

Tim Phillips [00:00:00]:

Today on VoxTalk's Economics, if a mother drinks alcohol while she's pregnant, will her child's life be shortened? Welcome to VoxTalks Economics from the Center for Economic Policy Research. My name is Tim Phillips. Every week we bring you the best new research in economics. So remember to subscribe. Follow us on Instagram as well. You'll find us at VoxTalks Economics. The World Health Organization reports that 3 million deaths every year result from the harmful use of alcohol. But would your life be shortened if you were exposed to alcohol even before you were born? We know that in utero exposure, as it's called, has effects for child development, but the impact on later life mortality has been harder to pinpoint.

Tim Phillips [00:01:00]:

David Jacks of the National University of Singapore is here to tell us about some groundbreaking research into this question that has used a famous natural experiment. David, welcome to VoxTalk's Economics.

David Jacks [00:01:13]:

Hello, Tim. Thanks very much for this opportunity to talk about our research with you today.

Tim Phillips [00:01:17]:

We are delighted to have you. Now, first of all, that medical consensus, as I understand it, it's that there is now no safe level of alcohol. Is that right?

David Jacks [00:01:28]:

That's the correct messaging on this, right? There is no real known safe level of alcohol consumption, whether we're talking about in day to day life or while folks are pregnant or any spectrum of life situation. We really don't find any systematic evidence to suggest that old 1990s consensus that just a little bit of alcohol was the optimal point of consumption, that seems to have all fallen away in the past three to four years in fact.

Tim Phillips [00:01:58]:

What do we know as well about in utero exposure specifically and child development?

David Jacks [00:02:05]:

Well, it's not good. We know from the early literature emerging from the 1960s and 70s where the first diagnosis of fetal alcohol syndrome came from. And we know that has some real telltale effects or symptoms, mix of physical defects, intellectual or cognitive disabilities. And that

clinical diagnosis really came out of more extreme forms of maternal alcohol consumption while mothers were pregnant. What we now have today amassed in terms of a body of evidence with respect to alcohol and child development is a little bit more nuanced. It's what's known as fetal alcohol spectrum disorders moving away from that extremes of maternal alcohol consumption into areas or levels of consumption which are a little bit more moderate, in which we might observe in more or less normal maternal behavior. But that still presents the same issues with respect to, in particular, intellectual and cognitive disabilities, problems with motor control and impulse control. And it's a surprisingly large number of children, at least in the United States, with respect to recent survey data, we're talking about up to 9% of all children suffering from some form of fetal alcohol spectrum disorders. This is a fairly large number if you think about the hundreds of millions of people living in the United States today.

Tim Phillips [00:03:30]:

Wow, your team investigated something slightly different: the effect of this in utero exposure on mortality later in life. Why don't we know as much about this as we know about the impact on child development that you've just explained?

David Jacks [00:03:48]:

It's mainly the lack of good experiments in this dimension. So for one thing, no one is running randomized control trials, good trials maternal alcohol consumption for obvious ethical reasons. What we have now is a form of clinical evidence. And in thinking about that fetal alcohol spectrum disorder diagnosis, this is again coming from masses of patients being seen in these settings. We really lack exogenous variation and potential exposure to in uteral alcohol consumption. And this is where bringing in this very long run historical perspective helps. History acts as a laboratory for us and allows us to run this experiment of understanding what could be those potential effects in the utero exposure on later life mortality.

[Voiceover] [00:04:48]:

We visited the London Foundling Hospital in August 2021 to meet Eric Schneider who has used the historical records of the hospital to establish a link between malnutrition and disease in children. Listen again to the episode: Does Malnutrition Cause Disease?

Tim Phillips [00:05:15]:

So in the 1930s, when the subjects of your research would have been exposed to alcohol in utero, what did people know about whether you should drink during pregnancy?

