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The role of modals in policies: The US opioid crisis as a case study ☆

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ABSTRACT

The present study uses corpus-assisted discourse analysis to examine the role of modality in policy verb phrases, using California opioid policies as a case study. By tracking the behavior of permissive and restrictive modals across time, this study highlights two potential discourse functions of modals in policy drafting: (i) to reflect the gravity of the issues on the ground, and (ii) to express permission and restriction by highlighting and deemphasizing a policy's suggestive intent, respectively. This study shows that the increased use of restrictive modality has significant positive correlations with California's worsening opioid crisis and its rising fatalities. A closer examination of state policy amendments reveals that altering policy modals has the potential to either broaden or limit the terms of existing policies. Informed by Van Dijk's "context models," this study provides a cogent applied corpus linguistics framework for analyzing policy text and offers both political and linguistic perspectives into our understanding of modals and how communities address epidemics, respectively.

1. Introduction

In 2011, the United States Centers for Disease Control and Prevention (CDC) declared prescription drug abuse a national epidemic after deaths from accidental overdose exceeded fatalities from vehicular accidents (Centers for Disease Control and Prevention, 2011). While policy documents are one of the most prominent and consequential outlets by which social issues are discussed (Fairclough, 2003), little attention has been paid to the role of modals—auxiliaries extensively used in statutes despite its potential ambiguity (Lyons, 1977)—in shaping policies. Using California opioid policies as a case study, this study addresses the following research question: "What linguistic and discursive functions do modals perform in policies?"

Employing corpus-assisted discourse analysis (Flowerdew, 2008) informed by Van Dijk's (1999) "context model" framework, this paper proposes two possible functions of policy modals. First, this study asserts that modals can reflect the gravity of the issues on the ground. The findings suggest that the worsening crisis and rising overdoses have a significant positive correlation with the use of restrictive modals. Also, the conditions under which restrictive and permissive modals are employed are in sync with the pressing concerns of the time. Second, this article shows that choosing restrictive modals over permissive counterparts can minimize a policy's optionality, while choosing permissive modals could highlight a policy's suggestive intent, therefore narrowing or broadening the set of possible interpretations in which policy stakeholders operate. Finally, this work presents key examples of California's policy amendments in which only modals were changed to show how such a process

of narrowing or broadening interpretations could potentially help adapt existing policies to emerging local realities.

Motivated by the need to understand the role of modals in critical policy issues, this study begins with an overview of the pertinent characteristics that allow modals to inform the restrictiveness and permissiveness of a policy. It then summarizes the evolution of US opioid crisis and policies. Next, this work uses corpus-assisted discourse analyses to examine California statutes concerning opioids. Finally, the findings and its implications are presented to identify how this study could inform policy analysis.

This present work contributes to the current body of applied sociolinguistic literature on the impact of policies, language and health (Hamilton and Chou, 2014; Schrauf and Müller, 2013; Ramanathan 2009, 2010; Sabat, 2006), and local realities (Hornberger, 2006; McCarty, 2014; Ricento, 2009).

2. Literature review

2.1. Policies

(Birkland, 2015) defines policy from a political science perspective as any form of communication from any level of government that declares what government intends to do to address public concerns. (Ball, 1990) and Goodnow (2017) define policies as authoritative texts and de facto practices used by governing institutions to reflect social knowledge into plans, procedures, and goals to guide local decision-making. Drawing on the linguistic aspects of these definitions, this study uses the following

Table 1

Deontic and epistemic interpretations of the sentence "You ___ take opioids."

Modal	Deontic Interpretation		Epistemic Interpretation	
Can, Could Might, May	Ability/ Permission	You have the ability/consent to take opioids.	Possibility	It is a likely that you are to take opioids.
Must, Should	Obligation	You have the responsibility to take opioids.	Necessity	It is compulsory that you are to take opioids.
Will, Shall, Would	Volition	You have the commitment to take opioids	Prediction	It is projected that you are to take opioids.

linguistically viable definition of policy: chunks of language (discourse) made up of lexical and grammatical features that denote a suggestive intent of regulatory measures and courses of action concerning a given issue.

The specific policy documents investigated herein are the statutes concerning opioids chaptered by the California State Senate and Assembly. As (Lian, 2020) states, "applying a corpus-assisted approach to the language of lawmakers can provide a glimpse into the ideologies of policymakers and politicians who create legislation" (p. 138). The language of policies permits the investigation into the current state of the community that implements it (Ramanathan and Morgan, 2007; Wodak, 2006). After all, the importance of policies relies on the need that calls for it.

2.2. Modality

Modals are grammatical features that allow us to carry out one of the most notable features of human language—the ability to express our attitudes, truths, and stances as they are displaced in time and space (Bhatia et al., 2008; Hacquard, 2016; Portner, 2009). This makes modals a popular choice for framing discourses, such as policies, intended to be carried out in the future. In fact, modals are highly salient in policy verb phrases, even if their polysemous properties can result in different interpretations of essential healthcare policies (Asprey, 1992; Garzone, 2013). Such vagueness and uncertainty created by policymakers can inflict issues on policy stakeholders tasked with carrying out the directives of policies addressing severe health concerns such as the opioid crisis among other health epidemics. This warrants a closer investigation of modality's role in today's policies.

The semantics of modals has been well discussed through their deontic (root or intrinsic) and epistemic (extrinsic) interpretations, as summarized in Table 1 (Coates, 1983; Saeed, 1997; Werth 1999; Kratzer, 2012).

Thompson's (2001) analysis of modal variation within academic writing argues that although distinguishing between deontic and epistemic forms can be informative, such classification offers little information about when or why one would choose one modal over another to communicate meaningful messages. This observation prompted Thompson (2001) to develop a model that quantifies modals according to rhetorical function instead of form. Thompson's (2001) framework examines the range of functions that writers aim to perform using modal auxiliaries to better understand its overall role in thesis writing. The present study takes on a similar, parallel approach by examining the potential range of functions performed by modals in the genre of policy drafting, allowing for a deeper understanding of how language is used in constructing policies.

2.2.1. Possible function of modals in policies

Modals Mirror Realities: In his work on political discourse and modality, Chilton (2004, pp. 57-59) suggests the "modal axis" concept, which states that people use modality to position themselves relative to their "truth" given the circumstances in that particular space and time. Here, truth could be the reality people deem as right or the actions and thoughts people seek to frame as right and just. Using Chilton's (2004)

model, if a person were to say *"I will visit the doctor tomorrow,"* they are using "will" to express a high degree of confidence towards the proposition because it is true in their reality. Therefore, choosing a different modal, like in the sentence "*I might visit the doctor tomorrow*" would have evoked a meaning that is farther from their truth. Chilton (2004) adds that in most instances of political discourse, the "self" often sees oneself as right or in the right while "the others" are perceived to be wrong or in the wrong. Since modals as a grammatical feature can express force and "realities," the modals that policymakers use could be indicative of their perceptions towards local issues and the actions they seek to address. Hence, this study renders the concepts of "modal axis" and "realities" into a policy perspective to propose that modals mirror the seriousness of issues on the ground.

Modals restrict and permit interpretation: (Searle, 1969) was among the first to relate (Austin, 1962) concept of "speech acts" to the idea of "rules," stating that "promising" as a speech act creates an obligation to enact a proposition. Meanwhile, (Boyd and Thorne, 1969)were among the first to make connections between "speech acts" and modals—describing the latter, particularly in imperatives, as illocutionary forces that assert, permit, and lay obligations, among others. Lyons (1977, p. 805) further advances the idea by describing modals as "illocutionary force operators" expressing varying levels of commitment. Although using different terminologies, subsequent studies agree that the concepts of "restricting" and "permitting" are speech acts that come with interpreting modals. For instance, Talmy (1988) suggests that some modals are best understood as the mediation between barriers and physical forces that "forbid" or "allow." Sweetser's (1990) reinterpretation asserts that the implication of these forces could additionally be intentional because modals can add or reduce barriers to either "stop" or "let" specific outcomes. Chilton (2004) uses the terms "command" or "prohibit" to describe the same speech acts associated with modals specifically found in policies. Chilton (2004) argues that—although modal interpretation is contingent upon prevailing norms at the time of use—there are undeniable prevailing patterns that allow modals to be represented in some form of scale. Simply put, Chilton (2004) implies that, although interpretation varies, we do not think of the modal "may" the same way we interpret "must" or "shall." This present study recontextualizes the speech acts that forbid or allow, stop or let, and command or prohibit into a more policy-oriented perspective that restrict or permit. Fig. 1 combines findings from key literature, including Boyd and Thorne (1969), Chilton (2004), Saeed (1997), and Werth (1999), on the restrictiveness and permissiveness of modality.

Modals found to allow for the most expansive set of interpretations are in the center, while those intended to be perceived as more restrictive are found towards both sides. For example, in the sentence "*The patient may/must/will take opioids*" the word "may" allows for the broadest interpretation because the modal simply denotes mere possibility or permission, leaving the decision to act upon the proposition to the policy stakeholder. Hence, "may" is found at the center of the scale. "Must" is similarly suggestive but more compelling due to its necessary and obligatory implications. The range of possible courses of action intended for policy arbiters to take is expected to be narrower when "must" is used instead of "may." Out of the three modals, "will" is expected to be the least negotiable of the three due to its predictive and commanding nature. This study draws on modality's ability to communicate discourses intended to prohibit or permit particular actions to make sense of modality's potential role in policies. Using specific examples from California opioid policies, this study suggests that another potential function of modality in policy discourse is to either permit or restrict certain actions through the highlighting or deemphasizing of a policy's suggestive intent, respectively.

2.3. Corpus-assisted discourse analysis

Corpus-assisted discourse analysis has been widely used in language policy and political discourse, as it allows for the analysis of
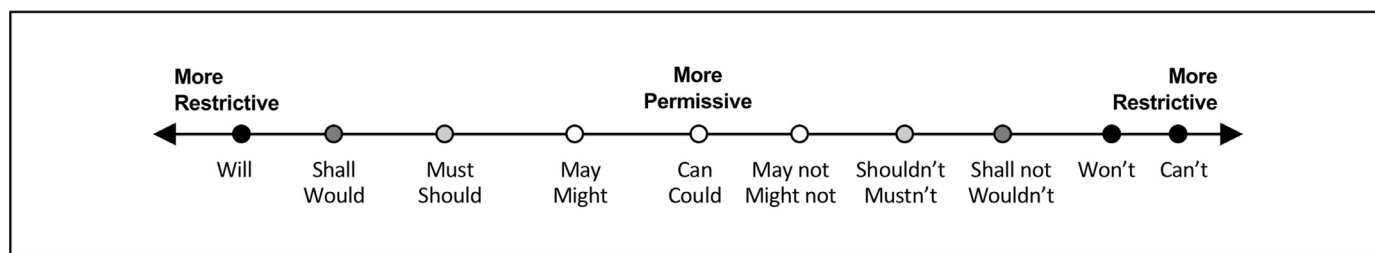
Fig. 1. Modal Scale Based on Strength of Restriction and Permission
Note. Summary of key literature on modality. Policy modals become stricter as they reach both ends of the scale.

