Transcription of Professor Bruce Link's Lecture:
Tuesday 11th December 2007

Professor Peter Holmes:
I'm from the University of Glasgow and it's my pleasure to be the academic coordinator for what is a growing link between the University of Glasgow and Columbia University in New York and that link has developed across a range of areas and particularly in the biomedical area and, within biomedicine, public health has been identified as being a particularly valuable area in which there is potential for considerable collaboration between Glasgow and New York and many of the issues that confront communities in the cities of New York and Glasgow. So tonight's lecture very much fits in with that agenda.

It's a great pleasure to have Bruce Link and Jo, his wife, here today with us. As you possibly know Bruce is professor of epidemiology and sociomedical sciences at the Mailman School of Public Health at Columbia University: clearly a very important and very large public health school. He is also a research scientist at the New York State Psychiatric Institute. His research career has essentially focused on how and what conditions social and economic inequalities are translated into health disparities, which is clearly very much a theme of the Glasgow Centre for Population Health. Along with his wife Jo, they co-direct the centre for the study of social inequalities in health at Columbia University. So it's a great pleasure to have him here with us today. The title of his lecture is 'Health patterns and trends in New York: exploring the idea of fundamental social causes of health status'. Bruce we look forward to your lecture. Thank you.

Professor Bruce Link:
Thanks so much for that nice introduction. It's really great to be here. I want to say a couple of things: first I want to thank Andrew Lyon especially, and all of you, but especially Andrew Lyon for having arranged this and for being such a terrific host. I want to acknowledge my wife, Jo Phelan who is sitting in the front there who really participated in all of the work I'll talk about today. She has agreed to take all the tough questions later on. Part of the reason I'm so happy to be here is that I spent some time here a long time ago when I was an undergraduate, I actually spent some time in Edinburgh, and one of the things that I did in Edinburgh during my semester there, I took a course in Scottish history and I remember in doing that sort of reading about the struggle between England and Scotland and somehow I always was rooting for the Scottish in those disputes and I don't know maybe it's the history of Americans… I don't know, but at any rate I feel this affinity for Scotland ever since I've been here and it's exciting to be a part of this connection between Glasgow and Columbia Universities and its great to be a part of Columbia in that undertaking.

So let me now get us started and I'll start us with some things that you will find pretty familiar and I'm going to start in my back yard. So here's New York City all cause, age-adjusted death rates In the lowest versus the highest income neighbourhoods in 2001 *[Slide 1]* and what you see won't surprise you – the poorest neighbourhoods have substantially higher age-adjusted death rates than do the wealthiest neighbourhoods. Here's New York City age-adjusted death rates by race *[Slide 2].* As you see there… you see this finding that's very prominent in the United States whereby blacks who face more discrimination, and who usually have lower socioeconomic circumstances, have higher death rates in New York City, both for males and for females. If you move from mortality to something like self-rated health, how healthy you are feeling, here's New York City's percent fair or poor self-rated health by income level, as indicated by percent poverty level and race/ethnicity *[Slide 3]* and what you see is both overall and within in each of the major ethnic groups in New York City there is this gradient that you are all familiar with, with respect to socioeconomic status in health. Now you have heard of egocentrism and you have heard of ethnocentrism and there is something called New York centrism. New Yorkers have this odd way of thinking that the world revolves around our little island of Manhattan and this is from the New Yorker Magazine *[Slide 4]* and, you know, it's the New Yorkers conception of the United States. Of course there is 9th Avenue on it, 10th Avenue, and then if you can see there is just a tiny little strip which is New Jersey and the whole rest of the country is basically a barren wasteland. So this is the idea of New York centrism and you may if I hadn't started you out with New York have begun to think that I have this too.

So let me take you to the United States as a whole and look here for what we find with regard to disparities. This is by educational level, something that the United States didn't start to collect until the late 1980s. This is all cause age-adjusted death rates *[Slide 6]* for people who are too young to die really, 25 to 64, and you see this gradient once again for both males and females – people with more education, much lower age-adjusted death rates. If you go to race across the United States you see much higher rates for blacks than for whites, age-adjusted death rates. In the United States for fair or poor self-rated health again the same pattern which you saw in New York City. So you are beginning to see this idea that these gradients are very prominent and exist in many places. And not to be completely centric, here is a slide on age-adjusted death rates in England and Wales *[Slide 9]* by your class system of occupational status with the highest rates being in class five and then that gradient that we're so familiar with. If we look at Scotland, this is Scotland's self-rated health by quintiles of income *[Slide 10]* and you see the same step-by-step linear gradient there.

