development patterns play a role in how water is handled when it falls from the sky. I'm going to mention only very briefly the question of the urban heat island. Urban areas are warmer than the surrounding countryside for two major reasons. The first is the loss of evapo-transpiration: a cooling effect that trees provide that accompanies the clearing of trees. The second is the installation of dark surfaces that absorb heat and re-radiate that heat during the cooler hours of the day when the city would ordinarily cool off. As a result cities are several degrees warmer than the surrounding countryside. This is relevant for two reasons. The first is that as we expand cities outward this temperature profile also expands outward creating, if you will, a shoulder on the mountain and expanding both the intensity of the heat island and the geographic expanse of the heat island. Given long term patterns of warming we can expect more heat waves and these will be magnified in cities so that we need to think very carefully about the development patterns. If we are going to spread the cities outward they need to be kept green, we need to think about the surfaces that we put down and if we can balance urban expansion with preservation of greenspace as a matter of design policy, that will help mitigate the heat waves that, as you all know from recent experience here in Europe, can have very high mortality tolls.

The last couple of issues I want to talk about in terms of health consequences are mental health and social capital issues. I want to begin by referring to child development. I'm not a developmental psychologist, but we do learn from the major works of child development that there are certain infrastructural or environmental antecedents of healthy wholesome development. One of the most interesting of these to me is what's called the 'cradle-room-house-doorstep- neighbourhood sequence'. What this refers to is the way your universe expands as you grow. When you're a newborn this is your universe; your universe is the crib and mum or dad take care of you. When you are two or three years old you're a toddler; your universe expands and now it's as big as this bedroom. When you're four or five years old and developing appropriately, the universe may now be the backyard or it may extend as far as the neighbour's house. When you're six or seven years old, you head down to the end of the block where there is a playground, you go visit friends a few houses away. When you're ten or twelve years old you begin getting more exploratory you want to go a few blocks away, maybe get an ice cream cone at one of these stores, maybe visit with your friends, maybe even see a movie. When you're fourteen or fifteen years old you're much more mobile and you're ready to go explore the entire town on your own, assuming that there is transit available because you can't yet drive.

Well, this is the sequence that is interrupted by the sprawling neighbourhood development pattern. The loop and lollipop neighbourhood may be very suitable for a child or a toddler because through traffic is minimised and that give the parents a sense of security and may be objectively safer for the children. But by the time the child gets to be ten or twelve years old and is ready to explore on a larger scale – it's a normal development pattern, it gives the child independence, a sense of geographic orientation, a sense of judgement – a child is prevented from doing that. So there is a developmental arrest if you will. Could that be part of the reason for what's become an iconic media image of the bored alienated suburban teenager who tells us with her body language what she thinks of life in general? Could that be a part of what is apparently an increasing incidence of depression among teenagers? Putting it differently, are we designing neighbourhoods so that they are optimally wholesome for children to develop normally through the entire development sequence from childhood to adulthood?

Another interesting mental health outcome is road rage. Road rage can be defined as events in which an angry or impatient driver tries to kill or injure another driver after a traffic dispute. This is a surprisingly unstudied but interesting phenomenon. These are the typical facial expressions of people who are driving on crowded road systems, so these are people who are at risk of committing acts of road rage. Road rage turns out to be pretty common in the US and Canada and in Australia. We have good studies from the UK, even from Holland, which I always think of as one of the most peaceful places around, where given enough time on the roads in frustrating circumstances people commit acts of road rage. Road rage has even risen to the level of a video game so that children can practice and refine their skills at committing acts of road rage before they actually start driving. What's interesting about road rage is that most of us don't commit acts of road rage, we don't get out of our car after a dispute with another driver, take a crow bar out and whack the other driver. If that's just the tip of the iceberg, what about the frustration that must underlie road rage, frustration that most of us manage to contain. These are results of an every two year survey performed in the US. It's a random digit dialling telephone survey of driver to ask about driving habits. So the drivers are asked: 'Within the last year has another driver made an obscene gesture at you?'. Fifty percent of Americans report 'yes'. 'Within the last year has another driver tried to intimidate you with a sudden or threatening move with his or her car?' Twenty eight percent of Americans say 'yes' and so on. Not very reassuring indicators of a healthy civic society. Even better than this is when the surveyors turned to 'What have you done to other drivers?'. So they ask 'How often do you say bad things to yourself about other drivers?' and the responses are sorted in 'never', 'rarely', 'sometimes' or 'often'. If we combine 'sometimes' and 'often' we are up to about 60%. Sixty percent of people admit that they sometimes or often say bad things to themselves about other drivers. 'How often do you complain or yell about other drivers to a passenger in your vehicle?' Just over 50%, 'sometimes' or 'often'. 'How often do you honk or yell at someone?' One in five. Here's my favourite. 'How often do you think about physically hurting another driver?' *[Laughter]* That's about 1 in 20, about five and half percent. So I advise American audiences when they leave the talk and they go home in their car, keep in mind that one out of 20 drivers going past you may be thinking about physically hurting you. *[Laughter]* This is a bad feeling isn't it?

