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Achieving Reductions in Opioid Dispensing: A Qualitative Comparative Analysis of State-Level Efforts to Improve Prescribing

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Abstract

Objective.—To determine whether any combination of state-level public health activities were *necessary* or *sufficient* to reduce prescription opioid dispensing.

Design.—We examined 2016–2019 annual progress reports, 2014–2019 national opioid dispensing data (IQVIA), and interview data from states to categorize activities. We used crisp-set Qualitative Comparative Analysis (QCA) to determine which program activities, individually or in combination, were *necessary* or *sufficient* for a better than average decrease in morphine milligram equivalent (MME) per capita.

Setting.—29 U.S. state health departments

Participants.—*S*tate health departments implementing CDC's Prevention for States (PfS) program

Main outcome.—Combinations of prevention activities related to changes in the rate of prescription opioid MME per capita dispensing from 2014 to 2019.

Results.—Three combinations were *sufficient* for greater than average state-level reductions in MME per capita: (1) Expanding and improving proactive reporting in combination with enhancing the uptake of evidence-based opioid prescribing guidelines and not moving toward a real-time PDMP; (2) Implementing or improving prescribing interventions for insurers, health systems, or pharmacy benefit managers in combination with enhancing the uptake of evidence-based opioid prescribing guidelines; (3) Not implementing or improving prescribing interventions for insurers, health systems, or pharmacy benefit managers in combination with not enhancing the uptake of evidence-based opioid prescribing guidelines. Interview data suggested that the three combinations indicate how state contexts and history with addressing opioid overdose shaped programming and the ability to reduce MME per capita.

Conflicts of Interest

The authors have no conflicts of interest to report.

Conclusions.—States successful in reducing opioid dispensing selected activities that built upon existing policies and interventions, which may indicate thoughtful use of resources. To maximize impact in addressing the opioid overdose epidemic, states and agencies may benefit from building on existing policies and interventions.

Increased prescribing of prescription opioids was one factor precipitating the current overdose crisis and contributed to it for two decades.[1] To improve prescribing and prevent opioid-involved overdose, states and federal agencies, such as the Centers for Disease Control and Prevention (CDC), implemented strategies, including developing and implementing opioid prescribing guidelines for chronic pain, enhancing and/or maximizing the utility of Prescription Drug Monitoring Programs (PDMPs).[2,3]

Currently, PDMPs exist in all 50 states, the District of Columbia, and several territories.[4] PDMPs collect and track data related to prescribed controlled substances. Healthcare clinicians and pharmacists can use PDMPs to monitor patient receipt of opioid and other controlled substance prescriptions and adjust prescribing or dispensing as appropriate.[5] State agencies, such as health departments and licensing boards can use PDMP data to assess prescribing practices (e.g., co-prescribing benzodiazepines and opioids) and patient behaviors (e.g., obtaining opioid prescriptions from multiple clinicians) associated with opioid-related harms, including overdose.[6,7]

PDMPs serve as a tool in improving opioid prescribing.[6,8–13] Research showed changes in PDMP use policies, including mandating clinician enrollment, embedding the use of the PDMP within clinical workflow, and limiting dispenser reporting time to one business day, are associated with decreases in opioid prescribing.[14–17] A systematic review of systems-level interventions found proactive strategies, such as PDMP enhancement legislation, targeted feedback to clinicians on their opioid prescribing behaviors, and patient education were associated with improvements in opioid prescribing.[18]

Evidence on the effectiveness of PDMPs on reducing opioid overdose or other opioid-related harms has been mixed, ranging from observed reduced rates of prescription opioid-related hospitalizations ,[19] to limited to no association with opioid-involved overdose,[20,21] to a higher likelihood of heroin-related deaths.[22] These differences may be related to variability in implementation of PDMP legislation. Research has shown states with proactive PDMPs (e.g., permit and/or require reporting of prescribing patterns without the clinician initiating action) have fewer heroin poisoning deaths and prescription opioid poisoning deaths compared with states with no or lower capacity PDMPs.[23,24]

CDC initiated the Prescription Drug Overdose Prevention for States Program (PfS) in 2015.[25] PfS was a four-year cooperative agreement initially funded 16 state-level agencies, including state health departments and state pharmacy boards (recipients), starting in 2015 to support opioid overdose prevention interventions. The PfS program had several opioid overdose prevention goals; additional information is published elsewhere.[3] This article focuses on activities related to two of these goals: (1) enhancing and maximizing PDMPs and (2) promoting information dissemination related to PDMP data and evidence-based opioid prescribing guidelines. Recipients were required to implement activities related to

these two goals whereas other activities were optional. CDC expected that achieving these two goals would result in improvements in opioid prescribing behaviors.

