The Economic Impact of the Prescription Opioid Crisis in Tennessee:

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Opioids have economic impact through many channels

- Life and death (mortality)
- Labor force participation
- Law Enforcement, Judiciary, and Corrections
- Health Care Utilization
- Education and Human Capital Formation $
- Children and Families

Less like a cannonball splash: '

More like a sodium brick '

Our time today:

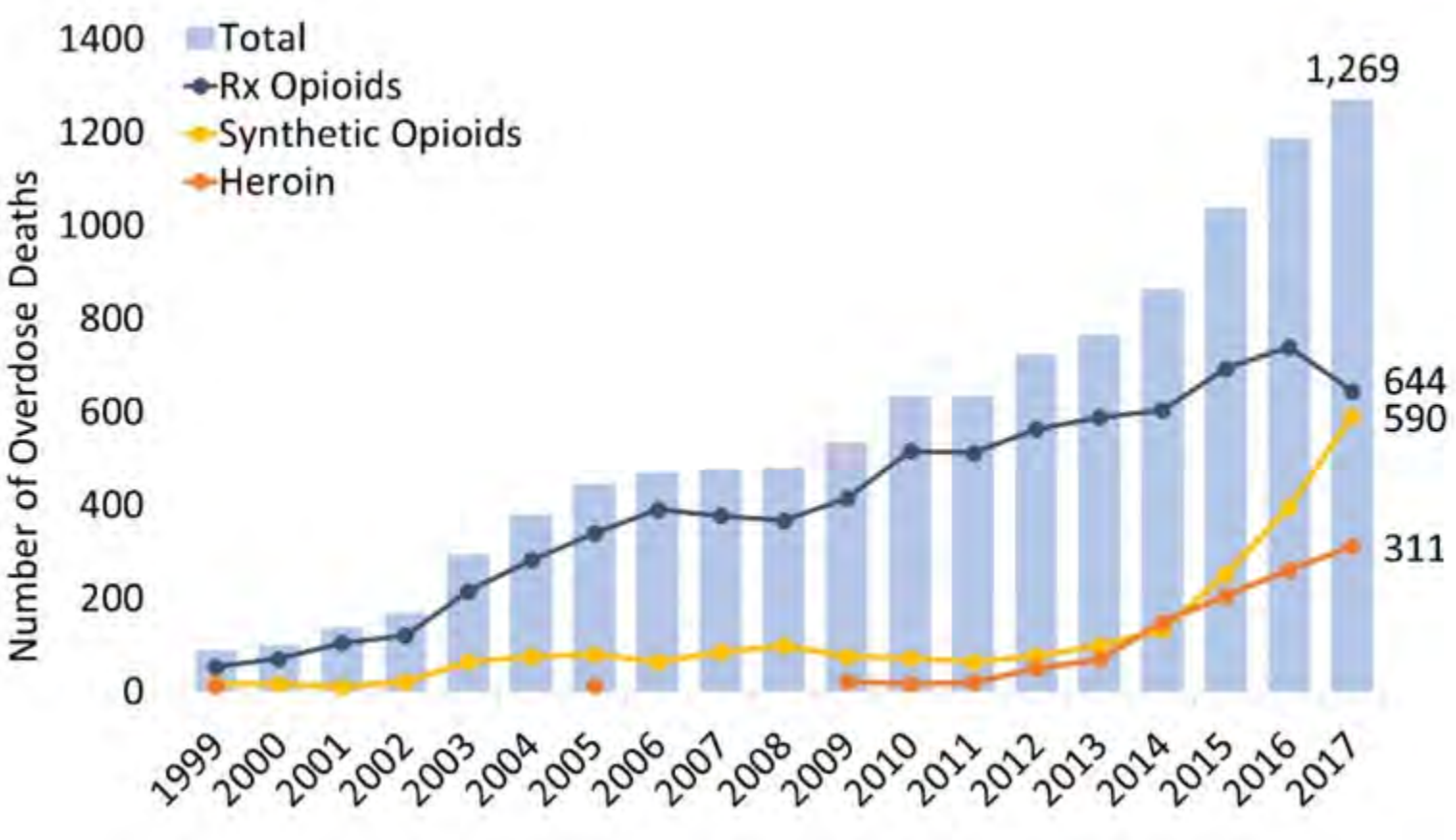
- Talk about magnitudes, but . . .
  - Estimates vary and in some cases are unknown.
- Highlight secondary and tertiary economic impacts of opioids.
- Highlight areas of intersection between these areas.
- Discuss evidence that efforts to reduce prescribing, without the right support, can do more harm than good.

Two things that bear repeating'

- $“There is some optimal number of opioids prescribed, and that number is not zero.” – Jason Hockenberry

- Policies, in all likelihood, will trade “Type 1” vs. “Type II” errors in who gets opioids.

Overdose deaths – source: CDC '



Economic Impact: Mortality '

- What we know:
  - TN 2017: 1,269 overdose deaths attributed to opioids.
  - CDC estimates the average net present value economic loss for each overdose at $1.3M. $
    - Most of this impact comes from foregone wages/productivity after the death.
- What we know less about:
  - How overdose deaths yield long run economic impact via family spillovers.
  - What is the correct “counterfactual” for an overdose death?

