



Why are Mortality Rates Rising for
Middle-Aged White Non-Hispanic
Americans? Could it Happen in Europe?
24th Annual Lecture

Professor Anne Case
and
Professor Sir Angus Deaton

15 June 2017
Royal Society
London

Office of
Health
Economics

Research

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Contents

1. Introduction.....	5
2. Mortality Trends in Europe, Australia and North America.....	6
3. Drivers of Mortality	8
4. Deaths of Despair.....	10
5. Not Just Men and Not Just Women.....	12
6. Mortality in Relation to Birth Cohort and Geography.....	14
7. Obesity, Heart Disease and Cancer.....	22
8. Education, Mortality Risk and Morbidity.....	24
9. Effects of and on Mental Health.....	29
10. Modelling Processes That Drive Mortality.....	33
11. Where Do We Go from Here?.....	36
12. References	38

1. Introduction

Low levels of mortality are important indicators of societal success. This lecture is about trends in mortality in the white non-Hispanic population in the United States of America (US), a subject which is not only interesting in itself, but also of global significance because we are all wondering whether this could happen to our own societies or to specific groups within them. The lecture was delivered by Professor Case, Sir Angus added some further reflections and then both professors engaged in a question and answer session at the end. The work discussed here, which is part of a much larger research agenda, leads to comparisons between the US and what might be happening in Europe. The authors' most recent work on the topic of mortality rates is summarised in three papers (Case and Deaton 2015, 2017a, 2017b; there are links to these papers at <https://scholar.princeton.edu/accase/publications>).

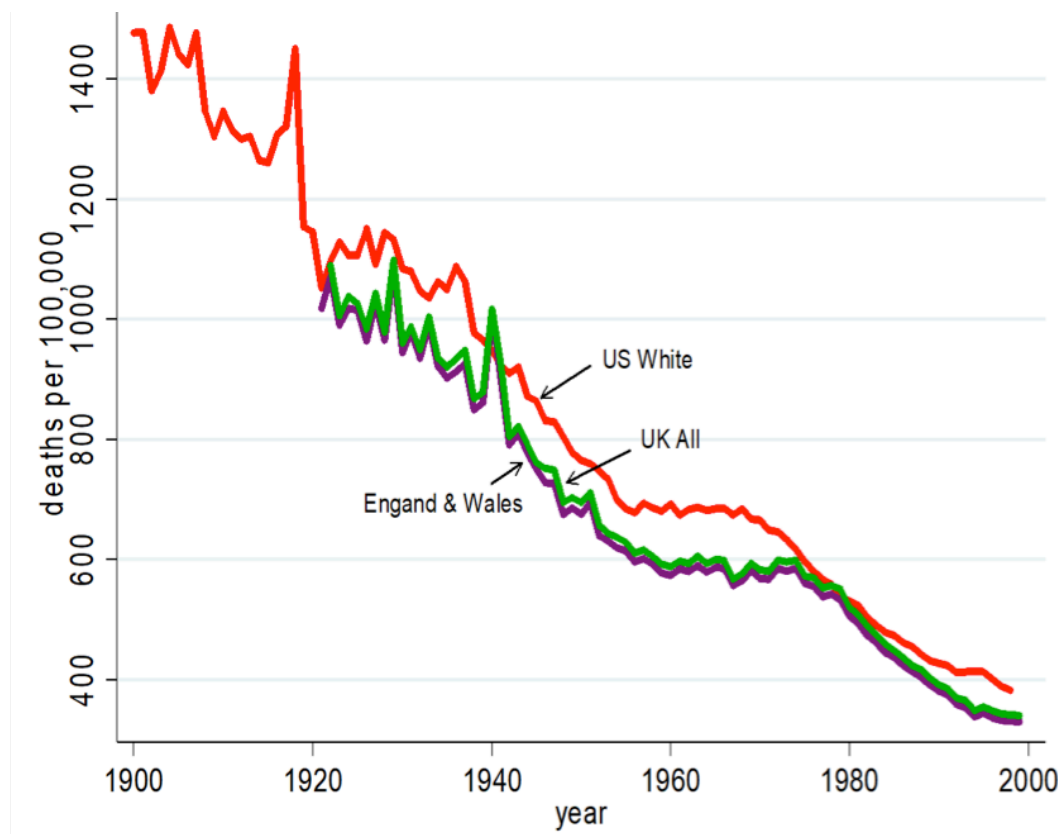
This version of the text is based on a transcript of the lecture and, as such, is often less formal and more colloquial than might be expected in an academic paper.

The work was supported by grants R01AG053396-01, 5R01AG040629-02 and P01 AG05842-14 from National Institute on Aging to the National Bureau of Economic Research.

Let us start with a little context. During the 20th century there was remarkable progress, in terms of both mortality and morbidity, for people in middle age and in old age in the US, in Europe and in the UK. Figure 1 presents all-cause mortality for (white) men and women between the ages of 45 and 54 over the period 1900 to 2000 in the US (red line). Mortality rates for that group fell from 1,400 to 400 during the course of the century (mortality rates in this lecture will be expressed in terms of deaths per 100,000 of the relevant population). The spike in 1918 corresponds to the flu epidemic. We think that the plateau around 1960 is explained by the fact that people in the 45 to 54 age group at that time smoked like chimneys when they were in their 20s and 30s, so were dying of heart disease and lung cancer twenty to thirty years later. Because health behaviours changed and many people stopped smoking, and because of the arrival of antihypertensives, mortality rates continued to fall after that point through the rest of the century.

The pattern for the whole UK (green line) and for England and Wales (blue line) follows very much the US pattern. The UK hit the plateau, and came off it, just slightly later than the US. Historically, it has been the case that the US represents a leading indicator of things that would happen elsewhere; this brings us back to the question as to whether or not we would expect to see things getting worse in Europe.

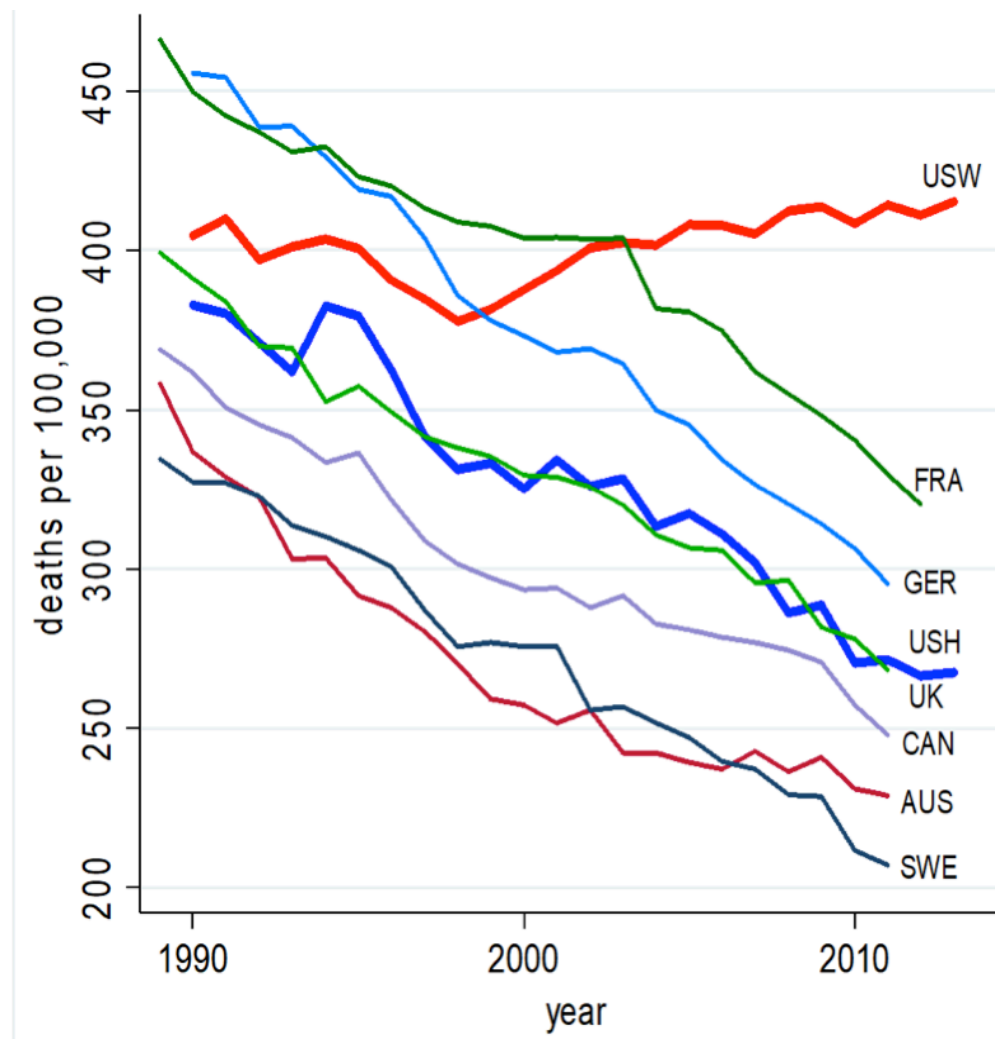
Figure 1. All-cause mortality, men and women ages 45-54



2. Mortality Trends in Europe, Australia and North America

An alternative title for this part of the talk might be “Is 50 the new 80?” (Case), or “Death in the Afternoon” (Deaton). Consider Figure 2. It compares mortality rates in middle age for France, Germany, Sweden, UK, Canada and Australia, from about 1990 onwards. Rates for 45 to 54 year olds fell on average 2 per cent a year. In any European country you care to mention, it can be pretty much guaranteed that mortality fell at 2 per cent a year on average over this period. By contrast, among white non-Hispanics in the US (Figure 2, red line), mortality rates actually stopped declining and started increasing.

Figure 2. All-cause mortality, ages 45-54, for US white non-Hispanics (USW) and Hispanics (USH), compared with France, Germany, Sweden, UK, Canada and Australia (updated from Case and Deaton 2015)



Source: Source: Figure 3 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.46

The curve for US Hispanics (thick blue line) is almost indistinguishable from that for the UK. Hispanics are poorer than whites, which raises an interesting question all by itself: why were the mortality rates better to start with and why did they continue to fall? African-Americans in the US start with mortality rates that are higher than whites but their mortality was falling during this period even faster than Hispanics, at 2.6 per cent a year. The original of Figure 2, from the paper which came out in the *Proceedings of the National Academy of Sciences* (Case and Deaton 2015), got a great deal of attention because there had not been a lot of focus on what was happening to whites in middle age in the US and somehow the fact that their mortality rates had started to rise flew beneath the radar. When we found this result, we actually took it around to people in medical schools because we wanted to check whether this was already well known; it seemed like something that people should already be aware of, but it turned out that it came as a surprise to all of the people we showed it to.

Table 1. Changes in Life Expectancy (years) in the US by race/ethnicity

Period	Group	Change in Life Expectancy	Source
2013-2014	Whole population	0	NCHS CDC Data Brief 244 Apr 2016
	Black Non-Hispanics	+0.1	
	Hispanics	+0.2	
	White Non-Hispanics	-0.1	
2014-2015	Whole population	-0.1	NCHS CDC Data Brief 267 Dec 2016

The CDC (Centers for Disease Control) in the US later put out data briefs in which they document what we had seen in our paper. For example, between 2013 and 2014, there was no overall improvement in life expectancy in the US; but it improved for blacks and Hispanics, both of whom are poorer than whites, whereas there was the first fall in several decades for white non-Hispanics (Table 1). It takes a lot to move life expectancy through deaths in middle age. Life expectancy is an index of what happens to mortality in childhood, in middle age and in old age, and in childhood things were improving, in old age things were improving. On the other hand, for whites in middle age between 2013 and 2014 and for Americans overall between 2014 and 2015, life expectancy fell (Table 1). This is not a little thing: it is actually big enough to be a real barometer for something bad that is happening in peoples' lives.

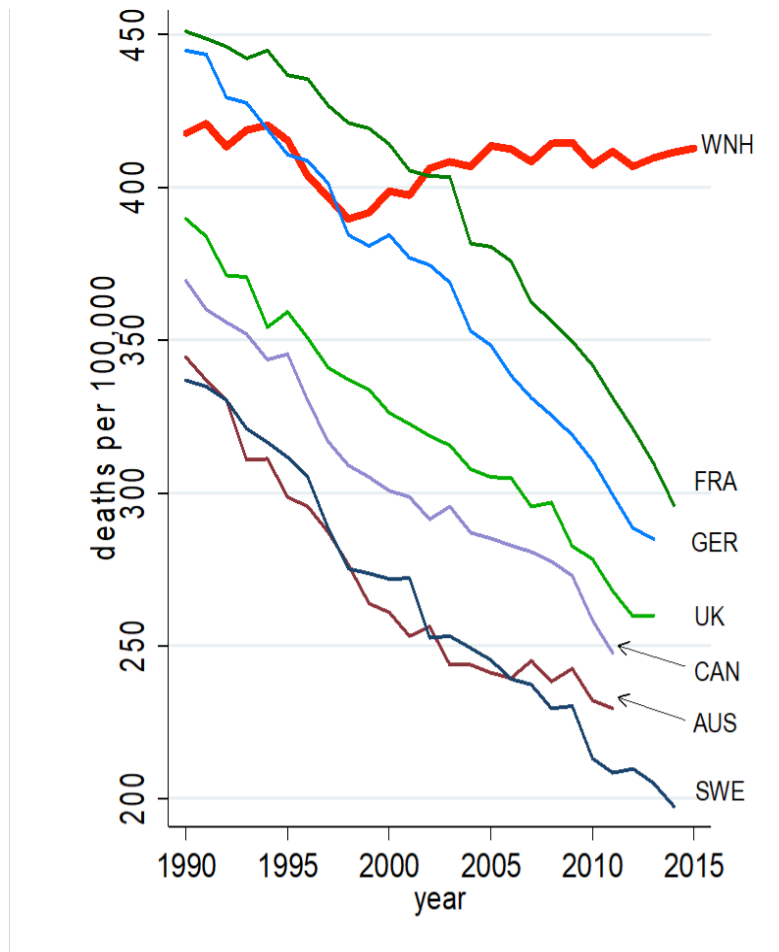
3. Drivers of Mortality

We need to talk about mortality by cause, by country, by sex, by education group, by race and by timing. The explanations that we do not rule out can be used to dig in further and see whether or not we can unearth the more fundamental causes of what is happening. In this lecture we do not talk in detail about whether concurrent economic conditions were responsible for the change in mortality, since what is happening currently does not correlate strongly with contemporaneous economic factors. Patterns of income and unemployment do not match the mortality changes across race or education, through time or age group. While we rule out an explanation in terms of concurrent economic events, we will present a model that does involve long run economic conditions, and that we think is going to be important for us moving forward. We will argue that economic and social events have a cumulative effect on peoples lives, and we will try to tie that to what is going on in Europe and what might happen next in the US and elsewhere.