Because proactive PDMP use and other health systems-based interventions have the potential to improve how opioids are prescribed,[8,26] it is important to understand which activities are associated with these changes. To enhance PDMPs, state agencies often implement multiple, mutually reinforcing activities simultaneously, which necessitates assessing how combinations of activities implemented under PfS are associated with changes in prescribing behaviors. The purpose of this analysis was to examine which combinations of PfS activities were associated with changes in opioid dispensing outcomes.

METHODS

We used three data sources: PfS recipients' annual progress reports (APRs), national opioid dispensing data (IQVIA), and in-depth interviews with recipient staff.

Annual Progress Reports

PfS recipients completed an APR from 2016–2018 documenting their implementation progress, their work plan, and successes and challenges. We used APRs to determine which PfS activities each recipient implemented.

PfS recipients could implement eight activities within two broad strategies: enhance and maximize the use and effectiveness of PDMPs; and implement community or insurer/health system interventions to prevent prescription drug overdose and opioid use disorder. Three activities (i.e., make PDMPs easier to use and access, conduct public health surveillance with PDMP data, identify and provide technical assistance to high-burden communities) were excluded from this analysis because they lacked variation, which would not contribute meaningfully to the results and would have artificially identified them as "necessary" conditions (80% or more recipients implemented the activity by 2017). The remaining five activities are:

- Move toward universal PDMP registration and use ("REGISTRATION")
- Move toward a real-time (i.e., reporting within 24 hours of dispensation) PDMP ("REAL-TIME")
- Expand and improve proactive reporting ("PROACTIVE REPORTING")
- Implement or improve prescribing interventions for insurers, health systems, or pharmacy benefit managers ("PRESCRIBING INTERVENTIONS")
- Enhance the uptake of evidence-based opioid prescribing guidelines ("GUIDELINES")

To implement REGISTRATION, recipients (N=17) conducted activities such as developing and disseminating educational materials for clinicians on PDMP and linking PDMP registration to licensure renewal. Moving toward a REAL-TIME PDMP (N=12) consisted of efforts like monitoring compliance with reporting laws on appropriate timelines (e.g., within 24 hours of prescription) and providing education on complying with state reporting

requirements. Expanding and improving PROACTIVE REPORTING (N=20) entailed developing algorithms to make reports more actionable to end users, sending reports directly to clinicians about potentially concerning dispensing patterns, providing education on how to use the reports, and sharing reports with licensing boards.

Implementing PRESCRIBING INTERVENTIONS (N=12) entailed implementing trainings for clinicians, medical examiners, emergency medical services (EMS), and law enforcement related to opioid use disorder and overdose prevention; crafting policies related to prescribing guidelines with health systems, payers, and worker's compensation agencies; and creating and disseminating messaging to destigmatize naloxone administration. Enhancing uptake of GUIDELINES (N=18) involved educating clinicians about the CDC or state prescribing guidelines, including academic detailing, or continuing medical education training, or broad dissemination of evidence-based prescribing guidelines to clinicians.

For each activity, we calibrated a recipient as a "1" if they reported implementing the activity at any time point prior to September 2017 (end of the fiscal year before the final funding year) in their APRs. We calibrated a recipient as a "0" if they did not report implementing the activity prior to September 2017.

IQVIA

IQVIA Xponent (2014 to 2019) dataset provided opioid dispensing data from over 59,000 U.S. retail pharmacies. We examined the rate of prescription opioid morphine milligram equivalent (MME) per capita (a PfS program outcome). MME per capita was calculated based on the total quantity and strength of dosage for each prescription. Each state's total MME was divided by the state's population estimate for the corresponding year. We calculated mean change in MME per capita across all states and the District of Columbia (PfS and non-PfS) from 2014 to 2019. The mean difference was −358.25 MME (range −150.20 MME to −774.53 MME).