Table 2
Four schematic categories accounted for during close discourse analysis and coding.

Category	Policy Information	Purpose
Time	When was the policy chaptered?	To map the changes in modal usage across time.
Location	Where is the policy enacted? (In this study, California is the controlled variable)	To understand the correlation between local events and modal usage.
Participants (Policy stakeholders)	To whom are the policies addressed?	To identify the policy stakeholders limited or empowered by modality.
Action (Policy action)	What is the policy about? The proposition introduced by the modal and main verb.	To reveal the purpose of the proposition that triggered certain modal choices.

large data sets through both quantitative and qualitative techniques (Flowerdew, 2008; Partington, 2003, 2008). Discourse analysis (DA) allows for a closer qualitative examination of the salient patterns revealed by corpus analysis (CA), while CA provides a quantitative textual analysis of specific grammatical features observed through DA (Baker, 2006; Friginal and Hardy, 2020; Orpin, 2005; Stubbs, 1996).

Friginal and Hardy (2020, p. 2) underscored the importance of going beyond the findings and patterns of corpus data and offering new knowledge by providing an "interpretation of the findings" and answering the question: "So what?"

DA is interpretative and explanatory, thus allowing researchers to interpret the set of possibilities that motivate and explain speech acts that are sometimes unknown, even to the language user (Fairclough and Wodak, 1997; Johnstone, 2018). This study employs DA to make sense of the modal choices of policymakers and aims to illuminate the role that modals play in policies.

Van Dijk's (1999, p. 131) context model framework—a schema designed to reduce the complexity of social situations and efficiently contextualize discourse through schematic categories—serves as the guiding principle for the DA conducted in this study. Specifically, the four schematic categories in Table 2 were conducive to the inductive coding process.

3. Methodology

3.1. Data

A total of 223 state policy documents comprising 110,108 words overall, enacted between 1970 and 2019, were gathered from California's legislative archives using the following primary keywords: opioids, controlled substance, schedule II, and narcotic (see Appendix A for a complete list of policies).

3.2. Analytical process

Step 1: creating a timeline

The first step was to map out the landmark opioid policies at the federal (United States) and state levels (California) into a timeline depicting the significant shifts in the history and sentiments associated with the crisis (Section 4). This timeline conceptualized the data narrative (Strauss and Corbin, 1997), making it useful as a backdrop against which the analysis of California policies was grounded.

Step 2: frequency analysis

After establishing the backdrop, the study focused on California opioid policies. The frequency analyses performed in this study tracked the behavior of modality and its correlation to the worsening opioid crisis. Modal frequencies were generated using MAXQDA, while statistical analyses were performed in SPSS (Version 26). The corpus was divided into a subcorpora of original policies and another of amendments to avoid conflating frequencies. In addition, the changes in all preceding and ensuing versions of amendments were carefully compared to account for newly added, deleted, and changed modals (Section 5). The patterns of restrictive and permissive modal usage that emerged from the frequency analysis helped guide the direction of the remaining study. Analysis of Variance (ANOVA) and Regression Analysis were conducted with the frequency of permissive and restrictive modals as dependent variables and "time" and "fatality rates" as predictors representing the worsening crisis. Mahalanobis distance was used to detect outliers because, unlike the typical Euclidean distance, it accounts for variables with different units when analyzing correlation (Divjak et al., 2014).

Step 3: coding for policy participants and purpose

Three coders trained in discourse analysis identified the policy stakeholders and purpose of the clauses in which modals were used. The process was informed by Van Dijk's (1999) context model framework (Section 2.2). Using axial coding, coders identified the major themes as they emerged from the corpus and finalized the categories as connections between themes became more apparent. This coding process allows categories to fit the data rather than the other way around (Strauss and Corbin, 1997). Fig. 2 and Tables 3 and 4 present the coding categories used in this study. Note that this study refers to individuals who enact or are addressed by policies with the more gender-neutral descriptor "policy stakeholders" or "policy arbiters" in place of the familiar "policy actors."

Coding was done in tandem—a process that is becoming increasingly popular in corpus-assisted studies surrounding health issues (Henry et al., 2020; Hood-Medland et al., 2021). as it allows coders to offer their expertise, discuss differences, and keep each other consistent. This method steps away from blindly going with the majority's code and allows the minority to explain their coding decisions. For example, the coders in this study debated whether a certain policy's purpose is to address substance abuse or guide state diversion programs. After listening to each other's reasoning, the coders realized that both themes have
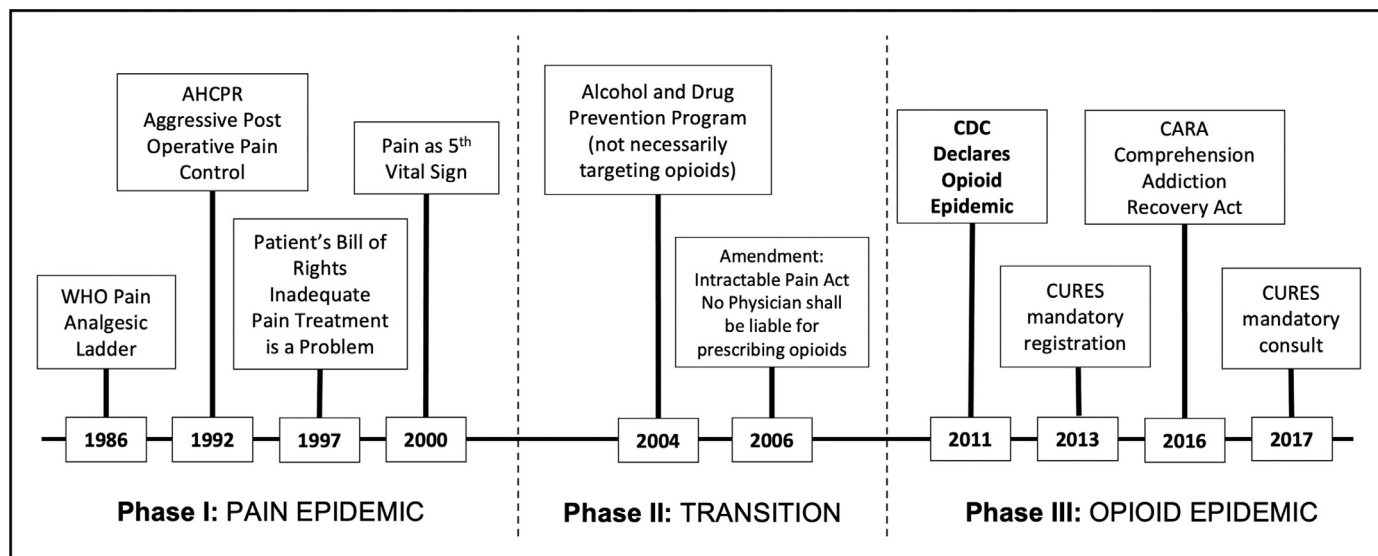
Fig. 2. The Three Phases of the Opioid Crisis Timeline with Pertinent Policy Examples.

Table 3
Policy Stakeholders Addressed in California Opioid Policies.

	Major entities addressed in policies	Description	Examples
A	**State Departments**	Local institutions, including sectors of state government, whose responsibility include public health concerns.	California Department of Health Care Services, California Department of Justice, Drug Enforcement Administration, California Department of Social Services, California Health and Human Services Agency
B	**Health care providers**	Medical providers licensed to furnish and dispense opioids	Physicians, Surgeons, Dentists, Pharmacist, Paramedics, EMT personnel, Nurses, Midwives, Emergency responders, Physician Assistants, Anaesthetist, etc.

Note. These categories were used in coding the stakeholders addressed in policies. For more examples, see Appendix C.

the same intended outcome, thus, creating a category for diversion policies. Because the recipients and the contexts of the policies were mostly evident in the text, it would be inefficient to code separately only to convene later and discuss the disagreements if coding in tandem accomplishes this immediately. Chi-square tests of restrictive and permissive modal distributions throughout each phase were conducted as well to measure any significant correlation between modality and the context in which it is used.

Step 4: discourse analysis

Finally, the patterns that emerged from CA helped guide the focus of the DA. I conducted a close reading discourse analysis of the policies, with a particular focus on the amendments of chaptered statutes. I specifically look at instances in which only the modal verbs were changed while the rest of the clause remained constant. By "interpreting" and "explaining" the motivations behind choosing and changing certain modals with respect to the severity of the crisis at the local level, I illustrate modals' capacity to: (i) reflect the gravity of local issues, and (ii) either highlight or deemphasize a policy's suggestive intent (Section 6).

Thus far, corpus-assisted DA of modals has mostly covered second language writing (Aijmer, 2002; Biber, 2006; Chen, 2012;

Table 4
Major themes describing the content of opioid policies.

	Major categoriesof policy action	Description	Examples
A	**General policies on handling pain**	Covers issues surrounding pain treatment.	Policies stating who can administer opioids in health centers.
B	**Prescribing guidelines**	Precautions and requirements needed before opioids can be dispensed, prescribed, or administered.	Policies limiting opioid prescribing. Policies on electronic prescriptions
C	**Training/education requirements**	Policies requiring policy stakeholders to develop and update their medical knowledge.	Mandatory certification requirement for physicians to take continuing education on the risks of opioids.
D	**Oversight**	Statutes granting policy stakeholders oversight power over other policy stakeholders, to keep each other accountable.	Policies allowing regulatory board to suspend licenses.
E	**Treatment of substance abuse/ diversion programs**	Includes all policies intended to address substance abuse.	Policies funding diversion programs

Note. These categories were used in coding the predicates or the intended actions to which modals were linked. For specific examples, see Appendix C.

McDouall, 2012). This paper extends the breadth of corpus-assisted modality research to include policies.