One of the criticisms of the original Figure 2, from our first paper (Case and Deaton 2015), was that people aged 45-54 were getting slightly older over the period, raising the possibility that mortality rates were going up due to the fact that those within the age-band were getting older. To take care of this, the numbers have been age-adjusted in Figure 3. Age-adjustment works

by taking a fixed population – here we used 2010 as the base but results are not sensitive to which year you use – and asking: if the population age-structure did not change, what would the (age-adjusted) mortality rates look like? The answer is that Figures 2 and 3 are almost identical. It is apparent that age-adjustment somewhat smooths out the mortality rates for the European countries and it also puts the US as very much in line with what was happening in Germany prior to the late 1990s, but it has very little effect on the overall picture.

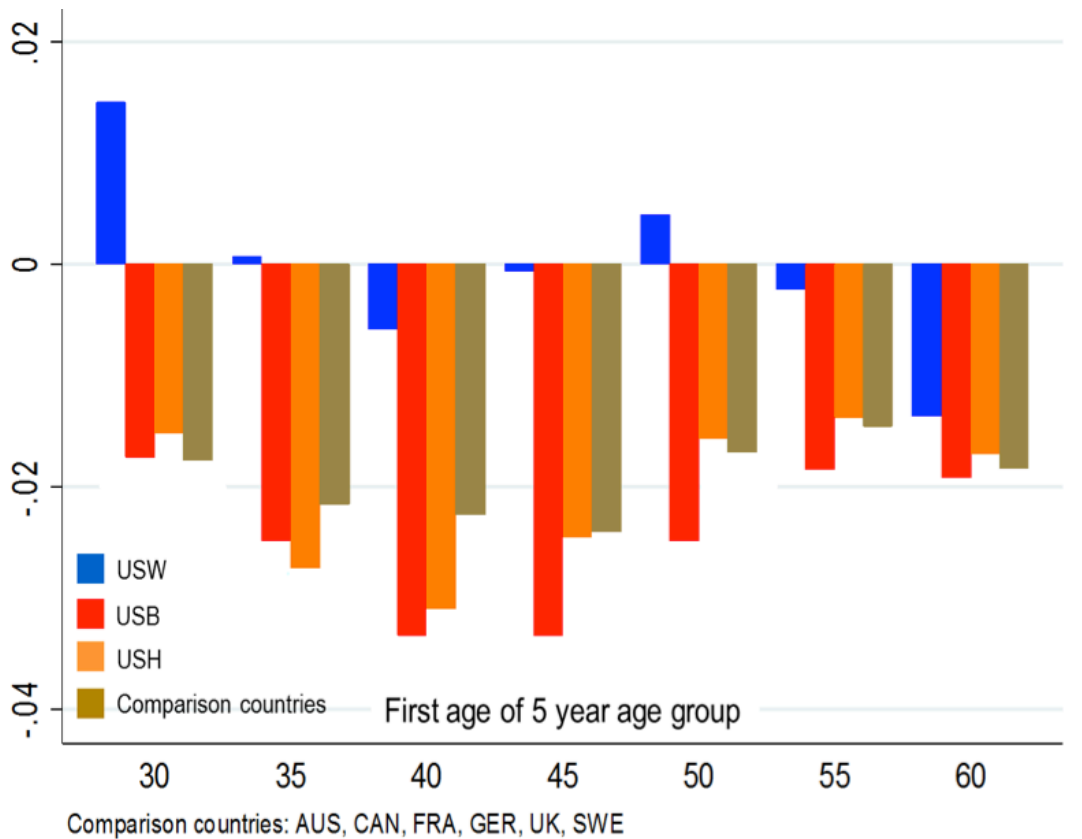
Figure 3. Age-adjusted mortality rates, ages 45-54, base year 2010



Source: Figure 3 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.56

An alternative to age-adjustment is to look at every single year of age and ask: what happened to the mortality rates of 45 year olds, 46 year olds, 47 year olds and so on? But this produces too much information to be easily displayed. Instead, we decided that the best strategy was to use five-year bands given that the ten-year band did not really make much difference. Figure 4 shows mortality trends as average changes per year over the period 2000 to 2014 for US whites (bright blue), US blacks (red), US Hispanics (orange) and the comparison group of Australia, Canada, France, Germany, UK and Sweden (beige). The rates by five-year age group among US whites under 60 have been, at best, flat – whereas black non-Hispanics in America are making progress, as are Hispanics, and as are all of the comparison countries.

Figure 4. Mortality trends 2000-2014 by five-year age group. US white (USW), black non-Hispanics (USB), Hispanics (USH) and comparison countries

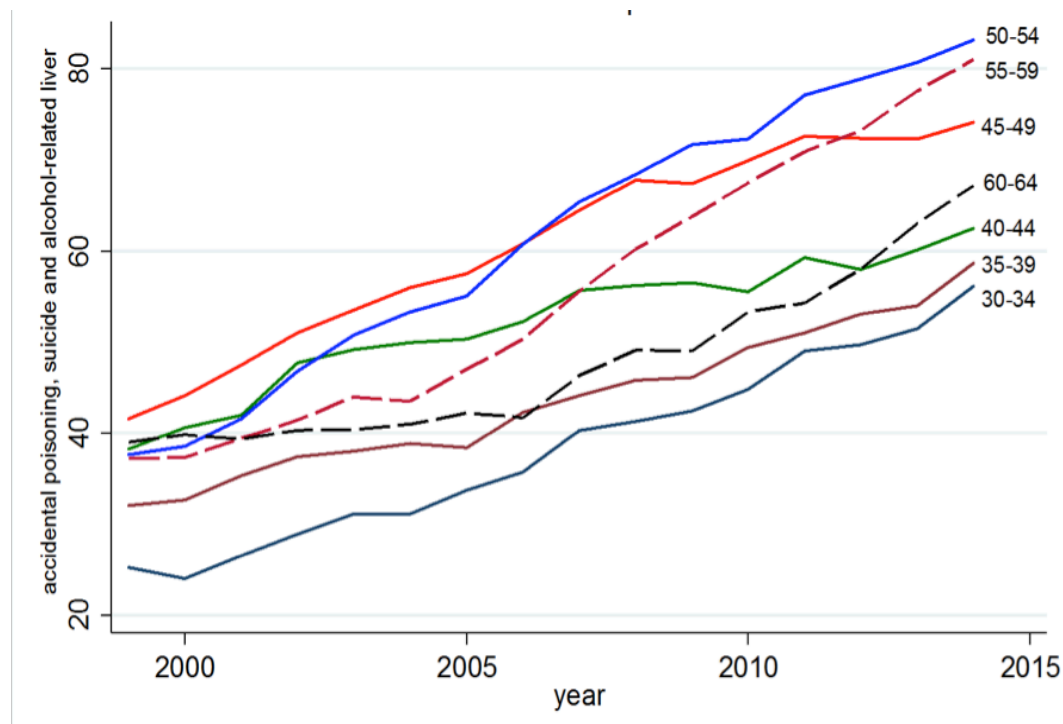


Source: Figure 3 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.56

4. Deaths of Despair

The three biggest factors driving up mortality rates have been what we now call, as a shorthand, ‘deaths of despair’: suicide; alcohol-related liver disease and cirrhosis; and poisonings; the last is basically drug overdoses, which are either accidental or intent undetermined. In every US state from 1999 to 2015, suicide rates went up for white non-Hispanic prime-aged (25-64 year old) adults. Over the same period for the same group, alcohol-related liver mortality went up in all states except New Jersey and Maryland (where it was static). And in every state, drug overdoses went up as well. Figure 5 shows that, in America, deaths of despair have gone way up.

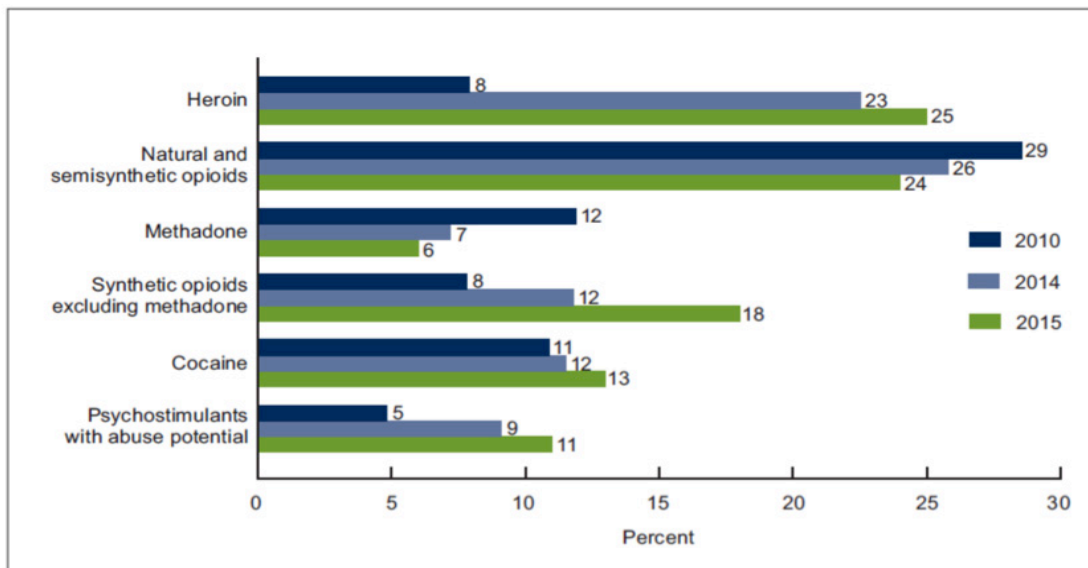
Figure 5. Poisoning, suicide and alcohol-related liver mortality by five-year age group (white non-Hispanics)



Source: Figure 4 – Case, A. and Deaton, A., 2015. *Proceedings of the National Academy of Sciences*, vol. 112 (49), pp.15081.

Classifying which drugs are responsible for the increase in poisonings is like trying to hit a moving target. If you look at drugs (Figure 6) what you see is that in 2010 the biggest percentage of drug overdoses came from the group which includes oxycodone, which is basically OxyContin. OxyContin is essentially heroin in a pill with a Food and Drug Administration label on it. It was legalised for sale on prescription by doctors in 1996 and the firm that owns OxyContin actually sent out a team of marketers across America to push this drug, arguing that no one need be in pain, and that those who disagreed had “opioid-phobia,” without mentioning the fact that this drug is highly addictive. Enough prescription painkillers were written to medicate every adult in the US around the clock for a month. That is an enormous amount of pain medication going out and a certain fraction of the population is going to become addicted to it: that is indeed what happened. Then they tried to turn the OxyContin taps off, but it happens that heroin is a pretty good substitute for OxyContin. It is not perfect (actually, OxyContin is better in terms of hitting the receptors in the brain) but it is close enough. And to make it a perfect storm, very pure black tar heroin started to come in from Mexico and this is incredibly cheap, cheaper than what a previous generation would have called ‘pot’ or ‘weed’. It is pure enough that you do not have to inject it. It means that a lot of people who might not want to use a needle in their arm can smoke it or snort it. As a result, heroin increased from being 8 per cent of overdose deaths in 2010 to 25 per cent in 2015 (Figure 6).

