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ORIGINAL ARTICLE

Medical Cannabis in the United States: Comparing 2017 and 2024 State Qualifying Conditions to the 2017 National Academies of Sciences Report

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Abstract

Objective: To compare the 2017 National Academies of Sciences, Engineering, and Medicine cannabis report to state medical cannabis (MC) laws defining approved qualifying conditions (QC) from 2017 and 2024 and to determine the evidence level of the QCs approved in each state.

Patients and Methods: The 2017 National Academies of Sciences (NAS) report assessed therapeutic evidence for over 20 medical conditions treated with MC. We identified the QCs of 38 states (including Washington DC) where MC was legal in 2024 and compared them to the QCs listed by these states in 2017. The QCs were then categorized on the basis of NAS-established levels of evidence: limited, moderate, or substantial/conclusive evidence of effectiveness, limited evidence of ineffectiveness, or no/insufficient evidence to support or refute effectiveness. This study was completed from January 31, 2023 to June 20, 2024.

Results: Most states listed at least one QC with substantial evidence—80.0% in 2017 and 97.0% in 2024. However, in 2024 only 8.3% of the QCs on states' QC lists met the standard of substantial/conclusive evidence. Of the 20 most popular QCs in the country in 2017 and 2024, one only (long-term pain) was categorized by the NAS as having substantial evidence for effectiveness. However, 7 were rated as either ineffective (eg, glaucoma) or insufficient evidence.

Conclusion: Most QCs lack evidence for use on the basis of the 2017 NAS report. Many states recommend QCs with little evidence (amyotrophic lateral sclerosis) or even those for which MC is ineffective (depression). These findings highlight a disparity between state-level MC recommendations and the evidence to support them.

Thirty-seven states and the District of Columbia, representing 73% of the United States population, have legislation in 2024 for medical cannabis (MC).[1] Each state determines the qualifying conditions (QCs) that allow patients to receive recommendation for MC by providers. QCs range widely between states, and commonly include conditions such as long-term pain, anxiety, and posttraumatic stress disorder (PTSD).[2] In 2019-2020, 2.5% of Americans reported using cannabis for medical needs, compared with 1.2% in 2013-2014, representing a 12.9% annual increase.[1]

Medical cannabis refers to products derived from the *Cannabis sativa* plant that are used to treat medical conditions or symptoms. The MC products contain cannabinoids, such as tetrahydrocannabinol (THC) and cannabidiol (CBD), which are both used therapeutically.[3,4] Like any pharmaceutical agent, there are potential clinical benefits and harms associated with MC and research into therapeutic uses of MC continues to evolve.[5,6] This presents a potential public health challenge, as the societal and political acceptance of the drug is moving faster than scientific understanding. One consideration for patients is

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cost—one study conducted among MC dispensary patients in New England reported that many were spending over 2000 dollars per year.[5] There is also concern about drug interactions, particularly involving CYP3A4, with the prescription formulations of THC and CBD.[7] Although lethal overdose from cannabis is extremely rare, there are infrequent but serious case-reports of fatalities involving cardiac events, and of cannabis hyperemesis syndrome, which is characterized by cyclical, severe vomiting.[8-10]

The National Academies of Sciences, Engineering, and Medicine[11] published a report in 2017 on the evidence for the therapeutic effects of cannabis and cannabinoids for over 20 conditions. This landmark publication involved reviewing more than 10,700 abstracts and has the potential to be a premier resource for states looking for scientific guidance for approving QCs.[11] However, it has not always been used with this purpose, as some states make decisions to include QCs by incorporating expert opinion, other evidence, and public wishes.[12,13] For example, Delaware allows citizens to petition to add QCs and approves conditions on the basis of 2 main factors: (1) the medical condition or treatment is debilitating and (2) marijuana is more likely than not to have the potential to be beneficial to treat or alleviate the debilitation associated with the medical condition or treatment.[14] Similarly, Illinois also allows for petitions to be made by citizens.[15] These petitions must include evidence generally accepted by the medical community and other experts that the use of MC alleviates suffering caused by the debilitating medical disease or treatment.