4. The us opioid crisis timeline

4.1. The first phase (1970s to 2003): addressing a lack of pain treatment

In the 1970s, the United States was dealing with an entirely different crisis—lack of pain treatment. This realization shifted the way physicians addressed pain from simply identifying its source to directly treating the pain itself (Caudill-Slosberg et al., 2004). In 1986, the (World Health Organization 1986) released the "analgesic/pain ladder"

Table 5

2006 Amendment of the 1990 California intractable pain act.

1990	2006
"A physician may prescribe or administer **controlled substances for** intractable pain."	"A physician and surgeon may prescribe, **dispense,** or administer **dangerous drugs or** controlled substances for **the treatment of pain, including, but not limited to,** intractable pain."
"No physician shall be subject to disciplinary action for prescribing or administering **controlled substances**"	"No physician shall be subject to disciplinary action for prescribing, **dispensing**, or administering **dangerous drugs or controlled substances.**"

Note. Characters in bold represent added segments. Statute was clipped for brevity. The rest of the content can be retrieved from the internet through California's legislation website.

Table 6

The 2013 Amendment of the 1996 California policy defining CURES.

1996	2013
"To assist law enforcement and regulatory agencies in controlling the diversion and abuse of Schedule II controlled substances"	"To assist **health care practitioners in their efforts to ensure appropriate prescribing, ordering, administering, furnishing, and dispensing of controlled substances,** law enforcement and regulatory agencies in controlling the diversion and abuse of Schedule II, **Schedule III, and Schedule IV** controlled substances"

Note. Characters in bold represent added segments. Taken from Health and Safety Code 11165 in which CURES is defined. Characters in bold represent the changes.

as an international guideline focused on advancing cancer pain treatment. This policy stated that if cancer pain relief is not adequate, "another strong opioid drug should be tried." Thus, physicians started prescribing opioids to relieve chronic pain. In 1990, California passed the Intractable Pain Act (Business and Professions Code section 2241.5), which stated that no physician shall be punished for prescribing opioids for chronic pain. Suffering from surgical operations also triggered the (Agency for Health Care Policy and Research 1992) guideline for more aggressive pain treatment. In 1997, California's Patient's Bill of Rights (Health and Safety Code section 124960) officially supported the use of opioids in treating chronic pain and noncancerous conditions.

Adhering to the calls made by The American Pain Society (1999) and (Department of Veterans Affairs 2000), the California Board of Registered Nursing released a policy in 2000 requiring nurses to include pain along with temperature, blood pressure, pulse rate, and respiration rate as vital signs gathered during clinic intake. Therefore, nurses in the state ask patients to rate their pain from one to ten. Nurses were also tasked with taking appropriate action when the patient's pain is not managed according to the agreed comfort level (California Board of Registered Nursing, 2000).

4.2. The second phase (2004–2010): transition to diversion

Based on the statistics presented by the CDC and the US Department of Health and Human Services, it was at this stage when the US opioid prescription rate substantially increased, averaging 81.2 prescriptions for every 100 Americans. In 2004, California released Senate Bill 1838: Alcohol and Drug Prevention Program, a blanket policy that addressed addiction. While the policy neither mentioned nor addressed opioid addiction, its larger-scale focus on drugs meant that it covered narcotics too. That said, some policies that made it easier to prescribe opioids were also enacted during this time. For example, the 2006 amendment to the 1990 Intractable Pain Act (Table 5) underwent subtle yet semantically marginal rewording. The words "dangerous drugs or" were added before "controlled substance," creating some degree of equivalency. The verb "dispense" was also added to the list of tasks physicians could do, therefore widening the possibilities of opioid treatment.

4.3. The third phase (2011 to present): the US opioid epidemic

This era marks the beginning of a more deliberate and aggressive campaign against opioid addiction, which started in 2011 when the CDC used the word "epidemic" to describe the state of opioid misuse in the country after deaths from accidental overdose exceeded fatalities from vehicular accidents. In 2013, California turned the law enforcement tool, Controlled Substance Utilization Review and Evaluation System (CURES), into a prescription monitoring system (Table 6). In 2017, physicians were required to consult CURES before prescribing opioids. The transition confirms that the opioid crisis is now predominantly a policy issue instead of a law enforcement concern.

In 2016, President Obama signed the Comprehensive Addiction Recovery Act (CARA), which became the first major federal legislation on addiction in 40 years and the most comprehensive effort undertaken to address the opioid epidemic. Ultimately, policies that came after 2011 were mostly focused on fighting the epidemic. Fig. 2 summarizes the key policies within the three timeline phases discussed above, while Table 7 provides an annual breakdown of the opioid-related fatalities in California.

5. Results

A frequency analysis of modal verbs in California opioid policies was conducted using MAXQDA, separating the original policies from their amendments to avoid conflation (Table 8).

When viewed alongside the modal scale in Fig. 1, Table 8 reveals the restrictive "shall" and the permissive "may" as the two primary modals used by California policymakers to frame the state's opioid policies. This dynamic contrast in modal choice determined the direction of the remaining analysis. The following section zooms in on the permissive-restrictive distinction to further explore the potential roles modals play in policies. Section 5.1 illustrates the correlation between the restrictiveness of modals and the worsening opioid crisis. While Section 5.2 details the correlations between restrictiveness and context.

5.1. Trends in modal restrictiveness and the worsening US opioid crisis

As the worsening US opioid crisis continue to be a fraught issue (Torres et al., 2020), changes in the frequency of restrictive and permissive modals across time can determine whether the general perception of the opioid crisis are reflected in the framing of policies. Note that each modal would have appeared in a unique policy clause; therefore, the frequency of restrictive or permissive modal is synonymous with the number of restrictive and permissive clauses.

Using ANOVA and regression analysis, with P values ≤ 0.05 considered statistically significant, time was found to have a significant positive correlation with the number of restrictive policy clauses at $p<0.050$ ($F(1,34)=9.603$, $p = 0.004$) and a positive, yet insignificant effect, on permissive clauses $p<0.050$ ($F(1,34)=2.913$, $p = 0.970$). These findings were justified by the gap between the regression coefficients of restrictive ($\beta=0.774$) and permissive ($\beta=0.159$) clauses. Hence, as general concerns for the crisis exacerbates with time, restrictive clauses significantly increased annually by 0.774, while permissive propositions increased not significantly only by 0.159 (see Fig. 3). Using Mahalanobis distance with a chi-square ($\chi2$) cut off of $p<0.010$, only one restrictive and two permissive outliers were identified but were not sufficient enough to affect the results. All statistical calculations can be found in Appendix B.

Fig. 4 reveals that worsening perception of the crisis has a strong association with the increase of stricter amendments at $p<0.050$ ($F(1,20)=14.541$, $p = 0.010$) but not with permissive amendments at
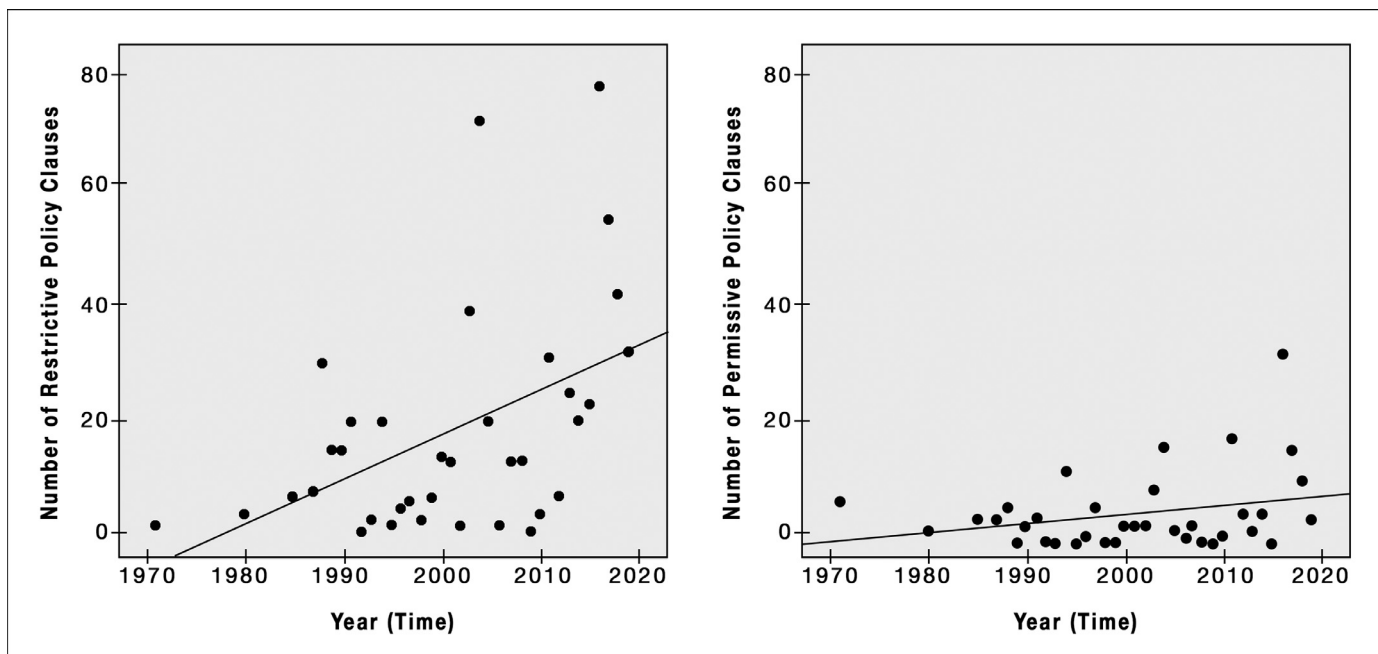
Fig. 3. Number of Restrictive (Left) and Permissive (Right) Modals/Clauses Across Time.
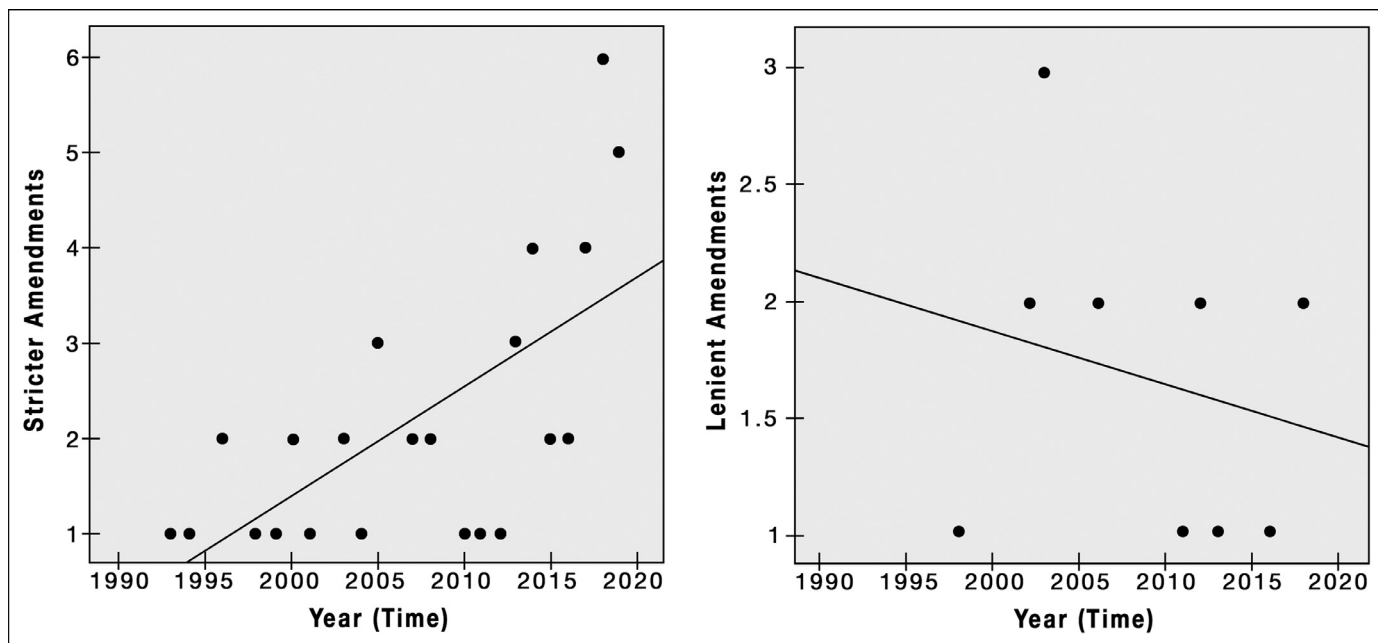
Fig. 4. Number of Stricter (Left) and More Lenient (Right) Amendments Relative to the Worsening Epidemic.