Figure 6. Percentage of drug overdose deaths involving selected drug categories (United States 2010, 2014, 2015)



Source: NCHS Centers for Disease Control, Data Brief 273

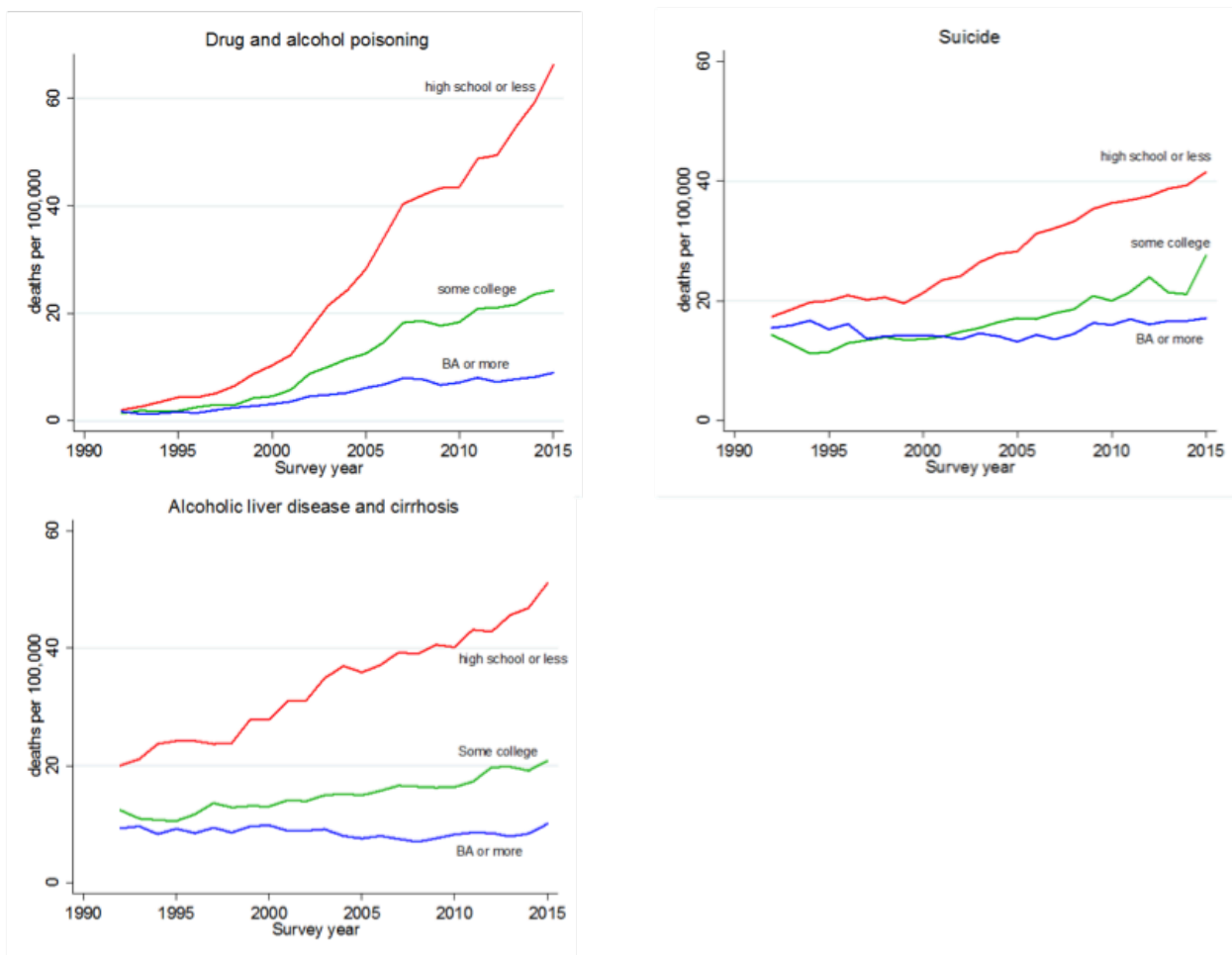
The ticking time bomb here is the category of synthetic opioids that includes Fentanyl, the drug that killed the pop star Prince. Fentanyl is extremely powerful, it is coming in at a rapid rate, and it is something that Europe is beginning to worry about as well. This is what is happening in terms of drugs, but we think that the current drug crisis started with these prescription painkillers, moved to heroin and now is moving on to Fentanyl. These deaths of despair are happening within every five-year age band in the US. Our paper focused on 45 to 54 year olds but, if you divide the population up into 30 to 34 year olds all the way to 60 to 64 year olds, from the late 1990s up to 2015, there is a surge in mortality rates from suicide, from drug overdose and from alcohol.

5. Not Just Men and Not Just Women

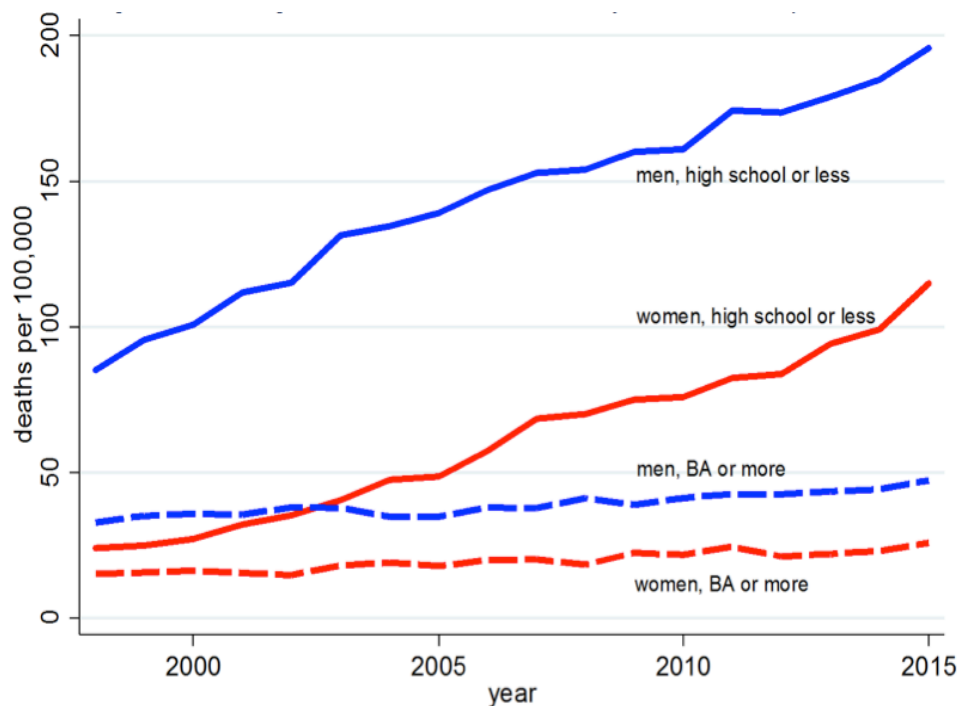
Both sexes have experienced rising deaths of despair. It is happening more to people who have less education. It is people with a high school degree or less who are actually getting hammered here (Figure 7). People with a college degree, yes, it has gone up a little, but this is really a crisis that is focused on people with less education. From the late 1990s to 2015 among people aged 50 to 54, the fraction with a high school degree or less was constant at about 40 per cent of the population, with some college education was 30 per cent and with a college degree or more was 30 per cent. It is not as if over this time period the group with only a high school degree became more and more negatively selected, it really is the case that among these groups they were about the same fraction of the population over this period.

Some newspaper reports want to make this a story about women, and indeed it is a story about women (Figure 8). Other news reports will write it up to say 'men and women' but the headline will read 'white men dying'. In part it may be that the headline writers cannot imagine women would kill themselves in these ways but, undeniably, that is what is happening. The increases for men and women are almost the same among drugs, suicide and alcohol, although the increase has been largest for drugs and that increase started before OxyContin was ever released into the marketplace. This is just for one five-year age group, 50 to 54, but very similar pictures could be drawn for all those other age groups we showed.

Figure 7. White non-Hispanic mortality ages 50-54 by cause of death and education class



Source: Appendix Figure 7 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.59

Figure 8. Drug, alcohol and suicide mortality (white non-Hispanics ages 50-54)

Source: Figure 11 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.50

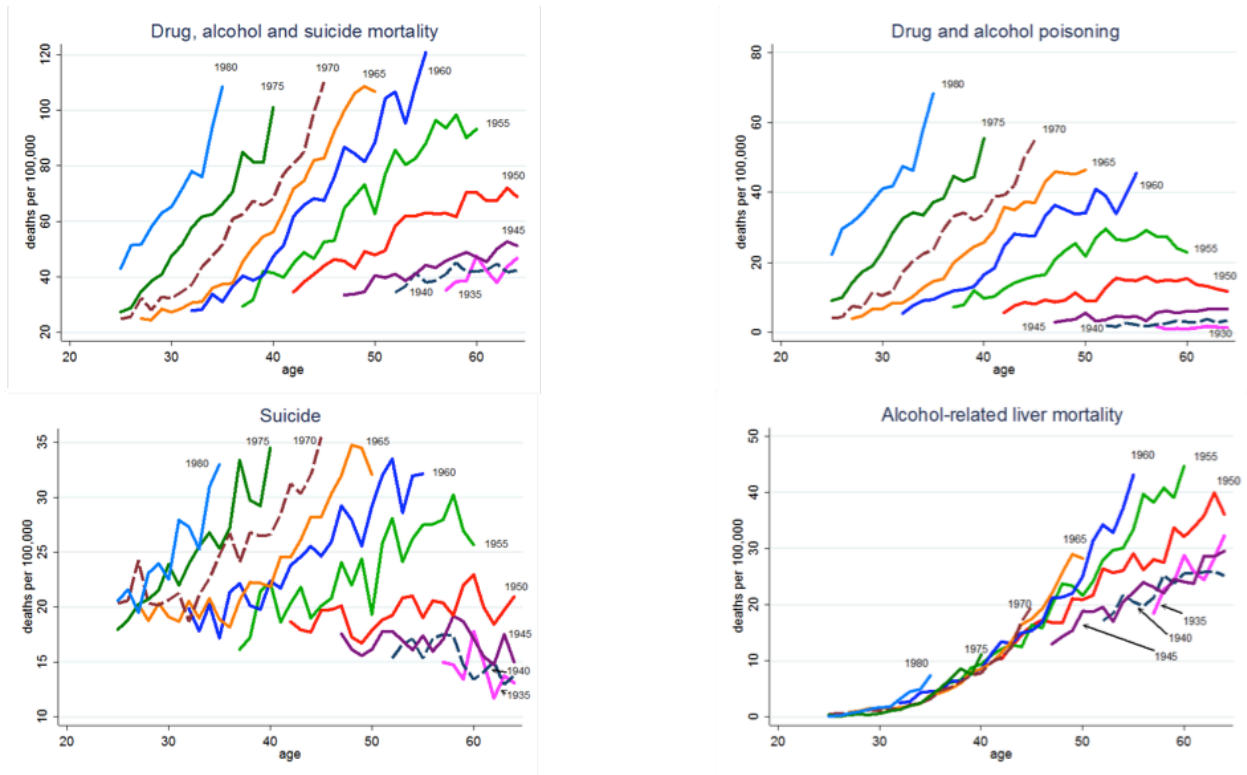
One other point needs to be made: there is no sign of the Great Recession in Figures 7 and 8. It is not as if these deaths of despair were something that just suddenly hit with the financial crisis. In the US there was extremely strong growth and wages in the 90s, followed by financial crisis in 2008. However, there is no abrupt change in these Figures but, rather, a very smooth trend.

6. Mortality in Relation to Birth Cohort and Geography

We now turn to deaths of despair, birth cohort by birth cohort (Figure 9). If we address the mortality rates from drugs, alcohol and suicide for the cohort born in 1935 (magenta line), the cohort born in 1940 (blue), and then 1945, 1950, 1955, 1960 and so on, we find that, at any given age, people born later have higher mortality rates than people who were born at an earlier time. Whatever is happening, it is hitting these younger cohorts, and ever-younger cohorts are being hit ever harder. This true for drugs and for suicide. Alcohol is a little bit special (Figure 9) because the liver is a really remarkable organ and it takes a lot for it to actually wear out. Heavy drinking can take place until about age 45, after which there begin both an upward shift and a rotation of the age mortality profiles.

Consequently, the cohorts born later have higher rates of mortality from cirrhosis and from alcoholic liver disease, which suggests much heavier drinking at younger ages for their livers to wear out by age 45. The same is true at age 50, and it is going to be progressively worse.

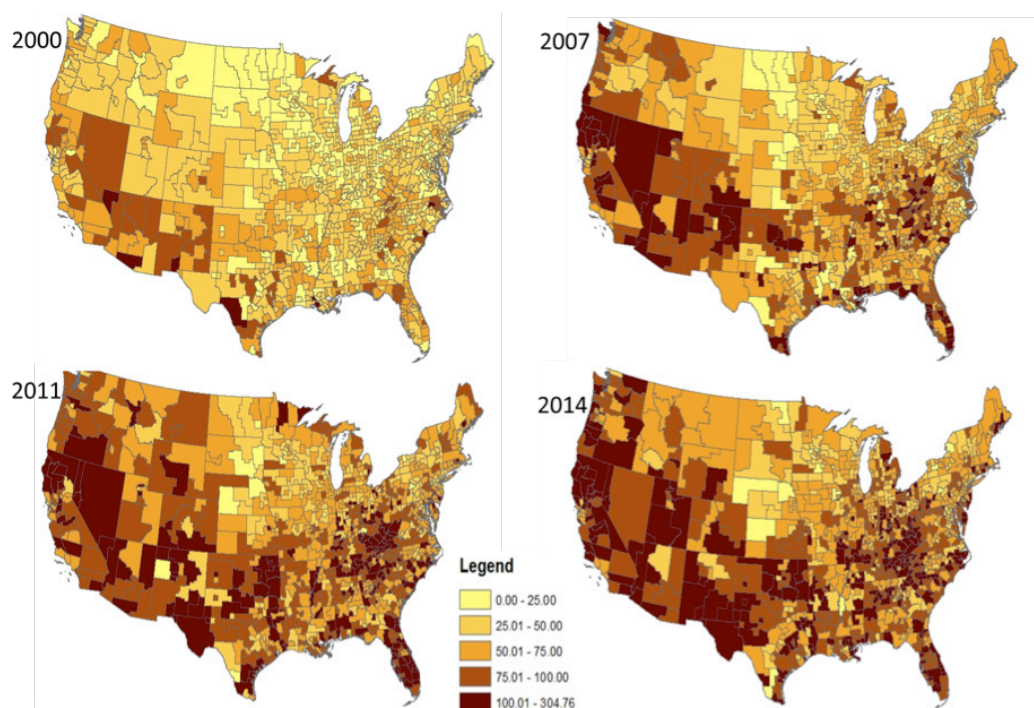
Figure 9. Drug, alcohol and suicide mortality by birth cohort, white non-Hispanics, less than BA



Source: Figure 7 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.48

To investigate spatial variation across the US in four different years, 2000, 2007, 2011 and 2014, we broke the country up into about 1,000 regions each with at least 100,000 people in them (Figure 10). Deaths of despair are fairly low in 2000 although in the south-west, where black tar heroin would be able to make its way across the Mexican border, by 2007 these deaths have become worse. They are also beginning to take hold in Appalachia, which is very poor coal-mining country. It starts to get bad in Florida and by 2011 it is beginning to show everywhere, including Minnesota, Michigan and Maine, states that we would not have thought of as being necessarily at high risk for deaths of despair. By 2014 there is no part of the country that has not been touched, and there is no kind of residential area that has escaped.