The process that states have applied thus far has resulted in a gap between the QCs recommended by states and the evidence to support MC use for those conditions. Other studies have incorporated the National Academies of Sciences (NAS) report to comment on public policy,[11,16,17] but none have analyzed how QCs allowed by all states with MC compare to the evidence in the NAS report.

In this study, we sought to detail the past and present QCs of all states in which MC was legal from 2017 to 2024 and to map the evidence of each QC. Our objective was to compare states' QCs at the time of publication of the NAS report in 2017 to the time of the study in 2024 to determine if the proportion of QCs in each category changed considerably. We hypothesized that the most QCs used by states would not align with substantial/conclusive evidence, and that QCs would not be updated to align with the evidence presented by the NAS.[11]

PATIENTS AND METHODS

Procedures

The QCs were collected for each of the 37 states and the District of Columbia where MC was legal in the United States as of April 2023 when analyses began. Data for those states that had MC policy in April 2023 was updated for 2024, but states that created MC policy since April 2023 were not added to our analysis. For ease of reporting, we refer to the District of Columbia as a state, making 38 states with MC in 2024. This information was verified by comparison to each state's MC program (Supplemental Appendix). We used an internet archive tool to collect the QCs for each state in 2017.[18] Of the 38 states with legalized MC in 2024, 31 had legalized MC in 2017. The NAS report[11] was published in 2017, making that the first year of data collection.

The NAS report was used as our gold standard of evidence because it is a comprehensive review of available evidence for 20 of the most popular QCs in the country.

Ten states (CA, DC, LA, ME, MD, MA, MO, NY, OK, and VA) in 2024 included blanket statements that permitted provider discretion to recommend MC for any condition that they deemed necessary. These statements were not included in the state's total number of QCs. States that had no QCs and allowed full discretion to the certifying provider were noted.

Each condition was divided into the categories established by the NAS report: conclusive/substantial evidence of effectiveness (eg, long-term pain), moderate evidence of effectiveness (eg, improved sleep outcomes for certain conditions), limited evidence of effectiveness (eg, PTSD), limited evidence of ineffectiveness (eg, glaucoma), and no/insufficient evidence to support or refute effectiveness (eg, epilepsy)[11] (Table 1).

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TABLE 1. Categories of Evidence Established by the 2017 National Academies of Sciences, Engineering, and Medicine (NAS) Report

National Academies of Sciences Categories of Evidence	Conditions/symptoms
Conclusive or substantial evidence of effectiveness	For the treatment of long-term pain in adults As antiemetics in the treatment of chemotherapy-induced nausea and vomiting For improving patient-reported multiple sclerosis spasticity symptoms
Moderate evidence of effectiveness	Improving short-term sleep outcomes in individuals with sleep disturbance associated with obstructive sleep apnea syndrome, fibromyalgia, long-term pain, and multiple sclerosis
Limited evidence of effectiveness	Increasing appetite and decreasing weight loss associated with HIV/AIDS Improving clinician-measured multiple sclerosis spasticity symptoms Improving symptoms of Tourette syndrome Improving anxiety symptoms, as assessed by a public speaking test, in individuals with social anxiety disorders Improving symptoms of posttraumatic stress disorder
Limited evidence of a statistical association	Better outcomes (ie, mortality and disability) after a traumatic brain injury or intracranial hemorrhage
Limited evidence of ineffectiveness	Improving symptoms associated with dementia Improving intraocular pressure associated with glaucoma Reducing depressive symptoms in individuals with long-term pain or multiple sclerosis
No/insufficient evidence to support or refute effectiveness	Cancers, including glioma Cancer-associated anorexia cachexia syndrome and anorexia nervosa Symptoms of irritable bowel syndrome Epilepsy Spasticity in patients with paralysis due to spinal cord injury Symptoms associated with amyotrophic lateral sclerosis Chorea and certain neuropsychiatric symptoms associated with Huntington disease Motor system symptoms associated with Parkinson's disease or the levodopa-induced dyskinesia Dystonia Achieving abstinence in the use of addictive substances Mental health outcomes in individuals with schizophrenia or schizophreniform psychosis