David Jacks [00:05:28]:

It's important to remind ourselves it's only until 1981 that the U.S. Surgeon General actually

issues their initial warning about the risks associated with alcohol consumption during pregnancy. And this is falling on the heels of the burgeoning understanding of fetal alcohol spectrum disorder, again emerging from the 1960s and 70s. And so the public at the time, in the 1930s had very little definitive knowledge of the potential negative effects of alcohol consumption during pregnancy on child development, much less to say later life mortality. What we're estimating in the context of the 1930s, it's not going to be confounded by differences in avoidance behaviors, by avoiding, say, conception or avoiding drinking while pregnant that you might think actually emerge in more recent contexts with respect to different socioeconomic status driving these avoidance behaviors. We're in an environment of so little information on the part of prospective mothers that they might be being told in some instances that, oh, this is bad for your baby, but they also might be told in exact opposite circumstances that, oh, this is quite good for your baby. It's like a very natural thing to be doing while pregnant. Sorry. Fortifying iron deficiencies in your blood through drinking beer and this sort of thing.

Tim Phillips [00:06:46]:

There was famous advertising to say Guinness is good for you. And I know very well that mothers used to give a little bit of gin to their babies to stop them crying, attitudes that seem strange now, if people did not know any different then this would be normal behavior.

David Jacks [00:07:10]:

Who's to blame them?

Tim Phillips [00:07:11]:

But in the middle of this, I mentioned that there was a famous natural experiment and that famous natural experiment is prohibition in the United States. Can you explain what that was and who was affected by it?

David Jacks [00:07:20]:

Yes, there's a huge literature, primarily coming from history as a discipline trying to understand where prohibition actually came from and the federal level, that is to say the national government level in the United States. We know that there's a really long standing temperance movement from the beginning of the United States in the 18th century. There's a sentiment towards limiting or abolishing alcohol consumption only really come to a head in the early 20th century. A confluence of many different factors religious sentiment, temperance movement, progressive politics in terms of seeing alcohol as this fundamental evil. We had that also overlaid with World War I and that it becomes very unpopular in certain social circles. To be drinking beer or spirits, which represented a diversion of basically agricultural production that could have been being sent to the battlefronts in France and Belgium and supporting the war effort. You have federal prohibition coming into effect in the United States from 1920. It is a

nationwide ban on the production and the transportation of alcohol. Any bans on consumption or prohibitions there are more or less at the local level. So we do know that there was a big effect shutting down the brewing and distilling industries of the United States. So it did actually find itself in binding for everyday consumers by shutting down the 5th and 8th largest industries of the U.S. So everyone was affected initially. We do get some indication that there was some substitution of formerly legal consumption into illicit categories. And I think that's the picture almost everyone has in their mind, oh, this is all bootlegging activity. This is all about gangsters making their way and providing this huge underlying demand for alcohol in these frankly, illicit and illegal ways. So that's part of the reason why we got started on this project was that if that popular opinion about what federal prohibition was and that it was in its essence, relatively ineffective, one way of gauging that would be then to look at the effects on public health. And so that's where we've had this specific focus on various forms of mortality that emerge in the 1930s once federal prohibition is repealed. So we have some work on infant mortality. We have some work on the effects of prohibition's repeal, on basically alcohol poisoning, homicide, and in this iteration, we're looking at this effect on affected cohorts and their later life outcomes.

[Voiceover] [00:10:16]:

The decisive vote of the 36th State against Prohibition is happy news for the grain raises of the United States and for many others throughout the land with an eye on December 5, work is being rushed in distilleries and bottling works. Thousands are being called back to work in plants of allied industries. Immediate benefits from repeal extend into almost every line of business and commerce. However, everyone's not waiting until December 15. The lid is off in many ways...

Tim Phillips [00:10:44]:

One thing we also know about prohibition well, I know it from watching movies on television is at the end of 1933, there's this big time when prohibition is repealed and everyone starts to party again. So you had prohibition. Now you don't have prohibition anymore. How does that allow you to do the sort of causal analysis that you want to do?