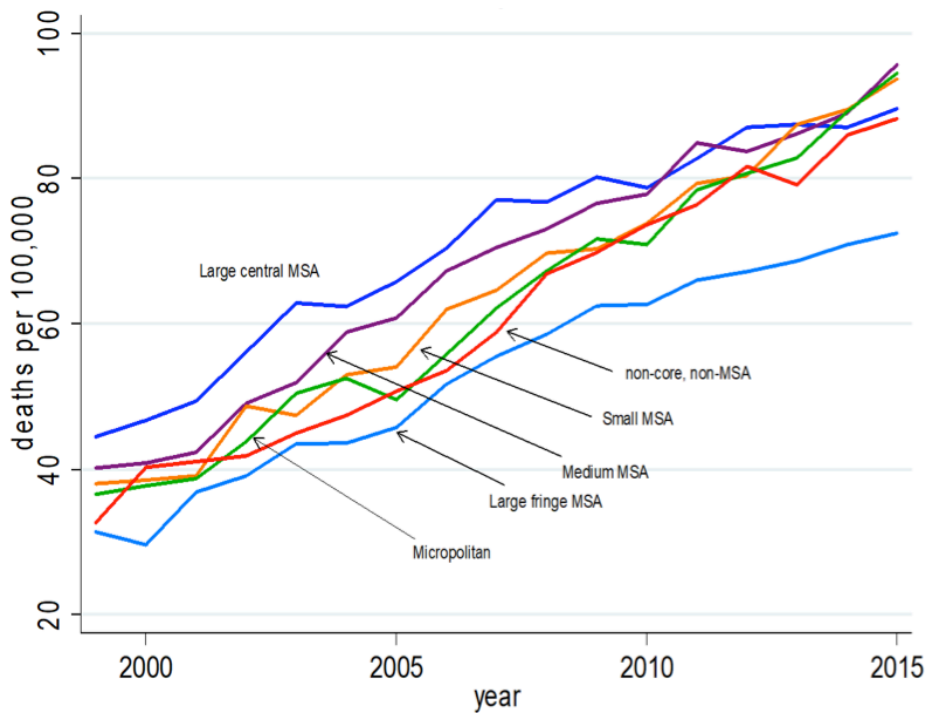
Figure 10. Drug, alcohol and suicide mortality, white non-Hispanics ages 45-54



Source: Figure 6 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.47

Figure 11 presents deaths of despair for people aged 50 to 54. The Large Central Metropolitan Statistical Areas (MSAs) are the big cities. The red line represents the deep rural areas. Many newspaper reporters want to go out to a deep rural area and tell you a story about what is happening there. And it is indeed happening there; but in fact it is happening everywhere. The curve that starts at a lower level but still proceeds up refers to the large fringe MSAs. These are where the mostly wealthy and better educated people are living; but it is happening there as well.

Figure 11. Drug, alcohol and suicide mortality (white non-Hispanics 50-54)



Source: Appendix Figure 2 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.56

We looked at drug overdoses in comparison countries (Figure 12). It’s a pity we do not have the numbers for Canada beyond 2010, but the Canadians are slow in releasing them. We hear from them that they are having a drug crisis there as well. From 2000, Sweden and Australia have certainly seen increases in deaths per 100,000 from drugs, but the numbers are dwarfed by what is going on in the US. The trends for US whites are huge, but the other places where you see the deaths of despair increasing are the English speaking countries (Figure 13). This sets UK, Ireland, Canada and Australia apart in this respect, and these are the places where warning bells should be going off because they are where the trends have been strongest.

Figure 12. Drug, alcohol and suicide mortality, men and women ages 50-54

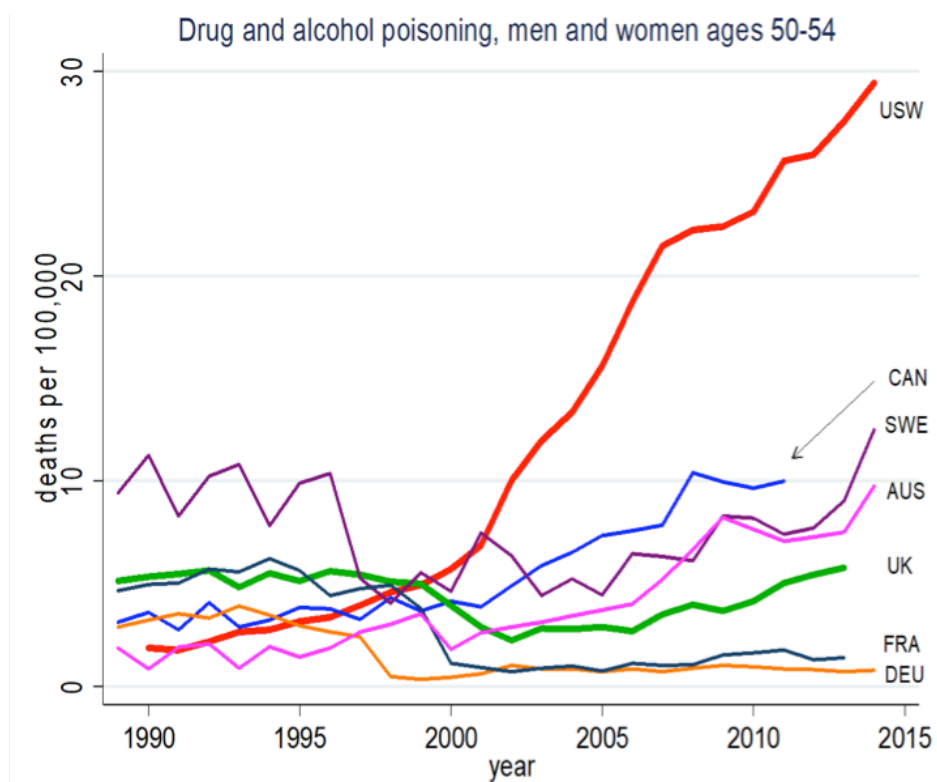
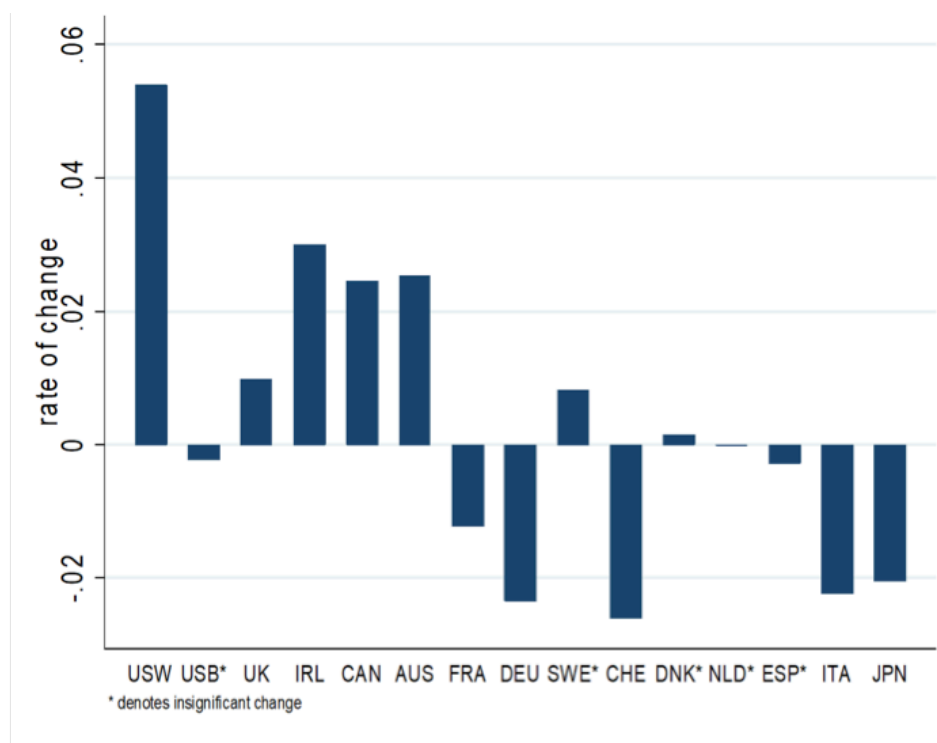


Figure 13. Drug, alcohol and suicide mortality, rate of change 1999-2014 (men and women ages 50-54)



Focusing specifically on the UK (Figure 14), the green line compares the entire UK with the data for US white non-Hispanics (red line). From 1990 to 2000 the two lines are relatively close. The line for England and Wales, which represents a large proportion of the UK population, looks like the UK-all line. The big run-up in Scotland was accounted for by alcoholic liver disease and cirrhosis. Northern Ireland shows serious signs of increase, largely due to suicide and liver disease. These are not drug overdoses (that is, poisonings). In England and Wales, mortality is divided about equally between suicide, alcohol and drugs. Thus, there has been an increase but nowhere near what it has been in the US.

Figure 14. Drug, alcohol and suicide mortality, men and women ages 50-54

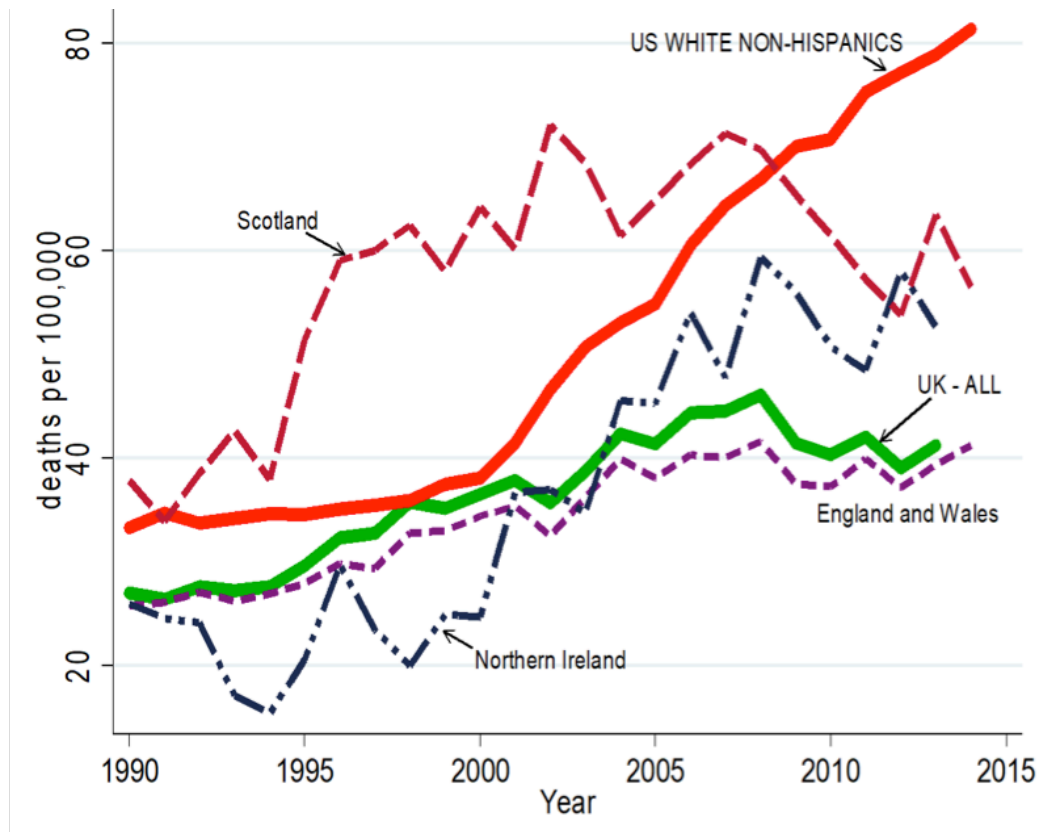


Figure 15 shows data for poisoning deaths - (A) US, (B) UK. These are figures for men and women grouped into birth cohorts as in Figure 9. There does not seem to be a problem of increase across birth cohorts in the UK for drugs. It is also not really a problem for suicide (Figure 16). Again, the increase in the US comprises both a shift up and a rotation, but there is nothing really comparable in the UK data.

Figure 15. Alcohol and drug poisoning, by year of birth. (A) US white non-Hispanics, men and women. (B) UK, men and women

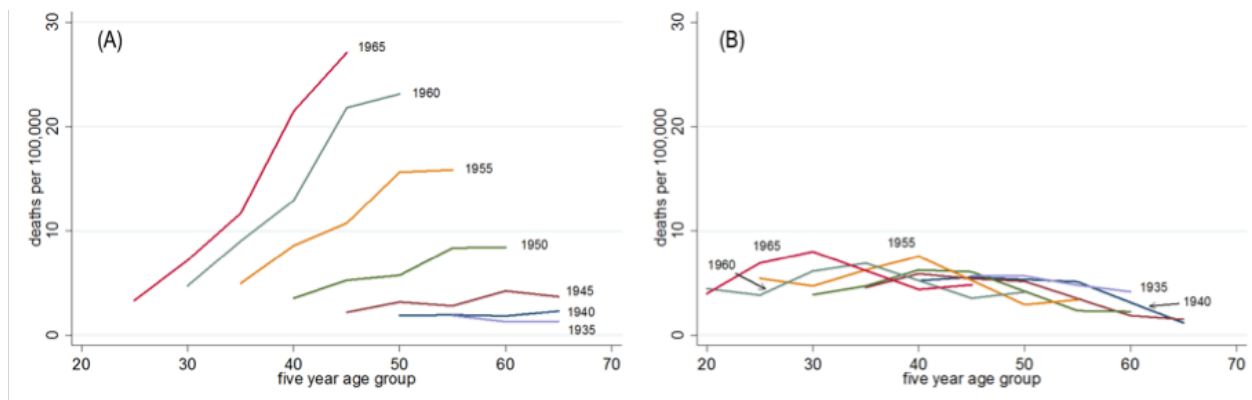
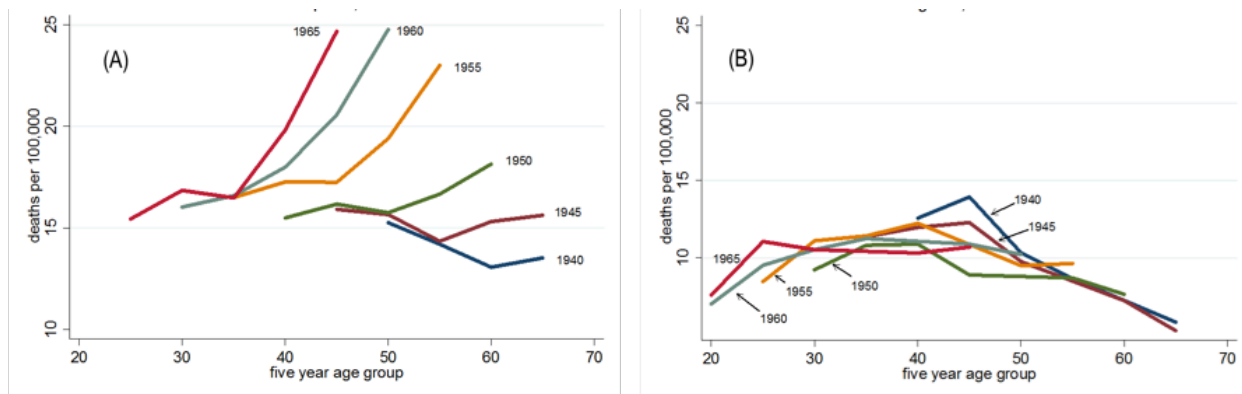


Figure 16. Suicide, by year of birth. (A) US white non-Hispanics, men and women (B) UK, men and women



Where the UK stands out, though, is in terms of alcoholic liver disease and cirrhosis, where at any given age, people born at a later date than those born in 1935, 1940 and 1945 are at higher risk of death (Figure 17). Alcohol is certainly a problem for the UK, and it is worse for later born cohorts. That is true for the UK taken as a whole (Figure 17A) and for England and Wales (Figure 17B). The data for the rest of the UK are a little bit noisier because their populations are smaller. Figure 17C shows the picture for Scotland, but one thing to note here is the vertical scale: 60 per 100,000 in Scotland, 30 per 100,000 in England and Wales (Figure 17B). The problem is worse in Scotland. The scale is back to 30 for Northern Ireland (Figure 17D), but again there is rotation through the later-born cohorts. While the US and UK differ in suicide and drug overdose deaths, the problems of deaths from alcoholic liver disease and cirrhosis looks very similar across the UK and the US (Figure 18A, B). This is true for UK men and for UK women (Figure 18 C, D). Like the US, the rates are higher for men than for women, but the pattern and the increase with later birth cohorts are very similar.