$p<0.05$ ($F_{(1,7)}=0.370$, $p = 0.562$). These findings were affirmed by the positive and negative standardized regression coefficients for stricter ($\beta=0.649$) and lenient ($\beta=-0.224$) amendments, respectively, thus suggesting that policymakers added more restrictive clauses, expunged more permissive clauses, or replaced more permissive clauses with stringent ones.

Another indicator of the worsening crisis is the increasing fatality rate. Fig. 5 reveals the number of fatal cases has a significant positive correlation with the increase in restrictive policies at $p<0.050$ ($F_{(1,33)}=7.352$, $p = 0.011$) and a non-significant correlation with the increase in permissive policies at $p<0.050$ ($F_{(1,33)}=3,236$, $p = 0.081$). The regression coefficient of restrictive policies ($\beta=0.012$) means that one restrictive policy is added for every ten opioid-overdose casualties.

5.2. Correlation between modality and context

5.2.1. Policy stakeholders: who are the policies for?

A chi-square test of modal distribution revealed a strong dependency relationship at $p<0.050$ between modal use and policy stakeholder throughout the first and second phases (see Fig. 6). Hence, from the 1970's up to the 2011 CDC declaration of the opioid epidemic, the likelihood of stricter policies being applied towards health care providers than their state counterparts was higher. Likewise, state departments had a higher chance of being subject to more permissive policies. On the contrary, modal distribution during the third phase was no longer predictable at $p<0.050$, showing a more balanced distribution of restrictive actions toward state departments and health care providers.
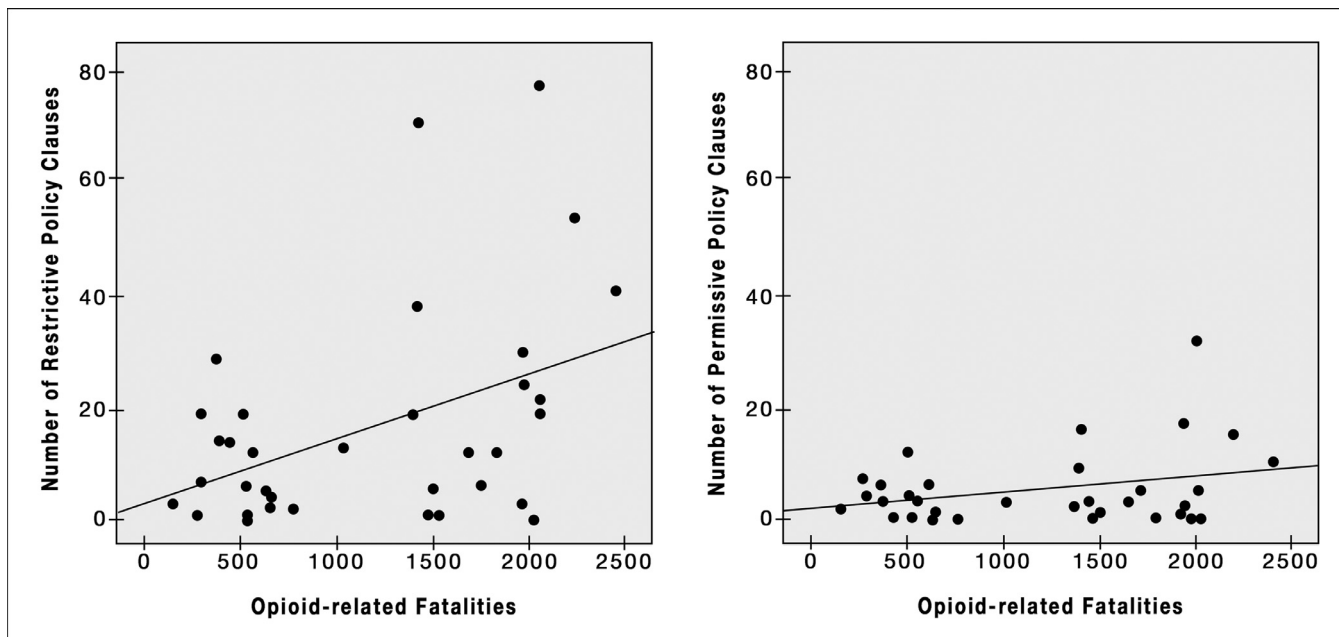
Fig. 5. Number of Restrictive (Left) and Permissive (Right) Clauses Relative to Number of Fatalities.
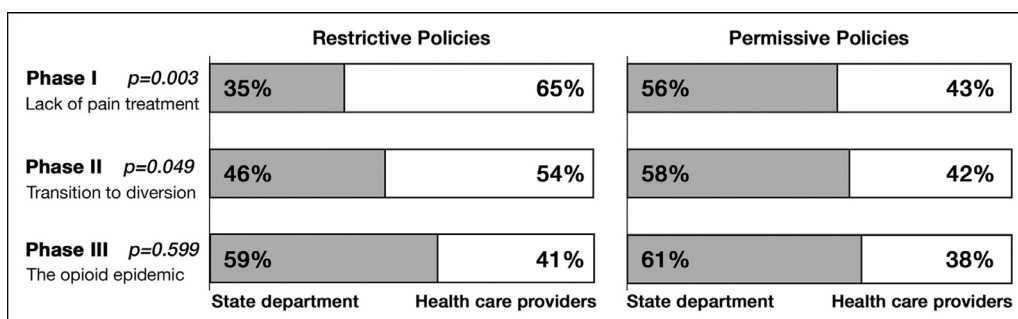
Fig. 6. Stacked Bars Showing the Distribution of Restrictive and Permissive Policies Across the Three Phases in Section 4
Note. The shaded and unshaded segments show the state department's and health care provider's share, respectively.
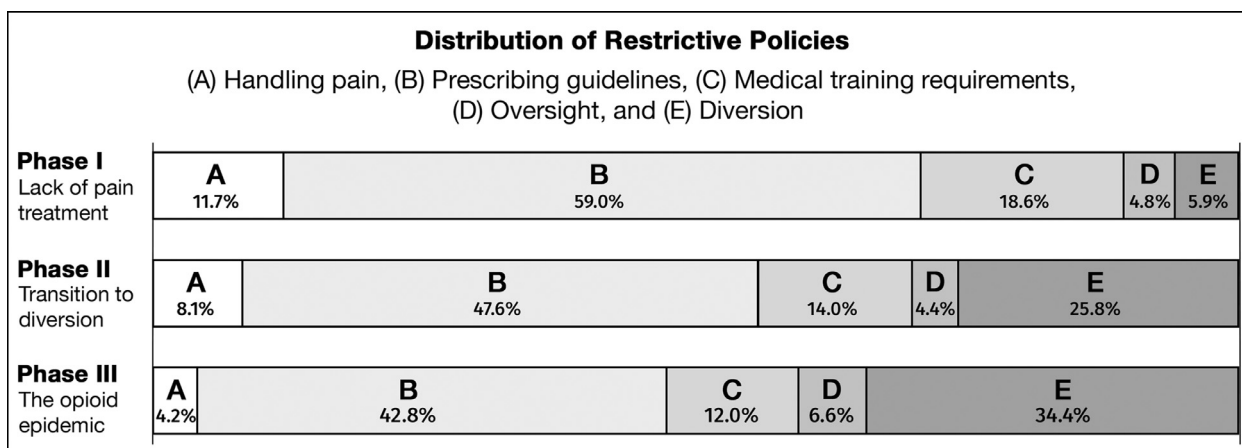
Fig. 7. Stacked Bars Showing Policy Actions and Their Percentage Share of Restrictive Policies.

5.2.2. Policy actions: what are the policies for?

The use of restrictive framing sheds light on which actions are considered by policymakers as important enough to warrant such phrasing. Fig. 7 presents the distribution of restrictive policies across the five ma-

jor policy actions that emerged from the coding process (outlined in Table 4).

Fig. 7 reaffirms that modals function as a reflection of the situations on the ground. These findings illustrate the growing concerns in oversight and rehabilitation as the crisis worsens. The distribution of restric-

Table 7
Number of opioid-related fatalities in California from 1968 to 2018.