Interviews

We used information from interviews to explore QCA findings by elaborating on how recipients implemented PfS activities and the broader opioid intervention context in the state at the time. From December 2017 through February 2018, we conducted semi-structured in-depth interviews with 29 recipients. For each recipient, the program director/principal investigator, program manager, and one other individual (e.g., evaluator consultant) could participate in a 90-minute telephone interview, which were audio-recorded (with participant permission) and transcribed. Interview topics included state context related to prescription opioid use, misuse, opioid overdose, state experience and history in implementing efforts to address the opioid overdose epidemic, state capacity for addressing the opioid overdose epidemic, and implementation successes and challenges. The analytic team coded interviews in NVivo 11.0, and double-coded 20% of interviews to assess intercoder reliability. At the completion of coding, the team generated code reports. RTI International's Institutional Review Board deemed these interviews as not research with human subjects; the interviews were approved under Office of Management and Budget (#0920–0879).

Analysis

To establish thresholds for inclusion in the set of achieving change in MME per capita, we used the mean change from 2014 to 2019 in the MME per capita. If a recipient state's MME per capita was below the mean value (−358.25 MME), we scored the recipient as "1", or having achieved substantive change compared with the national average. We scored a recipient as "0" if they showed no change or did not decrease more than the mean difference.

Qualitative Comparative Analysis (QCA) can examine the combinations of activities that generate *necessary* and *sufficient* relationships for an outcome to occur.[27] QCA also supports analyses of small and intermediate sample sizes, such as the 29 recipients. We used crisp-set QCA (csQCA) to examine which program activities, individually or in combination, were identified by the analysis to be *necessary* or *sufficient* for a better than average decrease in MME per capita.[27,28] A finding of a *necessary activity* or combination of activities indicates that the recipient needed to implement the activity to achieve a better than average decrease in MME per capita, but implementing that activity does not guarantee a better than average decrease. A finding of a *sufficient activity* or combination of activities indicates that if the recipient implemented the activity, then they also demonstrated the better than average decrease in MME per capita. However, we cannot say the conditions *caused* the outcome to occur.

After calibrating the activities and the outcome, we developed a truth table (Table 1), the central analytic device in QCA. The truth table specifies all possible combinations of activities and their implementation, lists all cases (i.e., recipients) that demonstrated a specific activity combination, and links each combination to the outcome. We applied the Enhanced Standard Analysis in our csQCA approach.[27,28] Consistency (cons.) characterizes the strength of a set relationship. Coverage (cov.) represents the portion of cases in the outcome and solution sets and broader relevance of a solution term. For individual solution terms, raw and unique coverage are also calculated. Raw coverage (raw cov.) indicates the portion of cases represented by a solution term; unique coverage (unique cov.) indicates the portion of cases represented by a single solution term.[27,28]

We used R's QCA and SetMethods packages and a 0.75 consistency threshold.[27,29,30] We conducted robustness tests.[17] We report the intermediate solution (parsimonious and conservative available on request). Our intermediate solution had one solution term with model ambiguity, which means there was one solution term that could be logically minimized differently; we prioritized findings based on interview data and our knowledge of the states arising from those interviews.

We reviewed the recipient interview transcripts and APRs for further context. We compared recipients that appeared in the same combinations to understand how particular combinations might have worked for those recipients. We present an example from a recipient for each combination.

RESULTS

Analysis of sufficiency revealed three combinations with high consistency: (1) implementing PROACTIVE REPORTING in combination with implementing GUIDELINES and NOT implementing REAL-TIME PDMP; (2) implementing PRESCRIBING INTERVENTIONS in combination with implementing GUIDELINES; and (3) NOT implementing PRESCRIBING INTERVENTIONS and NOT implementing GUIDELINES (Table 2 and Figure 1).

Sufficient Combination #1: PROACTIVE REPORTING AND GUIDELINES AND NOT REAL-TIME

This combination (cons=1.000; raw cov=.412) was implemented by seven recipients (AZ, NC, OH, OK, SC, UT, WV). Recipients representing this combination generally used two activities to complement recent or forthcoming state guidelines, regulations, laws, or legislation; these laws pertained to universal PDMP registration and use and entering prescriptions within 24 hours of dispensation. Because these states already had laws in place requiring real-time PDMP reporting, as shared in the interviews with program staff, it was reasonable to see why not implementing real-time reporting was part of the combination (See Supplementary Table for relevant state laws). Recipients used the two activities in the combination to provide reports and educational outreach to clinicians, which may have helped enable clinicians to make better use of the PDMP and align with state or federal prescribing guidelines.