Economic Impact: Labor Force

- Economic impact of prescription opioid use is complicated and difficult to measure.
  - Most early impact studies focused on loss of life and resulting lost productivity.
  - Labor market effects are one component, but easily quantifiable.
- Prompted by anecdotes and rumors from local chambers of commerce.
  - Harris, Kessler, Murray, and Glenn (2018): First study to examine the causal relationship between opioid use and labor market outcomes.

Potential for ambiguous effects '

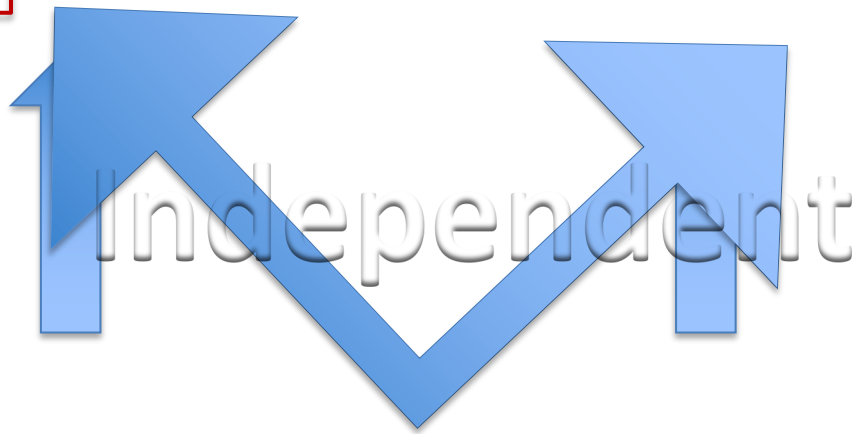
- Potential for positive effects:
  - Opioids may have some therapeutic value and may help some continue working a la Cox-2 inhibitors (Garthwaite, 2012; Butikofer and Skira, 2017).
- Potential for Negative Effects:
  - Concerns about dependence, misuse, and reduced performance/labor force participation.
  - Relationship may be similar to that of alcohol/illicit drug use and labor market outcomes
    - (Cook and Moore, 1993; French and Zarkin, 1995; Mullahy and Sindelar, 1993, 1996; Buchmueller and Zuvekas, 1998; Zarkin et al., 1998; DeSimone, 2002; Auld, 2005; Bray, 2005).

What we do '

- $ Empirically examine the relationship between per-capita Schedule II opioid prescription and labor market outcomes using county-level data.
  - $ Data from CSMD/PDMP from ten states.
- $ Why county-level analysis?
  - $ Data availability
  - $ Appropriate for estimating aggregate effects due to concerns about diversion (Lipari and Hughes, 2017; Garnier et al., 2010; Surratt et al., 2014)
    - $ 2013-2014: 66.3 percent of 'misused' opioids were from a friend/relative
    - $ 25.2 from a doctor
    - $ Only 8.5 from a drug dealer or stranger
  - $ County is a decent proxy for immediate physical social network AND a common region for policies to promote labor force engagement and economic development.

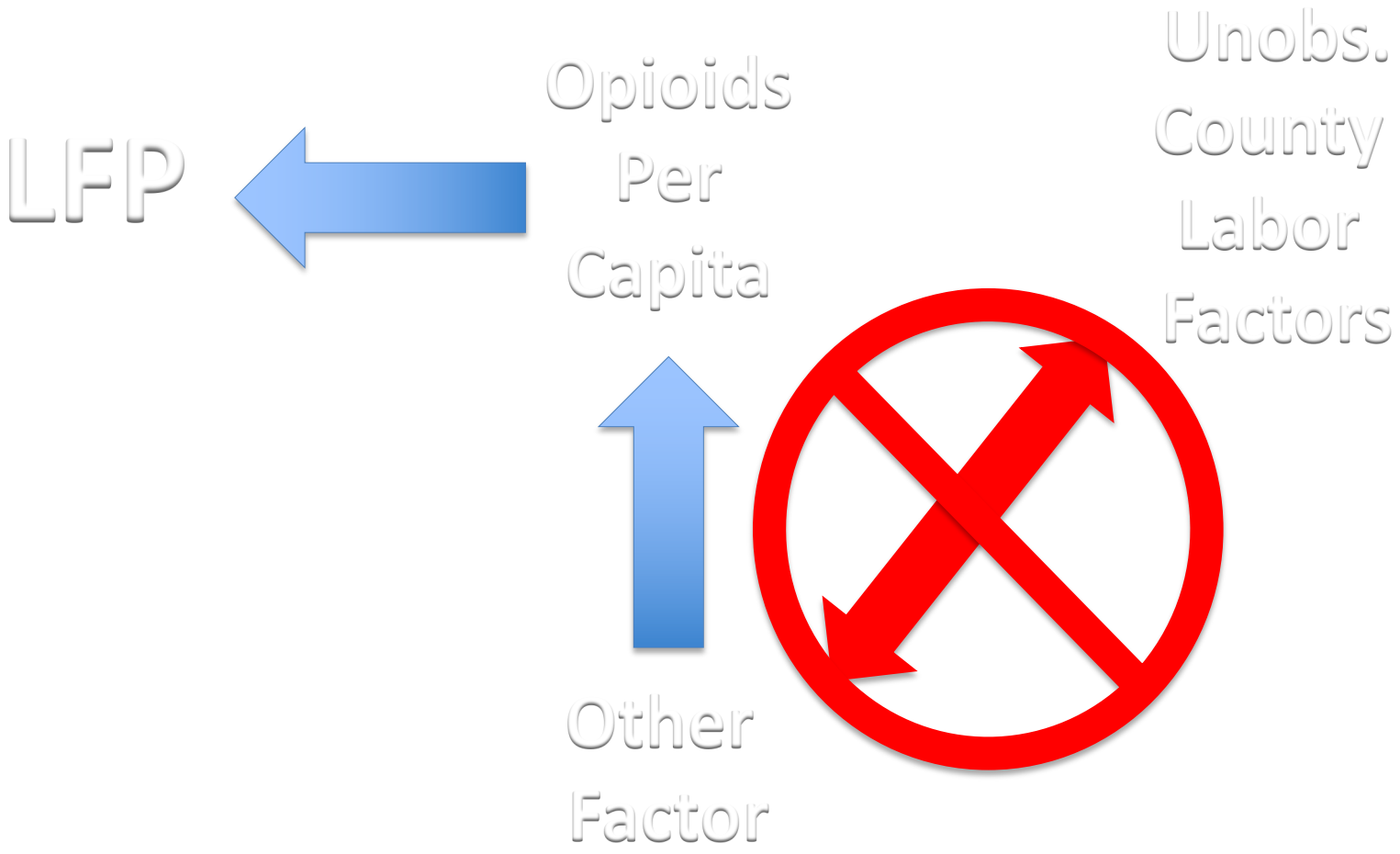
Empirics and Causal ' Identification '