Now we see this all the time and I'm sure everyone in this room is familiar with this, it's almost very predictable, you see it every place you look. You could look at Western Europe and see similar kinds of patterns. So what do we do when we see this; what's our next inclination? What is it that we try to think about as being the next important thing to figure out? I would say this simple diagram suggests what our logic often does and that is to say well what are the mechanisms involved? What explains this association between indicators of socioeconomic status like education, or income, or occupational position, and race, and morbidity and mortality? If we look at the associations we just saw, here are some of the things that we start to think about: differences in smoking behaviour, differences in diet, different exercise, difference in levels of stress, and so on. And if you were me, before I started thinking like I'm just going to start telling you about how I think, if you were me, you would tell yourself a couple of things you were thinking about this. The first thing you'd tell yourself is that if you could figure out what these things were (and we could have a longer list) you would have explained to yourself why this connection between socioeconomic status and health existed; you would have figured out what the mechanisms were. That's one thing you'd likely tell yourself. The second thing you'd likely to tell yourself is that if you could figure out what these intervening, modifiable – at least some of them are partially modifiable – intervening factors are you could make the socioeconomic status association go away because you'd figured out what the linking factors were and you could make it go away. And the third thing, when you look at the association between socioeconomic status and health repeated over and over again in different places and at different times, you might think it's the same thing in all those places – it's got to be the same thing; it's the same problem, it has to be the same set of mechanisms.

Now what I'd like to do next is engage you in a mind experiment to see if we can think about this connection just slightly differently. To do that we go back in history and we could tell the story about a lot of places, I tell the story about Rhode Island in the United States. So this is death rates per 1,000 people in Rhode Island in 1865 and we didn't have great measures of socioeconomic status then, but the tax payers were more wealthy than the non tax payers and here are a few age categories and what you see is the same thing you saw before though we see here doubling or tripling of the death rates in the poorer group than in the richer group.

Going forward in time to the 1930s in the United States and we look at, this is quintiles of the census track that you live in, that's the area where you live, from the highest to the lowest. You see the same gradient and it's about double in the lowest as compared to the highest census tracked areas. So then what's my point with this mind experiment? Well imagine yourself back in Rhode Island in 1865 and doing what we just did for the current data; that is trying to figure out what the mechanisms are. Well the mechanisms would have been contaminated water, poor sanitation, crowded sub-standard housing and the diseases would have been things like cholera, TB and smallpox that people were dying from. These were the big killers of the time. The interesting thing is we did something about those risk factors: they cleaned up the water system, vastly improved the sanitation system, it's not like everybody has great housing in Rhode Island in the current era, but the housing is substantially better and then we developed vaccines and people don't die of TB, smallpox and cholera in Rhode Island any more. Those are the mechanisms that explained the socioeconomic status association back then, but now we see it in the current era: even though we got rid of all the intervening risk factors there is something resilient about this connection between socioeconomic status and morbidity and mortality.

It's this line of thinking that leads to this idea of fundamental social causes and we say that fundamental social causes involve resources such as knowledge, money, power, prestige, beneficial social connections that determine the extent to which people are able to avoid risk and adopt protective strategies so as to reduce morbidity and mortality. Now this is the important part of this idea because it says that because such resources can be used in different ways, in different situations, fundamental causes have effects on disease, even when the profile of risk and protective factors and diseases change is radical. So that you can use these resources in different places, in different times and it will shape the pattern of disease outcome in those different places and times and it's their persistent effect on health, in the face of dramatic changes in mechanisms that leads us to call them fundamental.

Now I don't want to over privilege these things as being the only thing that's important; clearly many other things are important for health. It would be useful if you are thinking along the lines of tagging certain types of causes, we're using this term fundamental causes to refer to this process, but you could talk about genetic causes as original causes, you could talk about the final biological pathways as essential causes, but we wanted a term to point to these kinds of causes that keep reproducing the connection between socioeconomic status and health as fundamental causes. We think about them operating at two levels. One is the individual level: people use their knowledge, what they know, they use their money, they use their power, they use their prestige and beneficial connections to obtain healthy outcomes. You can see yourself doing that if you face a health crisis, or your spouse does. You use everything you've got to try to get the best situation you possibly can.

