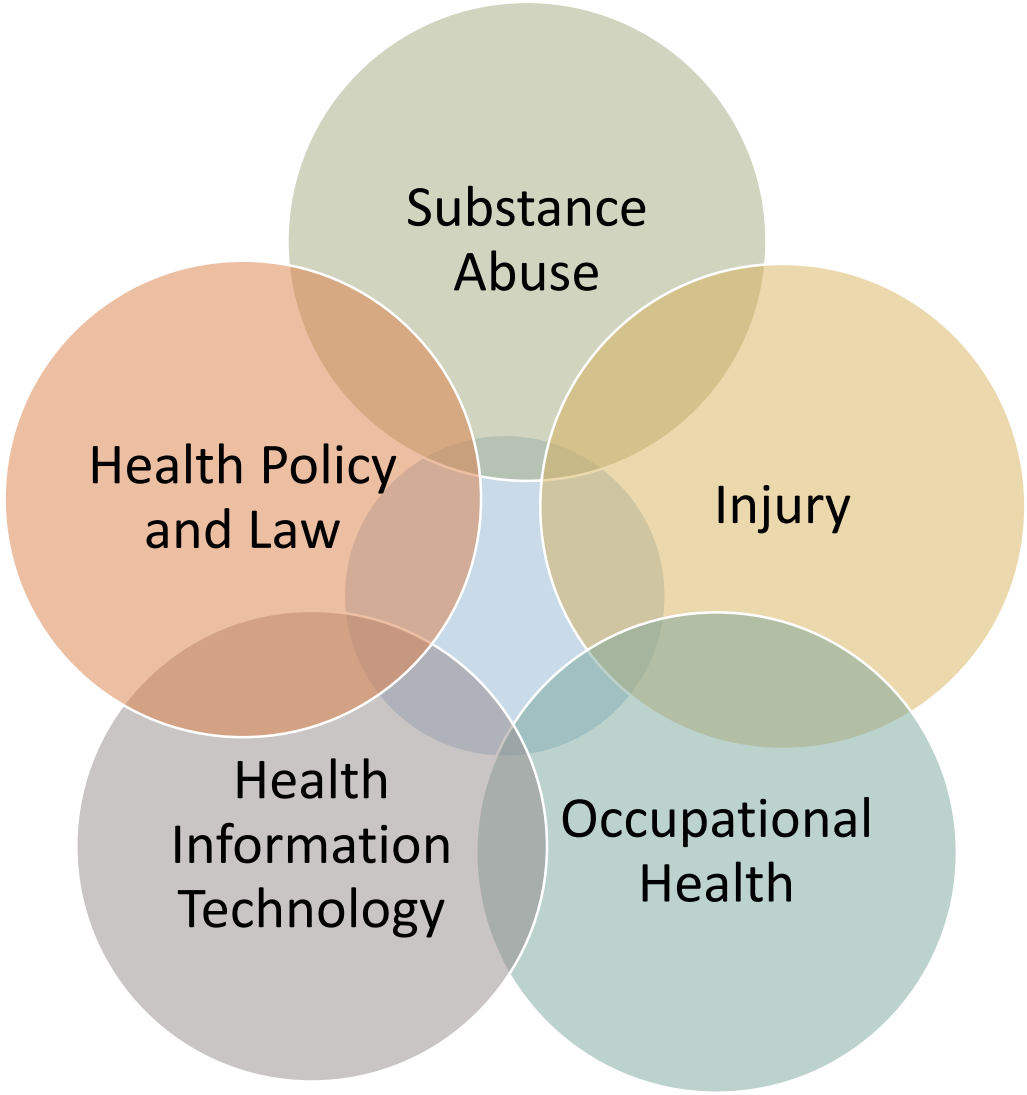
Morphine Equivalent Daily Dose Policies

Evaluating a Tool to Combat the Opioid Epidemic

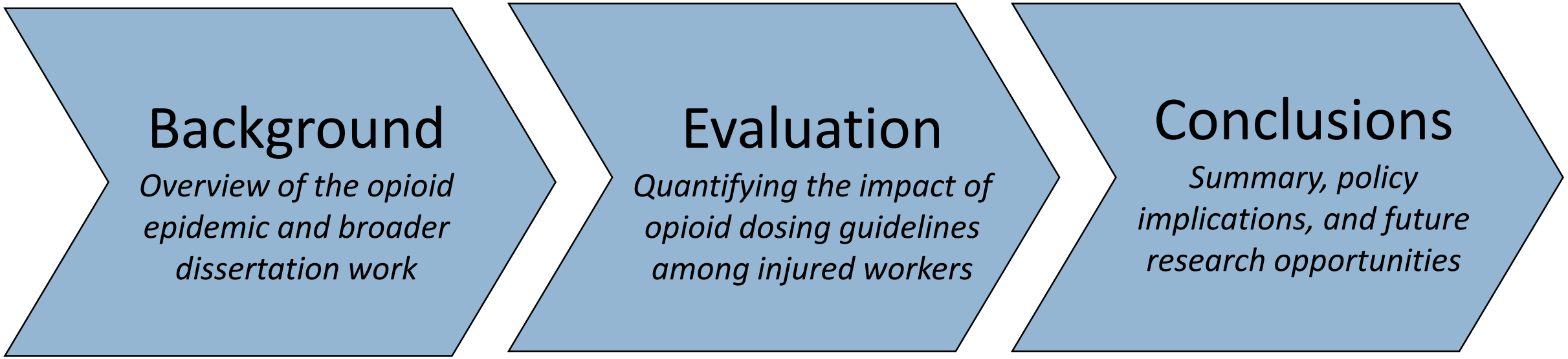
Sara E. Heins, PhD Candidate
Department of Health Policy and Management

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

My Research and Background



Outline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Conclusions
Summary, policy implications, and future research opportunities