Year	Fatalities	Crude Rate	Year	Fatalities	Crude Rate	Year	Fatalities	Crude Rate
1968	113	0.6	1985	519	2	2002	1453	4.2
1969	166	0.8	1986	520	1.9	2003	1398	4
1970	280	1.4	1987	290	1	2004	1413	4
1971	273	1.3	1988	365	1.3	2005	1372	3.8
1972	376	1.8	1989	432	1.5	2006	1511	4.2
1973	428	2.1	1990	375	1.3	2007	1657	4.6
1974	529	2.5	1991	288	0.9	2008	1801	4.9
1975	629	2.9	1992	523	1.7	2009	1987	5.4
1976	506	2.3	1993	640	2	2010	1929	5.2
1977	161	0.7	1994	501	1.6	2011	1939	5.1
1978	123	0.5	1995	528	1.7	2012	1719	4.5
1979	153	0.7	1996	651	2	2013	1948	5.1
1980	145	0.6	1997	617	1.9	2014	2024	5.2
1981	215	0.9	1998	768	2.3	2015	2018	5.2
1982	314	1.3	1999	1474	4.4	2016	2012	5.1
1983	279	1.1	2000	1012	3	2017	2199	5.6
1984	343	1.3	2001	551	1.6	2018	2410	6.1

Note. Crude rates, or death rates per 100,000 population, is a measure used when age-adjusted rates are not available. Data was gathered using the CDC WONDER database. To generate the report for opioid-related fatalities, the following International Classification of Disease (ICD) codes had to be identified: ICD-8 E853.0 for 1970–1978; ICD-9 E850.0 for 1979–1998; ICD-10 underlying cause-of-death codes: X40–44, ~~X60–64, X85, Y10–Y14~~ and multiple cause-of-death codes: T40.0- T40.4, and T40.6 for 1999–2018. (Centers for Disease Control and Prevention, 2021a; Centers for Disease Control and Prevention, 2021b; Centers for Disease Control and Preventionc)

Table 8
Modal frequencies in original policies and amendments.

Subcorpus A: Original Policies *n = 30,013 words* (97 documents)				Subcorpus B: Amendments *n = 80,095 words* (126 documents)			
	Modal	Frequency per 100,000 words	Percentage		Modal	Frequency per 100,000 words	Percentage
1	shall	1585.98	70.83	1	shall	1644.30	74.07
2	may	509.78	22.77	2	may	454.46	20.47
3	can	93.29	4.17	3	will	47.44	2.14
4	will	19.99	0.89	4	would	42.45	1.91
5	would	13.33	0.60	5	can	21.22	0.96
6	could	6.66	0.30	6	should	8.74	0.39
6	should	6.66	0.30	7	must	1.25	0.06
7	might	3.33	0.15	0	could	0.00	0.00
0	must	0.00	0.00	0	might	0.00	0.00

Note. Frequency values are calculated relative to every 100,000 words to balance the uneven subcorpus (see Baker, 2006).

tive policies across the three phases hints at the priorities policymakers have at that point in time. When the problem was lack of pain treatment, the first three categories— which were about addressing pain and learning about the ability of opioids to treat pain—recorded their highest share of restrictive modals. These high numbers dwindled as the state's problem switched from lack of pain treatment to addressing the worsening crisis. The more striking result shown in Fig. 7 is the constant increase in restrictive policies addressing (D) oversight and (E) diversion, which reflects the state's growing concerns towards drug abuse and need for rehabilitation programs.

6. Analysis

To further investigate the possible role of modality in policies, I conducted a closed DA of the amendments in which policymakers decided to keep the rest of clause the same except for the modals. The following excerpt from a 2013 amendment of a 2002 policy (Table 9) shows a shift from permissive towards restrictive by simply replacing a single modal.

Understanding modality would require looking into the modals—the only element that differs in both iterations of the same policy—and the possible outcomes that could arise from choosing one over another. DA assumes that—in this case—California policymakers purposefully

choose to replace "may" with "shall" in their legislation. Policymakers are neither legally nor traditionally bound to use "shall" as a default (see Williams, 2009). Otherwise, they would not go through all the troubles of amending a policy only to change a single word. Indeed, state policymakers are paying attention to modality when drafting a bill that replaces "may" with "shall."

The deontic interpretation associated with "may" in the 2002 policy is that the policy stakeholder, the California Department of Justice, has the discretion over whether to release the patient's controlled substance history to the respective physician. Using the permissive "may" to frame the policy gives the policy stakeholder more flexibility, especially because the policy action is presented as an option they could elect not to take. Such interpretation contrasts directly from the volitional (deontic) and predictive (epistemic) nature associated with "shall," which denotes a more restrictive stance on the part of the policymakers. Policies are meant to suggest certain actions and using "shall" over "may" does not change the fact that the enactment of the policy ultimately relies on the actions and decisions of policy stakeholders, framing a policy using a modal that "restricts" rather than "permits" makes the policy's suggestive intent less apparent. Meanwhile, the use of permissive modals like "may" could remind stakeholders that they have the luxury of making a choice. Thus, "shall" has the potential to limit the

interpretation of policies by minimizing the optionality that comes with more permissive modals like "may." In contrast, using a more permissive modal could assign policy stakeholders more freedom because it broadens individual understanding of policies and highlights suggestive rather than mandatory intent. Thus, modal choice could widen or minimize the space in which the meaning of a policy can be negotiated. Moreover, Table 9 provides further evidence that modal usage mirrors the events on the ground. The amendment, which pushed for more vigilant communication between California's Department of Justice and health care providers, was chaptered during Phase III, when the state's main concern was to address the epidemic.

In the following excerpt (Table 10), a restrictive modal was replaced by a permissive alternative during Phase I, at a time when inadequate pain treatment was the state's problem.

In this example, "shall not," a modal that denotes strong prohibition was replaced by "may," a modal that is on the permissive side of the modal scale (see Fig. 1). The policy action of prescribing opioids went from being framed as a strongly prohibited action to being at the discretion of nurse-midwives as policy stakeholders. The modal change leaves more room for policy stakeholders to interpret the policy. With a permissive modal, the policymakers are able to elicit less defined outcomes. The amendment enacted during Phase I allowed more healthcare workers to administer opioids, at a time when policymakers were more focused on pushing health care providers to be more aggressive with pain treatment.

The last excerpt (Table 11) illustrates how modal change can intensify the semantic weight of the collocating verb phrase, further minimizing an already small interpretive space.

The wide range of interpretations evoked by "may" can partly be attributed to the modal's ability to convey both what "may" or "may not" be done. Hence, the addition of "not" lessens the ambiguity and optionality that comes with "may." In other words, while "may" and "may not" are still more permissive than their "shall" counterparts, "may" allows for a broader set of interpretations in comparison to "may not." This explains why current literature (see Fig. 1)—including (Boyd and Thorne, 1969)Boyd and Thorne (1969) as well as Chilton (2004)—did not group modals with their negative counterparts. The 1994 version of the policy has the modal "may not" which is already less permissive than "may," yet the modal amendment in 2017 suggest that the level of prohibition "may not" evoked was still insufficient, prompting policymakers to replace it with "shall not" and further minimize what was already a weak semantic expression of possibility. As local policymakers, their knowledge of the severity of the opioid crisis within their constituency makes "shall not" a more fitting choice called for by their immediate environment. These findings offer tangible evidence that appends a policy perspective to Talmy (1988) and Sweetser's (1990) understanding of modality as forces that "stop" or "allow," but as forces that "limit" or "broaden" interpretations.

The policymakers convening to amend only one lexical item suggests that they perceive the significance of modality in policy framing. The key examples presented here show that particularly targeting modals in amendments suggests its importance in the framing of policies relative to the events happening on the ground.

7. Limitations

While Table 7 affirms that the opioid-related fatality rates in the state increased with time, the approach used in this study suffered from the limitation of relying on proxies such as time and death rates to quantify the worsening crisis. Some may find it beneficial to learn the motivations behind modal use from the policymakers themselves. Attempts to contact the policymakers involved were unsuccessful. However, the use of DA to "interpret" and "explain" the set of possibilities motivating speech acts, which are sometimes unknown even to the language user, remedies this issue (Fairclough and Wodak, 1997; Friginal and Hardy, 2020; Johnstone, 2018). It should also be acknowledged that DA serves

Table 9
An amendment showing the change from permissive to restrictive modality.

Health and Safety Code 11165.1 2002 [Phase I]	2013 [Phase III]
The Department of Justice **may** release to that practitioner the history of controlled substances dispensed to an individual under his or her care…	The Department of Justice **shall** release to that practitioner the history of controlled substances dispensed to an individual under his or her care…

Note. Statute was clipped for brevity. The rest of the content can be retrieved from the internet through California's legislation website.

Table 10
An amendment showing the change from restrictive to permissive modality.

Business and Professions Code 2746.51 1991 [Phase I]	2001 [Phase I]
Drugs furnished by a certified nurse-midwife **shall not** include controlled substances…	Drugs furnished by a certified nurse-midwife **may** include controlled substances…

Note. Opioids are controlled substances. This statute was shortened for brevity. The changes do not affect the analysis. The rest of the content can be retrieved from the internet through California's legislation website.

Table 11
An amendment showing change in modality from slightly permissive to restrictive.

Business and Professions Code 3502.1 1994 [Phase I]	2017 [Phase III]
A physician assistant **may not** prescribe controlled substances without a physician's order.	A physician assistant **shall not** prescribe controlled substances without a physician's order.

Note. Statute was shortened for brevity. The changes do not affect the analysis. The rest of the content can be retrieved from the internet through California's legislation website. More examples of modal amendments are provided in Appendix D.

as the backbone of the coding process, and in turn, the frequency analyses, yet these background processes do not often make their way into final papers.

The restrictive and permissive framework is not intended to be a definitive categorization of the core functions of modal auxiliaries in policies, as the corpus is limited and discourse analysis, while informative, is intended to be inferential. However, this study is presented because of its heuristic value to policymakers and legal aides who recognize the significance of using modals and to policy stakeholders tasked with interpreting modal-heavy policies to carry out certain functions and achieve outcomes.

8. Conclusion

The present study provides a cogent linguistic framework for analyzing the role of modal auxiliaries in policy text. The findings of both corpus and discourse analyses suggest two potential functions of modals in policies, which include: (i) mirroring or calling attention to the gravity of the issues happening on the ground, and (ii) highlighting or deemphasizing a policy's optionality to broaden or limit the range of possible interpretations under which policy stakeholder could operate.

As Thompson (2001, p. 151) points out, paying attention to modal usage "reveals something of the choices that are available" in expressing meanings and "something of the way written discourse is constructed." Chilton (2004) further emphasizes that perceptions of local realities influence one's modal choices. Pairing these two ideas together helps make sense of policymakers' overwhelming decision to use "shall" over alternatives as the opioid crisis worsens.