To expand and improve proactive reporting, recipients created reports for clinicians. Reports were generated when clinicians had patients who were identified as high risk based on parameters determined by state staff (e.g., multiple opioid prescriptions with multiple clinicians). Reports contained information such as the volume of opioids prescribed during the quarter, the number of patients receiving opioids, clinicians' top three prescribed medications, monthly MME average of prescribed hydrocodone and oxycodone, and overlapping prescriptions of opioids and benzodiazepines.

To enhance the uptake of evidence-based opioid prescribing guidelines, recipients supported use of the PDMP by developing and disseminating resources for PDMP use, report interpretation, and prescribing guidelines and by providing training on these topics, including academic detailing.

At the outset of PfS, Utah ranked among the states with the highest proportion of overdose deaths from prescription opioids; consequently, activities to address clinician behavior were essential to their approach. The recipient implemented reporting enhancements within its PDMP (under PROACTIVE REPORTING). They increased the quality and frequency of their proactive reports of potentially concerning prescribing behavior to licensing boards, regulatory agencies, and law enforcement, and built clinical alerts into their PDMP systems which allowed prescribers to make adjustments more quickly. To enhance uptake of prescribing guidelines (GUIDELINES), Utah first developed clinical guidelines on prescribing opioids in 2009 and updated these guidelines to align with existing evidence through PfS. This recipient and its local grantees disseminated the updated guidelines in

Utah hot spots. In parallel, they implemented academic detailing with the assistance of an outside clinical partner. They identified high-risk regions and clinical specialties to reach for academic detailing. Finally, they provided technical assistance on developing interventions to raise awareness and increase uptake of the prescribing guidelines.

Sufficient Combination #2: PRESCRIBING INTERVENTIONS AND GUIDELINES

The second *sufficient* combination (cons=1.000, raw cov=.294) represents five recipients (DE, OR, PA, WI, WV) that targeted prescribing practices through a combination of implementing or improving interventions for health systems-level opioid prescribing and working at the clinician level to enhance the uptake of evidence-based opioid prescribing guidelines.

Recipients' improvements to health systems included reviewing prior authorizations, incorporating PDMP enhancements such as clinician "report cards", which compare prescribing patterns of the clinician to other clinicians in the same discipline within the PDMP system (even in the absence of potentially concerning prescribing patterns), and PDMP- health IT (i.e., electronic health record, pharmacy dispensing software systems) data integration, increasing coverage of complementary and integrative health for chronic pain, and updating their state's naloxone standing order to allow pharmacists to dispense to anyone at risk or in a position to help someone at risk of opioid overdose without a prescription.

These systems-level activities complemented other activities for clinicians, such as disseminating educational materials about evidence-based opioid prescribing guidelines and academic detailing. A key component was collaboration; all five recipients noted partnerships with other state agencies, stakeholder groups, and professional societies were integral to their activities.

At the health systems level, Delaware worked with their PDMP vendor to develop and disseminate quarterly "report cards" for all clinicians based on their current prescribing practices. At the clinician level, they worked with a communications vendor to disseminate educational materials for clinicians supporting evidence-based opioid prescribing practices based on the CDC Rx Awareness campaign and in collaboration with the state's Addiction Action Committee. These materials included a clinician education toolkit disseminated through the state's opioid prescribing awareness website and webinars facilitated by the Medical Society of Delaware.

Sufficient Combination #3: NOT PRESCRIBING INTERVENTIONS AND NOT GUIDELINES

The third solution (cons=1.000; raw cov=.235), though counterintuitive, consists of four recipients (CT, KY, ME, NV) that were engaged in substantial opioid overdose prevention strategies before receiving PfS funding. The absence of these two activities does not suggest that states will be successful if they take no action, rather the interviews suggest the importance of state context and history in program implementation. These recipients may have been successful in reducing MME per capita by using their PfS funding to support other activities. For example, Kentucky already worked on these activities through the previous CDC-funded BOOST cooperative agreement, and thus did not need to pursue

these activities as part of PfS. Kentucky and Nevada were among the first states to pass legislation mandating checking their state's PDMP prior to prescribing a Schedule II-IV controlled substance and requiring daily reporting of controlled substance dispensation. Both recipients have focused their PfS program efforts on developing centralized data systems —such as integrating PDMP data with other surveillance systems (e.g., Drug Overdose Fatality Surveillance System, Office of Vital Records Registry)—and disseminating data to communities. These efforts were part of the activities excluded from the analysis because of lack of variation. Prior to PfS funding, Maine and Connecticut established statewide working groups to develop overarching goals and responsible parties to reduce the likelihood of duplicated efforts, which allowed them to focus their efforts on data integration and innovative data dissemination.