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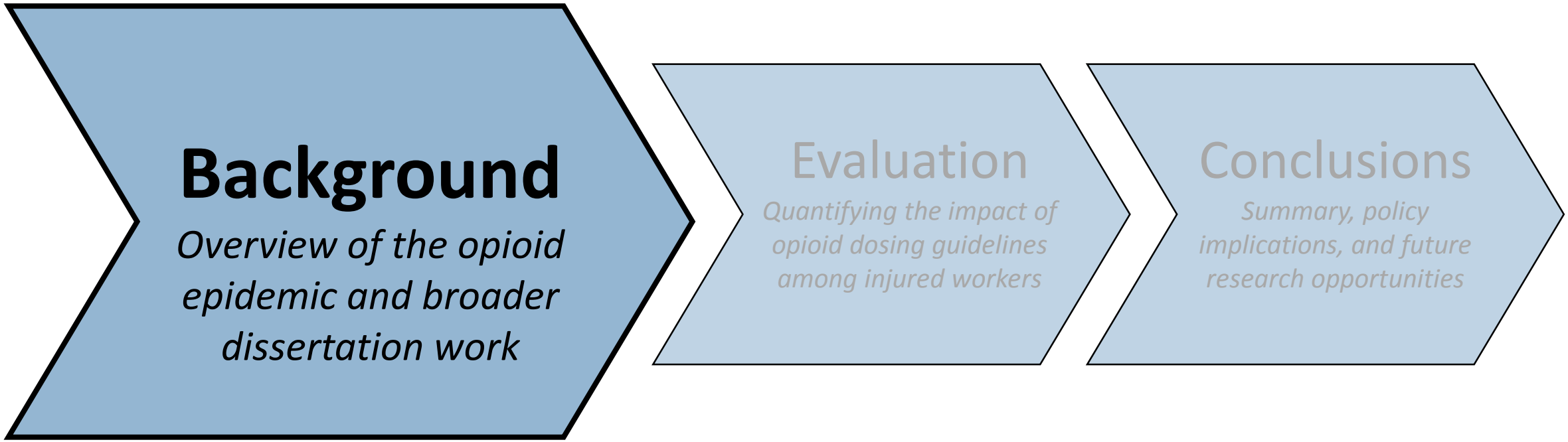
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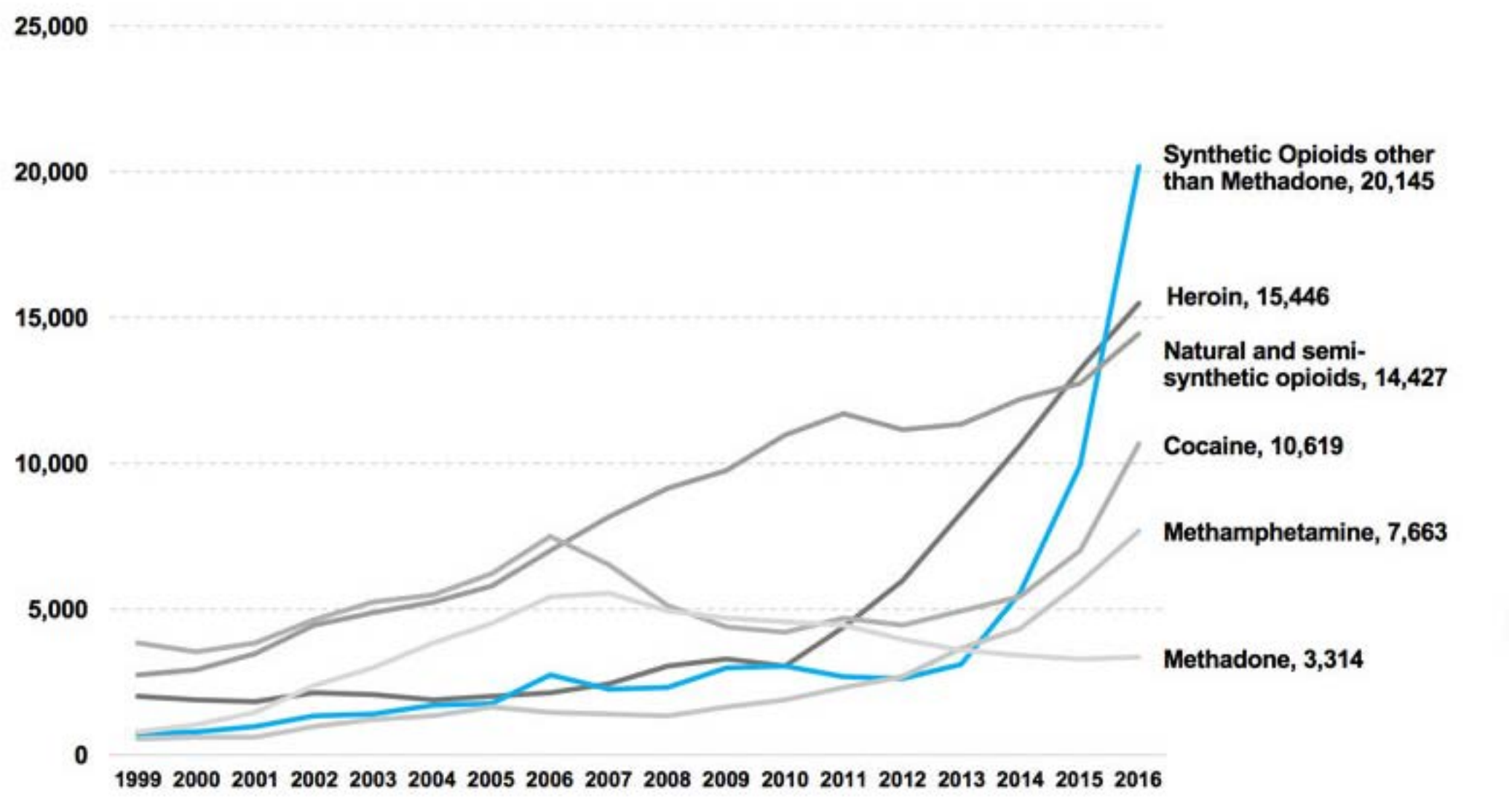
The Opioid Epidemic in America