The approach presented in this study allows policymakers to save time in examining the policies of pertinent local issues because the min-

ing of modals from the corpus (i) created a sketch showing the status of permissively and restrictively framed policies, (ii) uncovered the policy stakeholders addressed in restrictively framed policies, and (iii) exposed the prioritized actions of which optionality is limited. By focusing on modals and their collocating verb phrases, policymakers can assess where policies of pertinent local and even federal issues—such as gun control, abortion, abuse of power, rights to assemble and protest, among many others—stand and whether current restrictions adequately match the community's needs.

This study contributes to the existing small body of literature covering the language of health policies through CA and DA. The investigation, however, also opens several questions regarding opioids: What roles do other grammatical categories serve in policies? How are doctors functioning in these current, relatively narrow interpretive spaces regarding opioid prescriptions? What forces and ideologies are stopping policymakers from using simpler language instead of using modals which clearly relies on the interpretation of policy stakeholders? These questions are crucial for applied, socio, and corpus linguistics to address in future research. This paper is a step in this direction to develop a cohesive understanding of not just modals but also policies and health crises.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. California policies and number of restrictive and permissive modals (phrases)

Policy Code	Year	Original/ Amendment?	Word Count	Restrictive Phrases	Permissive Phrases
Business and Professions Code 1645	**1994**	**Original**	**247**	**3**	**3**
Business and Professions Code 1645	2013	Amendment	366	+4	0
Business and Professions Code 1645	2018	Amendment	329	+2	−1
Business and Professions Code 1645	2018	Amendment	330	0	0
Business and Professions Code 208	**2013**	**Original**	**384**	**5**	**1**
Business and Professions Code 208	2016	Amendment	476	+1	0
Business and Professions Code 209	**2013**	**Original**	**183**	**2**	**0**
Business and Professions Code 2190.5	**2001**	**Original**	**165**	**4**	**2**
Business and Professions Code 2190.5	2003	Amendment	173	0	0
Business and Professions Code 2190.5	2018	Amendment	210	+1	0
Business and Professions Code 2191	**1990**	**Original**	**279**	**7**	**2**
Business and Professions Code 2191	1993	Amendment	367	+2	0

Policy Code	Year	Original/ Amendment?	Word Count	Restrictive Phrases	Permissive Phrases
Business and Professions Code 2191	1996	Amendment	427	+1	0
Business and Professions Code 2191	1998	Amendment	447	+1	0
Business and Professions Code 2191	2014	Amendment	468	+1	0
Business and Professions Code 2191	2017	Amendment	484	0	0
Business and Professions Code 2191	2018	Amendment	497	0	0
Business and Professions Code 2196.2	**1998**	**Original**	**61**	**2**	**0**
Business and Professions Code 2196.2	2018	Amendment	74	0	0
Business and Professions Code 2196.8	**2013**	**Original**	**106**	**2**	**0**
Business and Professions Code 2241.5	**1990**	**Original**	**544**	**7**	**1**
Business and Professions Code 2241.5	1994	Amendment	555	0	0
Business and Professions Code 2241.5	2004	Amendment	555	0	0
Business and Professions Code 2241.5	2006	Amendment	469	−1	0
Business and Professions Code 2241.5	2015	Amendment	476	0	0
Business and Professions Code 2454.5	**1989**	**Original**	**73**	**2**	**0**
Business and Professions Code 2454.5	1994	Amendment	164	+1	0
Business and Professions Code 2454.5	2017	Amendment	180	+2	0
Business and Professions Code 2454.5	2018	Amendment	202	+1	0
Business and Professions Code 2746.51	**1991**	**Original**	**616**	**11**	**2**
Business and Professions Code 2746.51	2001	Amendment	1140	+6	+1
Business and Professions Code 2746.51	2002	Amendment	1111	−1	0
Business and Professions Code 2746.51	2005	Amendment	1214	+2	0
Business and Professions Code 2746.51	2012	Amendment	1221	0	+1
Business and Professions Code 2746.51	2018	Amendment	1236	0	0
Business and Professions Code 2836.1	**1991**	**Original**	**471**	**8**	**2**

Policy Code	Year	Original/ Amendment?	Word Count	Restrictive Phrases	Permissive Phrases
Business and Professions Code 2836.1	1996	Amendment	591	+3	+1
Business and Professions Code 2836.1	1999	Amendment	754	+3	0
Business and Professions Code 2836.1	2002	Amendment	724	−1	0
Business and Professions Code 2836.1	2003	Amendment	837	+2	0
Business and Professions Code 2836.1	2004	Amendment	812	0	0
Business and Professions Code 2836.1	2012	Amendment	816	0	+1
Business and Professions Code 2836.1	2018	Amendment	825	0	0
Business and Professions Code 2836.4	**2017**	**Original**	**267**	**1**	**0**
Business and Professions Code 3059	**1987**	**Original**	**191**	**1**	**2**
Business and Professions Code 3059	2000	Amendment	428	+6	+2
Business and Professions Code 3059	2004	Amendment	420	0	0
Business and Professions Code 3059	2018	Amendment	394	−1	−1
Business and Professions Code 3502.1	**1994**	**Original**	**571**	**9**	**7**
Business and Professions Code 3502.1	2000	Amendment	817	+6	0
Business and Professions Code 3502.1	2004	Amendment	875	+1	0
Business and Professions Code 3502.1	2007	Amendment	1097	+5	0
Business and Professions Code 3502.1	2012	Amendment	1101	0	0
Business and Professions Code 3502.1	2015	Amendment	1333	+5	−1
Business and Professions Code 3502.1	2018	Amendment	1342	0	0
Business and Professions Code 3502.1.5	**2017**	**Original**	**296**	**1**	**1**
Business and Professions Code 3502.1.5	2018	Amendment	296	0	0
Business and Professions Code 4052.01	**2014**	**Original**	**427**	**6**	**2**
Business and Professions Code 4052.10	**2017**	**Original**	**365**	**11**	**2**
Business and Professions Code 4052.11	**2019**	**Original**	**50**	**1**	**0**
Business and Professions Code 4076.7	**2018**	**Original**	**71**	**1**	**0**
Business and Professions Code 4106.5	**2018**	**Original**	**339**	**5**	**1**
Business and Professions Code 4113.5	**2018**	**Original**	**442**	**4**	**1**
Business and Professions Code 4119.8	**2016**	**Original**	**179**	**2**	**1**
Business and Professions Code 740	**2018**	**Original**	**42**	**0**	**0**
Business and Professions Code 741	**2018**	**Original**	**289**	**1**	**0**
Business and Professions Code 742	**2018**	**Original**	**95**	**1**	**0**
Civil Code 1714.22	**2007**	**Original**	**395**	**4**	**1**
Civil Code 1714.22	2010	Amendment	492	+1	+1
Civil Code 1714.22	2013	Amendment	524	+1	+1
Civil Code 1798.24	**1987**	**Original**	**1035**	**6**	**2**
Civil Code 1798.24	1992	Amendment	962	0	0
Civil Code 1798.24	1995	Amendment	974	0	0
Civil Code 1798.24	2005	Amendment	1368	+1	+1
Civil Code 1798.24	2006	Amendment	1359	0	+1
Civil Code 1798.24	2008	Amendment	1360	0	0
Civil Code 1798.24	2010	Amendment	1464	+2	0
Civil Code 1798.24	2014	Amendment	1473	+1	−1
Civil Code 1798.24	2018	Amendment	1506	−1	0
Education Code 49414.3	**2016**	**Original**	**1662**	**24**	**11**
Education Code 49,476	**2018**	**Original**	**153**	**2**	**1**
Health and Safety Code 11,158.1	**2018**	**Original**	**284**	**2**	**0**
Health and Safety Code 11,158.1	2019	Amendment	500	+4	**0**
Health and Safety Code 11,161.5	**2003**	**Original**	**756**	**11**	**6**
Health and Safety Code 11,161.5	2005	Amendment	990	+6	−1
Health and Safety Code 11,161.5	2011	Amendment	1399	+8	−1
Health and Safety Code 11,161.5	2018	Amendment	1484	+1	+2
Health and Safety Code 11,161.7	**2003**	**Original**	**121**	**2**	**0**
Health and Safety Code 11,162.1	**2003**	**Original**	**516**	**17**	**1**
Health and Safety Code 11,162.1	2007	Amendment	672	+3	+2
Health and Safety Code 11,162.1	2011	Amendment	729	+1	+1
Health and Safety Code 11,162.1	2018	Amendment	786	−1	0
Health and Safety Code 11,162.5	**2006**	**Original**	**117**	**2**	**0**
Health and Safety Code 11,162.5	2011	Amendment	128	0	0
Health and Safety Code 11,162.6	**2003**	**Original**	**203**	**5**	**0**
Health and Safety Code 11164	**1988**	**Original**	**785**	**21**	**5**
Health and Safety Code 11,164	1991	Amendment	782	0	0

