

# Driving Under the Influence of Cannabis and Traffic Fatalities

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# Introduction

- Motor vehicle crashes are leading cause of death for ages 5-34<sup>1</sup>
- 43% fatally injured drivers <24 had cannabinoids in system<sup>2</sup>
  - 2005-2009
- ONDCP identified reducing “drugged driving” as primary goal
  - 10% reduction by 2015<sup>2</sup>

1. CDC. 2013.

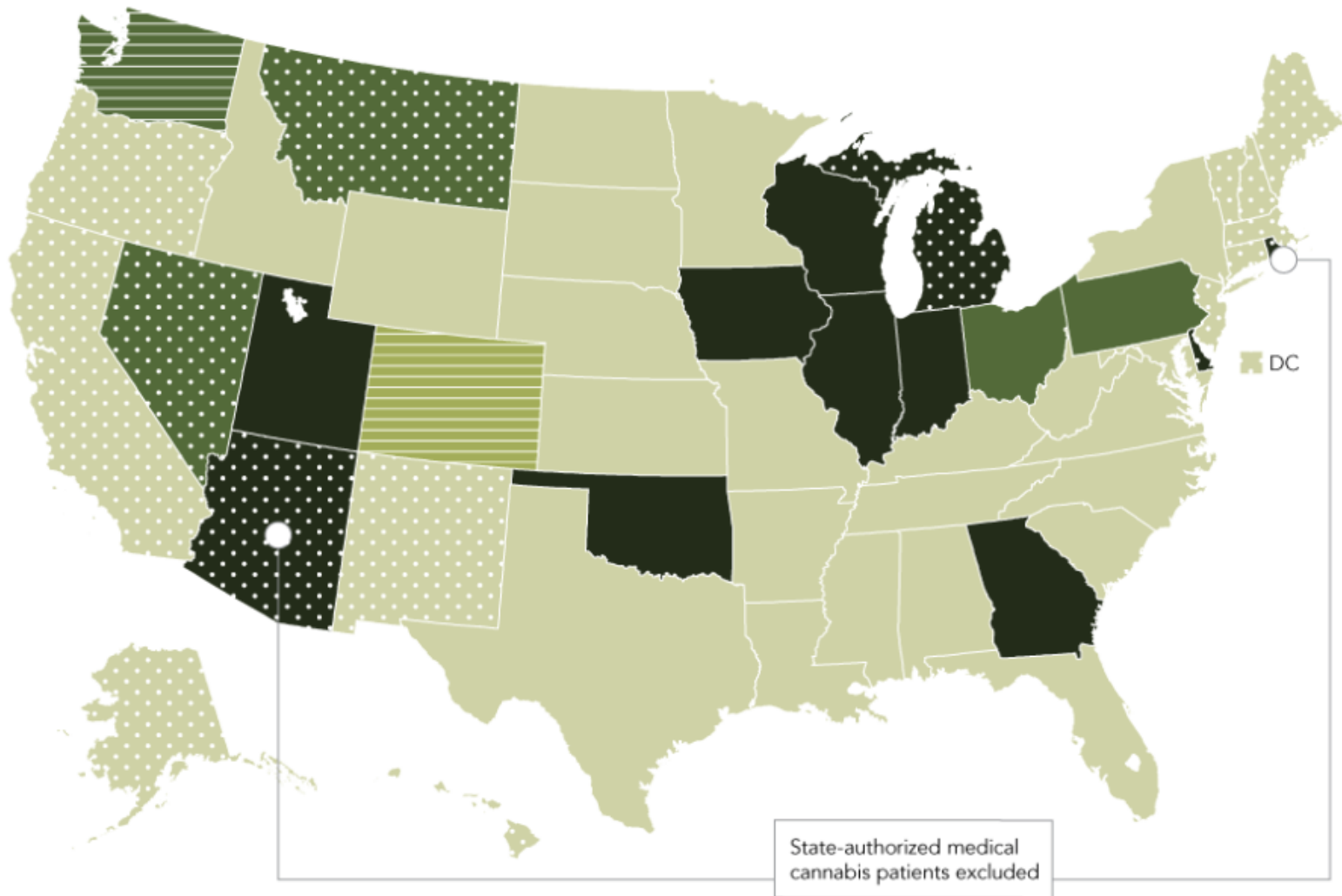
2. ONDCP. 2011.