Resources also provided access to generally salutary context to neighbourhoods, to occupational conditions or marriages. So events, just for example, in neighbourhoods… I'll give you one personal example from our neighbourhood and that is that I live on a block and two houses down there is a women who lives in a much smaller house, but she happens to be, with this phenomenon of beneficial connections, very well connected. There's a very tiny risk of a man my age walking out on a snowy morning and shovelling snow getting a heart attack; it's a tiny, tiny risk. When the snow ploughs come by they pile up the snow in front of your driveway. If you want to get your car out you've got to go out there and shovel it out, but the woman down the road is well connected and across from our house is a park, it wouldn't be a park if I was a poorer person, but a park. So there is no reason not to plough the snow into the park rather than on our driveways and so this woman has organised and used her clout to have them shovel the snow on the other side and I have a slightly better health profile as a consequence. Now the idea here is that you extend that to all the other details of life. My neighbours are helpful in keeping out crime, pollution, noise, making sure that there's fruit and vegetables in the local markets because they want them. This all helps me and I don't have to do anything, it's just there, it's a package deal that comes along with my neighbourhood. The same is true of my occupation – I guess we all don't all get health care but I get health care as part of my occupation. My job, they negotiate for good conditions for that and so on and it's not a dangerous job. Marriages, the higher your socioeconomic status, the more likely you are to marry someone who is also of higher education and income and that person's resource is their knowledge about health can be helpful too. All these things can come along as a package deal in the fundamental causes idea.

Ok. Now I'm going to take you some place you wouldn't think I'd go next and that is to dramatically put, in ways you might not think I would go in this direction is that sometimes socio-epidemiologists, people like me, who tend to focus on the bad things, we're intrigued by obesity epidemics and the like. I want to turn our focus to something that is very positive and that's been going well and that is life expectancy in the United States. This is life expectancy since 1950. My dad was born about here; our daughter was born about here. There is huge dramatic change that's occurred in terms of life expectancy over a relatively short period of time… the life expectancies of two people I know. It's true in Scotland too, males and females, much better. It turns that United States and Scotland aren't the top of the world, but within the United States and Scotland life expectancy is going up substantially; that is we are not the best with respect to life expectancy. And its broad based. You go to heart disease – dramatic decline in heart disease mortality over time since the 1950s, less than half of what it was in 1950 and the year 2000. Go to something like cancer in the United States *[Slide 23]* the rate went up till about the 1990s and now they have been coming down. The yellow line is stroke, it goes down dramatically over this period. This is happening with the major killers, ditto the infectious disease like flu, it's on its way down. HIV went up until we discovered antiretroviral drugs and now it's coming down. This is lung cancer in Scotland: it went up for men and dropped substantially; it's just beginning to drop down for women.

Some people worry about maybe we're living longer but we're living worse. This slide *[Slide 24]* is indicative of maybe, you know, that not only are we living longer, but we are feeling healthy over time. This is from the general social survey in the United States. This is a survey that's done in the United States every two years and it's been done since 1972 to 2004. What this shows is the percentage of people saying they have good or excellent health when they were born in different periods. So if you were born in the 1910s, 57% of the people when they were interviewed – and they are aged 60-69 – 57% of them indicated that they had good or excellent health if they were born in 1910. If it's 1920s it's 63% and if it's 1930s it 74% so this is evidence suggesting that not only is mortality going down, life expectancy going up, but people are actually feeling healthy, they report that they feel healthy over time. So what is the point here? Well something is driving these dramatic improvements in health and we can label it for now 'X' *[Slide 25]*. What is this 'X' thing? What I want you to start to think about is shouldn't whatever this 'X' is be an important part of our explanation of health disparity because it's been such a huge trend in the United States and across the world towards improved population health? Shouldn't whatever is driving that be some part of our explanation of disparities?

If we stop and think about how we often try to explain disparities here are some of the things we might think about *[Slide 26]*: we might think about genetic factors as being explanatory of the disparities that are observed in the current era, but genetic factors can't be the only things that's responsible for that great big dramatic movement towards improved population health. The changes occurred too fast for it to be genetic factors alone.

What about stress? Well, we would have to argue that our lives have become less stressful. Anyone want to raise their hands and vote for that one? I mean maybe it was more stressful and maybe we have the image that our lives are stressful but for my field of psychiatric epidemiology the evidence seems to suggest – not everybody deals with it – that rates of depression are going up in the younger cohorts and people have even postulated something as 'agent blue', something making people feel down and blue and depressed that's causing the increase in depression over time. So can we really think that stress has been declining?