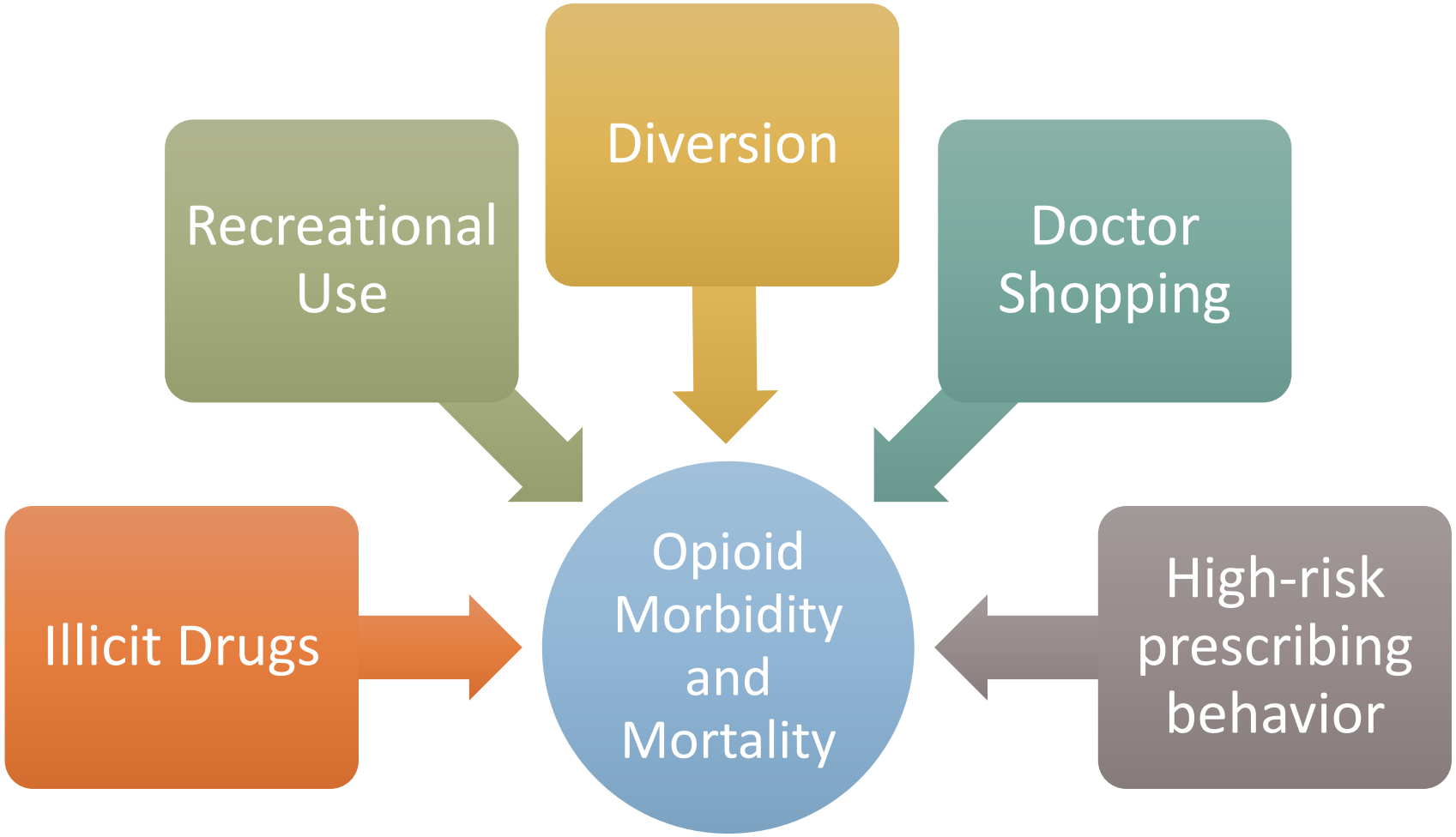
- Opioids include prescription painkillers and illicit drugs
  - Natural and semi-synthetic opioids (e.g. morphine, hydrocodone, oxycodone)
  - Methadone
  - Heroin
  - Other synthetic opioids (e.g. fentanyl)
- Prescription opioids effectively treat pain, but have high risk of dependency
- Concern that prescription opioids may be gateway to heroin and other illicit drugs
- Can cause respiratory distress and death when taken at high doses or combined with alcohol or other drugs

Drugs Involved in Overdose Deaths: 1999-2016



Source: National Institute on Drug Abuse (NIDA) https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates

Contributors to the Opioid Epidemic



Policy Responses

Rescue Drugs

Abuse-Resistant Formulations

Safe Disposal Programs

PDMPs

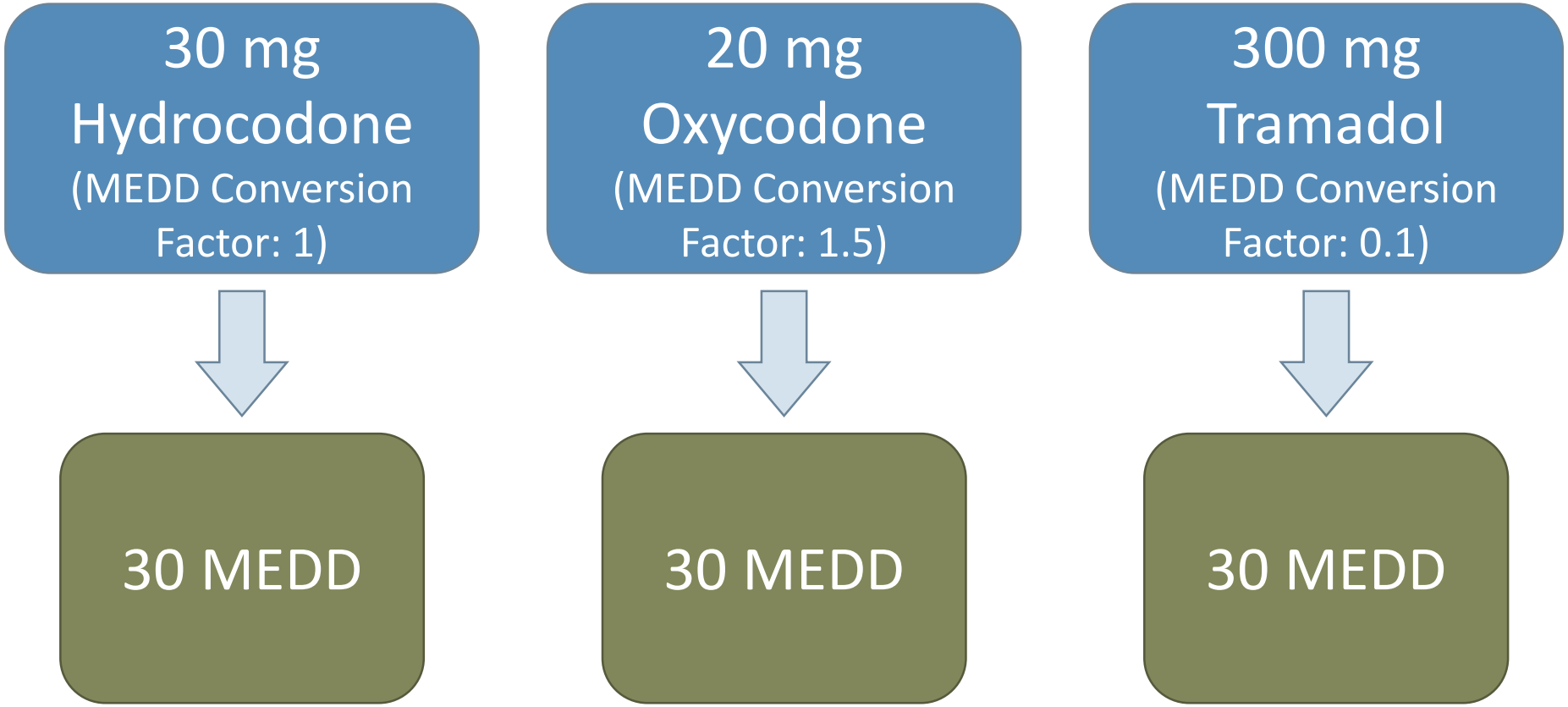
Regulation and Legislation

Guidelines and Education

Morphine Equivalent Daily Dose (MEDD) Policies

- MEDD: Measure allowing comparison across opioids
- MEDD thresholds set over which prescribing is restricted or discouraged in some way
- Threshold value and policy type varies greatly by state and organization
- Adopted by several state Medicaid agencies, health departments, workers' compensation boards, and licensing organizations

Example MEDD Calculation



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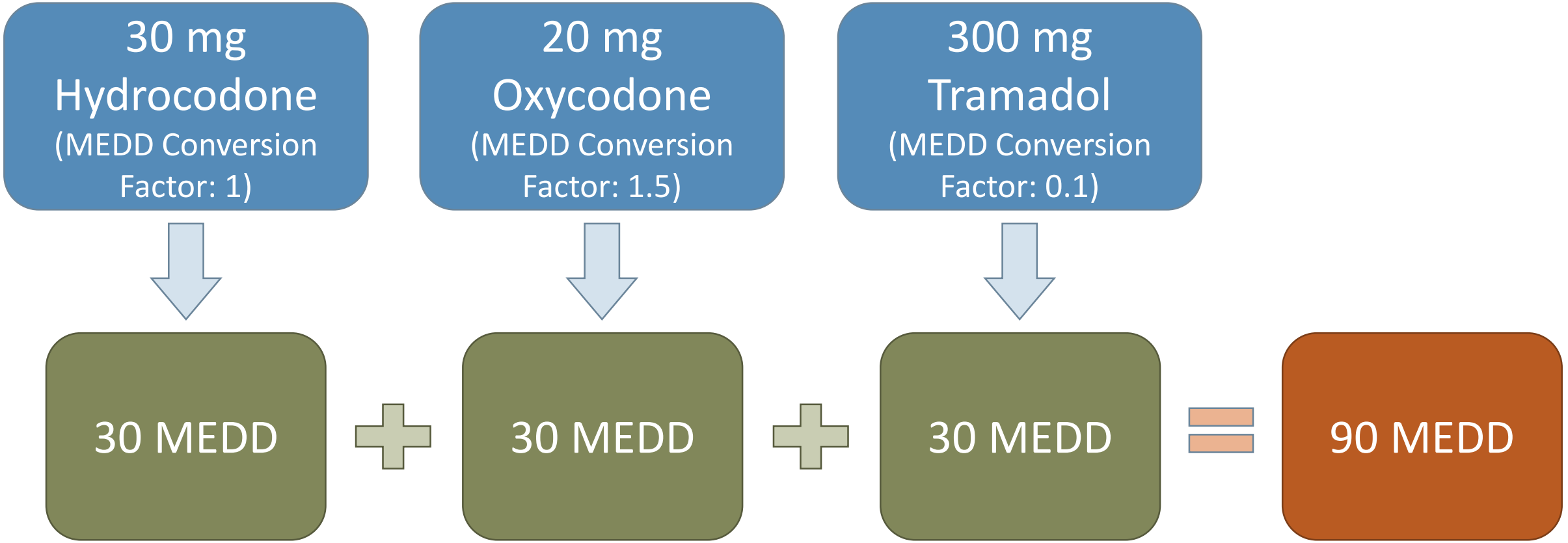