$$Y_{ist} = \beta_0 + \beta_1 X_{ist} + \beta_2 O_{ist} + \beta_3 R_{is} + \gamma_s + \delta_t + \epsilon_{ist}$$



Poor unobserved health
Poor mental health
Economic depression
Other latent factors

“Instrumental Variable” '



What we find '

- We find causal evidence that at the mean, a 10% increase in opioids prescribed per capita leads to a .56 percentage point decrease in labor force participation.
  - This implies that increases in opioid use per capita can explain over half of the decline in labor force participation since 2000.

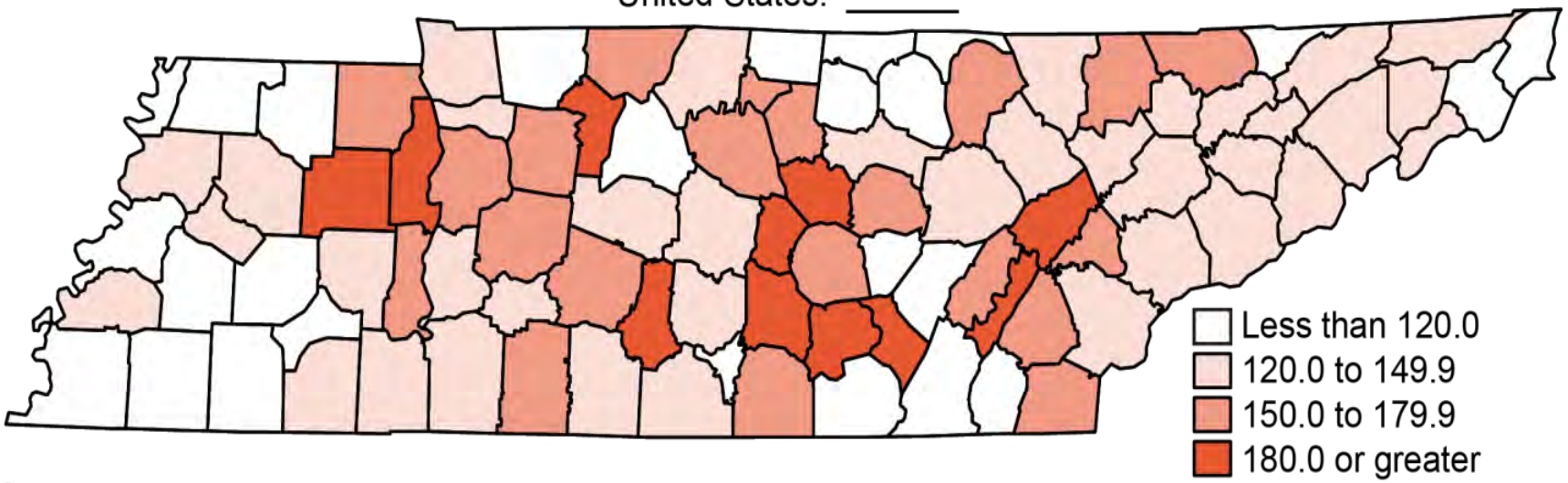
So, what does this mean in Tennessee?

A 10% decrease in prescription opioid use would lead to an additional $825 million in personal income.