What about social involvement and participation? The voting going up dramatically to have produced any change like the one we saw. What about income inequality? Well in the United States at least, income inequality has gotten much worse, it's much wider spread that it use to be. It can't be the explanation for these improvements; it's not the same thing that's driving these improvements in health.

So then what is this 'X' thing? Well it's not just any one thing, but it's probably many things *[Slide 27]*. So the discovery of the germ theory is a strong candidate for declines in rates of infectious disease in the first half of the twentieth century, recent declines in age adjusted death rates from one cancer and probably influenced by the lag effective decline in smoking rates in earlier decades, the rapid decline in HIV/AIDS mortality is probably related to the anti-retroviral drugs that were developed and disseminated in the 1990s, and then they're screening for disease, public health efforts to increase the consumption of fruits and vegetables, promote exercise, eradicate smoking, smog control, flu shots, seatbelts, angioplasty, screening for early detection of cancer, and on and on and on; a long list.

So 'X', this thing that's driving populations, is clearly not one thing and a slightly different thing for different diseases and probably different things at different times, but the confluence of all these things has clearly had an enormously positive impact on population health. So clearly human beings in a relatively short time have dramatically increased their capacity to control disease and death. Then we connect that to this fundamental cause reason that I introduced you to a few minutes ago. It says that our enormous capacity to control disease and death combine with social and economic inequality is what creates health disparities. It's sort of a simple idea. It does so because of a very basic principle: when we develop the ability to control disease and death, the benefits of this new found capacity are not distributed equally throughout the society or the population, but are instead harnessed more securely by individuals and groups who are less likely to be exposed to discrimination and who have more knowledge, money, power, prestige and beneficial social connections. People who are more advantaged with respect to resources such as these, and who are less likely to be help back by discrimination, benefit more and have lower death rates as a consequence and disparities are the result. So it's the connection between our capacity to control disease and death and inequality that generates disparities is the proposition that's being put forward.

Let's think about how this might happen when we trace through a few examples. Now I'll give some examples and then I'll really develop one in a little bit more detail. So if you think about the Titanic sinking, so when bad things happen, do social conditions shape the outcome? The Titanic sinks and the death rates go by the class of the cabin that you are in and the people in the lower class cabins are much more likely to die than the people in second class and the group with the fewest dying were in the first class. And the WTC is the World Trade Centre, only a terrorist attacked us in New York City, they attacked us at the centre of our power, that's what they wanted, that was what they were after, that's who they really wanted to get. It happens and then social structure comes in because what happens is the powerful people start going down the steps and the blue collar (firemen and police) are running in. The people who are running down the steps tell stories about the firemen hauling their hoses up into the tower and the people going down the steps some of them get out and the ones who went up with the hoses died. Immediately there's the social shaping of that event. Then there's hurricane Katrina, this horrible circumstance that happened with the hurricane in New Orleans. That was very dramatically shaped by social consequence. Then you can think about that in all the day to day tragedies that occur in people's lives. That sort of makes sense because when bad things happen they are shaped by social factors.

But what about when good things happen? For example, when we discover that smoking is harmful to health or we develop new technology, like cancer screenings and the like. Here the idea is that when we discover good things for health the same process apply whereby people with more knowledge, money, power, prestige and beneficial social connections are more likely to be able to benefit from that new found capacity. I'm going to develop one of those. It'll be a familiar story to you, but I want to show it to and have you think about it from this lens that I'm developing about fundamental causes and the idea of the social shaping of events. The interesting thing here is that we have some data about how people thought about smoking and lung cancer. For a long period of time in the United States there was a series of studies done by public opinion researchers, nationwide gallop surveys. They did some quite early on and these data are available and so we will be able to look at what's happened since 1954.

These surveys were done just after the information from the cohort studies had been published showing a link between smoking and death from lung cancer and the case control studies had been done a couple of years earlier, so this is when the really dramatic evidence was about to come out. This slide *[Slide 31]* is about the percent of people who have said that they have heard anything about cigarette smoking being the cause of cancer. There are a couple of things I notice in this slide. First thing is that a lot of people had heard this news so it's not like, you know, they hadn't heard about this. The second thing to notice is somewhat of a gradient occurred right away where people with higher socioeconomic status with 16 years or more of education were much more likely to have heard about it than people with less than 12 years of education, the beginning of this social shaping. They didn't transfer this immediately into the belief that smoking causes cancer so this *[Slide 32]* is the percent responding yes to a question asking whether smoking is a cause of lung cancer by education in 1954; this very early period. Again there are two interesting things to note. One is that only a minority of people believed, even after this evidence had come out, that smoking can be a cause of cancer and it was pretty flat with respect to socioeconomic status. A socioeconomic status gradient had not emerged here in this belief that smoking was a cause of cancer.