Dissertation Research

Systematically identify and characterize state-level MEDD threshold policies

Evaluate MEDD threshold policies in workers' compensation population

Evaluate MEDD threshold policies in privately insured population

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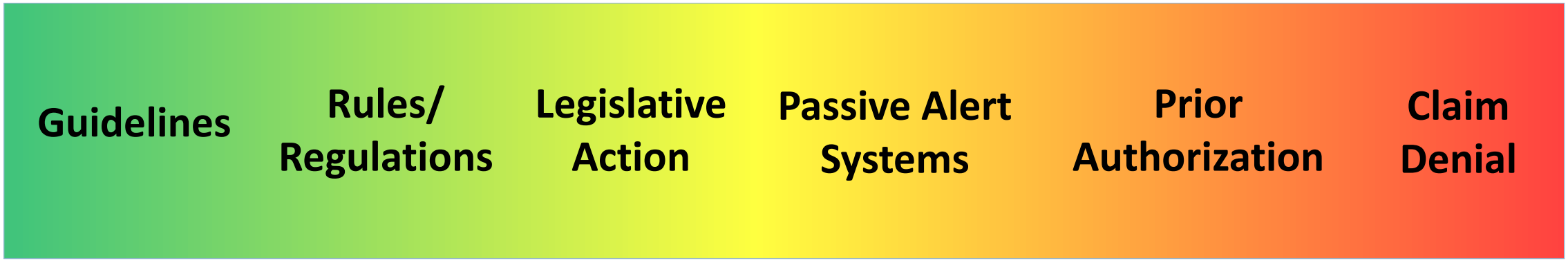
Overview of Mapping Project

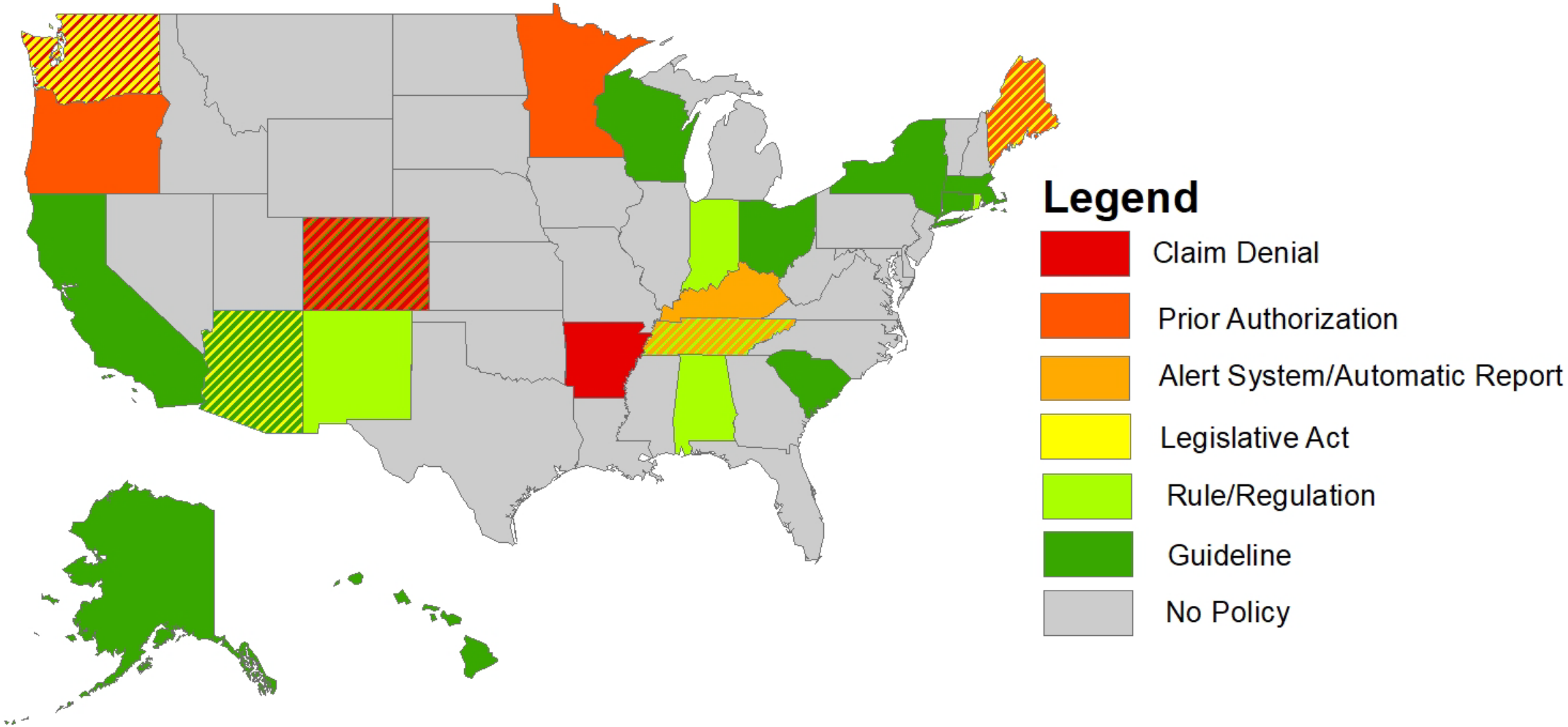
- **Search strategy:** Systematic search of legal databases and state agency websites
- **Verification strategy:** Checked final list against policy compilations, academic literature, and the Medicaid Drug Utilization Review Annual Report Survey. For states with no MEDD threshold policy found, at least one representative contacted to confirm the lack of a formal policy
- **Coding strategy:** Began with list of a priori questions and code categories. Policies were redundantly coded.
- **Analysis:** Mapped policies using ArcGIS and evaluated distribution of thresholds and policy characteristics.