The QCs that only partially fit into the NAS-established categories, when taken exactly as written, were categorized as partial (Table 2).[11] For example, 93.4% of states list cancer as a QC and although there are several applications of MC for cancer listed in the NAS report (eg, antiemetic for chemotherapy-induced nausea/vomiting, cancer-associated anorexia cachexia syndrome, and long-term pain associated with cancer) each had a

TABLE 2. Common State Qualifying Conditions for Medical Cannabis that Were Deemed Partial Because of Broad Wording, Compared With Evidence Found by NAS[11]

Qualifying Condition	NAS Evidence Related to This Condition
Anxiety	Limited evidence for: anxiety symptoms in those with social anxiety.
Cachexia	Limited evidence for: increased appetite and decreased weight loss in HIV/AIDS. Insufficient evidence for: anorexia/cachexia syndrome in cancer.
Cancer	Conclusive/substantial evidence of effectiveness for: long-term pain in cancer, chemotherapy-induced nausea and vomiting.Insufficient evidence for: cancer regression, cancer-associated anorexia/cachexia syndrome.
HIV or AIDS	Limited evidence of effectiveness for: increased appetite and decreased weight loss in HIV/AIDS.
Multiple sclerosis	Substantial evidence for: patient-reported MS spasticity, long-term pain due to MS. Moderate evidence for: improved short-term sleep outcomes for MS. Limited evidence for: clinician-measured MS spasticity. Limited evidence of ineffectiveness for: depressive symptoms due to MS.
Nausea	Conclusive evidence for: chemotherapy-induced nausea and vomiting.
Seizure	Insufficient evidence for: epilepsy.
Severe and persistent muscle spasms	Substantial evidence for: patient-reported MS spasticity. Limited evidence for: clinician-measured MS spasticity.Insufficient evidence for: spasticity due to paralysis due to spinal cord injury, dystonia, Parkinson's disease motor system symptoms, or levodopa-induced dyskinesia.

MS, multiple sclerosis; NAS, National Academy of Sciences.

different level of evidence. As such, cancer and other broad QCs were categorized as partial. Each partial QC counted as a single QC in the total QC count per state. Many states listed QCs that were not studied in the NAS report (eg, Crohn disease) which were categorized as not available (N/A).

Data Analysis

A 2 (time) × 2 (level of evidence) χ^2 was completed with GraphPad Prism to analyze differences ($P<.05$) in QCs of each category for 2017 versus 2024[19] (Supplemental Table 1, available online at http://www.mcpiqojournal.org). This analysis was done, in the case of one category, by comparing the number of total QCs with insufficient evidence across all states in 2017 (55 QCs) to 2024 (74 QCs), versus the number of total QCs in all other categories in 2017 (386 QCs) and 2024 (542 QCs). Figures were prepared with Prism (v10.0) and heatmaps were constructed using HeatMapper.[19]

RESULTS

Number of QCs in 2017 and 2024

Of the 31 states with legal MC in 2017, the number of QCs varied 5-fold (Minimum=8 in Alaska, Colorado, Maryland, and Massachusetts; Maximum=40 in Illinois) with a mean of 14.7 (Table 3).[11]

Of the 38 states with legal MC in 2024, the average number of QCs in a state was 18.7, and there was a 10-fold difference in QCs between the state with the fewest (South Dakota, 5) and the most (Illinois, 52) (Table 3). Ten states included with their QCs the ability of providers to recommend MC at their discretion—whereas 5 (District of Columbia, Maine, New York, Oklahoma, and Virginia) left the decision to the discretion of the provider, requiring no QCs whatsoever.

Results of QCs in 2017 and 2024

In 2017, 80.0% of states (24 states) with a QC list had at least one QC with substantial evidence (Table 3), but only 6.8% of the country's QCs (30 QCs) had at least substantial evidence. Overall, 90.0% of states (27) listed one or more QCs with limited evidence of ineffectiveness (Table 3). States without a QC list, that solely leave the decision to recommend MC to a patient up to the provider, were not counted in these analyses.