David Jacks [00:11:08]:

In 1933 and 34 in particular, as prohibition was repealed, that didn't really amount to significant changes immediately in terms of alcohol consumption per capita. So we have some differences emerging across time and across individual, say, counties or states. And that's a lot of what we're relying on, is that variation that's coming from differences in the access of clean, legal alcohol that emerges in 1933. And the reason for this is for the fact that, yes, in 1933, they get rid of nationwide federal prohibition, but that creates this really unique environment that then the country as a whole reverts back to the set of laws that were in existence in 1919 when federal prohibition was actually passed. And prior to federal prohibition, there's various forms of prohibition at the local level that could be happening at the city level, the county level, the state

level. So throughout 1933, as the repeal process is going along, everyone's pretty jazzed up. They're like, oh, yeah, great. We're going to be able to drink in 1934. But then they realize, wait, we have this giant legal quagmire that emerges from the fact that even though we got rid of the nationwide prohibition on production and transportation, our local laws still don't allow for actual consumption. So we're relying on this staggered rollout of prohibition at local level, whether that's at the county level or the state level, to really get at this availability of alcohol type argument.

Tim Phillips [00:12:49]:

Then you're looking at mothers who would have been able to drink and mothers who would not have been able to drink alcohol, I guess. But you're looking at the impact on their children many, many decades later, aren't you, in this research? That's quite challenging, isn't it? Which kind of cohorts can you compare? Where do you find the information to be able to do this?

David Jacks [00:13:13]:

So one of the nice things about looking at more or less contemporary outcomes in the form of this later life mortality is that we actually have access to the full universe or population of deaths that occurred in the United States from around the late 1970s all the way up until the mid to late 2000s. We don't have the information on who exactly you are, where you live, anything like this. We have the information, however, on where you were born, when you were born, where you died, and when you died. So then we can look at hundreds of millions of individuals, how long they lived, right, and whether there's any ability then to locate and figure out where they were actually born. So we take those records of all these deaths in the 1990s and 2000s and match that up with what were the local laws prevailing with respect to alcohol availability in the time around your birth, both before and after? And what does that tell us then about any putative effects on later life mortality?

Tim Phillips [00:14:21]:

So you're not trying to establish whether someone who died in this period was exposed to alcohol in utero, but you can say that it was more or less likely depending on where they were born?

David Jacks [00:14:35]:

That's correct. In the ideal setting, I think you've laid out what we would like to do in terms of really understanding this individual, Tim, born in, I don't know, Nottingham in some year, and we can really track out then what your familial background is and have an understanding and a full record of, say, what your mother's alcohol consumption was. Unfortunately, we will never be able to recover that information. That's not even a historical limitation. That is something you would face in today's setting as well if you tried to replicate this kind of exercise. But what we do

have to rely on is precisely what you delineate there. We don't know exactly which individuals in the wet states had mothers that drank. All we're looking for is a statistical difference, your later life outcomes, which is potentially correlated then with the prohibition status of your birth state or your birth county. And so this is more along the lines of what would be known as an intent to treat because, in effect, everyone who was born in your county or state was treated exactly the same as you. Now, there's alcohol available in 1934, but there will be that variation that we can hopefully account for coming from the fact that, say, your and my mother's differed in terms of their approach to alcohol or stance on alcohol. And if that's true across two individuals, once we start aggregating that up to the level of a county with thousands of people or a state with hundreds of thousands of people, that gives us the statistical power to delineate these cohorts who are exposed to alcohol availability both in the in utero period but also throughout their childhood as well.

Tim Phillips [00:16:21]:

What did you find? Is there a difference in mortality rates that was caused by likely in utero exposure in the period you're looking at?