Figure 17. Alcoholic liver disease and cirrhosis mortality rates for men and women, by year of birth

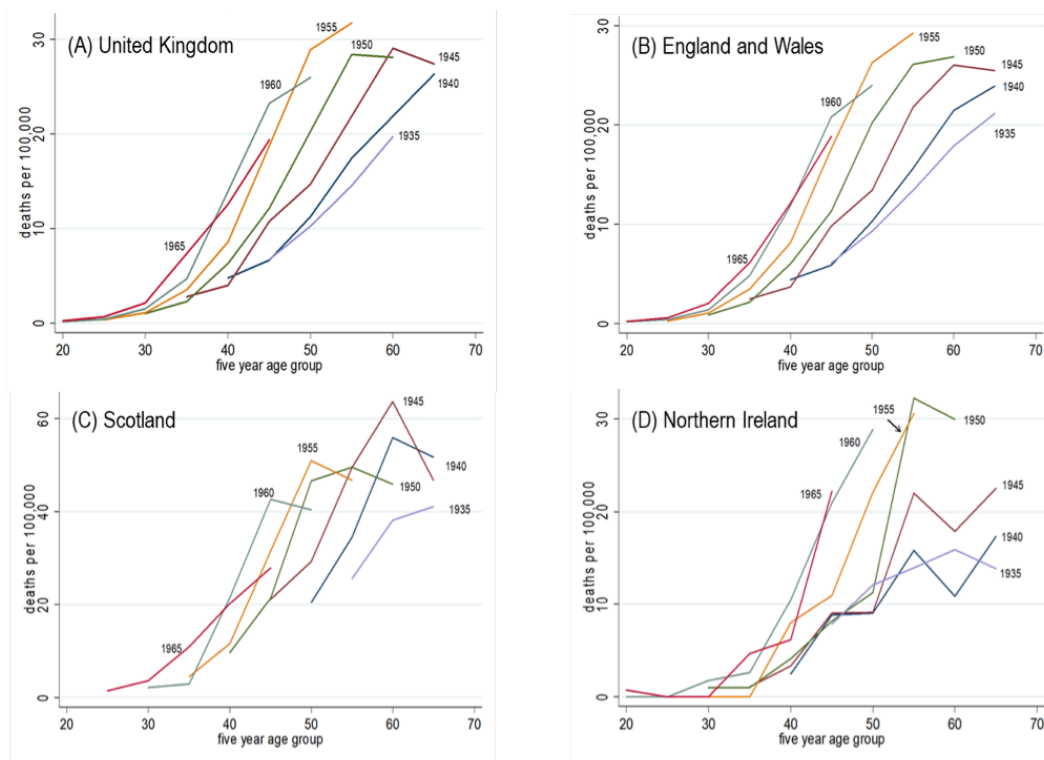
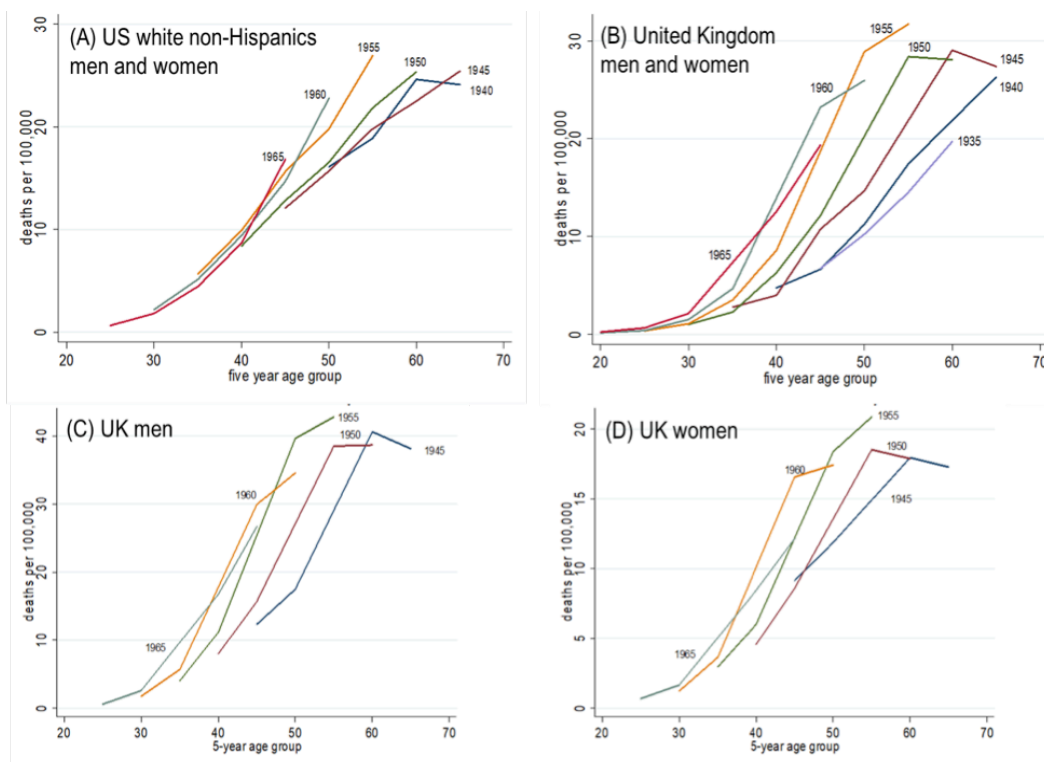


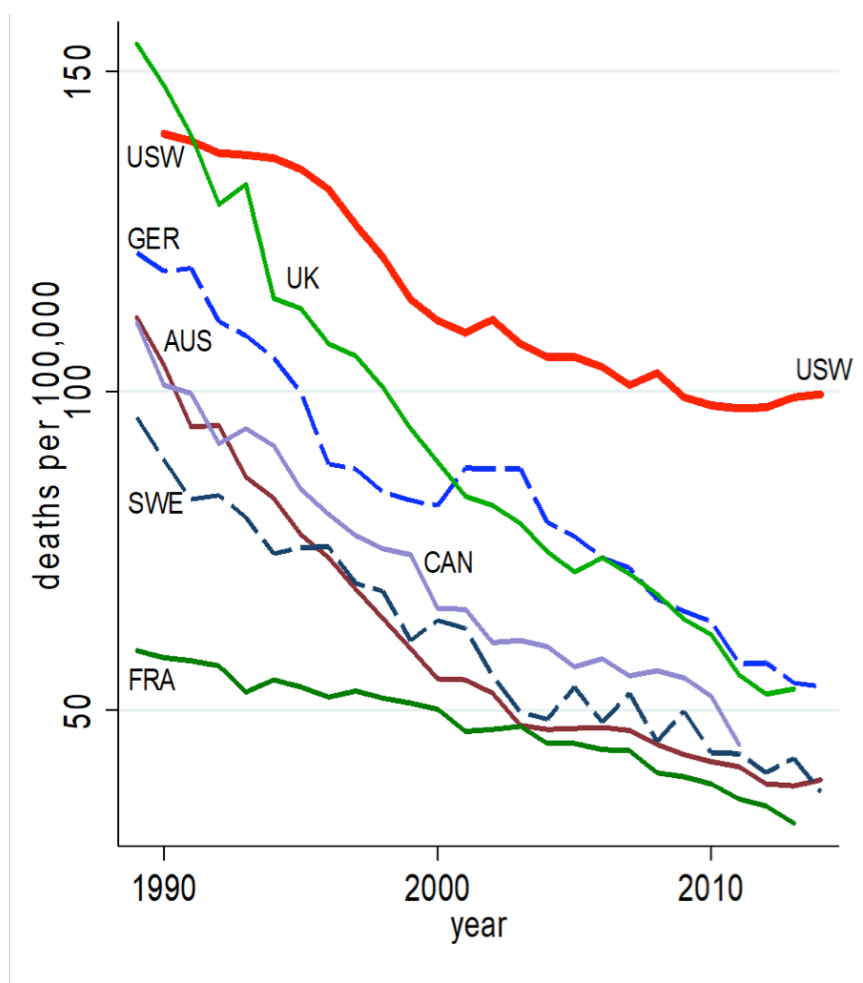
Figure 18. Alcoholic liver disease and cirrhosis mortality rates by year of birth



7. Obesity, Heart Disease and Cancer

None of this would have come to light, and we would never have written the original paper had the US continued to make progress against mortality from heart disease. Increases in deaths of despair were being offset by the improvement in rates of heart disease mortality up until the turn of the century; but when progress in the US stopped and rates of heart disease mortality stopped falling and began to turn the wrong way (Figure 19), rising deaths of despair, which in the meantime had become much larger, took over and drove up all-cause mortality.

Figure 19. Heart disease mortality, men and women ages 50-54

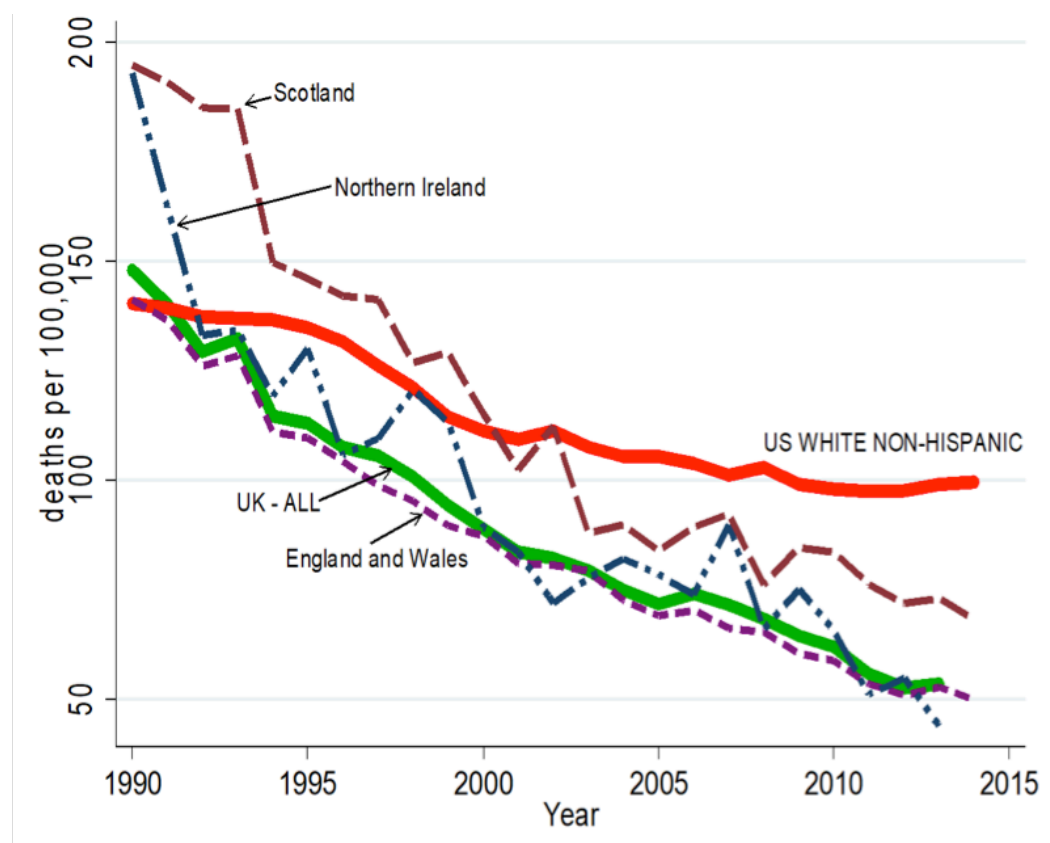


Source: Figure 8 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp. 48

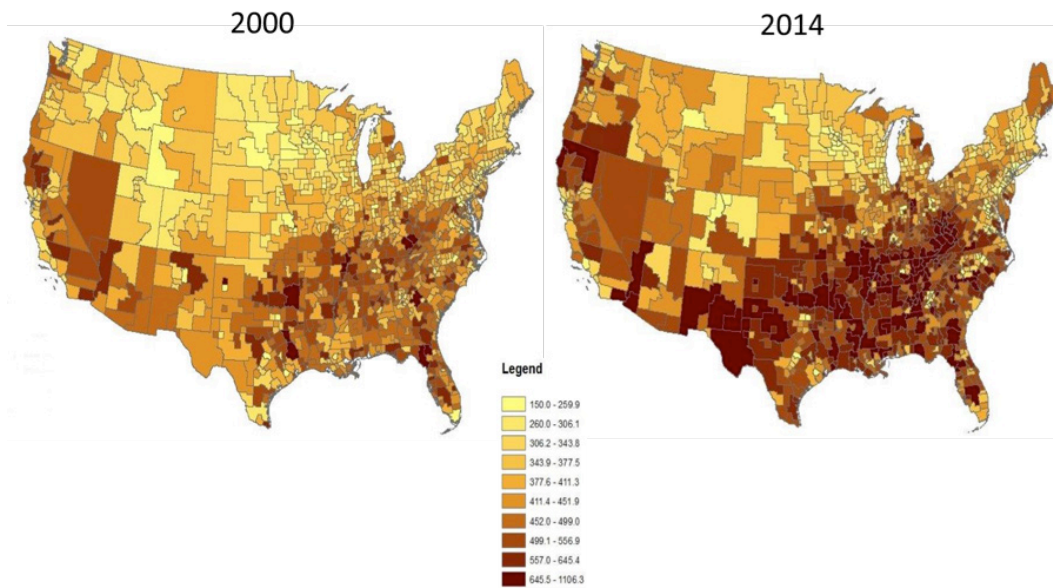
At first, we had been seeking one cause for why all-cause mortality was going down and then coming back up (Figure 2), but actually there are two things at work here: one is that we stopped making progress against mortality from heart disease and the other one is that mortality started to rise from suicide, drugs and alcohol.