Change in Per-capita Income from 10% decrease in opioids prescribed '

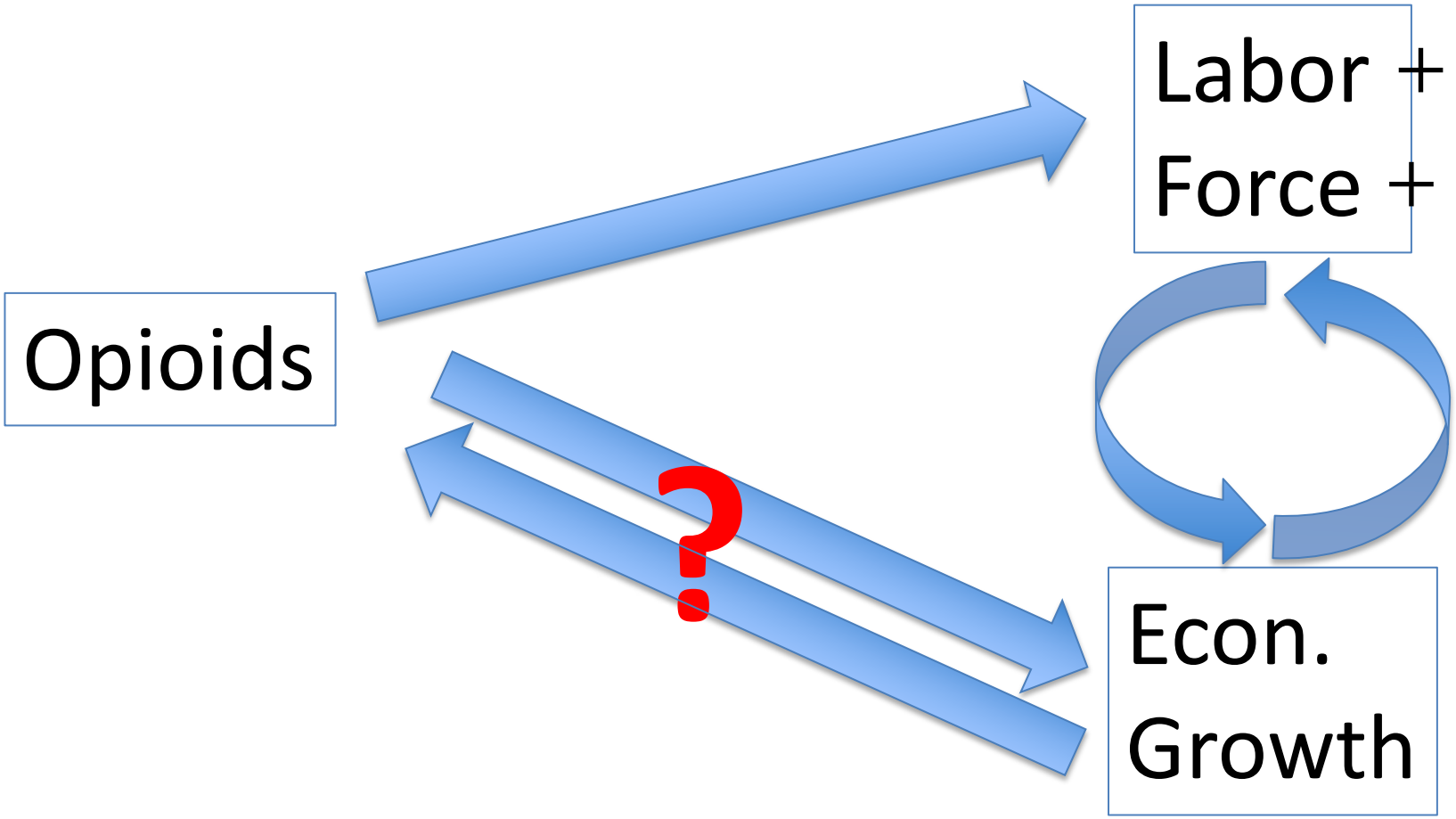
Figure ____ : _____

Tennessee: _____
United States: _____

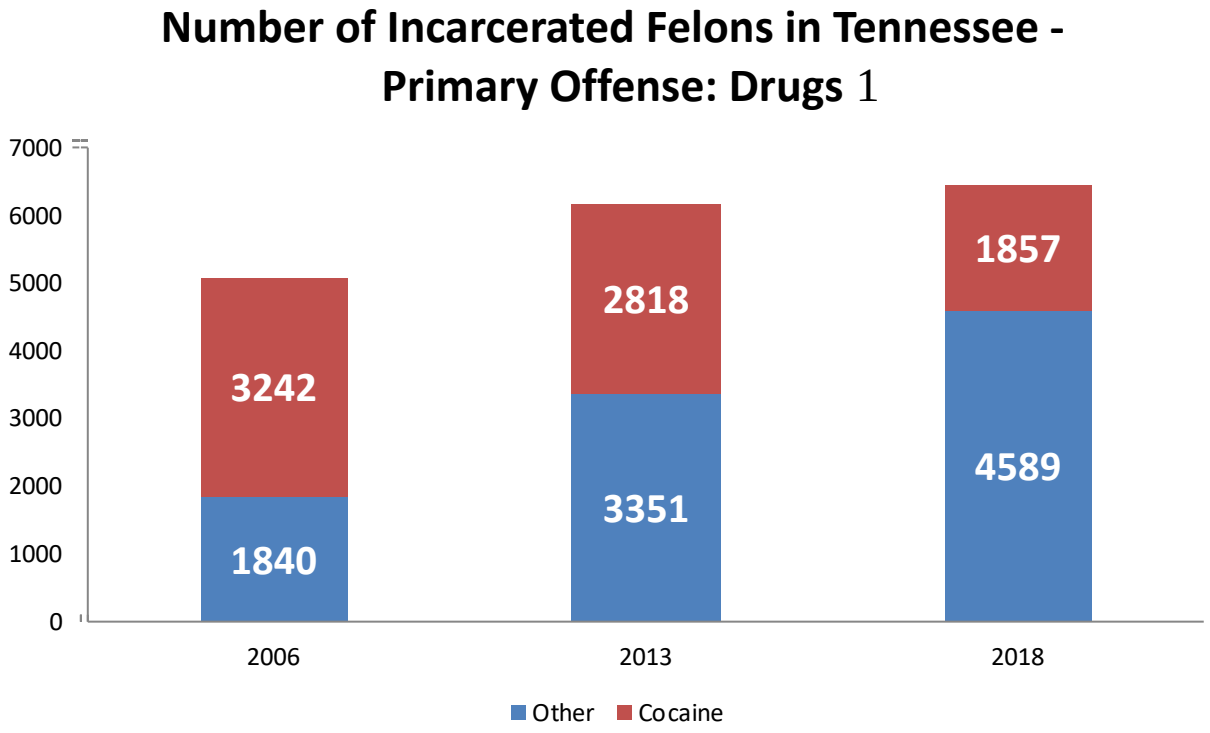


Source: _____ .

Economic Impact: Labor Market '



Economic Impact: Law Enforcement, Judiciary, and Corrections



Source: TN Department of Corrections Annual Reports