David Jacks [00:16:31]:

Yes. So our set up, in terms of teasing this out statistically, is that we basically try to saturate our empirical model with as many of these confounders as possible with respect to common trends that are there in terms of what state you were born into or what year you were born into, other very important things which we're controlling for. Also thinking about the 1930s, this is, of course, the period of the Great Depression. This is also the period with the famous rollout of the New Deal to basically mitigate some of the financial hardship of the Great Depression. Once we control for all that other stuff, what we find is that for those affected cohorts born into these wet states, there's a 3% higher probability of dying in your 50s, 60s and early 70s, as opposed to those who were not exposed to free and legal alcohol. 3% sounds really big in some sense, but at the same measure, everyone dies, Tim, so all we're really seeing is that for this particular window of someone's life, from the age of 50 up to 75, these affected cohorts were 3% more likely to die in that period. But the unaffected cohorts, of course, could just be or will be dying later in life for sure. So it's not a huge shift in mortality that we're talking about here. But I think the important point of it, for us at least, is the fact that we can actually identify this effect statistically is quite important, and it's really going to hopefully push forward on research in this dimension and in this area in the future.

Tim Phillips [00:18:29]:

Do we know what's driving this extra 3%, what people are dying of?

David Jacks [00:18:33]:

There's also causes of death listed for every person that dies in the United States at this time. And so what's nice about this, we move away from the headline result that I mentioned before, this 3.3%, and we then go into further cause specific sources of mortality. And that is then translating into the fact that in utero exposure to alcohol availability is associated with increases in mortality coming from heart disease and stroke, which are mechanisms which make very much sense in a physiological way because this is precisely some of the systems which literature on fetal alcohol syndrome identified. We also know from work by others looking at this period of the 1930s and thinking about the deprivations of the Great Depression and how that might have marked children and those particularly in utero at the time of the Great Depression. There's some great work by two researchers, Duque and Schmitz, are actually able to show that the Great Depression had this effect on people's epigenetic aging. So even at the cellular epigenetic level, they can track this out. In the 2000s, in the 2010s you can delineate that if your mother suffered during the Great Depression, it actually resulted in you having accelerated aging in later life. So we imagine that we have the same sort of stressors that emerge with respect to the Great Depression in terms of physiological mechanisms can also be there with respect to the stress that alcohol induces on embryos while in utero.

Tim Phillips [00:20:17]:

And with that in mind, you can be certain that this is about in utero exposure. It's not just some artifact of early years care for these children.

David Jacks [00:20:29]:

One of the things that we're trying to check for is the fact that there are no what is known as parallel trends violations. So basically this idea that whatever is driving later life mortality, which we correlate with prohibition status of your state, that that wasn't actually in existence prior to the repeal federal prohibition. So doing that also allows us to look at the perspective of individuals or cohorts born in a particular state in a particular year. So say Texas in 1935, we can track out the estimated effect of your state going wet both prior to and after your actual birth. And so that then allows us to really pin down the fact that everything that we establish in terms of a statistical pattern is coming from your potential in utero exposure. So it's not about early childhood experience and some of the very compelling stories that people would have around this would be oh, this is a child born into a household with extreme amounts of alcohol consumption. This is about dads getting their paycheck on a Friday and disappearing into the pub and the bar until Saturday or Sunday and just drinking away their wages and there's nothing left for paying the rent or purchasing nutritious food. We don't have any indications that it's occurring in this earlier childhood setting. Right. It's really coming fully off this potential in utero exposure.

Tim Phillips [00:22:07]:

I would have thought that there might be something different about the particular places which

had prohibition before and after that might be a little bit different. Are you sure that it's not something about those places, maybe even the family structures or the health care that's available in them?

David Jacks [00:22:25]:

A little bit of this revolves around this idea that within the empirical model, again, we can have saturate everything that we could control for. So we have these statistical controls for every state of birth, interacted with every potential year of death. Every year of death, interacted with every potential year of birth. So it's really this exercise in kind of removing all this variation which might be coming from these unobserved factors. Another check that we have on this as well because we are particularly concerned about say, differential health care access or maybe again, something related to families. If you thought it was something about differential health care access, one check you can do on that is to see if there's any differences across females and males or are there any differences across non whites and white people, particularly on that last component. Thinking about the racial history of the United States, you would imagine that it might be systematic differences across non white and white people particularly related to differential health care access. And the fact that we still determine the same effect for non white and white people suggests then it's really not anything related to that health care component. It's again, very much pinned down to this in utero period.