Some people think it is no puzzle that the US is not making progress on mortality from heart disease because the US population is fat, and in fact there are some people who have long argued that obesity was going to catch up with us, and who are now triumphantly vindicated. Which may certainly be part of the explanation but, in the UK, 25 per cent of the adult population is obese as opposed to 28 per cent in the US, but the UK continues to make progress in heart disease while the US does not (Figure 19). This is something we do not yet understand but are hoping to learn more about because it is going to be an important part of the story. We also wonder whether or not mortality from heart disease is related to the drug crisis in a way that is not yet well understood by the medical community, but we certainly need to know more about it. Figure 20 compares mortality from heart disease in the US to the parts of the UK. US whites started like England and Wales, and below Scotland and Northern Ireland, but the US ends up at a heart disease mortality rate that is higher than any component part of the UK.

Figure 20. Heart disease mortality, men and women ages 50-54



Between 2000 and 2014 there has been a dramatic increase in all-cause mortality rates in almost every part of the US (Figure 21). Only 3 states out of 50 in the US have mortality trends proceeding in the right direction over this period: California, New York and New Jersey.

Figure 21. All-cause mortality, white non-Hispanics, ages 45-54

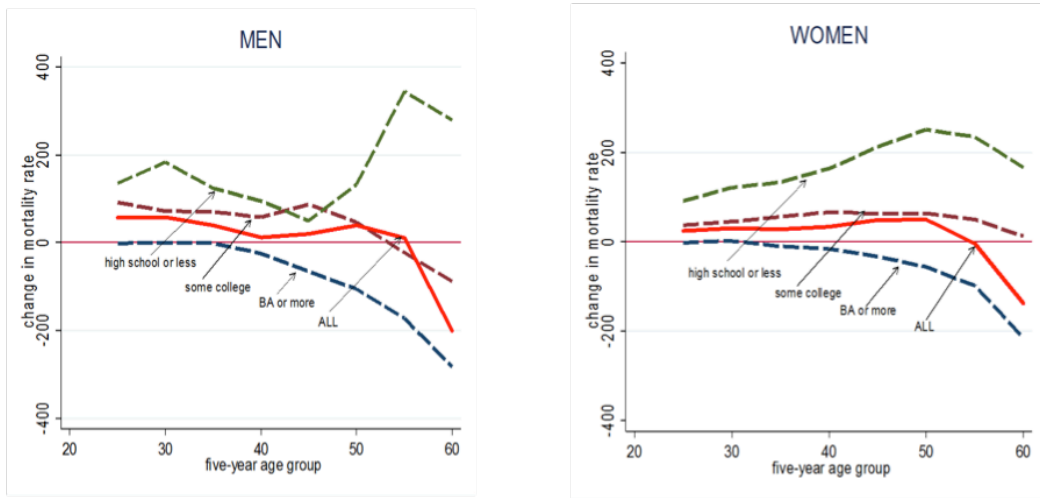
Source: Figure 9 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.49

As an aside: one of the few bright spots runs from Washington DC through Princeton, New Jersey, and up to Boston, following the I-95 highway and the Acela train corridor, where the very well-educated people live and where incomes are higher. But, in general, the picture looks pretty bleak.

8. Education, Mortality Risk and Morbidity

Let us return to men versus women. All-cause mortality rates can rise because of deaths of despair, or because of what is happening to heart disease, or what is happening to cancer, or something else, and all of those might be different for men and women. But when it comes to change in mortality rates between 1998, when they were at their lowest, and 2015, education is certainly a divider (Figure 22). The green line shows people with a high school degree or less, purple represents people with some college but not a bachelor's degree, and the blue line shows people with a college degree. We see more similarity than we see differences between men and women. The apparent relationship with education does not mean that if you were handed a bachelor's degree it would protect you, but it is certainly a marker for the fact that your mortality risk is higher if you are in one of the other groups.

Figure 22. Change in mortality rates, white non-Hispanics 1998-2015



Source: Figure 10 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.49

Figure 23. Change in mortality from 1992-95 to 2012-15 for US white non-Hispanic men

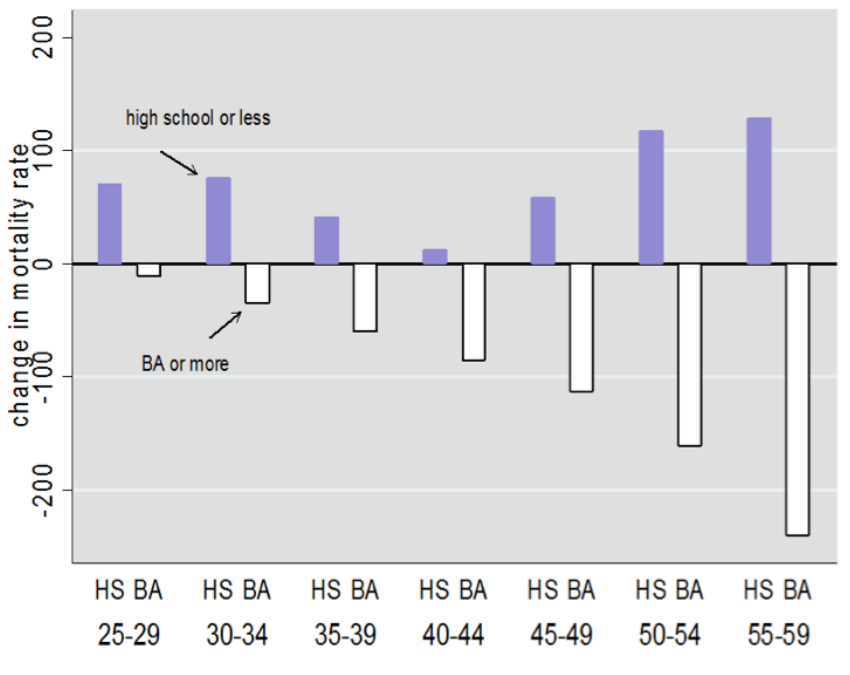
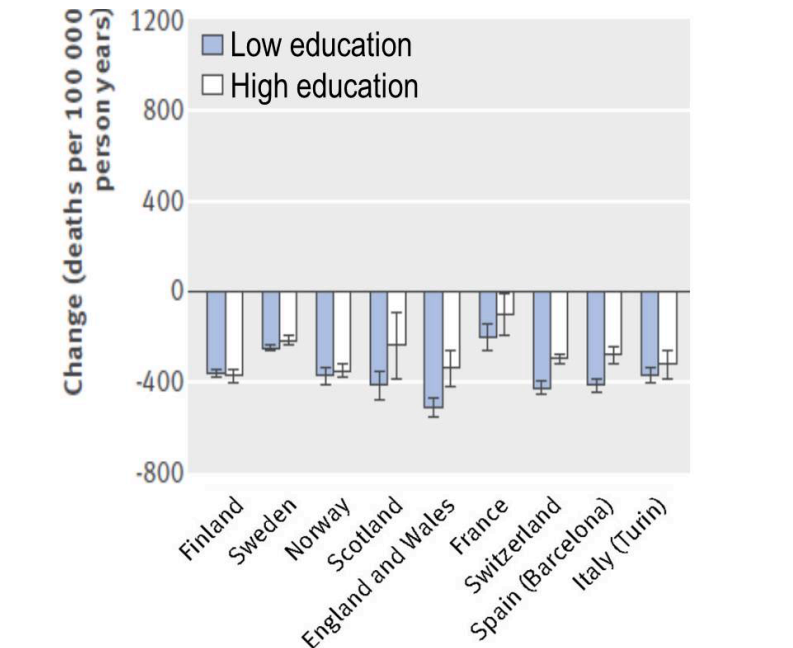


Figure 23 shows the gap that is caused by mortality increasing for people with less education and declining for people with a college degree or more for every five-year age group between 25 to 29 year olds all the way up to 55 to 59 year olds.

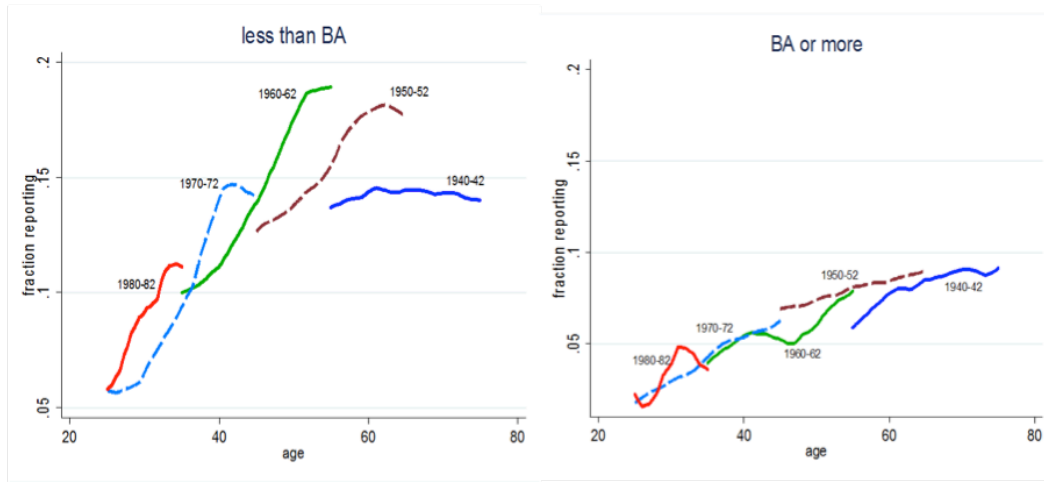
Figure 24. Absolute changes in mortality 1990-94 and 2005-09 (from Mackenbach et al., 2016)



Source: Figure 24 – Mackenbach, et al., 2016. *British Medical Journal*, vol. 353, pp.3

That contrasts dramatically with what we see in Europe. Johan Mackenbach and his collaborators (Mackenbach et al., 2016) compared mortality changes during the early 90s, and from 2005 to 2009, between people with low education and high education in a range of countries or in some cases parts of countries like Barcelona in Spain (Figure 24). In the US, if you take low education and high education, what you see is that among the low educated group, high school or less, mortality rates are increasing and in those with a college degree they are falling. You get just the opposite in Europe; everybody’s mortality rates are improving but they are improving more for people with less education. That is also true in Scotland and in England and Wales. The mortality drop is greater for people with less education than people with more education. We do not understand yet why the US and UK should be so dramatically different.

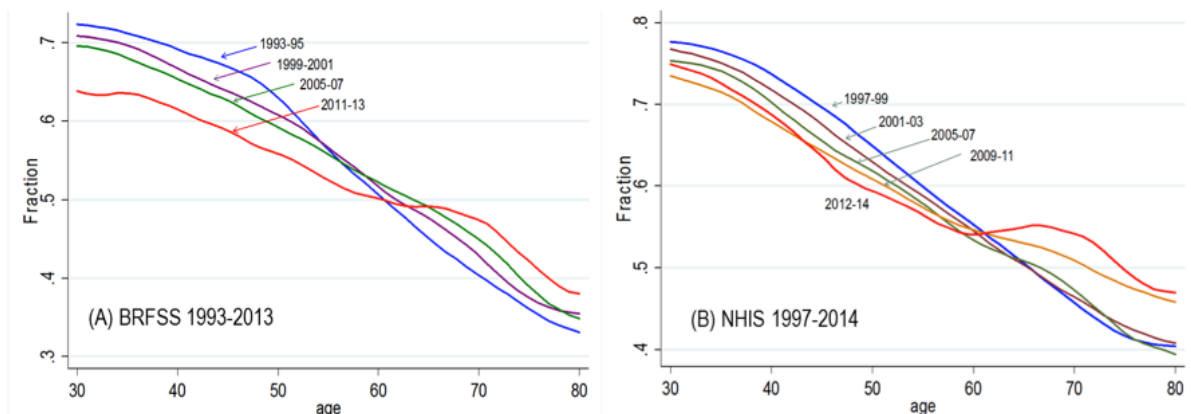
Figure 25. Fraction reporting sciatic pain, white non-Hispanics by birth year and education class



Source: Figure 13 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.51

We need briefly to consider morbidity, because underneath the sea of deaths there is a sea of pain. Figure 25 compares, by birth cohort, people with less than a bachelor’s degree, which is a four-year college degree in America, and people with a BA or more. The fraction of people reporting themselves as having sciatic pain (extreme lower back pain that shoots down the leg because the sciatic nerve has been grabbed) is increasing greatly, birth cohort to birth cohort, for people with less than a BA, whereas for people with a BA or more, we see pain levels gradually going up with age but no difference across cohorts. Not just sciatic pain but neck pain, facial pain and lower back pain are all increasing in this way.