In 2024, 97.0% of states (32) with a QC list had at least one QC with substantial or conclusive evidence of effectiveness (Figure 1A), but only 8.3% of states' QCs (51) had at least substantial evidence. Ninety-one percent of states (30) listed one or more QCs with limited evidence of ineffectiveness (Figure 1B), most commonly glaucoma. In 2024, most (90.9%) states had at least one QC that was not in the

TABLE 3. United States Total Number of Qualifying Conditions (Total QCs), Total Qualifying Conditions That are Labeled With Conclusive/Substantial Evidence of Effectiveness (Number Effective), and Total Qualifying Conditions That are Labeled With Limited Evidence of Ineffectiveness (Number Ineffective) by the 2017 National Academies of Sciences, Engineering, and Medicine report[11,a]

State	Total QCs 2017	Number Effective 2017 (%)	Number Ineffective 2017 (%)	Total QCs 2024	Number Effective 2024 (%)	Number Ineffective 2024 (%)
Alabama	N/A	-	-	15	1 (6.7)	0 (0)
Alaska	8	1 (12.5)	1 (12.5)	8	1 (12.5)	1 (12.5)
Arizona	13	1 (7.7)	2 (15.4)	14	1 (7.1)	2 (14.3)
Arkansas	18	2 (11.1)	2 (11.1)	18	2 (11.1)	2 (11.1)
California	11	1 (9.1)	1 (9.1)	11	1 (9.1)	1 (9.1)
Colorado	8	1 (12.5)	1 (12.5)	11	1 (9.1)	1 (9.1)
Connecticut	21	0 (0)	1 (4.8)	40	6 (15.0)	1 (2.5)
Delaware	15	1 (6.7)	1 (6.7)	17	1 (5.9)	2 (11.8)
District of Columbia	Provider discretion	-	-	Provider discretion	-	-
Florida	13	1 (7.7)	1 (7.7)	13	1 (7.7)	1 (7.7)
Hawaii	15	1 (6.7)	1 (6.7)	15	1 (6.7)	1 (6.7)
Illinois	40	0 (0)	2 (5.0)	52	2 (3.9)	2 (3.9)
Louisiana	10	0 (0)	0 (0)	27	3 (11.1)	3 (11.1)
Maine	16	1 (6.3)	2 (12.5)	Provider discretion	-	-
Maryland	8	1 (12.5)	1 (12.5)	9	1 (11.1)	1 (11.1)
Massachusetts	8	0 (0)	1 (12.5)	8	0 (0)	1 (12.5)
Michigan	14	1 (7.1)	2 (14.3)	26	1 (3.9)	2 (7.7)
Minnesota	10	1 (10.0)	1 (10.0)	21	2 (9.5)	2 (9.5)
Mississippi	N/A	-	-	25	3 (12.0)	3 (12)
Missouri	N/A	-	-	24	2 (8.3)	2 (8.3)
Montana	15	2 (13.3)	1 (6.7)	15	2 (13.3)	1 (6.7)
Nevada	9	1 (11.1)	1 (11.1)	15	1 (6.7)	1 (6.7)
New Hampshire	18	0 (0)	2 (11.1)	24	2 (8.3)	2 (8.3)
New Jersey	14	0 (0)	1 (7.1)	17	1 (5.9)	1 (5.9)
New Mexico	21	2 (9.5)	1 (4.8)	22	2 (9.1)	1 (4.5)
New York	11	2 (18.2)	0 (0)	Provider discretion	-	-
North Dakota	18	1 (5.6)	2 (11.1)	29	2 (6.9)	2 (6.9)
Ohio	21	1 (4.8)	2 (9.5)	26	1 (3.9)	2 (7.7)
Oklahoma	N/A	-	-	Provider discretion	-	-
Oregon	10	1 (10.0)	1 (10.0)	10	1 (10.0)	1 (10.0)
Pennsylvania	17	2 (11.8)	1 (5.9)	24	2 (8.3)	1 (4.2)
Rhode Island	11	1 (9.1)	2 (18.2)	11	1 (9.1)	1 (18.2)
South Dakota	N/A	-	-	5	1 (20.0)	0 (0)
Utah	N/A	-	-	16	1 (6.3)	1 (6.3)
Vermont	12	1 (8.3)	1 (8.3)	12	1 (8.3)	1 (8.3)