Then, going forward, here's what happened in the United States *[Slide 33]*. Here are the early years that I just showed you, and everybody now believes, almost everybody believes, that smoking is a cause of cancer in the United States, but it took a long time. It took from 1954 to 1999 for that change in people's sets of belief to occur. Here is what happened with respect to the socioeconomic status gradient in that belief *[Slide 34]*. This is back when the association was fairly flat, then you can see that by 1969 and 1972 a gradient had begun to emerge. It was still there in 77 to 85. Now almost everybody believes it, but there is still somewhat of a gradient in the belief that smoking is a cause of lung cancer.

Then if you to smoking behaviour from these same surveys the trend is definitely going downward, almost monotonic uniform, step by step downward over time *[Slide 35]*. Here is the socioeconomic status gradient of smoking over those periods *[Slide 36]*. If you go back into the early period there is no strong gradient with respect to socioeconomic status, in fact the highest group smoke a little bit more than the lowest group and so there's no strong gradient. There is still no strong gradient in 69 to 72 then it begins to open up and now it's fairly prominent with respect to education and smoking behaviour; a bit more. One point is that this took a long time to occur and then it begins to be shaped by socioeconomic status. When we learn meaningful life saving information, smoking is a cause of lung cancer, then it ends up being shaped by socioeconomic factors. It couldn't have been shaped in an earlier period when we didn't know the information that smoking causes cancer, but when we learn it then it ends up coming to be shaped by socioeconomic factors.

Here is the end of the story. This *[Slide 37]* is age adjusted lung cancer mortality among men from 1950 to 1998. The thing that you find here is… this is like the best socioeconomic status information we have in the United States. This is the lowest quintile of the county in which you live in terms of medium income and the like and this is the highest. If you go back to the 1950s, lung cancer rates were higher in the higher socioeconomic status area, that line begins to flatten out, it flattens out relatively soon compared to the low socioeconomic status that continues to rise and only began to drop at the end. So the social shaping ended up being a social shaping of the socioeconomic status association with lung cancer over time.

Here's a couple of points to be made from this very familiar story about smoking. It exemplifies the process specified by the fundamental cause theory – there's the social shaping of new knowledge and this social shaping creates health disparities by socioeconomic status. The story sensitises us to the fact that other forms of health knowledge and technology are also shaped in this way. So one of the very interesting findings came from this guy Skinner at Dartmouth College in the Unites States. What he looked at in the US was what areas of the United States were quickest to adopt the use of relatively inexpensive beta blockers for addressing heart disease and what he found was that it was the same areas of the US, the same states within the United States, they were quick to pick up beta blockers and use them and save lives in their states as were the same states that had picked up hybrid corn some 30 years earlier and it was also true that the same states were the first ones to adopt personal computers and a special kind of tractor that was more efficient. So this said that there was something deeply social about the spread of these innovations and that it wasn't just about medicine, it wasn't just the medical establishment, there is something about these areas that made this spread of a very useful and health protective new innovation spread differently across the United States.

The third point I'd make about the smoking story is the length of time it takes for knowledge and behaviour to change and to spread is very instructive. It's not simply a matter of being smart enough to know the evidence and act, because if that had been true in 1954 most of the people who'd heard about it they would have changed their behaviour and so again it's likely deeply social and this tells me an important story about the emergence of health disparities. Let me just say what that important story is. What I'd like to do with this slide is imagine ourselves jumping into a different slice of time than we exist in now and thinking how we might have thought, or how some people might have thought, at that particular slice of time. So let's now insert ourselves into 1969 and 1972 and most of us are in this group, have a college education or more. Let's imagine us thinking what's going on with these folks. The information has been around for a long time, it came out in 1954, the surgeon general asserted it, everyone should know that's smoking is bad for your health. What's wrong with them, them down there at the lower end? So if we can have that way of thinking in 1969 and 72 and then transport ourselves – the same us, the ones who have college educations or more, into the current era – and have a look though it turns out that the them, the people who were the them back in 1969 to 72 are doing as well as the rest were back in 1972. In other words it's not something about the people on the bottom, it's about this spread, this social change that occurred, the changes in the norm and they change more slowly in the lowest socioeconomic group than they did in the higher sector group. There is nothing fundamental about these people that they can't get the message because they did so, just a little bit later. It has something to do with our policies and so on… about why it should be and so on; just a little bit later. You could tell the same story for the smoking behaviour, if you go back to 1972 this is the us, the damned who have less than 12 years of education 15 or 20 years later are doing a little better than the us back in 1972.