Figure 26. Fractions of white non-Hispanic men and women reporting themselves to be in Excellent/Very Good Health in national surveys



In large nationally representative surveys of physical health in the US, people are asked, “How would you say your health is at present, excellent, very good, good, fair or poor?” Doctors hate this question, but social scientists love it because it is cheap to ask and because it is also predicative of changes in ability/disabilities and changes in mortality. In surveys, about 70 per cent and more of 30 year olds report themselves in excellent or very good health, and this falls with age (Figure 26). That is not so surprising. I like to tell my students, “You can kind of see where you are and you can kind of see where this is going and it is not going to be pretty”. Figure 26A, blue line, shows how people reported between 1993 and 1995, and the purple between 1999 and 2001, in a Behavioral Risk Factor Surveillance System (BRFSS) survey. The fraction of people under age 55 reporting themselves in excellent or very good health is falling and the fraction of the elderly reporting themselves in excellent or very good health is going up. By 2005 to 2007 the divergence gets even more pronounced, and even more so in 2011 to 2013. The National Health Interview survey (NHIS) shows exactly the same patterns, so it is not a peculiarity of the BRFSS (Figure 26B).

Figure 27. Self-assessed health in Europe. Fraction of men and women reporting good/very good health

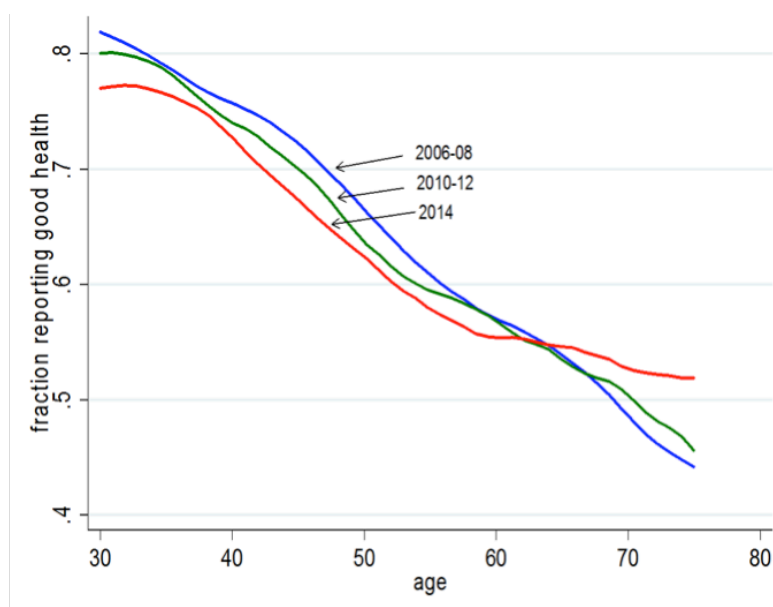
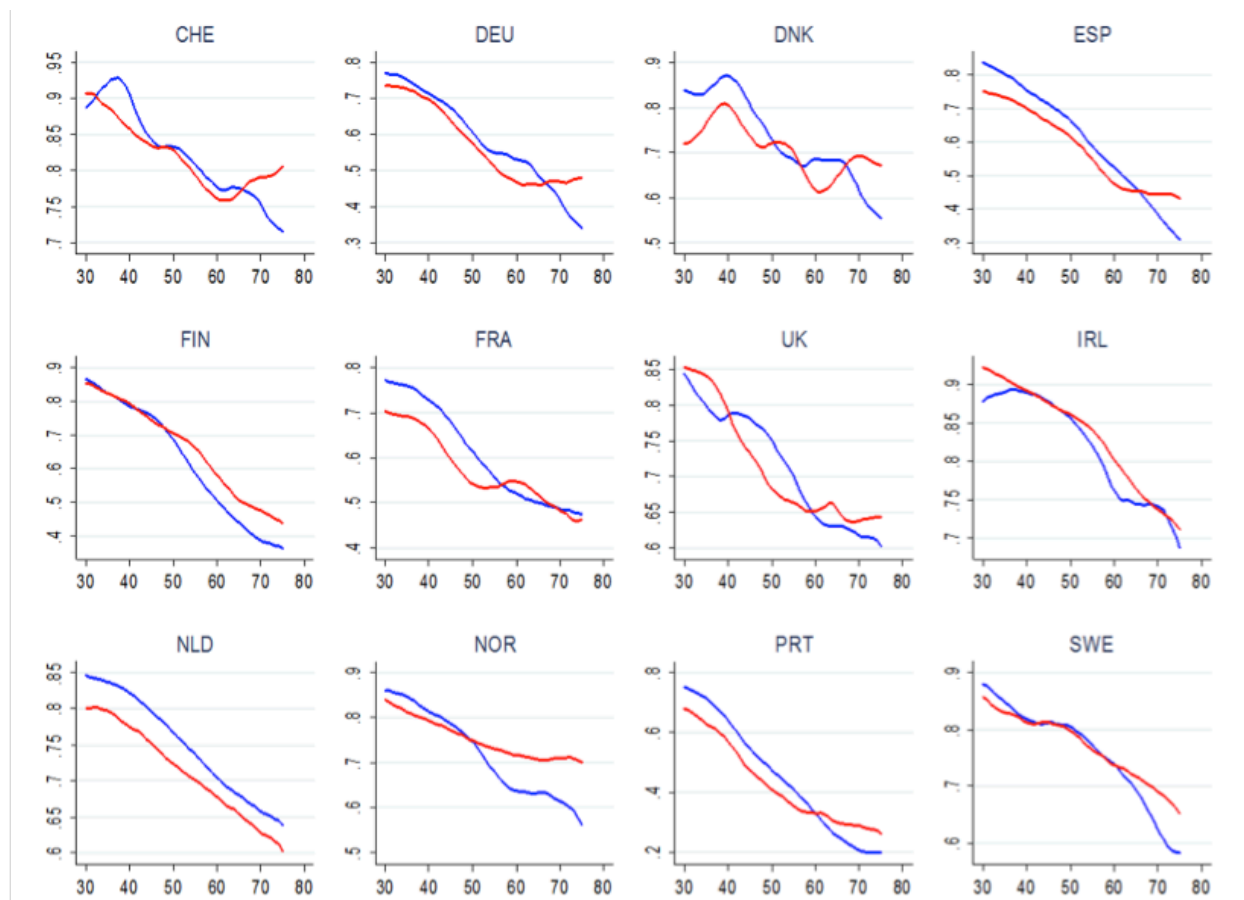


Figure 28. Fraction reporting Good/Very Good Health by age, ESS 2006-08 (blue line) and 2014 (red line)

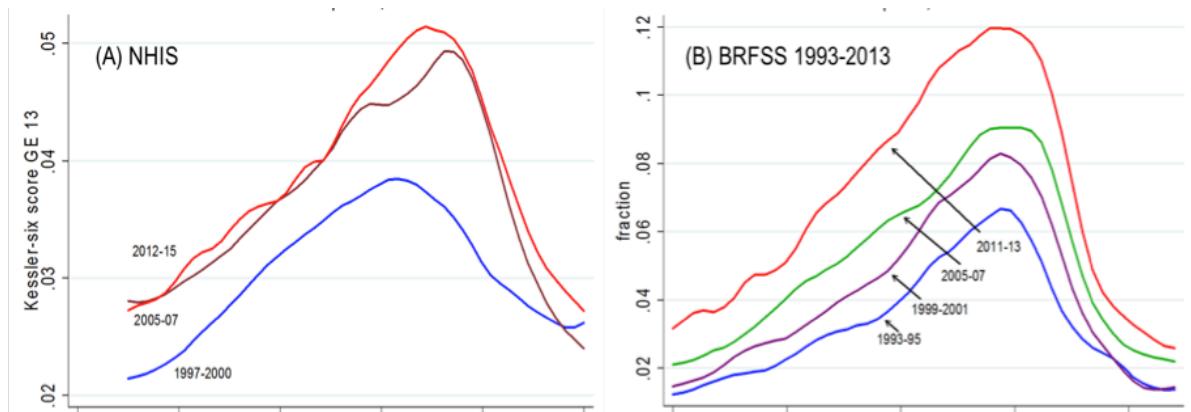


This is also beginning to appear in the European Health Interview survey (ESS) (Figure 27): between 2006 and 2014 people in middle age are reporting worse health and the elderly reporting better health. Figure 28 divides up the ESS data by country, including the UK. People in middle age are less likely to report themselves in excellent or very good health than they were even as recently as 2006 to 2008 - maybe a precursor of something to come.

9. Effects of and on Mental Health

Here we'll take a brief look at mental health, a further serious problem in the US. The number of people reporting themselves as being unable to work is going up with every year. Figure 29 summarises the kind of facts that you can assemble.

Figure 29. Incidence, among white non-Hispanics, of serious mental distress (A), and fraction reporting themselves unable to work (B)

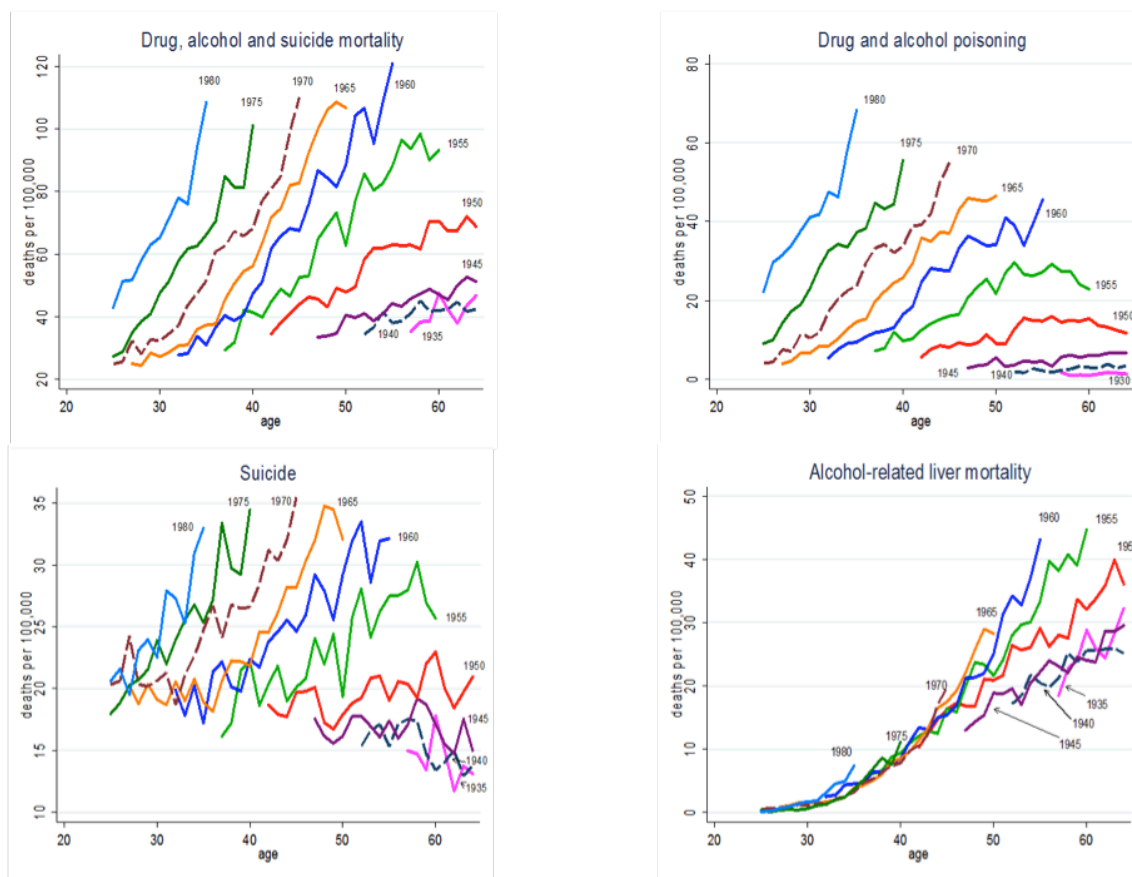


We are looking for causes that:

- Affect men and women in about equal measure
- Affect white non-Hispanics in the US, but pass over blacks and Hispanics
- Have larger effects in later born birth cohorts
- Disproportionately affect adults with less education
- Affect both morbidity and mortality
- *May* be related to slowdown in progress in heart disease and cancer
- Have not had the same effects on mortality in other rich countries
- *May* be taking a toll on health and alcohol-related mortality in the OECD

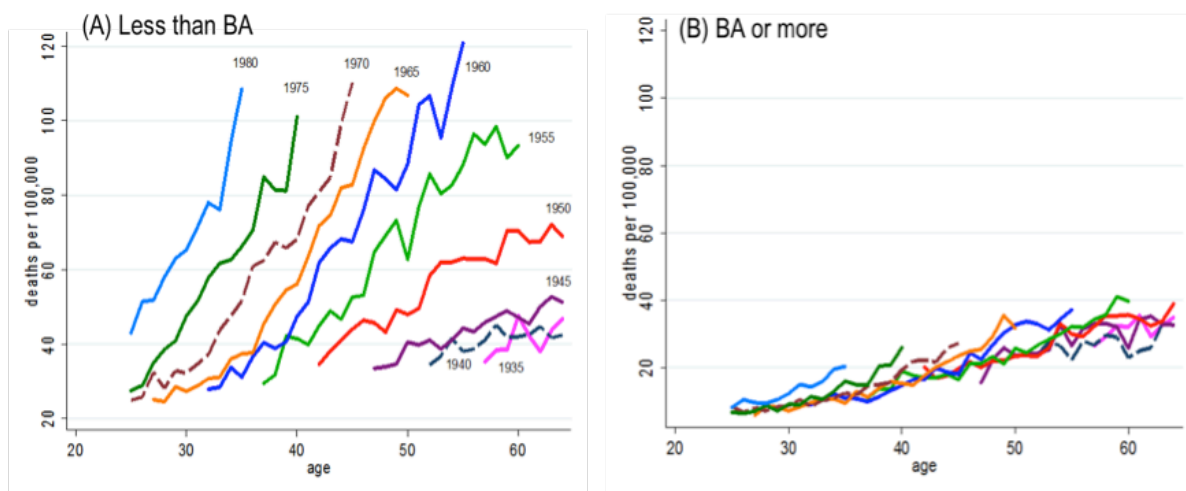
We are working on a theory of cumulative deprivation, that something is happening to make later born birth cohorts struggle more, and with that struggle they are killing themselves, either slowly with drugs and alcohol or quickly with a gun or a rope.