Economic Impact: Law Enforcement, Judiciary, and Corrections

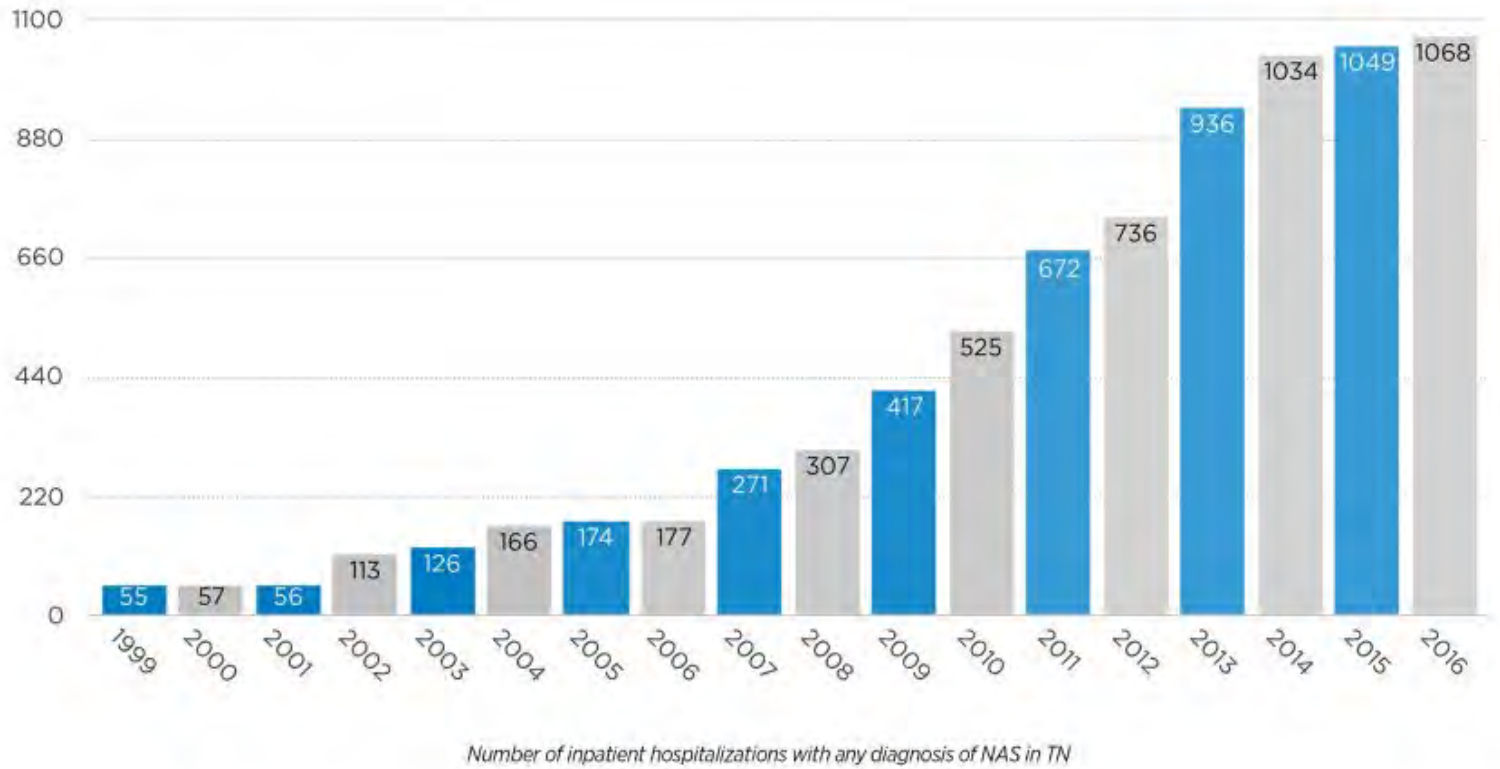
- Crime is costly–
  - Drug related crimes affect individuals' lives, property costs, and require people to take costly security and personal protection measures they wouldn't otherwise take.
- Enforcement is costly
  - Like everyone else, police resources are finite.