Here's an interesting and a kind of embarrassing story about the United States *[Slide 41]*. This is the percentage of American citizens who believe that the sun goes around the earth and that sound travels faster than light. So 24% of Americans believed that the sun goes around the earth and 22% believe that sound was faster than light. The reason I put this up, not to just embarrass Americans that we hadn't done better with respect to education, but this is among people who believe that the sun goes around the earth and that sound travels faster than light, who think that smoking is a cause of cancer. So even the people who believe that the sun goes around the earth have gotten this message because this message can basically be delivered to everyone.

So now I've been talking about an idea, laid out the idea, and I walked through a mechanism whereby you would think of how routinely it occurs. Now you might then want to say well, is there anyway to put this idea to some kind of a test, where we through it out there against the empirical evidence and see whether it comes up and works. So now we say that socioeconomic status differences arise because people of higher socioeconomic status use these flexible resources to avoid this and adopt protective strategies. It follows that the socioeconomic status gradient should be more pronounced for diseases that we can do something about, for which there are known and modifiable risk and protective factors. So then our first test is going to involve ratings of the preventability of death and specific causes and we are going to use something called the US National Longitudinal Mortality Survey, it's a huge study over 350,000 people around the United States. They were interviewed as part of the US current population survey, this is what keeps track of our unemployment statistics and so on. Then they were followed for nine years forward in a prospective manner by the national death index for mortality and cause of death. They found what I've showed you before. In this study – this is from the study when it was first published in 1995 – they find the same kind of gradient that you find so common both by income for both males and females.

Now what we are trying to investigate is whether we can find a situation that's consistent with our thinking that where this gradient is not so pronounced as we see it here. So we're thinking that if we look at diseases that we can't prevent, we don't know how to prevent death from those diseases or prevent the diseases from occurring, then we should find a flatter gradient because we're pointing to this ability to avoid disease and death as being a major cause of disparities. So this is the rating task we gave to two famous social epidemiologists, Ana Diez Roux and Ichiro Kawachi, and we asked them thinking both of ability to prevent disease from occurring and treat it once it occurs, for what degree was it possible in the early 1990s to prevent death in this disease and have them rate each disease for which a cause of death had been registered in the national death index. And they rated on a five point scale from virtually impossible to prevent to virtually all deaths preventable and they were quite reliable with each other and had correlated with an independent set of ratings that were similar in a manner that gave us some confidence, enough confidence, to test our hypothesis using the ratings.

Here are some examples of low preventability causes of death and high preventability of causes of death. So low preventability are things like brain cancer, ovarian cancer, gallbladder cancer, multiple sclerosis and pancreatic cancer and high preventability were lung cancers, heart disease, colon cancer and pneumonia. And the idea here is that for a disease like brain cancer for all intents and purposes me and George Bush and the guy who sells me my coffee on the corner of 168th Street in Manhattan have about the same chance of dying from that disease. We really don't know too much about how to prevent it or how to cure it once it's occurred. That might be slightly overdrawn, but we have much less capacity to address this disease than we have to address these diseases. So we don't expect a gradient with respect to low preventability of diseases – me and George Bush and the guy who sells me the coffee are pretty much in the same boat with respect to these disease, but we're not with these diseases. George Bush has a heart attack, you know, he's gonna get the absolute best, I'll get pretty good and the guy who sells me my coffee could be in trouble.

So here's what we found. I'll show you just a couple of examples. We used education here *[Slide 48]*, we also did it with income and got pretty much the same thing. What you're seeing here is the percent dying in the nine year follow up period and this is of rather young ages. Then you see a sharp gradient in the high preventability disease and a slight gradient, but not nearly as sharp a one as we do for the low preventability; this is relatively flat. It's true if you use either the relative risk or if you have used the gaps between the lines. It's even a little more striking if you go to an older age group, 45 to 64; high preventability, the sharp gradient *[Slide 49]*. This is the one we've come to expect. This is the one we think is driving the gradient that we see all the time and more for the high preventability causes of death than the low preventability. This one's flat and this one is a sharp gradient. We tested this statistically and determined that this gradient is significantly greater than this gradient for both education and income. This is a test of the idea.