Policy Code	Year	Original/ Amendment?	Word Count	Restrictive Phrases	Permissive Phrases
Health and Safety Code 11,164	1994	Amendment	787	0	0
Health and Safety Code 11,164	2000	Amendment	857	+1	+1
Health and Safety Code 11,164	2002	Amendment	860	0	0
Health and Safety Code 11,164	2003	Amendment	438	−10	−3
Health and Safety Code 11,164	2005	Amendment	469	+1	0
Health and Safety Code 11,164	2006	Amendment	506	0	0
Health and Safety Code 11,164.1	**2003**	**Original**	**154**	**2**	**2**
Health and Safety Code 11,164.1	2013	Amendment	146	+1	0
Health and Safety Code 11,164.1	2019	Amendment	157	+1	0
Health and Safety Code 11,165	**2003**	**Original**	**489**	**8**	**3**
Health and Safety Code 11,165	2006	Amendment	575	0	0
Health and Safety Code 11,165	2011	Amendment	612	0	0
Health and Safety Code 11,165	2013	Amendment	797	+2	+2
Health and Safety Code 11,165	2016	Amendment	900	+1	+1
Health and Safety Code 11,165	2018	Amendment	1314	+6	+4
Health and Safety Code 11,165	2018	Amendment	1315	0	0
Health and Safety Code 11,165	2019	Amendment	1471	+5	0
Health and Safety Code 11,165.1	**2002**	**Original**	**255**	**3**	**3**
Health and Safety Code 11,165.1	2003	Amendment	217	−1	0
Health and Safety Code 11,165.1	2006	Amendment	221	0	0
Health and Safety Code 11,165.1	2011	Amendment	494	+2	+4
Health and Safety Code 11,165.1	2013	Amendment	600	+5	−4
Health and Safety Code 11,165.1	2015	Amendment	600	0	0
Health and Safety Code 11,165.1	2016	Amendment	670	−1	0
Health and Safety Code 11,165.1	2017	Amendment	1459	+5	+5
Health and Safety Code 11,165.1	2019	Amendment	1487	+2	0
Health and Safety Code 11,165.2	**2011**	**Original**	**810**	**18**	**11**
Health and Safety Code 11,165.3	**2011**	**Original**	**78**	**1**	**2**
Health and Safety Code 11,165.3	2012	Amendment	74	0	0
Health and Safety Code 11,165.4	**2016**	**Original**	**1156**	**9**	**0**
Health and Safety Code 11,165.5	**2013**	**Original**	**350**	**2**	**2**
Health and Safety Code 11,165.6	**2018**	**Original**	**28**	**1**	**0**
Health and Safety Code 11,166	**1998**	**Original**	**77**	**2**	**0**
Health and Safety Code 11,166	2003	Amendment	74	0	0
Health and Safety Code 11,167	**1994**	**Original**	**284**	**6**	**2**
Health and Safety Code 11,167	1998	Amendment	205	−3	0
Health and Safety Code 11,167	1999	Amendment	205	0	0
Health and Safety Code 11,167	2003	Amendment	218	+1	0
Health and Safety Code 11,167	2012	Amendment	232	0	0
Health and Safety Code 11,167.5	**1988**	**Original**	**400**	**8**	**1**
Health and Safety Code 11,167.5	1993	Amendment	363	0	0
Health and Safety Code 11,167.5	1994	Amendment	371	0	0
Health and Safety Code 11,167.5	2003	Amendment	304	−2	0
Health and Safety Code 11,220	**1995**	**Original**	**29**	**1**	**0**
Health and Safety Code 11,220	2017	Amendment	50	0	0
Health and Safety Code 11,453	**1980**	**Original**	**174**	**3**	**2**
Health and Safety Code 11,601	**2014**	**Original**	**174**	**3**	**1**
Health and Safety Code 11,756. 5	**2019**	**Original**	**200**	**4**	**0**
Health and Safety Code 1179.80	**2016**	**Original**	**215**	**2**	**2**
Health and Safety Code 11,839.1	**2004**	**Original**	**88**	**0**	**0**
Health and Safety Code 11,839.1	2013	Amendment	88	0	0
Health and Safety Code 11,839.1	2017	Amendment	96	0	0
Health and Safety Code 11,839.2	**2004**	**Original**	**39**	**0**	**0**
Health and Safety Code 11,839.2	2012	Amendment	76	0	0
Health and Safety Code 11,839.2	2013	Amendment	76	0	0
Health and Safety Code 11,839.2	2017	Amendment	147	+1	+1
Health and Safety Code 11,839.22	**2004**	**Original**	**20**	**1**	**0**
Health and Safety Code 11,839.22	2014	Amendment	22	0	0
Health and Safety Code 11,839.24	**2004**	**Original**	**40**	**1**	**0**
Health and Safety Code 11,839.24	2014	Amendment	40	0	0
Health and Safety Code 11,839.3	**2004**	**Original**	**1133**	**27**	**6**
Health and Safety Code 11,839.3	2013	Amendment	1142	0	0
Health and Safety Code 11,839.3	2014	Amendment	1205	+2	0
Health and Safety Code 11,839.3	2017	Amendment	1219	+1	−1
Health and Safety Code 11,839.5	**2004**	**Original**	**109**	**2**	**2**
Health and Safety Code 11,839.5	2013	Amendment	109	0	0
Health and Safety Code 11,839.5	2017	Amendment	123	0	0
Health and Safety Code 11,839.6	**2004**	**Original**	**513**	**7**	**4**
Health and Safety Code 11,839.6	2017	Amendment	528	0	0
Health and Safety Code 11,849	**2004**	**Original**	**72**	**2**	**2**
Health and Safety Code 11,849.5	**2004**	**Original**	**187**	**5**	**1**
Health and Safety Code 11,852.5	**2004**	**Original**	**646**	**25**	**1**

Policy Code	Year	Original/ Amendment?	Word Count	Restrictive Phrases	Permissive Phrases
Health and Safety Code 11,852.5	2012	Amendment	848	+5	+3
Health and Safety Code 11,857	**2019**	**Original**	**193**	**2**	**1**
Health and Safety Code 11,857. 02	**2019**	**Original**	**224**	**2**	**0**
Health and Safety Code 11,857. 03	**2019**	**Original**	**180**	**2**	**1**
Health and Safety Code 11,857. 08	**2019**	**Original**	**71**	**2**	**0**
Health and Safety Code 11,876	**2012**	**Original**	**50**	**1**	**0**
Health and Safety Code 124,236	**2018**	**Original**	**176**	**4**	**1**
Health and Safety Code 124,960	**1997**	**Original**	**383**	**1**	**3**
Health and Safety Code 124,960	2011	Amendment	356	0	0
Health and Safety Code 124,961	**1997**	**Original**	**383**	**4**	**3**
Health and Safety Code 124,961	2011	Amendment	356	0	0
Health and Safety Code 1254.7	**1999**	**Original**	**99**	**3**	**0**
Health and Safety Code 1254.7	2017	Amendment	82	0	0
Health and Safety Code 1367.43	**2017**	**Original**	**53**	**2**	**0**
Health and Safety Code 1371.1	**1989**	**Original**	**173**	**4**	**0**
Health and Safety Code 1371.1	1992	Amendment	173	0	0
Health and Safety Code 1371.1	2008	Amendment	386	+6	0
Health and Safety Code 1371.1	2009	Amendment	392	0	0
Health and Safety Code 1371.1	2017	Amendment	438	+1	0
Health and Safety Code 1797.170	**1989**	**Original**	**113**	**4**	**0**
Health and Safety Code 1797.170	2008	Amendment	122	0	0
Health and Safety Code 1797.170	2014	Amendment	235	+3	0
Health and Safety Code 1797.170	2018	Amendment	510	+4	+1
Health and Safety Code 1797.197	**2001**	**Original**	**64**	**2**	**0**
Health and Safety Code 1797.197	2014	Amendment	295	+3	+3
Insurance Code 10,123.145	**1989**	**Original**	**170**	**4**	**0**
Insurance Code 10,123.145	2008	Amendment	368	+6	0
Insurance Code 10,123.145	2009	Amendment	372	0	0
Insurance Code 10,123.145	2017	Amendment	418	+1	0
Insurance Code 10,123.203	**2017**	**Original**	**48**	**2**	**0**
Labor Code 5307.27	**2003**	**Original**	**82**	**3**	**0**
Labor Code 5307.27	2015	Amendment	183	+4	0
Labor Code 5307.27	2016	Amendment	290	+4	0
Labor Code 5307.28	**2015**	**Original**	**108**	**2**	**0**
Labor Code 5307.29	**2015**	**Original**	**413**	**11**	**1**
Penal Code 1001.85	**2016**	**Original**	**180**	**3**	**0**

Policy Code	Year	Original/ Amendment?	Word Count	Restrictive Phrases	Permissive Phrases
Penal Code 1001.86	**2016**	**Original**	**239**	**5**	**0**
Penal Code 1001.87	**2016**	**Original**	**592**	**5**	**4**
Penal Code 1001.88	**2016**	**Original**	**389**	**3**	**5**
Penal Code 2694.5	**2016**	**Original**	**388**	**6**	**0**
Welfare and Institutions Code 14,021.37.	**2019**	**Original**	**283**	**4**	**1**
Welfare and Institutions Code 14,124.14	**2018**	**Original**	**387**	**8**	**1**
Welfare and Institutions Code 14,197	**2017**	**Original**	**2311**	**26**	**7**
Welfare and Institutions Code 14,197	2018	Amendment	2243	0	0
Welfare and Institutions Code 14,197	2019	Amendment	2456	+2	+1
Welfare and Institutions Code 3300	**2005**	**Original**	**269**	**8**	**2**
Welfare and Institutions Code 3303	**1985**	**Original**	**242**	**6**	**3**
Welfare and Institutions Code 3305	**1985**	**Original**	**81**	**0**	**1**
Welfare and Institutions Code 3306	**1971**	**Original**	**122**	**1**	**4**
Welfare and Institutions Code 3307	**1971**	**Original**	**21**	**0**	**1**
Welfare and Institutions Code 3309	**2005**	**Original**	**37**	**1**	**0**
Welfare and Institutions Code 3310	**1971**	**Original**	**35**	**0**	**1**
Welfare and Institutions Code 3311	**1971**	**Original**	**35**	**0**	**1**
Welfare and Institutions Code 5848.51	**2016**	**Original**	**987**	**13**	**8**

Total per year:

Year	Restrictive Phrases	Permissive Phrases	Year	Restrictive Phrases	Permissive Phrases
1971	1	7	2002	1	3
1980	**3**	**2**	**2003**	**38**	**9**
1985	**6**	**4**	**2004**	**71**	**16**
1987	**7**	**4**	**2005**	**19**	**2**
1988	**29**	**6**	**2006**	**1**	**1**
1989	**14**	**0**	**2007**	**12**	**3**
1990	**14**	**3**	**2008**	**12**	**0**
1991	**19**	**4**	**2009**	**0**	**0**
1992	**0**	**0**	**2010**	**3**	**1**
1993	**2**	**0**	**2011**	**30**	**17**
1994	19	12	2012	6	5
1995	**1**	**0**	**2013**	**24**	**2**
1996	**4**	**1**	**2014**	**19**	**5**
1997	**5**	**6**	**2015**	**22**	**0**
1998	**2**	**0**	**2016**	**77**	**32**
1999	**6**	**0**	**2017**	**54**	**15**
2000	**13**	**3**	**2018**	**41**	**10**
2001	**12**	**3**	**2019**	**31**	**4**
2002	**1**	**3**	**Total**	**618**	**180**

Appendix B. Statistical Analysis.

Section 5.1, Fig. 3: Regression results between time and number of restrictive phrases.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.469[a]	.220	.197	17.15300

[a] Predictors: (Constant), Year.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2825.334	1	2825.334	9.603	.004[b]
	Residual	10,003.666	34	294.225		
	Total	12,829.000	35			

[a] Dependent Variable: Restrictive.
[b] Predictors: (Constant), Year.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	−1530.795	499.543		−3.064	.004
	Year	.774	.250	.469	3.099	.004

[a] Dependent Variable: Restrictive.