Economic Impact: Law Enforcement, Judiciary, and Corrections

- Incarceration is costly –
  - Operations costs: TDC could provide a better number than my guesstimate.
    - However, diversion from prison to treatment has been shown to be highly costs effective (Zarkin et al., 2018)
  - Opportunity costs: incarcerated individuals are not contributing to the tax base or GDP.
  - Dynamic costs: Individual with felony convictions are 10% less likely to be employed in the future and usually at lower wages.
    - Audit studies: felons are 50% less likely to receive a call back from job applications.
  - Dynamic costs: Effects of incarceration on children and outcomes over their lifecycle.

Economic Impact: Health Care

NAS Births '



Number of inpatient hospitalizations with any diagnosis of NAS in TN

Economic Impact: Health Care
NAS Births '

- Still climbing: 2017 – 1090 NAS births.
  - Hospital costs for infant with NAS: $19,340
  - Hospital costs for infant w/o NAS: $3,700
    - (Winkelman et al., 2018)
- Long-term costs:
  - Increased care needs over first year.
  - Children with NAS 33% more likely to have educational disabilities, requiring classroom therapy, etc. (Fill et al., 2018)
    - This studies are on a birth cohort from 2008-2011. We still have no idea what the true long-run costs are.

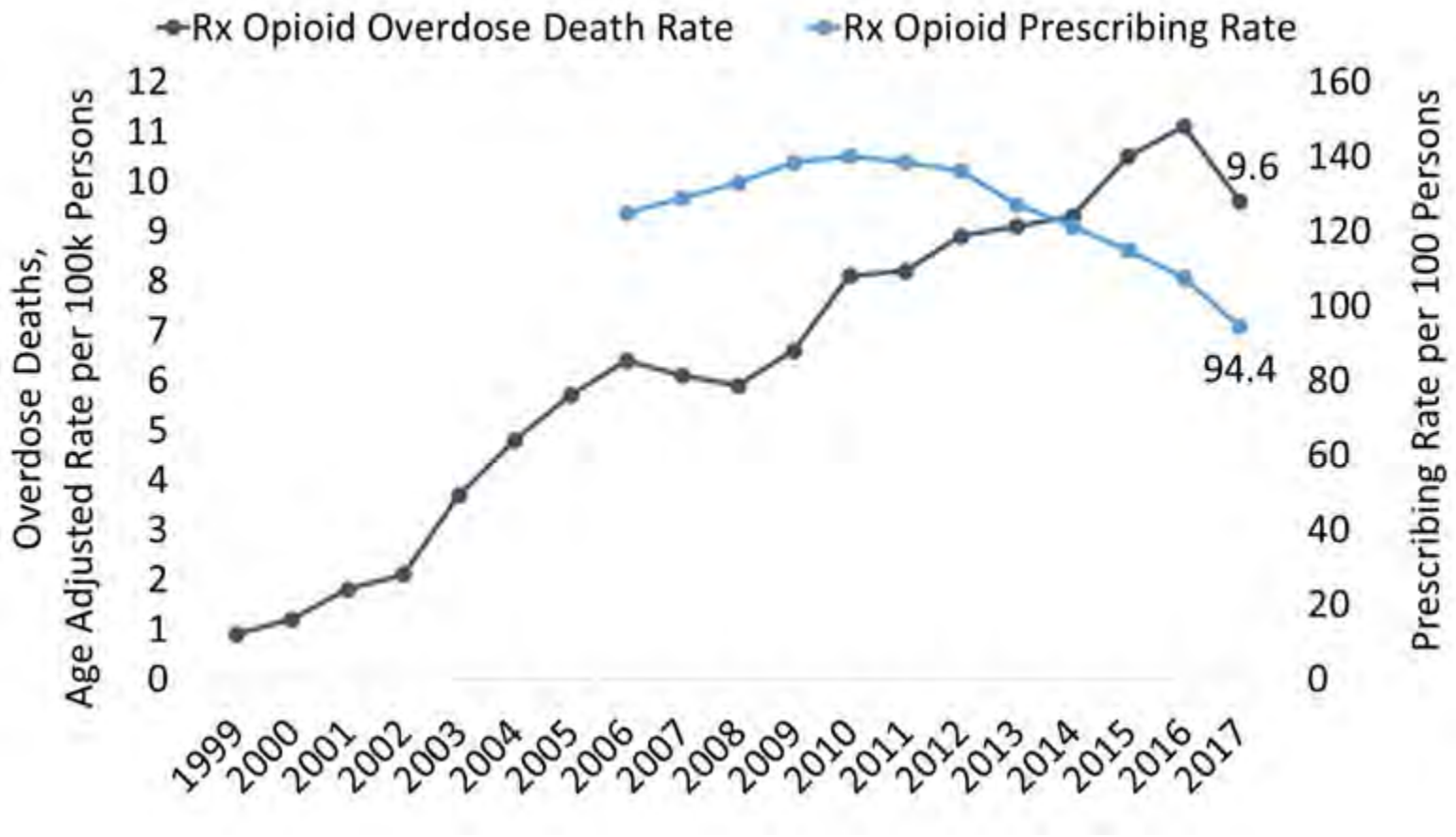
Economic Impact: Health Care

- Florence et al (2013) estimate based on matched sample that individuals who are opioid dependent cost an additional $13,700 - $17,042 to treat per year.
  - Extrapolates to $617M in TN if we are nationally representative in dependency rates.