Figure 30. Drug, alcohol and suicide mortality by birth cohort, white non-Hispanics, less than BA



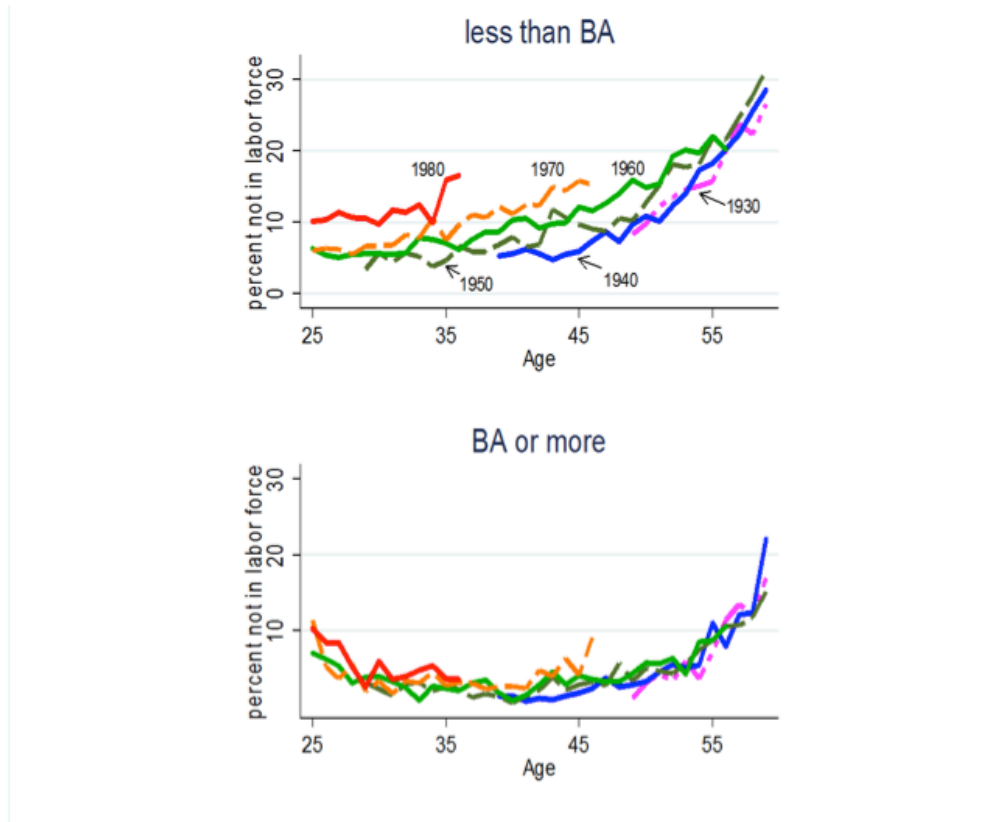
Source: Figure 7 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.48

Figure 31. Drug, alcohol and suicide mortality, white non-Hispanics by birth cohort



You see two Americas in Figures 30 and 31, divided into people without and people with a college degree. It's just stunning: the non-degree group is being hammered. People without a college degree also differ in terms of their participation in the labour force (Figure 32). With each successive birth cohort, a significantly larger share of men are not working; they are not looking for work and they are not employed.

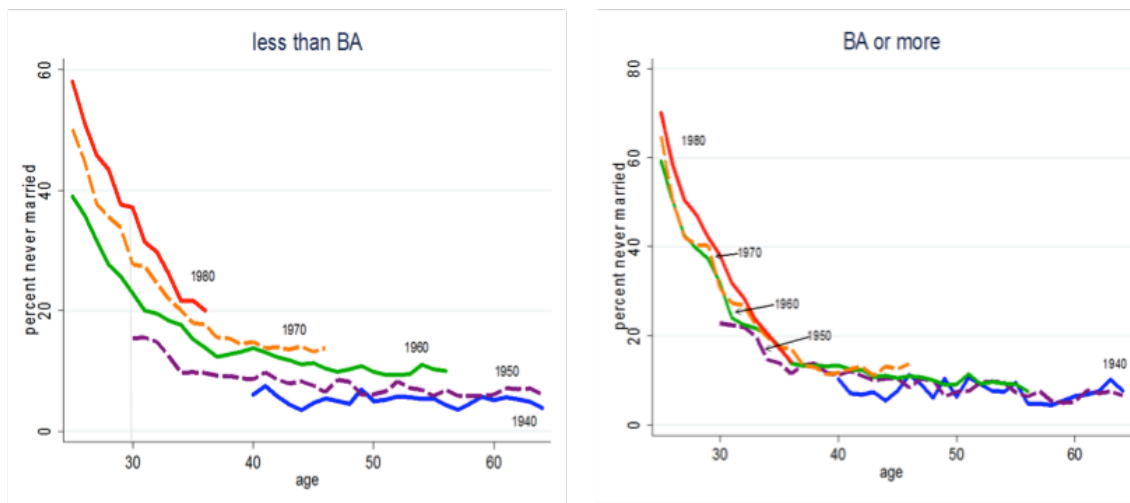
Figure 32. Percent not in the labour force, white non-Hispanic men, by birth cohort and education



Source: Figure 18 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.53

Whatever this thing is, it is also affecting marriage rates (Figure 33). Birth cohort to birth cohort among the people without a college degree, younger cohorts are significantly less likely to be married than the cohort that came before. Cohabitation is not unusual in Europe, but cohabitation in the US was more uncommon. Cohabitation in Europe is more stable than it is in the US where it is quite fragile. If you move in with your girlfriend, she may even have a baby with you but that does not mean you are settled. She may decide she has better prospects and you are on your way out or you might decide you have better prospects and she is on her way out, but it does not have the kind of stability that you tend to find in cohabitation in Europe.

Figure 33. Percent of birth cohorts never married, white non-Hispanic men and women



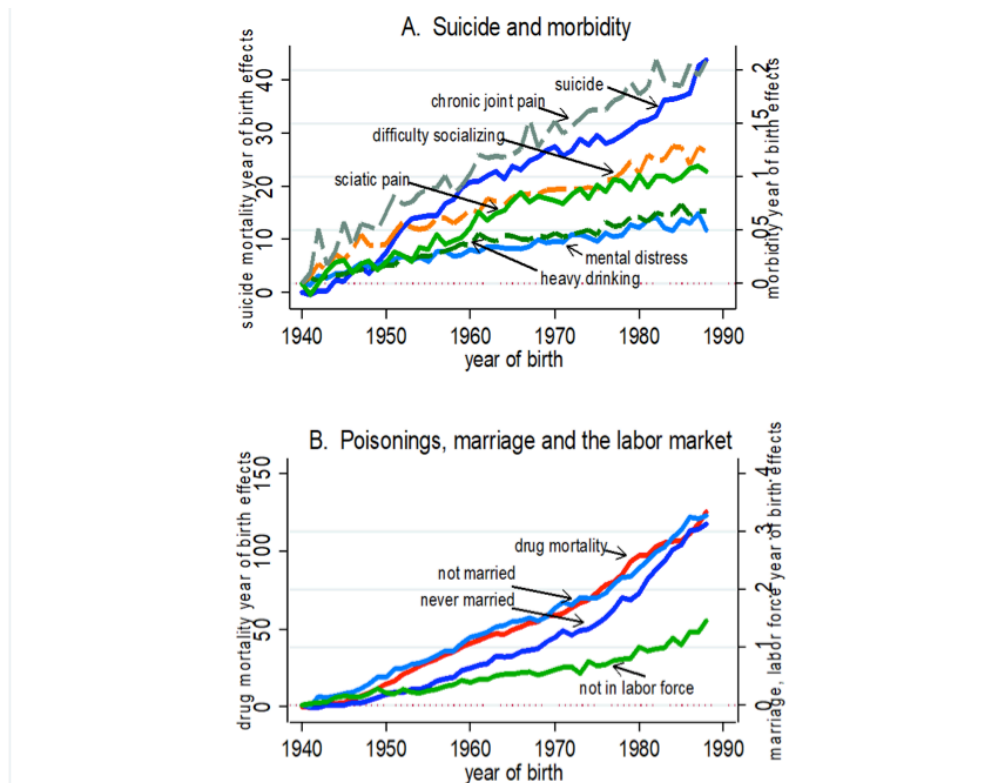
Source: Figure 19 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.54

We think that this is a long-term process of decline for people without a BA and the steady deterioration in their job opportunities that began in the late 1970s. Employment with on-the-job training for people without a college degree started to disappear, partly because of globalisation but to a large extent because of technological change. Those jobs where there was a ladder up, where there were benefits, where there was a hope of doing better, are gone and they are not coming back. This may be a central part of what is going on because social structures are much weakened, higher-paying secure jobs have disappeared and stable marriages have given way to fragile cohabitation. Moreover, in the US, which is much more religious a place than Europe is on average, people still report that they are religious, but the legacy churches - Catholic and mainline Protestant churches - have given way to Evangelical churches (which are much more individual-oriented, where each person has a personal relationship with his or her saviour). But that individuality lacks the kind of stability that the legacy churches provided to parental, grandparental and earlier generations.

10. Modelling Processes That Drive Mortality

What we want to do is to construct a model to see whether or not the same kind of process is afoot for pain, for mental distress, for social isolation, for saying that you are having difficulties socialising with your friends, for marriage, for heavy drinking (and for obesity too but we will not discuss this further here), and then mortality from suicide and drug overdose (Figure 34).

Figure 34. Mortality, morbidity and labour force participation



Source: Figure 20 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.54

We have looked at the birth year effects relative to 1940 for every birth cohort, pinning all of the 1940s effects to be equal to zero. There is a real deterioration that, in the cases of chronic pain, difficulty socialising, mental distress, heavy drinking, sciatic pain and suicide (Figure 34A), looks almost linear. Whatever the cause, it is happening in some sort of a linear fashion or it is at any rate having a linear effect on all of those things. There is some non-linearity in terms of poisonings, not being married and not being in the labour force (Figure 34B). There seems to be more curvature for these conditions which is visible in a more rapid rate of increase at the end of the period in Figure 34B compared with 34A.

Figure 35. Log wages and labour force participation, white non-Hispanic men, less than BA.



Source: Figure 34 – Case, A. and Deaton, A., 2017a. *Brookings Papers on Economic Activity*, pp.55

We wonder whether the root cause to all of this lies in the labour market (Figure 35). Wages have declined for the group without a college degree. Relative to people born in 1940, people born in every one of the successive cohorts have actually seen a fall in wages (the vertical axis in Figure 35 shows decline as a positive number), which matches their not being in the labour force. We think that the story is one of lack of prospects: if you are not in the labour force, you are less likely to form a stable marital attachment and more likely to turn to drink or drugs. It is a story about the slow collapse of the white working class, which may be summarised as follows.

For each birth cohort entering the labour market without a BA after those born in 1945:

- Men start with lower real wages in later born cohorts
- Wage profiles change with each cohort, with earlier and lower peak earnings
- Decreasing or zero returns to experience after age 40, for cohorts born 1960 and later
- Less rewarding careers for later cohorts
- Lower marriage rates, higher divorce for those who get married, poorer family lives
- Less labour force attachment, more mental distress, more difficulty socializing, more pain, more drugs, more alcohol, more suicide
- All of these follow the same pattern over birth cohorts

We think this process was unfolding before the heavy-duty prescription opioids flooded the American markets, but certainly their presence has acted as an accelerant and made it a lot worse. We also think that these are cumulative effects. It is not so bad for a person who might have lost their job at age 55 but is very close to retirement age, but it is much worse for someone who is just starting out and has no hope of seeing a good future unfold for them. European countries have not suffered in the same way and this is where the work is going now. We know that there are differences, social safety nets are better, social connection may be better, there may be more stability in cohabiting relationships, and it has also been crucial that prescription opioids have not been a genie let out of the bottle this side of the Atlantic. Wage growth is stagnant in Europe and some other countries since the great recession and the financial crisis of 2008, but the long-term stagnation in the US labour market from 1970 through to 2015 was not seen in Europe. It will be interesting to see whether or not there is a close articulation between stagnation of wages over the longer haul and what has happened to deaths of despair. Black non-Hispanics have fared better; they may be eligible for more anti-poverty programmes. We think that they have stronger family networks. There are kin networks that have been in place that have been through much harder times and we think this might be part of what holds body and soul together for black non-Hispanics.

11. Where Do We Go from Here?

What do we recommend? We are academics, so of course we are going to say that we need to know more before we can say more about what should be done. Between us we argue. I think that better skill training for the jobs that will be available in the 21st century might be a place to go. I will let Angus speak for himself on that topic. We think that there is dysfunction in the health insurance market in the US which actually spills over into the labour market. One reason that wages have been stagnant for so long in the US is that employers pay health insurance and health insurance has become costlier and costlier. It does not mean that people value health insurance at the price an employer pays for it, but, valued or not, it comes out of their wages. A single payer system may allow wages to rise and people to make middle-class lives for themselves. We think that if people understood the luxury of what they were buying in the US by not having a single payer system – it is estimated that about \$1 trillion a year is wasted in the US – they might actually move to a single payer system. As Milton Friedman said long ago, you need crisis to bring policy change and, with crisis, you find that “the politically impossible becomes the politically inevitable”.

We have built up our own cartoon gallery around the subject of this lecture and I’ll leave the last word with one of our recent exhibits.



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