Have you heard of sidewalk rage? For some reason it doesn't exist. We have two forms of transportation: one that seems to make people angry and hostile at each other and it incidentally puts them at risk of crashes and pollutes the air; another that builds social capital, doesn't make them angry and hostile, and promotes physical activity. Yet we have designed transportation systems that are almost exclusively dependent on the first and not the second in many parts of our country.

That leads to a discussion on social capital: the glue that binds us together as a society. It's the companion asset after human capital and physical capital defined as behaviours--social networking and engagement--and attitudes--trust and reciprocity. Examples of these behaviours include having friends over to your house, going over to friends' houses, voting, going to church or synagogue or mosque, getting involved in civic associations, or coming to lectures like this. These are indicators of social capital. Trust and reciprocity are identified and measured / operationalised by survey questions. The reason there is so much attention to social capital recently is that it seems to have been declining over the last few decades in the US and in other parts of the developed world, as put most eloquently by Robert Putnam in his book 'Bowling Alone'. The bowling leagues that typified post World War II United States had begun to decline as an indicator of the decline of social capital. We care about that because social capital is very good for health. Here is a measure of mistrust; this is lack of social capital. The proportion of people within each state who endorse the statement 'most people would try to take advantage of you if they got the chance'. So this is mistrust. On the 'Y' axis you have mortality, state by state. What you see here is a remarkable relationship reproduced in many, many studies that as social capital declines, mortality rises. So if we can do something in the physical environment to promote social capital we certainly want to do that as a public health intervention.

How might sprawl play a role? Well, in the first place the more time people spend commuting over large distances, the less time they have available to be involved in civic activities and to be engaged. This is a simple question of algebra. In the second place the question of 'ageing in place' arises. If you move with your young family to a suburban neighbourhood you might have a half acre of land, a little garden, three bedroom house that is perfectly suitable as you raise the kids. But when the kids are grown and gone to university you're ready to downsize. Now in a conventional town or city, as we have lived in traditionally for centuries, there'd be a variation in housing. You'd be able to move down the block or around the corner to a smaller home. In a large homogenous residential tract you don't have that option so you need to leave the community altogether preventing this phenomenon of 'ageing in place' and undermining the social capital to which that continuity would contribute.

"Third places," or "places of the heart," are places that aren't home and aren't work, but are places where we can congregate and meet people; cafes, sidewalks, public squares and parks. In many, many suburban developments that are privately driven, this part is left out. This was an ingredient of traditional city and town planning that seems to be gone. These places contribute to social capital.

Finally there is the question of income inequality. Now if you were driving along a road and you saw a cluster of signs like this distinguishing housing by social class you would think it was either a bad joke or tasteless because we don't segregate ourselves exclusively by social class, do we? Well here are real photos of roadside scenes outside Atlanta where I live. You can see that the homes in this development are in the \$600,000 range, the ones here in the \$129,000 range, and so on. Each is a separate development; each homogeneous. There is no more surgically precise way to separate us by social class than this sort of housing arrangement. If that in turn confronts us daily with indications of income inequality, if it deepens the practical side of income inequality, then that undermines social capital as well.

So there is a range of ways in which this pattern of transportation and land use that I've called sprawl might affect and undermine health. What do we do about it? Let me finish up by talking about a couple of development patterns that are catching on in the States, catching on in many other parts of the world called "smart growth" or "new urbanism." This is really nothing new, this is a rediscovery of the old and time tested, but we are approaching it with new kinds of health data in mind and with new loyalty to help called 'smart growth'. You can see some local jurisdictions here doing smart growth measures as matters of public policy. Mixed land use, higher density use of land, using densities that traditionally prevailed in cities and towns before the advent of the automobile balanced by greenspace preservation. One of the impulses to move to the suburbs is to have access to greenery, people love that, but there is no reason that can't be provided in urban areas too as long as it's planned for. Transportation options so that public funds go not only into roadways, but also in a balanced way into pedestrian infrastructure, multi-use trails, and transit, parks and public spaces and affordable housing to address that issue of disparities. One of the problems we've had in the States is that as redevelopment occurs in previously desolate urban areas where only poor people are living, those people are pushed out in a process called gentrification and they then have no good place to live. So these redevelopments that are taking place now need to take place with very explicit focus on affordable housing for everybody across the income spectrum.