No activities or combinations of activities were identified as *necessary* for achieving substantive change in MME per capita.

DISCUSSION

Prescribing of opioids for pain and the decision to taper opioids to lower dosages involves a careful weighing of the benefits and risks of opioid therapy for each individual patient through a shared decision making process. [31] This analysis shows that, at a population level, different combinations of activities among PfS states were related to substantive reductions in prescription opioid MME per capita. This reduction was an intended program outcome, as recipient states had challenges with high levels of prescription opioid prescribing prior to the program. CDC's Guideline for Prescribing Opioids for Chronic Pain—United States, 2016 and other state opioid prescribing guidelines supported improvements in how opioids were prescribed through clinical practice guidelines and enhancements to PDMP. PfS and the CDC Prescribing Guideline were designed to ensure patients have access to safer, more effective pain treatment while reducing the risk of opioid use disorder, overdose, and death.

These results support that states can select activities that best fit their circumstances. Building on extant capacity and focusing resources can support program effectiveness.[32] The counterintuitive finding of recipients not implementing particular activities highlights that PfS recipients were thoughtful about using funding to best address gaps in their opioid response, building on prior efforts. One of the solutions involved not implementing two activities. Our analysis of interview data indicated states in this combination may not have selected to implement these activities because of related ongoing efforts in their states or having implemented these activities through other funding streams. Consequently, not pursuing activities supported by other efforts suggests that recipients strategically focused on activities where they had gaps or had the greatest need.

Implementation of enhancing uptake of evidence-based guidelines (GUIDELINES) appears in two *sufficient* combinations of activities. This activity may be particularly supportive in achieving substantive change in MME per capita when recipients also had support for related actions. Recipients implementing this activity strove to educate clinicians and disseminate information about safe prescribing practices by implementing academic

detailing, providing continuing medical education, and collaborating with multiple stakeholders to disseminate information.

The interview data showed recipients who achieved a substantive reduction in MME per capita often had a supportive policy context (Supplemental Table 1) and may have selected activities to complement or support existing and new regulations. Combinations of activities and policy contexts may have been reinforcing, such that the PfS program enabled recipients to design interventions that strengthened the implementation of laws requiring compliance with states' PDMP laws. It also is possible that selecting activities aligned with the current policy context increased partner engagement, which is a critical factor in the effectiveness of PDMP legislation.[33]

Limitations

First, states had multiple efforts to address opioid prescribing, including implementing policies and other programs expected to affect prescribing behavior. This analysis focused on activities funded by PfS. We could not control for all contextual factors; nor are controls appropriate for QCA. QCA limits analysis to a smaller set of conditions. Consequently, we could not include additional activities or policies without creating far more possible combinations than the number of cases could accommodate (i.e., "limited diversity"). Second, three activities were excluded from analysis because of lack of variation. Although these may have been important activities, they would not meaningfully contribute to the solution terms. Third, for activity calibration, we relied on self-reported data in recipient APRs; each recipient could implement multiple efforts under each activity category. Consequently, we coded the general activity category as implemented if the recipient engaged in efforts in support of the broader activity. The broader activity category may mask important differences in the specifics of recipient efforts (Supplemental Table 1). However, each recipient's interviews and transcripts helped explain why individual solution terms worked in each state's context. Fourth, for the outcome, we used national mean change in MME per capita to define substantive change because of a lack of an external standard, despite the best practice of using external standards for QCA.[27,28] Such an approach at the population level does not adequately capture individualized risk/benefit discussion occurring between clinicians and patients regarding reductions in opioid prescription dosages. We conducted a sensitivity analysis with a 5% change in MME per capita (increasing and decreasing the threshold). The solution terms and parameters of fit were somewhat sensitive to larger decreases in MME per capita but were not logically inconsistent solution terms presented in the paper. Since there is no standard referent for what constitutes an appropriate MME per capita, increasing or decreasing the threshold does not have specific clinical meaning. Finally, because QCA is not designed to assess individual impact or contribution of specific activities, we cannot explain the degree to which one activity contributed relative to another.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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IMPLICATIONS FOR POLICY AND PRACTICE