MEDD Policy Types

Lower Theorized Impact *Higher Theorized Impact*



MEDD Policy Type by State



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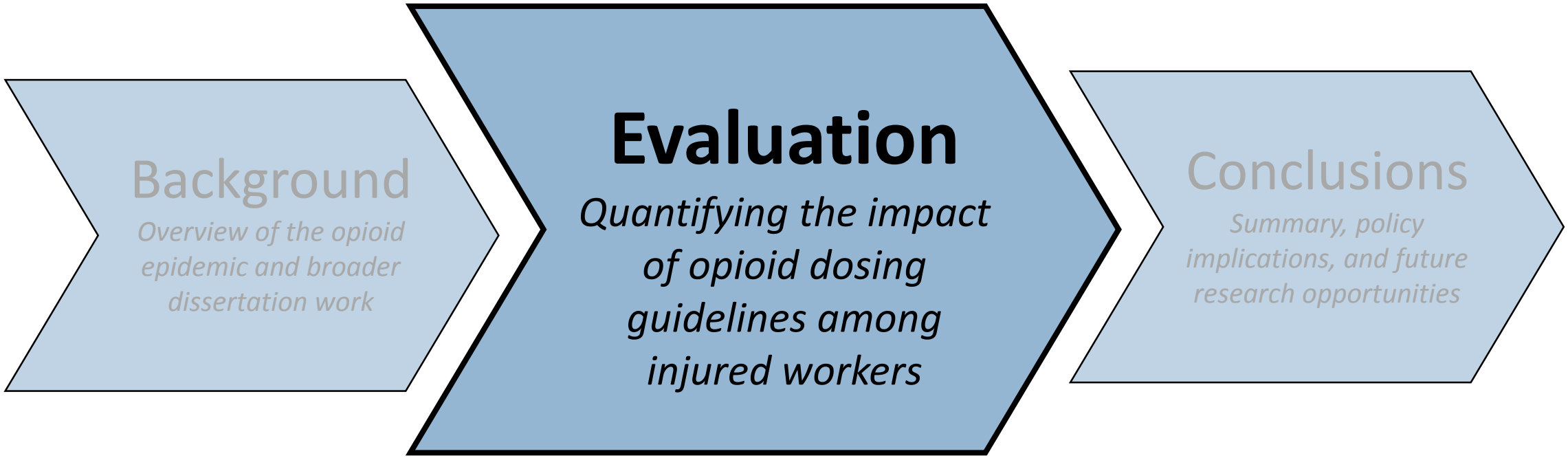
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Objective: *Evaluate the impact of two MEDD guidelines on prescribed dose in workers' compensation population*

Opioid Utilization and Policy in Workers' Compensation Populations

- Work-related injuries are common entry point to opioid use
- Long-term opioid use is associated with slower return to work
- Workers' compensation claimants tend to receive opioids at higher doses and for longer periods of time than do opioid users in the general population
- MEDD workers' compensation guidelines tend to target individuals with chronic, non-cancer pain

Dataset and Population

- Large, national workers compensation insurer
- Employees with a time-loss injury, age 16-64, injured after January 1, 2000, ≥1 opioid prescription 2010-2013
- Administrative claims data
  - Demographic and employer information
  - Diagnosis codes
  - National Drug Codes (NDC)
  - Dates of service

Policy Implementation Timeline

State	Policy	2010				2011				2012				2013			
CT	Guideline, 90 MEDD											**X**					
MA	Guideline, 120 MEDD									**X**							
IL	Control																
IN	Control																
PA	Control																

State Inclusion Criteria

Treatment States

- Passed opioid guideline 2010-2013
- Not monopolistic workers' compensation state

Control States

- No major opioid legislation, PDMP, or other MEDD policy 2010-2013
- Not monopolistic workers' compensation state
- Parallel trends in MEDD utilization pre-policy

Key Variables

- **Primary outcome**: MEDD (continuous, log, >120 MEDD, >90 MEDD) calculated using NDC, quantity, days supply, and MEDD crosswalk file
- **Main independent variable**: Policy in effect (dichotomous and months since implementation)
- **Control variables**
  - Age
  - Sex
  - Injury severity (Abbreviated Injury Severity Scores for six body regions)
  - Employment status (Full-time or part-time)
  - Months since first opioid prescription
- **Effect modifiers**
  - Acute pain diagnosis (Defined set of ICD9 codes)
  - Cancer diagnosis (Defined set of ICD9 codes)
  - High baseline use (At least one month >120 MEDD or >90 MEDD prior to February, 2012)

Analysis Strategy

- **Study Design:** Interrupted time series with comparison states
- **Unit of analysis**: Person-month
- **Model type:** GLM (Generalized linear mixed)
- **Stratified analyses**
  - Massachusetts and Control States/Connecticut and Control States
  - Acute pain diagnosis/No acute pain diagnosis
  - Cancer diagnosis/No cancer diagnosis
  - High baseline use/No high baseline use
- All models included state fixed effects, linear time trend, and clustering at the individual and state level

Population Characteristics

	Control states, N=4,482 people (40,149 months)	Treatment states, N=2,034 people, (19,457 months)	p-value[a]
State, N (%)			
MA	–	1412 (69.4%)	–
CT	–	622 (30.6%)	–
IL	1990 (44.4%)	–	–
IN	549 (12.3%)	–	–
PA	1,943 (43.7%)	–	–
Male, N (%)	3,329 (74.3%)	1,555 (76.5%)	0.06
Full-time	4,148 (92.6%)	1,809 (88.9%)	<0.001
Age, Mean (SD)	43.9 (10.7)	44.1 (10.7)	0.46
Acute pain diagnosis, N (%)	4,265 (95.2%)	1,912 (94.0%)	0.05
Cancer diagnosis, N (%)	95 (2.1%)	52 (2.6%)	0.27
ISS, Mean (SD)	3.7 (4.5)	4.1 (5.5)	0.003

a. P-values based on chi-square tests for categorical variables and t-tests for continuous variables
Abbreviation: *ISS, Injury Severity Score*