Tim Phillips [00:23:49]:

David, I assume that these health effects don't suddenly show up in your 50s and 60s, perhaps you're looking at a cohort here which represents the strongest fetuses because those effects might also show up in earlier years as well. So that would change any estimate of the impact of in utero alcohol exposure.

David Jacks [00:24:12]:

That's precisely right. So within this literature of kind of applied economics and also extending to kind of the medical literature. With respect to these in utero effects, there is what is known as kind of a culling effect. So basically the weakest of embryos are eliminated during pregnancy when there are specific harms happening during that period. And then there's also a related idea that conditional on surviving that trauma and getting through this culling, that you could still be scarred and this kind of scarring effect that we're identifying in terms of exposure to alcohol. This is a nice link to earlier work that we had where we were more concerned with the contemporary outcomes. So getting rid of a federal prohibition in the 1930s, what did that mean for mortality in the 1930s itself? So we have the original paper which was about infant mortality. There was a story here about potential maternal alcohol consumption, about that being particularly bad for children while in utero, and then that would eventuate amount to some sort of culling effect. That's precisely what we've been able to determine in a different paper that the repeal federal prohibition significantly raised the level of infant death precisely in those counties

that allow for repeal earlier rather than later.

Tim Phillips [00:25:47]:

By now, the tide has turned. Governments advise against drinking any alcohol at all while pregnant. Can we learn anything from this research that is useful for public policy now in 2023?

David Jacks [00:26:02]:

That's a very fair question. And now there's this established consensus with respect to alcohol consumption on many dimensions, with respect to public health and mortality in its various forms. But we see what could be a parallel with respect to the decriminalization and legalization of other drugs. In particular, what I had in mind in terms of genesis of this project was with respect to cannabis legalization, we're looking at a very analogous situation that just as in the 1930s, no one really knew about the long run effects of alcohol consumption for better or worse. And I think worse, we actually don't have good clinical evidence with respect to long run effects of cannabis consumption, particularly at the chronic levels or high levels that we see emerging with respect to this particular point of in utero exposure. Canada, where I previously worked, went through a very large legalization episode for cannabis within the past few years. And one of the disconcerting things to see was surveys of mothers reporting very dramatic increases in cannabis use while pregnant. And this is not a judgment call on my part. This is more about, again, the public health component here. And when pressed on what the messaging was coming down from the federal legalization of cannabis, was this presumption that, well, if it's legal, then it must be safe. And I think that's an unfortunate implicit message that's been sent out again in this particular sensitive period of time when women are pregnant. This is particularly the point in time you probably want to abstain from any alcohol and cannabis or other drug use because of these long run effects. That's about as far as we could push this in terms of learning anything from the experience of prohibition and its repeal from this public policy perspective in 2023.

Tim Phillips [00:28:00]:

Well, it is fascinating research on the limits of our knowledge on public policy and how we've managed to push those back. David, thank you very much.

David Jacks [00:28:10]:

All right. Thank you very much, Tim.

Tim Phillips [00:28:21]:

The paper is called Later Life Mortality and the Repeal of Federal Prohibition. The authors are David Jacks, Krishna Pendakur, Hitoshi Shigeoka and Anthony Wray. It is discussion paper

18274. And as David has mentioned, there are other related papers, so use this as your gateway to all of that research.

[Voiceover] [00:28:51]:

This has been a VoxTalk from the Centre for Economic Policy Research. If you enjoyed this episode, remember to subscribe. You can find us wherever you get your podcasts. Next week on VoxTalk's Economics, after several high profile bank failures in the U.S. can we make banking safe?