# Policy Context

- DUID laws are inconsistent across states
- Three types of DUID laws
  - *Per se* policies
  - Zero tolerance *per se* policies (recommended by ONDCP)
  - Effect based policies
- 16 states have a DUID cannabis policy<sup>3</sup>
- Washington passed Initiative 502, November 2012<sup>4</sup>
  - Legalized recreational cannabis
  - *per se* law of 5 ng/mL of THC in the blood
  - Increase in cannabis lab tests, but no increase in overall impaired driving<sup>5</sup>

3. Hall and Diehm. 2014.; 4. Washington Secretary of State. 2012.; 5. Johnson. 2013.



3. Hall and Diehm. 2014.

### Driving laws

**ZERO-TOLERANCE PER SE CANNABIS LAWS**

State's legal limit is set at zero nanograms (one-billionth of a gram) per milliliter

**PER SE CANNABIS LAWS**

Exceeding the state's legal THC limit can result in DUI, regardless of driver's behavioral impairment

**PERMISSIVE INFERENCE LAWS\***

Impairment inferred but not defined by blood THC levels

**EFFECT-BASED LAWS**

Evidence of impairment by a recently ingested substance must be established

# Introduction

- No consensus THC level correlating with behavioral impairment
- According to NHTSA<sup>6</sup>...
  - Chronic users can have plasma levels of 45 ng/mL THC 12 hours after using cannabis
  - Inadvisable to predict behavioral effects based on THC concentration alone



U.S. Department of Transportation  
**National Highway Traffic Safety  
Administration**

6. NHTSA. nd.

# Rationale and Aim

- ONDCP recommends zero tolerance *per se* policies<sup>2</sup>
- NHTSA highlights the drawbacks of *per se* policies<sup>6</sup>
- Only one study examines *per se* policies and traffic fatalities<sup>7</sup>
  
- Explore whether Washington's *per se* law reduces fatal collisions
  - WSDOT Data: 2006-2013

2. ONDCP. 2011.

6. NHTSA. nd.

7. Andersen and Rees. 2012.

# Background

- Cognitive studies
  - Cannabis impairs perception of time, attentiveness, motor coordination, tracking, and other complex driving tasks<sup>7-11</sup>
- Experimental studies
  - Using driving stimulation equipment
  - Cannabis users show minimal impairment and tend to overcompensate for their perceived level of intoxication<sup>7-11</sup>
- Epidemiologic studies
  - Mixed results<sup>8</sup>
  - Using international data, two meta-analyses indicate a double increased risk of motor vehicle accidents associated with cannabis use<sup>12-13</sup>

7. Andersen and Rees. 2012.; 8. Sewell et al. 2009.; 9. Kelly et al. 2004.; 10. Anderson et al. 2011., 11. Lennéa et al. 2010.; 12. Li et al. 2012.; 13. Asbridge et al. 2012.

# Background

- Drivers are driving under the influence of drugs<sup>2</sup>
  - 1 in 8 weekend nighttime drivers tested positive for illicit substances
  - 1 in 8 high school seniors drove after using cannabis in 2010
  - 1 in 4 fatally injured drivers that tested positive for illicit substances were under the age of 25
  - 28% of males who tested positive for drugs used cannabis, compared to 17% of females
- Combination of cannabis and alcohol while driving
  - Combining the two increase risk of MV accident<sup>8</sup>
- Substitutes or compliments?
  - Implementing MM policies decreased fatalities and alcohol consumption<sup>14</sup>

2. ONDCP. 2011.

8. Sewell et al. 2009.

14. Anderson et al. 2011.



# Background

- Limited Policy Literature
- One study, 2012<sup>7</sup>
  - Fatality Analysis Reporting System data, 1990-2010
  - No evidence that *per se* laws reduced traffic fatalities
- One report, 2010<sup>15</sup>
  - Summarizing the implementation of *per se* laws in 15 states
  - Could not obtain DUID data from states
  - Focuses on *per se* policy implementation utilizing discussions with law enforcement agents and governmental officials