A second way to kind of test the idea is to look at evidence of trends over time. So if this core proposition is true we should find that disparities by socioeconomic status and race emerge when new health enhancing information or technology is obtained. So for example as occurred for heart disease, Hodgkin's disease and colon cancer, but if it remains largely unpreventable or less preventable than other diseases disparities will not change dramatically with time so brain cancer, ovarian cancer or pancreatic cancer. The United States has much better trends by race because we didn't start keeping socioeconomic evidence until the late 1980s and death statistics. We will start with the diseases that are low in preventability. And this is consistent – brain cancer – with the idea of low preventability; the line is not going down. What we find is that white males have higher age adjusted death rates than black males, happens to be true, but there is no crossing of the lines, we don't see anything moving here for these diseases that we that we don't know enough to do anything about. The same thing is true for ovarian cancer, pretty flat lines, there's a gap between blacks and whites, it happens to be that the white females have slightly higher rates of death from this. Go to pancreatic cancer, blacks tend to have higher rates, but again you don't see the lines coming down and you don't see them crossing. But now let's change our focus and start to think about diseases that we have dramatically improved our ability to deal with, and look at heart disease first.

If you went back to 1950, the early studies, the descriptive epidemiology, described it as a disease of white people and also people with higher socioeconomic status, but here, consistent with the idea we've learned how to deal with the diseases, the lines are on there way down, but the disparity opens up over time such that the disparities that we see in the current era is one that was produced over time. If we go to all cancers combined here's the findings for blacks and whites. Whites used to be slightly lower and now the disparity disadvantages blacks. With respect to breast cancer, this is what you see. You see the lines crossing so your disadvantaged group is ending up with the higher rate over time. Same is true for colon cancer and for some of these you can tell fairly compelling stories. I can't prove these stories, but they are stories that are consistent with the pictures so there is something like a poor persons diary – beans and the like, high in red meats when blacks were very poor. As their socioeconomic status grows, their rates of colon cancer rose. The current disparity is one that emerged over time. It wasn't something that existed all the time in nature, it's some thing that was produced over time. Look at some figures about socioeconomic status, this is again the socioeconomic status of the county you live in because we don't have it on an individual socioeconomic status. Here you see ageadjusted, all cancers combined *[Slide 59]*. It used to be higher in the higher socioeconomic status. It flattened out quicker in your higher socioeconomic status; dropped faster. The current disparity that we see is one that emerged over time. To

take one specific cancer, colon cancer, you see the lines connecting *[Slide 60]* and the current disparity being one that was created over time.

Some people worry that, well, you're using only mortality data – does this happens with anything that doesn't have to do with mortality? Here's a story about high cholesterol, cholesterol above 240 *[Slide 61]*. If you go back to 1971, 1976 and 1980 what you see is that the people that are below the poverty level had lower cholesterols than people that are 200% above the poverty level or between 100 and 200% above the poverty level. It was also true in 76 and 80. There is this period of equality; you would have found no disparities in 1988 to 1994. By 2001 there is a disparity between lower socioeconomic status group having the highest rate of high cholesterol.

So when we examine race and socioeconomic status disparities and mortality by particular diseases we find dramatic evidence that such disparities are created over time. Groups with more resources and who face less discrimination benefit more greatly from our new found capacity and disparities emerge. This means that explanations that propose relatively unchanging causes of disparities like genes, relative deprivation, social participation can't be the main reasons for health disparities. So if you are thinking genes and you're thinking race and genes, I don't like doing that some people do, but if you had that thought and you came along and you took a slice of time, you jump into that slice of time, jump into 2000, you could develop an idea that maybe the difference between blacks and whites is due to some genetic problem. The trouble is where was the gene there and why wasn't it working there to produce the opposite effect? I had that trouble in looking at that picture and using that explanation. I already used a picture like this and imagine well the reason that the lower socioeconomic status people have higher rates of lung cancer is they look around and they see other people have more than they do and they sort of give up on life and it just doesn't matter if someone smokes a cigarette because they have more than I do. That kind of reasoning would be consistent with that picture, but is not really consistent with that picture unless you add in something else because it's still the same low socioeconomic status people looking around so it's hard to use constant explanations to explain these changing patterns over time.