- Over time, PDMP enhancements (e.g., making them more accessible and ensuring more timely data entry, maximizing PDMP use among clinicians and their delegates and offering education and reports to support clinician and clinician delegate use) that improve opioid prescribing can help reduce risk for opioid misuse, use disorder, and overdose.
- This study describes some of the activities that states used to improve the way opioids are prescribed, thus reducing MME per capita, while ensuring patients have access to safe pain management.
- To maximize new funding and increase efficiency, state agencies can assess existing policies and activities and identify how to enhance or build on efforts when developing implementation plans.
- PDMP improvements and educational activities may help continue the trend from 2010 to 2017 of decreased opioid prescribing.[34]

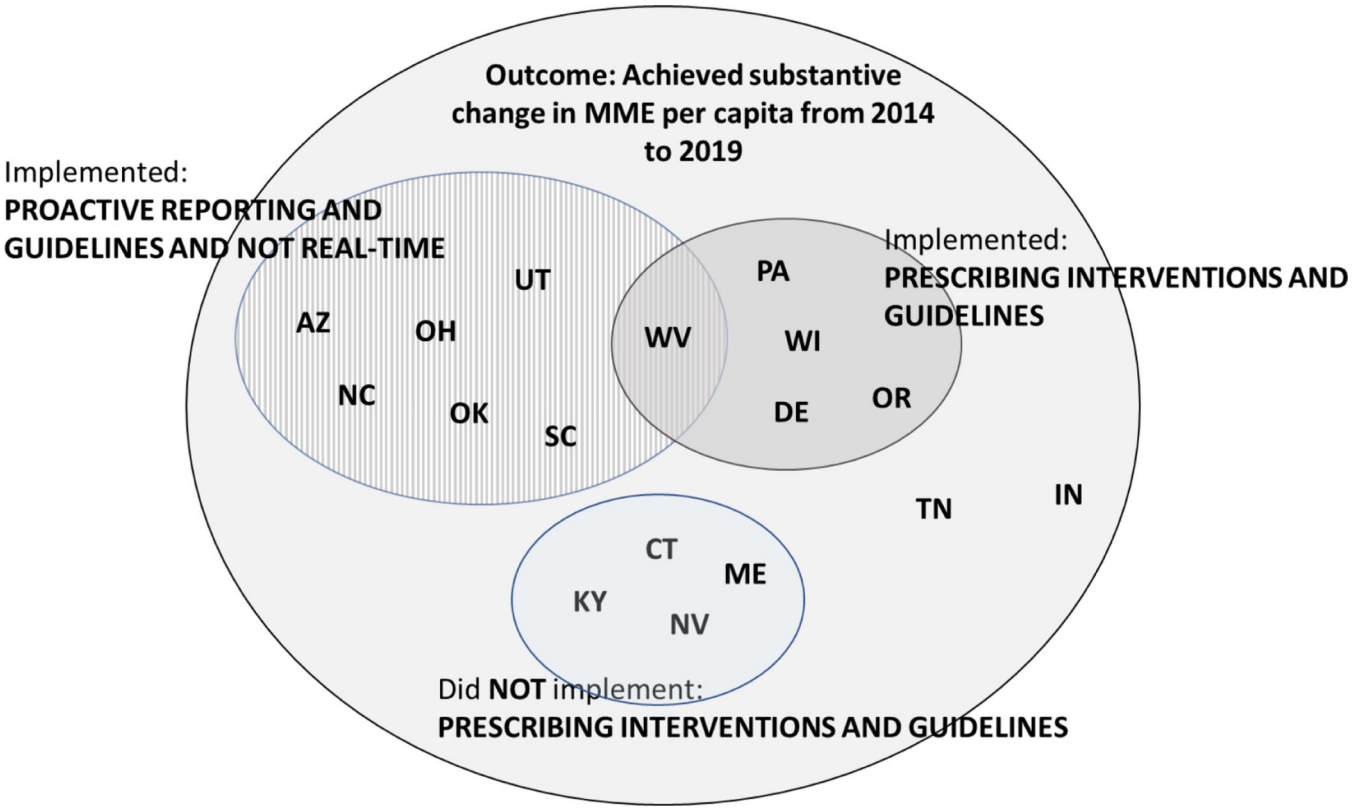

Figure 1. ***Sufficient*** **Combinations of Activities for Achieving Substantive Change in Morphine Milligram Equivalents (MME) per Capita**

Note. Large circle represents the outcome set of having achieved a substantive change in MME per capita from 2014 to 2019. Indiana (IN) and Tennessee (TN) achieved the outcome but were not accounted for by the three solution terms (the small circles). West Virginia (WV) is covered by two solution terms and thus appears in the overlapping circles. REAL TIME: Move toward a real-time PDMP; PROACTIVE REPORTING: Expand and improve proactive reporting; PRESCRIBING INTERVENTIONS: Implement or improve prescribing interventions for insurers, health systems, or pharmacy benefit managers; and GUIDELINES: Enhance the uptake of evidence-based opioid prescribing guidelines.