Section 5.1, Fig. 3: Regression results between time and number of permissive phrases.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.281[a]	.079	.052	6.40435

[a] Predictors: (Constant), Year.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	119.467	1	119.467	2.913	.097[b]
	Residual	1394.533	34	41.016		
	Total	1514.000	35			

[a] Dependent Variable: Permissive.
[b] Predictors: (Constant), Year.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	−313.309	186.512		−1.680	.102
	Year	.159	.093	.281	1.707	.097

[a] Dependent Variable: Permissive.

Section 5.1, Fig. 4: Regression results between fatal cases and number of restrictive phrases

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.427[a]	.182	.157	17.693

[a] Predictors: (Constant), Fatal_Cases.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2301.580	1	2301.580	7.352	.011[b]
	Residual	10,330.591	33	313.048		
	Total	12,632.171	34			

[a] Dependent Variable: Restrictive.
[b] Predictors: (Constant), Fatal_Cases.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.199	5.831		.549	.587
	Fatal_Cases	.012	.004	.427	2.711	.011

[a] Dependent Variable: Restrictive.

Section 5.1, Fig. 4: Regression results between fatal cases and number of permissive phrases

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.299[a]	.089	.062	6.462

[a] . Predictors: (Constant), Fatal_Cases.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	135.130	1	135.130	3.236	.081[b]
	Residual	1377.841	33	41.753		
	Total	1512.971	34			

[a] Dependent Variable: Permissive.
[b] Predictors: (Constant), Fatal_Cases.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.740	2.129		.817	.420
	Fatal_Cases	.003	.002	.299	1.799	.081

[a] Dependent Variable: Permissive.

Section 5.1, Fig. 5: Regression results of time and number of stricter amendments

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.649[a]	.421	.392	1.119

[a] Predictors: (Constant), Years.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.217	1	18.217	14.541	.001[b]
	Residual	25.056	20	1.253		
	Total	43.273	21			

[a] Dependent Variable: Stricter_Amendment.
[b] Predictors: (Constant), Years.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	−227.495	60.232		−3.777	.001
	Years	.114	.030	.649	3.813	.001

[a] Dependent Variable: Stricter_Amendment.

Section 5.1, Fig. 5: Regression results of time and number of more lenient amendments

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.224[a]	.050	−0.085	.737

[a] Predictors: (Constant), Years.

ANOVA[a]					
Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	.201	1	.201	.370	.562[b]
Residual	3.799	7	.543		
Total	4.000	8			

[a] Dependent Variable: More_Lenient.
[b] Predictors: (Constant), Years.

Coefficients[a]	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	48.271	76.566		.630	.548
Year	−0.023	.038	−0.224	−0.609	.562

[a] Dependent Variable: More_Lenient.

Mahalanobis Distance

$D2$ was calculated for each observation and their associated probability was conducted with chi-square ($\chi2$). The probability shows that only two cases are significant at 0.01 level, which means outliers are not a big problem in this study.

Case	Mahalanobis Distance (D2)	P value
1	3.9391	0.14
2	0.62676	0.73
3	0.69183	0.71
4	0.54776	0.76
5	0.79757	0.67
6	1.26938	0.53
7	0.11653	0.94
8	0.18053	0.91
9	0.80489	0.67
10	0.66178	0.72
11	3.11252	0.21
12	0.7246	0.7
13	0.47758	0.79
14	1.87848	0.39
15	0.66178	0.72
16	0.58502	0.75
17	0.09628	0.95
18	0.09348	0.95
19	1.21477	0.54
20	1.46068	0.48
21	9.29489	0.01
22	0.92665	0.63
23	0.74008	0.69
24	0.09348	0.95
25	0.99356	0.61
26	0.80489	0.67
27	0.54762	0.76
28	5.59924	0.06
29	1.08831	0.58
30	1.93678	0.38
31	0.02934	0.99
32	3.0709	0.22
33	17.1007	0.00
34	3.71915	0.16
35	1.7862	0.41
36	2.3269	0.31

Appendix C. Example policies for each policy action

(A) General policies on handling pain: Propositions discussing pain and its relief.

Health care provider: This includes the procedures medical staff could take in the actual treatment of pain, including gathering pain as a vital sign or affirmation that opioids can be prescribed for chronic pain.

"Every health facility licensed pursuant to this chapter shall, as a condition of licensure, include pain as an item to be assessed at the same time as vital signs are taken." 1999 Health and Safety Code 1254.7

"A physician and surgeon may prescribe or administer controlled substances to a person … for a diagnosed condition causing intractable pain." 1990 Business and Professions Code 2241.5

State department: Making sure that pain needs are met.

"Department of Justice shall maintain for three years a written, readily retrievable record identifying (1) the prescriber; (2) the name, strength, and quantity of the controlled substance dispensed; (3) the circumstances under which the emergency prescription was filled." 1994 Health and Safety Code 11167

(B) Prescribing guidelines for controlled substances: Includes all the precautions and requirements needed before an opioid is prescribed.

Heath care provider: Checking/maintenance of prescription monitoring program, procedures in printing and filling up prescription forms, conditions pharmacists follow upon dispensing opioids, etc.

"A health care practitioner or a pharmacist… shall submit an application developed by the Department of Justice to obtain approval to access information stored on the Internet regarding the controlled substance history of a patient maintained within the Department of Justice, and the department shall release to that practitioner or pharmacist." 2013 Health and Safety Code 11165.1

State department: Setting up licensing requirements and procedures, formularies and medication schedule.

"The Department of Justice …shall Identify and implement a streamlined application and approval process to provide access to the CURES Prescription Drug Monitoring Program (PDMP) database for licensed health care practitioners…" 2003 Business and Profession Code 209

(C) Training/education requirements: Everything that involves learning, including mandatory training for health care personnel on opioid medications and its risks.

Health care providers: Taking mandatory classes in order to renew licenses. Training of physician assistants, nursing, paramedics, etc.

"All physicians and surgeons shall complete a mandatory continuing education course in the subjects of pain management and the treatment of terminally ill and dying patients" 2001 Business and Professions Code 2190.5

State department: making sure practitioners are up to speed with new medical findings or deciding the "continuing education" classes providers have to take so they can keep their license.

"The board may prescribe this mandatory coursework within the general areas … the risks of addiction associated with the use of Schedule II drugs." 2018 Business and Professions Code 1645

(D) Oversight: Policies intended for oversight, which includes discussions about malpractice and possible license suspension.

State department: responsibilities in making sure policies are enacted at the local level.

"The board shall adopt regulations providing for the suspension of the licenses at the end of the two-year period until compliance with the assurances provided for in this section is accomplished." 1994 Business and Professions Code 1645

(E) Treatment of substance abuse/ diversion: Includes all actions that are specifically intended to approach substance abuse problem.

State department: includes information dissemination on prevention as well as establishing and funding diversion treatment programs

"The department shall …license the establishment of narcotic treatment programs in this state to use replacement narcotic therapy in the treatment of addicted persons." 2004 Health and Safety Code 11839.3

Health care providers: consists of policies discussing the actual treatment of addiction.

"At the end of 30 days from the first treatment, the prescribing or furnishing of controlled substances, except medications approved by the federal Food and Drug Administration for the purpose of narcotic replacement treatment or medication-assisted treatment of substance use disorders, shall be discontinued." 2017 Health and Safety Code 11220

Appendix D. Example of modal amendments

The following examples show the change of modals like "may" and "will" to "shall." The text in bold represent the other changes from one policy to another. Take note of the year in which the amendment took place. Bold text denotes change

Business and Professions Code 1645

1994

If the board determines that the public health and safety would be served by requiring all holders of licenses under this chapter to continue their education after receiving a license it **may** require that they submit assurances satisfactory to the board that they **will** inform themselves

2018

All holders of licenses under this chapter **shall** continue their education after receiving a license as a condition to the renewal thereof, and **shall** obtain evidence satisfactory to the board that they have, during the preceding two-year period, obtained continuing education

Health and Safety Code 11165.1

2002

A licensed health care practitioner eligible to **obtain triplicate prescription forms** or a pharmacist **may** make a written request for, and the Department of Justice **may** release to that practitioner or pharmacist, the history of controlled substances…

2003

A licensed health care practitioner eligible to **prescribe Schedule II or Schedule III controlled substances"** or a pharmacist **may** make a written request for, and the Department of Justice **may** release to that practitioner or pharmacist, the history of controlled substances …

2011 (Year the CDC declared the epidemic)

"A health care practitioner or a pharmacist eligible to prescribe… **may provide a notarized application developed by the Department of Justice to obtain approval to access information stored on the Internet regarding the controlled substance history of a patient maintained within the Department of Justice,** and the department **may release to that practitioner or pharmacist** the history of controlled substances …

2013

"A health care practitioner or a pharmacist eligible to prescribe… *shall* **submit an** application developed by the Department of Justice to obtain approval to access information stored on the Internet regarding the controlled substance history of a patient maintained within the Department of Justice, and, **upon approval,** the department **shall** release to that practitioner the **electronic** history of controlled substances …

Health and Safety Code 11165.5

2003

The department **may** revoke its approval of a security printer for a violation of this division or action that would permit a denial pursuant to subdivision (d) of this section.

2011 (Year the CDC declared the epidemic)

The department **shall impose restrictions against security printers who are not in compliance with this division pursuant to regulations implemented pursuant to this division and** (2) **shall** revoke its approval of a security printer for a violation of this division or action that would permit a denial pursuant to subdivision (d) of this section.

Business and Professions Code 3502.1

1994

A physician assistant **may not** administer, provide or transmit a prescription for Schedule II through Schedule V controlled substances without an order by a supervising physician and surgeon for the particular patient.

2017

A physician assistant **shall not** administer, provide, or transmit a prescription for Schedule II through Schedule V controlled substances without advance approval by a supervising physician and surgeon for that particular patient

Here is an example of the restrictive "shall not" switching to the permissive "may," which took place in 2001, when the main concern still revolved around solving the problem of pain undertreatment.

Business and Professions Code 2746.51

1991

Drugs or devices furnished by a certified nurse-midwife **shall not** include controlled substances under the California Uniform Controlled Substances Act…

2001

Drugs or devices furnished **or ordered** by a certified nurse-midwife **may** include **Schedule II** controlled substances under the California Uniform Controlled Substances Act…

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