How do we get there? What should we be doing as a society, in a collaboration, that ranges from urban planners to physicians? Well, all of the measures that you see here I want to submit to you are important. We need better research. I referred obliquely to some research, didn't have time to go into it in detail, but we really need a lot better knowledge than we have. With great respect to the architects and planners in the room I will say that the tradition in the architectural and planning literature is very, very different than, and incompatible with, modern trends in health literature. If I tell you that you should take a particular medication to lower your cholesterol level you expect me to be able to cite evidence that that medication is efficacious and safe. I better have good randomised clinical trials otherwise I have no business recommending the medicine to you. If I recommend to you that you should have sidewalks of a certain width or parks every so often in the city I ought to have, if not similar evidence, evidence that goes in the same direction. I ought to have evidence rather than ex-cathedra pronouncements. Traditionally in architecture and planning, the best writers have simply declared what they think is the way to do things without presenting empirical evidence that it works. We need to get together across these disciplinary divides and work to develop the evidence so that we have solid guidelines on how best to design and build places. I won't talk because of lack of time about the specific methodological questions that arise.

Let me say one thing about it. We do have a fair amount of research showing that people who live in more walk-able neighbourhoods walk more than people who live in less walk-able neighbourhoods. Well, that doesn't prove anything because it's possible that people sort themselves out; it may be that the physically active people select to live in walk-able neighbourhoods so that they can walk, and the couch potatoes select to live in non walk-able neighbourhoods because they expect to drive. The ideal approach to establish that the environment influences activity patterns is a randomised trial. I would sort everybody in this room randomly into one of two kinds of neighbourhoods, a suburb and a town, and then follow over time to see which group walks more. Well you can't do that with people, but there are quasi-experimental designs like observing before and after an environmental modification. We are observing the same people before and after moving to see whether the environment truly is a predictor and which aspects of the environment. Is it density? Is it mixed land use? Is it particular infrastructure styles? Which are the ways that we should promote healthy habits and healthy outcomes? To do that we need partnerships. Many, many professions as listed here: physicians and nurses, urban planners, transportation engineers, and so on.

We need better messages. We need to talk about community design as a matter of healthy wholesome lives, not only for ourselves but for our children and grandchildren. Too often these days – certainly it's true in the States and I imagine that there is some truth to it here as well – development patterns and residential choices are discussed in the context of property rights, investment opportunities, very important things, but we lose the frames that might help fill out the story. We lose the frames like trans-generational responsibility, fiscal responsibility: shouldn't we fix existing infrastructure first before spending more money on brand new infrastructure and green fields? Wholesome, healthy places are one of the frames through which we ought to think about the way we design and build places.

Social marketing is important and here's why. *[Laughter]* A very important take home message is that as crucial as healthy, wholesome environments are, they're not the whole story. People still do make behavioural choices in the context of healthy environments. Just because you give them a path or a sidewalk they won't necessarily walk, as you see here. Well we know a lot about social marketing in health world. For years tobacco was aggressively socially marketed and, by the way, my friends at the CDC reminded me to congratulate you for the recent switch to a non-smoking country. This is a wonderful thing – congratulations. Until that kind of change occurred, we all saw messages like this. Reassuring, in this case, women that if they would smoke they would have perfect complexions, elegant costumes to wear, success in life; reassuring men that if they would smoke they would have *[laughter]* manly appearances, strong jaw bones, big muscles and the ability to succeed in life; reassuring everybody that if you smoked you would find love; reassuring young people, more recently, that if you would smoke you would be able to go shopping and run down cobbled streets with your friends afterwards with your mouth open and not fall *[laughter]*.

Marlboro was famous – you’ve seen these ads. Marlboro reassured men that if they would smoke they would not only have strong jaw bones and good muscles, but they would have the ability to wear cowboy hats and red shirts and gaze meaningfully into the middle distance. Not to be outdone, Camel reassured men that they would get all of that and the ability to strap a holster on to their kneecap and it would stay there. *[Laughter]* Well then we began to get money for social marketing in the opposite direction and ads like this began to appear about five or ten years ago as the result of funds made available from litigation. Cool cigarettes were spoofed with ads like this. Joe Camel became Joe Chemo. This one had a lot of attraction. And with ads like that, smoking rates dropped precipitously. We can change behaviour. We can even change addictive behaviour with good messaging. So it is the question of what kinds of neighbourhoods would we like to live in? What kinds of housing choices should people make? We live in free societies, people have the right to make the choices they want to make, but it certainly is within the province of the public health sector to do social marketing, to bring these issues to people’s attention and to frame them as health issues, which they are.