7. Anderson and Rees. 2012.

15. Lacey et al. 2010.

# Data Source

- Washington State Department of Transportation<sup>16</sup>

Collision

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graph TD; A[Collision] --> B[Law enforcement officers submit collision reports to Washington State Patrol]; B --> C[Data are compiled, analyzed, and disseminated by WSDOT's Statewide Travel and Collision Data Office]; C --> D[The Washington Traffic Safety Commission codes and analyzes all traffic fatalities as part of the federal Fatality Analysis Reporting System];
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Law enforcement officers submit collision reports to Washington State Patrol

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# Sample

- Washington State Department of Transportation
- Between 2006-2013
  - 2,195,487 collision reports filed for motor vehicle driver, passenger, pedestrian, etc.
  - Only motor vehicle driver reports analyzed ( $n = 1,579,720$ )
- Annual collision data 2006-2013, panel data set using county-level unit of analysis ( $N = 39$ )



# Variables

- Dependent variable
- 1. Traffic fatalities ( $n = 5,661$ )
  - The number of motor vehicle fatality reports in a given year
  - The same fatality can be reported more than once
- Main independent variable
- *Per se*
  - Indicator of whether Washington's *per se* policy was in effect
  - Implemented in December 2012

# Variables

- Individual-Level Covariates
  - age and sex of driver
  - month, day of the week, and time of day of the collision
  - number of motor vehicles involved
  - collision report type (state route, city street, or county road)
  - roadway type (two-way divided highway, two-way undivided highway, interchange, etc.)
  - vehicle type (passenger vehicle, truck, bus, motorcycle, taxi, etc.)
  - hit and run (yes or no)
  - contributing circumstances (DUI, DUID, following too close, failing to signal, exceeding speed limit, etc.)
  - posted speed limit
  - restraining system type (refers to seatbelt use)

# Methods

$$(1) \text{Fatalities}_{ct} = \beta_0 + \beta_1 \text{Per se}_c + X_{ct} + m_c + \varepsilon_{ct}$$

- $c$  and  $t$  index county and year
- *Per se*: indicator for WA *per se* cannabis driving policy
- $X$ : county-level covariates
- $m$ : county fixed effects
- $\varepsilon$ : error term
  
- County-Level Fixed Effects Model
  - $\beta_1$  is the coefficient of interest and represents the effect of Washington's *per se* law on fatal collisions, *Fatalities*

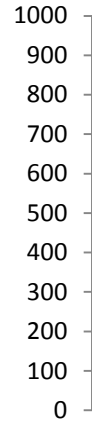
# Methods

$$(2) \text{ Fatalities}_i = \beta_0 + \beta_1 \text{Per se}_i + X_i + \varepsilon_i$$

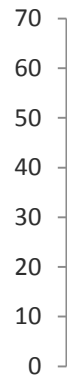
- $i$  indexes individual
- *Per se*: indicator for WA *per se* cannabis driving policy
- $X$ : individual-level covariates
- $\varepsilon$ : error term
  
- Individual-Level Regression
  - $\beta_1$  is the coefficient of interest and represents the effect of Washington's *per se* law on fatal collisions, *Fatalities*

# Results

## Fatalities



## DRE Cannabis



2006 2007 2008 2009 2010 2011 2012 2013



# Results

- Eq(1) County-level
- Adoption of *per se* law is associated with a statistically insignificant increase in traffic fatalities
  
- Eq(2) Individual-level
- Adoption of *per se* law is associated with a statistically insignificant increase in traffic fatalities

7. Anderson and Rees. 2012.

15. Lacey et al. 2010.

# Discussion

- In 2012, WA become 16<sup>th</sup> state to implement a DUI cannabis policy.
- Added to limited body of driving under the influence of cannabis policy literature
- Supports the previous study and finds no evidence of a reduction in traffic fatalities
  - Cannot determine why policy is not working
  - Poor policy design?
  - Presence of law does not mean individuals are aware of the law

# Discussion

- Main Limitation
  - One year follow-up period
- Conclusion
- What this means for Oregon...
  - Next month Oregonians will vote on recreational cannabis
  - “Drivers won’t face the driver impairment standards for THC imposed under Washington's recreational pot law.”<sup>17</sup>
  - Driving while under influence of cannabis will still remain illegal
  - Needed: a valid and reliable test to assess cannabis impairment

17. Crombie, N. 2014.

Thank you

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