TABLE 1.

Truth Table for Prevention for States Enhancement Activities and Substantive Change in Morphine Milligram Equivalents (MME) per Capita

Row Number	REGISTRATION	REAL-TIME	PROACTIVE REPORTING	PRESCRIBING INTERVENTIONS	GUIDELINES	Recipients with This Combination	N	Consistency
1	1	0	1	0	1	AZ, NC, OH, SC	4	1.000
2	1	1	1	1	1	OR, PA, WI	3	1.000
3	0	0	1	0	1	OK, UT	2	1.000
4	1	1	0	0	0	CT, ME	2	1.000
5	0	0	0	0	0	KY	1	1.000
6	0	0	0	1	1	DE	1	1.000
7	0	0	1	0	0	NV	1	1.000
8	0	0	1	1	1	WV	1	1.000
9	1	1	1	0	1	IN, RI	2	0.500
10	1	1	1	1	0	IL, MA, TN	3	0.333
11	0	0	0	0	1	CO, NE, NY, VA	4	0.000
12	1	0	1	1	0	CA, MD, NM	3	0.000
13	0	1	0	1	0	WA	1	0.000
14	0	1	1	0	1	VT	1	0.000

Data Sources: 2016–2018 PfS Annual Progress Reports and 2014–2019 IQVIA Xponet Dataset

Note. 1 = Recipient implemented the activity; 0 = recipient did not implement the activity.

These analyses excluded two states that did not provide data on the PDMP enhancement activities.

Consistency indicates the degree to which the combination produces the outcome, or the strength of the linkage between the combination and the outcome (in this example, what proportion of the recipients implementing that combination of activities demonstrated substantive reductions in MME per capita in both 2014 and 2019 or better than average reductions in prescribing rates). Consistency ranges between 0 (not consistent) and 1 (perfect consistency).

This table shows only the 14 combinations with empirical cases; it excludes the remaining 18 possible combinations with no empirical cases.

TABLE 2.

***Sufficient* Combinations of Activities for Achieving Substantive Reductions in Morphine Milligram Equivalents (MME) per Capita from 2014 to 2019 among Prevention for States (PfS) Recipients**

Combinations of Activities *Sufficient* for Achieving More than the Mean Reduction for MME per Capita from 2014 to 2019 among PfS Recipients

Combination	Solution Term (Implemented)	Raw Coverage	Unique Coverage	Consistency	Recipients with This Combination
1	Implement improve proactive reporting (PROACTIVE REPORTING) AND enhance uptake of evidence-based opioid prescribing guidelines (GUIDELINES) AND NOT move toward real-time PDMP (REAL-TIME)	.412	.353	1.000	AZ, NC, OH, OK, SC, UT, WV
2	Implement or improve opioid prescribing interventions for insurers, health systems, or pharmacy benefit managers (PRESCRIBING INTERVENTIONS) AND enhance uptake of evidence-based opioid prescribing guidelines (GUIDELINES)	.294	.235	1.000	DE, OR, PA, WI, WV
3	NOT implement improving opioid prescribing interventions for insurers, health systems, or pharmacy benefit managers (PRESCRIBING INTERVENTIONS) AND NOT enhance uptake of evidence-based opioid prescribing guidelines (GUIDELINES)	.235	.235	1.000	CT, KY, ME, NV
Total solution consistency = 1.000					
Total solution coverage= .882					

Data Sources: 2016–2018 PfS Annual Progress Reports and 2014–2019 IQVIA Xponent Dataset

Note. Raw coverage indicates the portion of cases represented by a solution term. Unique coverage indicates the portion of cases represented by a single solution term. Consistency indicates the degree to which the combination produces the outcome, or the strength of the linkage between the combination and the outcome. Consistency ranges between 0 (not consistent) and 1 (perfect consistency).