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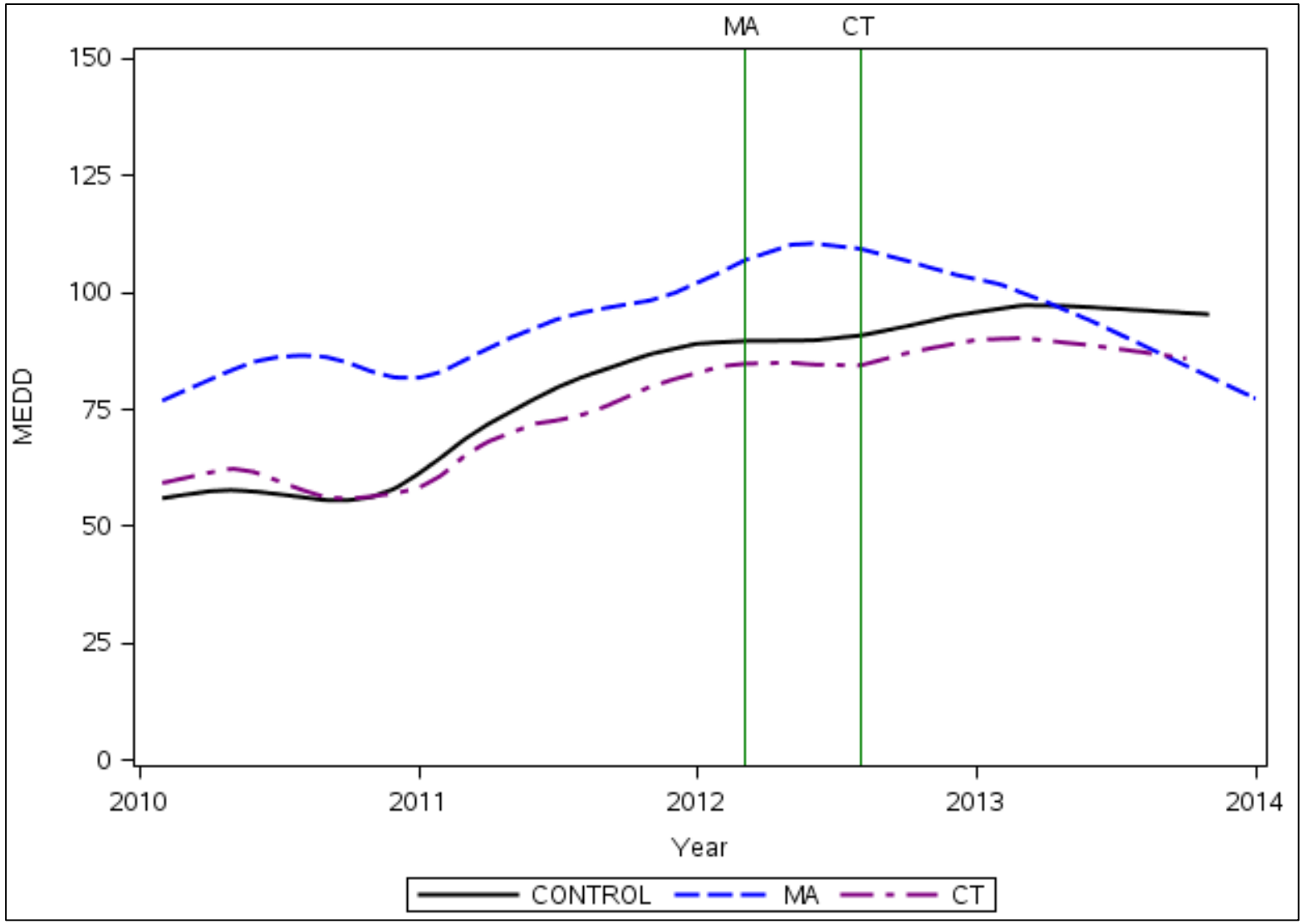
MEDD by state over time



Regression Results-MEDD Outcome, All subjects

Variable	Estimate	95% CI	p-value
Months Policy in Effect	-1.87	(-2.37, -1.37)	<.001
Age	-0.98	(-1.10, -0.86)	<.001
Male	17.58	(14.82, 20.34)	<.001
Months after Jan 2012	0.73	(0.62, 0.85)	<.001
Full-time employee	21.30	(17.20, 25.40)	<.001
CT (reference=PA)	-12.95	(-16.92, -8.98)	<.001
IL (reference=PA)	-20.26	(-23.25, -17.26	<.001
IN (reference=PA)	-23.06	(-29.07, -17.05	<.001
MA (reference=PA)	7.55	(4.28, 10.81)	<.001
Months since first opioid rx	0.73	(0.68, 0.78)	<.001

*Includes controls for six Abbreviated Injury Score body regions and clustering at individual and state levels