We need to celebrate synergy and stop thinking in silo terms. The silo here is the metaphor that we commonly use for stovepipe thinking, another metaphor. Here’s an example of synergies that we need to recognise and celebrate. This is an ad for an old medication called ‘Bonnore’s Electromagnetic Bathing Fluid’. Has anybody ever taken this? *[Laughter]* Good. If you had it would have cured your neuralgia, your cholera, your rheumatism, your paralysis, your hip disease, your measles, your female complaints, if you have any, and so on. Now obviously there aren’t medications that do this. If you had a medication that cured everything you would run to the stock market and buy stock in the pharmaceutical company. But we do have environmental strategies that come close to being that synergistic in their benefits. Smart growth, the pattern of development that I talked about, probably does help with obesity, with heart disease, with cancer, with depression, with diabetes, with gall bladder disease, and so on. This is a cost efficient, safe means of intervening in health and improving health. Here is an example. This is a mother walking her children to school somewhere in the United States. The year is 1956, the last known time it happened. *[Laughter]* What’s good about this is that they’re getting physical activity, but that’s not all. What’s also good is that they are decreasing their contribution to air pollution by not driving, they’re decreasing their contribution to global warming, they’re building social capital by meeting people on the sidewalk, physical activity is an effective antidepressant, the injury risk is lower walking on a good sidewalk than it is driving, mum’s osteoporosis risk will decrease if she remains physically active. That’s all I can fit on the slide, but I will mention that in addition to these and other health benefits, by the way, if we have to put fewer funds into building more and more roadways then more social funds are available for education, for health care, for law enforcement, for other priorities that are important to us all.

We need to showcase success. I show pictures like this back in the States and I talk about this familiar ‘back from Europe’ refrain that people mention. They say: “I just came back from France / Italy / Belgium and it was fantastic. I walked everywhere, I ate like a pig and I lost weight. It was great. I wish I could do that here. I wish you could walk around this country.” I have a developer friend, a real estate developer, who says there are two things Americans hate, they hate sprawl and they hate density. And it is true, it really is a dilemma in our national tastes and it’s a dilemma for a developer who wants to do well commercially. One of the problems is that we have so little experience with good density. There is good density and there is bad density, but the good density is what you see in the traditional towns and cities, both in Europe and, in more rare cases, in North America. What we need to do as public health leaders and as design and planning leaders is to help people envision that things don’t have to be the way things are or if things are already pretty good, things don’t have to get bad. You can take a scene like this, familiar to any American and to any Canadian or Australian, and you can imagine putting an island down the middle, putting buildings up against the sidewalk, expanding the island, putting in some transit and some bicycle lanes and this then becomes a very civilised place where you would allow your children to go by themselves rather than protect them from it. You can take a bleak looking intersection like this and envision putting in a good building in the far corner, expanding the sidewalks, putting in some trees to humanise the place and it becomes a better environment. You can take one of these... I know you have malls here; I saw a couple of malls in the way in from the airport today. We have loads of these in the States, in fact so many that the original generation of malls is beginning to fail commercially as the cities expand ever outward. These are great opportunities for redevelopment. You take this expansive parking lagoon that surrounds every mall – these are dependant on automobile patronage – and you build buildings in there, you build commercial space with sidewalks and pedestrian infrastructure then you put residential space above the commercial space so you truly have mixed use. These are being done now, they are great commercial successes in most cases, and they’re healthier human eco-systems than what we have become used to. You could do this with highway overpasses as you see here. This looks like a difficult place to humanise, but it’s not. You can take a low density, residential neighbourhood that was clearly built with cars in mind, put in sidewalks, crosswalks. The rotary is a traffic calming devise to make things safer for pedestrians and this becomes a safer place, and again here.

Well, in conclusion, the city is the typical human habitat. More than 50% of the worlds population lives in cities, more than 50% of dwellers in the United States live in suburbs and as the automobile becomes the predominant form of transportation and cities expand outward, this is a trend in many places. Don’t do it the way we did it. Sprawl is the prototypical style in the US, but as I’ve argued it has a number of health consequences that we need to be aware of. Alternatives to sprawl offer both environmental and health advantages and it’s with those advantages in mind that we need to design and build safe, healthy, sustainable and beautiful communities.

Thank you very much for coming. Thank you for hearing me out. I would be happy to take questions and comments.

[Applause]