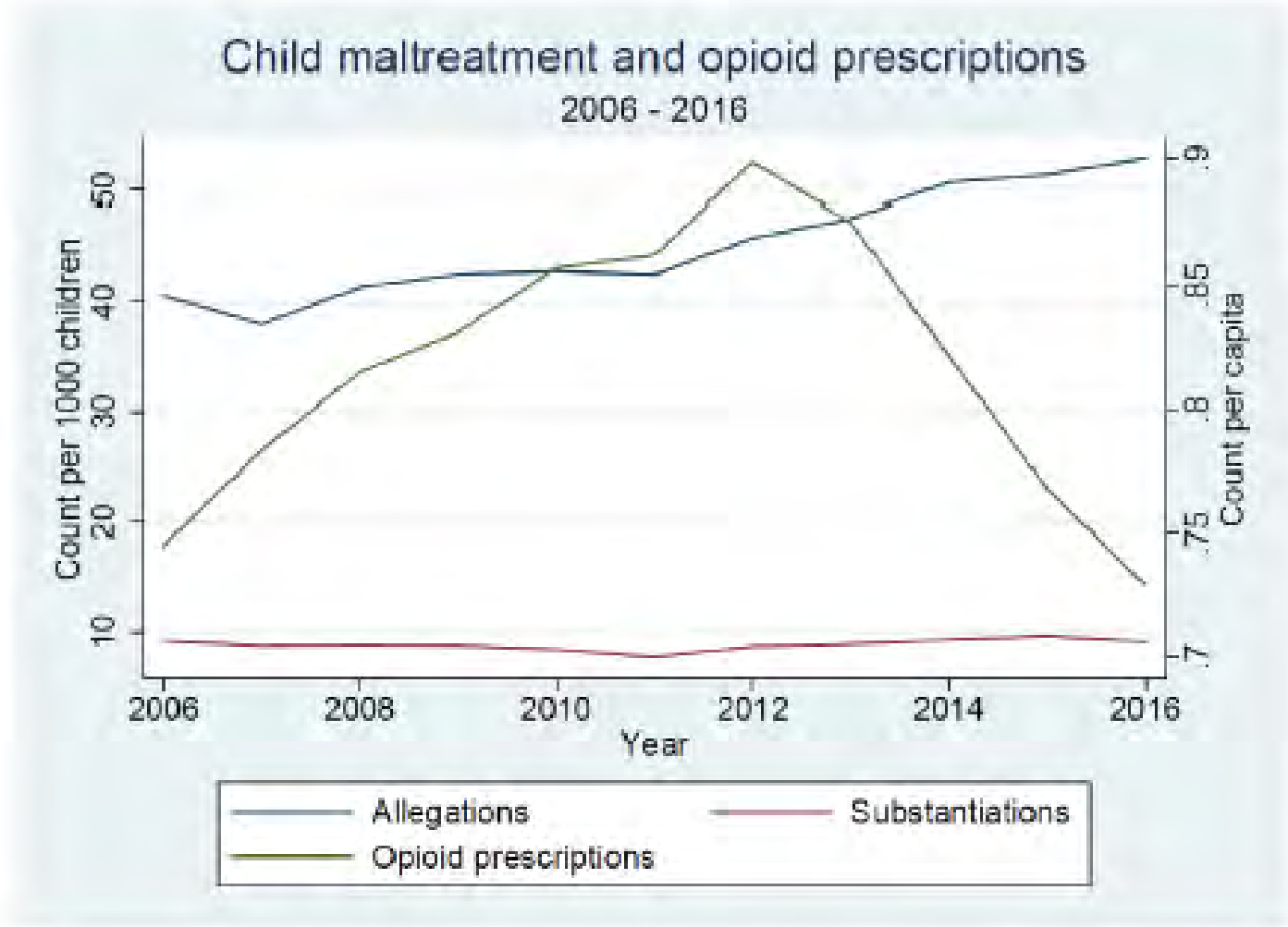
Economic Impact: ' Children and Families '

- Estimates of the lifetime economic impact of child maltreatment range: 200K-800K.
- How do opioids affect child maltreatment?
- Over the last few years, we (Evans, Harris, and Kessler) observe a negative correlation between opioid use and child maltreatment.
  - Perplexing.

As we become more aware of the crisis – prescribing is falling.