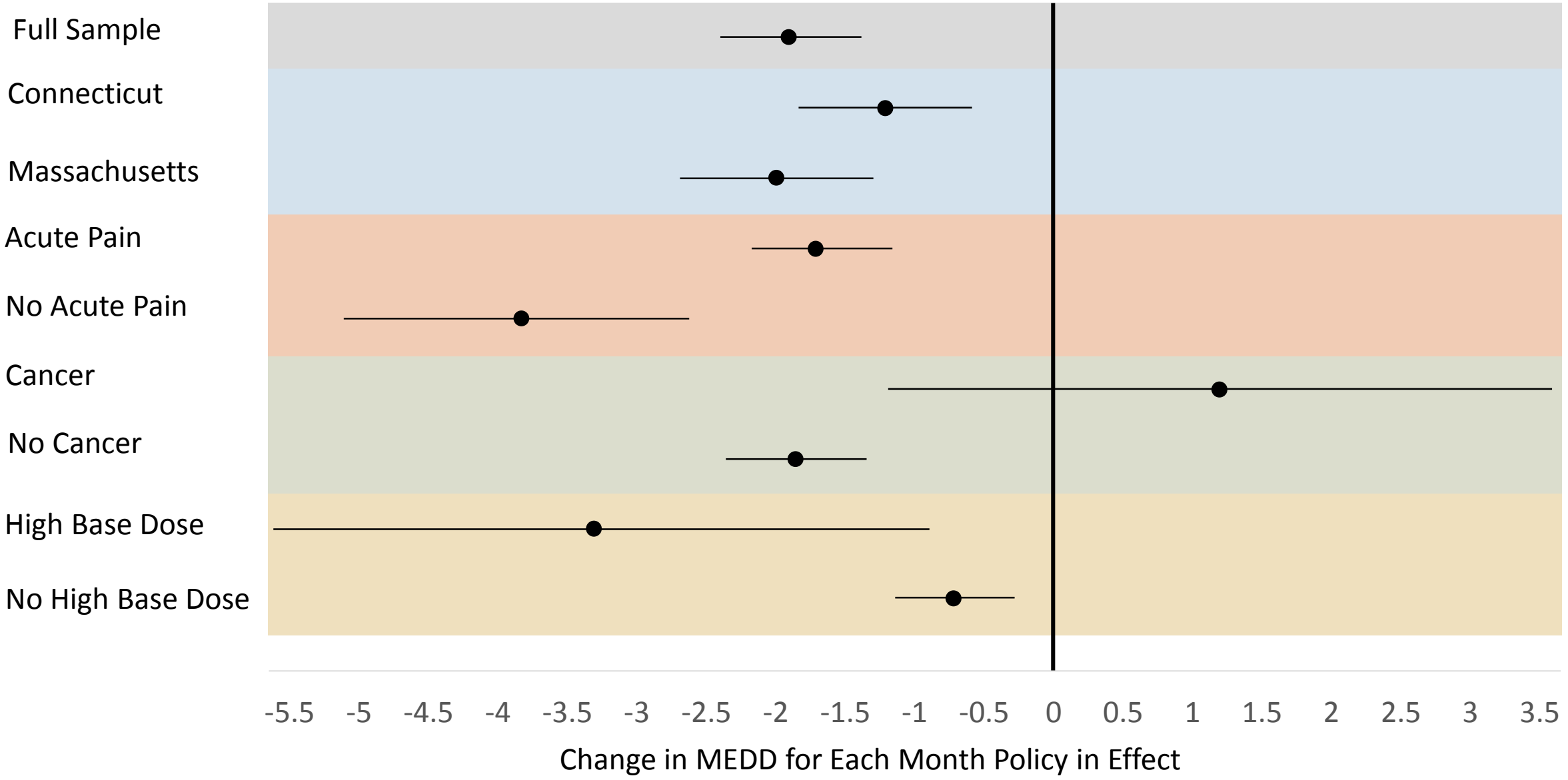
Regression Results-MEDD Outcome, Full Sample

Variable	Estimate	95% CI	p-value
Months Policy in Effect	-1.87	(-2.37, -1.37)	<.001
Age	-0.98	(-1.10, -0.86)	<.001
Male	17.58	(14.82, 20.34)	<.001
Months after Jan 2012	0.73	(0.62, 0.83)	<.001
Full-time employee	21.30	(17.20, 25.40)	<.001
CT (reference=PA)	-12.95	(-16.92, -8.98)	<.001
IL (reference=PA)	-20.26	(-23.25, -17.26	<.001
IN (reference=PA)	-23.06	(-29.07, -17.05	<.001
MA (reference=PA)	7.55	(4.28, 10.81)	<.001
Months since first opioid rx	0.73	(0.68, 0.78)	<.001

For each month the policy was in effect, patients received about 2 mg MEDD lower dose than would otherwise be expected. This translates to an **11% reduction in MEDD** in treatment states as compared to control states.

*Includes controls for six Abbreviated Injury Score body regions and clustering at individual and state levels

Effect Size and 95% Confidence Intervals by Subgroup



Strengths

- Prior policy surveillance provided strong understanding of policy environment
- Large, longitudinal database from national insurer
- Made use of multiple pre- and post- time points and control states
- Stratified analyses indicate larger decreases in MEDD relative to control states in intended target groups
- Controlled for injury severity and other demographic information

Limitations

- Complex and rapidly changing policy environment
- Opioids only observed from a single payer
- No pain scores, limited medical history
- High dose prescribing only one of many risk factors
- Population may not be generalizable to all injured workers
- Lack of understanding of MEDD calculations among prescribers
- Broader criticism of MEDD as a measure

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Conclusions

- Guidelines were associated with decreased MEDD in both Connecticut and Massachusetts
- Larger policy effect was seen in Massachusetts than in Connecticut, possibly due to more robust dissemination efforts
- Policy effects were larger among patients with chronic, non-cancer pain and those with high baseline use

Policy Implications

- Multiple policy options exist to reduce high-dose prescribing
- Disseminating MEDD guidelines to doctors who treat workers' compensation cases may reduce high-dose opioid prescribing: an important risk factor for opioid-related mortality, while still allowing for autonomy in practice
- High-dose opioid prescribing is only one risk factor for opioid mortality and a multi-pronged strategy may be appropriate

Current and Future Work

- **Current**
  - Examining nine additional policies in private insurance population, including policies with higher theorized impact
- **Near-term**
  - Impact of policies on return to work outcomes in workers' compensation population and overdoses and adverse events in private insurance population
  - Identify geographic regions with shortages of pain specialists
- **Long-term**
  - Additional policy surveillance studies on substance abuse, occupational health, and injury prevention legislation
  - Study integration of opioid-related passive alert and clinical decision support systems into electronic medical records
  - Community-based research, long-term follow-up of naloxone users

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Thank you to my advisor, Renan Castillo, and my dissertation committee members, Keshia Pollack, Colleen Barry, and Caleb Alexander. Thank you to Adrienne Ghorashi, Lindsay Cloud, and the Policy Surveillance Program at Temple Law.

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Questions?

Contact: sheins2@jhu.edu