I'll talk about three things quickly because I think it has slightly different… some of the implications for policy are obvious, but some are less so and maybe you'd like to hear what I think. First is, and this is the more obvious one, social policies that provide resources to the resource poor. The second one is population health policy that focuses on changing contextual factors that effect everyone in the context regardless of resources and the third one is to do something that I like to think about as population health policies that contextualise individual risk. I know some of you have thought a lot about these things but let me just say a little bit about them.

Social policies that provide resources to resource poor, and I wish I was this powerful, but lets imagine that we lopped off the lower end, that is we gave more resources to low socioeconomic status people, we got rid of that line and then a gap would be lowered between the richest and the poorest in the country, the most educated and least educated if we were able to diminish the extent of social inequality. Now sometimes people look at that and say that you can't really do that, it's not going to work, it doesn't happen in society. Well, I like to think of that as we are always doing things like that with respect to policy in terms of taxation and the likes, it's just that they're not usually thought about as health policies but they are things that we can change and in the United States we have changed the by making them worse, I mean the gap between the rich and the poor is much larger than it use to be. So my thinking is that if we did things to make it worse, greater, we could also do things to make it narrower. It is in our power, it's whether we have the will to do it.

Sometimes when I give this talk, especially to people who are out in the street trying to address the health disparities, there is a tone in it that this is going to happen no matter what. The people with more resources, no matter what their health conditions are, they are going to use their resources to generate a health disparity. People in the top will make sure they get the best situation and there is something depressing about that if you're out there trying to do things that reduce the disparities. So the thing I like to think about is, in that regard, is that the slope of the disparity can either be worse or better and we can try to make it less bad… Our policies could to go forward and make it worse so that it's sharper, they could make it less and you know maybe ideally we could do something whereby we make it a little bit better for everybody, high socioeconomic status, whatever. That's one thing I like to think about: that that gradient, whatever it is, is a flexible gradient just like the resources are and things we do to try and minimise it can help. Just because we might not make it go away, doesn't mean that we shouldn't try to make it less steep than it is in the current era. So another that I think, and this is not a way of thinking of particularly congenial and where I come from in the country as a whole, in the United States, we are very individualistic in our reasoning and one of our major ways of trying to affect help is to get personal about it and personalise; put it all in the hands of the individual. The idea there is that when we do that, when we give all of the responsibility to the individual, those with more resources are more likely to be able to use those resources to get an advantage. But what if we could think, as we have in some cases, about more contextual types of intervention? If we are thinking about dental caries, you know, think about an intervention that affects everyone like fluoridation, whereas for one like flossing you have to have the time, the kids can't be screaming to do the flossing, you have to remember to do it, take responsibility to do it and so on, whereas fluoridation helps everybody regardless. And then airbags versus seatbelts: the seatbelts you have to hitch up, the airbags will help you no matter what. Or with respect to lead paint, cleaning up lead paint versus handing out leaflets to tell parents how to keep their children from ingesting the paint chips. The latter intervention, the parents with fewer kids, more time and more know how and so forth are more likely to protect their kids than poor people with tons of kids and have to go and work and don't have anybody to look after the kids and so on. And then meat inspection versus information to prepare and wash cutting boards in the United States we have to carefully wash our cutting boards, that's something we have to have time, the knowledge and so on to do, whereas if you inspect the meat for contaminants, you'll have protected everybody.

Could we think of more things like that as our interventions? If we were able to think of more things that help everyone together, population health interventions, then we would be able to reduce disparities. Finally if the interventions require individual action then the idea would be to put a context around those risk factors, that is find out what puts people at risk of this and then try to intervene broadly and comprehensively to remove existing barriers to individual action. So the last thing I pointed to was population health trends – you can't do that for absolutely every health intervention. For example, you have to go individually to get your colonoscopy; it just has to be you. So what you try to do if you are concerned about disparity is try to think about all the contextual barriers that might exist for somebody with less knowledge and less resources.

So that's back to the New Yorker cartoon. I hope I haven't been speaking a foreign language though sometimes I worry that I have in terms of speaking American here, but I thank you very much for your attention and I'm interested to hear what you have to say.

[Applause]

Professor Peter Holmes:
Thank you very much Bruce that was a very stimulating and interesting presentation. I hope it fosters this growing link between Glasgow and Columbia. We see so many things here that resonate with our situation.

Thank you again.

Applause]