Similar pattern with child maltreatment

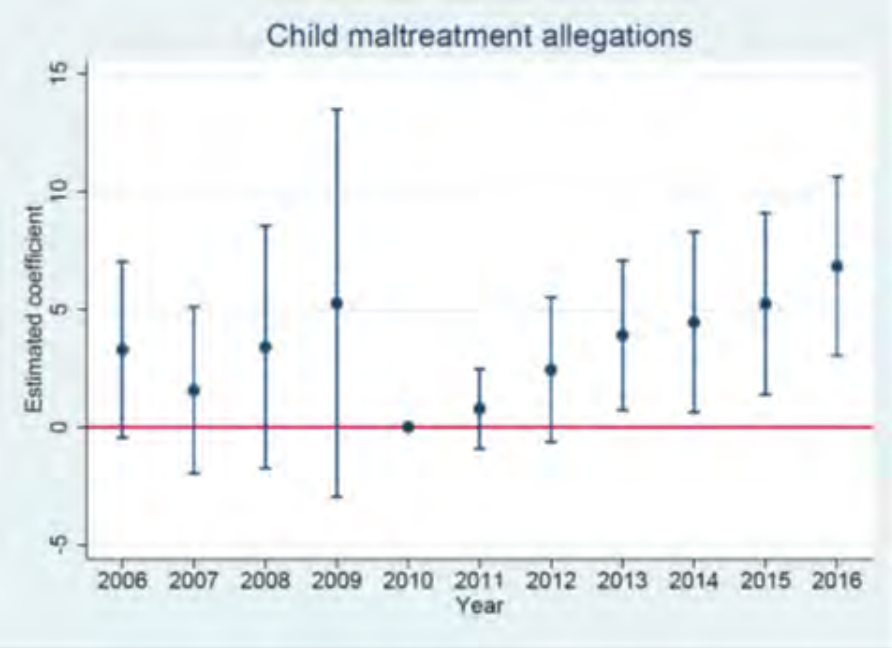


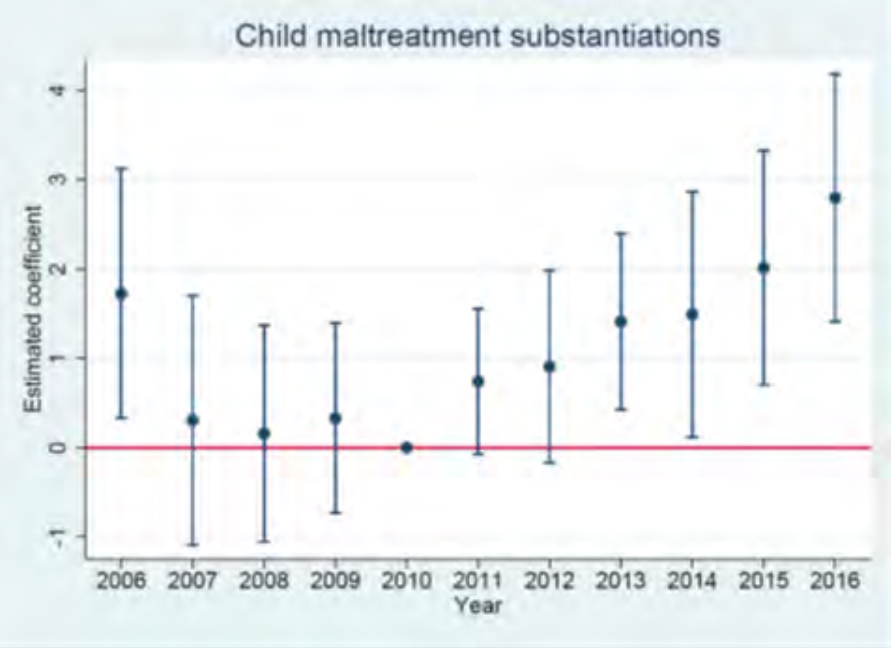
Don’t shut it off . . . '

Good Intentions, Mixed Results '

- PDMP's
  - Reduce misuse of schedule II opioids (Mallatt, 2018; Buchmueller and Carey, 2018
  - Reduce foster care admissions (Gihleb et al., 2018)
  - Increase heroin related crime in counties with high opioid use prior to PDMP implementation (Mallatt, 2018)
- OxyContin reformulation
  - Increased heroin use (Cicero et al., 2012; Cicero and Ellis, 2015)
  - Increase heroin overdose deaths (Alpert et al., 2018; Evans et al., 2019; Larochelle et al., 2015; Coplan et al., 2013)
  - Increase Hepatitis C incidence (Powell et al., 2019)

In high dependency counties – reformulation of OxyContin is linked to child maltreatment.





Working on this in real time

- Evaluating how the implementation of a must-access PDMP affects child maltreatment.
- Can we triangulate these adverse family effects using arrests for runaways or domestic violence?
- How does access to alternative like Medication Assisted Therapy mitigate these outcomes?

Key Takeaway: You are in the right room. This is worth doing. '

- $There are substantial economic gains to be had on a number of fronts from addressing the opioid epidemic.
- $All of these facets of our population are inexorably linked.
- $Evidence suggests that for *any* solution to be effective $ – each component has to be designed mindful of how these components are related.
  - Medical/Health care
  - Economic and Community Development
  - Law Enforcement, Judiciary, and Corrections
  - Neighbors and Community
  - Education
- $We *have* to figure this out *together.*

Key caveat

- No matter what plans of action come from this, empirical research reveals that people don't always respond to nudges/programs the way we expect.
- Even solid, evidence-based practices may have unanticipated spillovers.
  - Syringe exchange programs → Increased HIV (Packham, 2019)

Thank you!

. . . and let us know how we can help

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