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TABLE 3. Continued

State	Total QCs 2017	Number Effective 2017 (%)	Number Ineffective 2017 (%)	Total QCs 2024	Number Effective 2024 (%)	Number Ineffective 2024 (%)
Virginia	N/A	-	-	Provider discretion	-	-
Washington	21	1 (4.8)	1 (4.8)	21	1 (4.8)	1 (4.8)
West Virginia	15	2 (13.3)	0 (0)	15	2 (13.3)	0 (0)

[a]Also included is the percent of the state's total QCs in each category (%). States without QCs that permit provider discretion to recommend medical cannabis (MC) for any condition that they deem necessary are marked as provider discretion. States that had no MC in 2017 are marked as N/A.

NAS report. Twenty-eight percent of the country's QCs (171) were not included in the NAS report, and 37.2% (229) were a partial fit (Figure 1).

Changes to QCs Since 2017

Of the states with MC in 2017, 20.0% listed a higher percentage of QCs with substantial evidence in 2024 versus 33.3% listed a lower percentage. Around half (46.7%) recommended a lower percentage of ineffective QCs by 2023, whereas only 6.7% recommended a higher percentage (Figure 2).

Using a corrected *P*-value ($P<.00833$), our χ^2 analysis reported no significant difference in any categories of evidence from 2017 to 2024. However, with an uncorrected *P*-value ($P<.05$) we found a significant increase in the QCs not studied by the NAS (Supplemental Table 1). These QCs increased from 97 in 2017 to 171 in 2024. QCs labeled partial increased from 195 to 229. There was no significant difference between the number of QCs with substantial evidence between 2017 and 2024 with corrected or uncorrected *P*-value (Supplemental Table 1). This was also true of the other categories of evidence (moderate/limited evidence, evidence of ineffectiveness, and insufficient evidence). Of the 20 most popular QCs in the country in 2017 and 2024 (Figure 3), only one (long-term pain) was categorized by the NAS as having substantial evidence for effectiveness.[11] However, 7 (amyotrophic lateral sclerosis, Alzheimer disease, epilepsy, glaucoma, Huntington disease, Parkinson's disease [PD], and spastic spinal cord damage) were rated as either ineffective or insufficient evidence (Figure 3).

DISCUSSION

Most QCs (91.7%) that states use to qualify patients for MC recommendation do not align with evidence for benefit.[11] Most states allow QCs for which the effects of MC have not been well-studied (eg, amyotrophic lateral sclerosis, Parkinson's Disease, and opioid dependence) or are known to some degree to be ineffective (eg, Alzheimer disease, glaucoma, and Huntington disease).[11] When comparing QCs from 2017 (the time of publication of the NAS report) to 2024, there was no data to suggest that states updated their recommendations on the basis of the evidence gathered by the NAS.[11] In fact, the only types of QCs that have significantly increased, albeit at an uncorrected threshold, are those that were vaguely labeled (ie, partial in our categorization scheme) or not reported on by the NAS report. Partial was the largest category in both 2017 (44% of QCs) and 2024 (37%). Those within this category incompletely fit into one or more categories, each varying in level of evidence.

We found no evidence that states revised and updated QC lists according to levels of available evidence. The nonsignificant results suggest that there was no considerable increase in the number of QCs with substantial evidence over time. No states removed QCs from their list during the study period, so states only lowered their percentage of QCs labeled ineffective by dilution (Figure 2).

It is important to note that the low percentage of QCs with substantial evidence reflects the limited availability of strong evidence for MC use, as identified by the NAS report. Only 3 conditions (long-term pain, chemotherapy-induced nausea and

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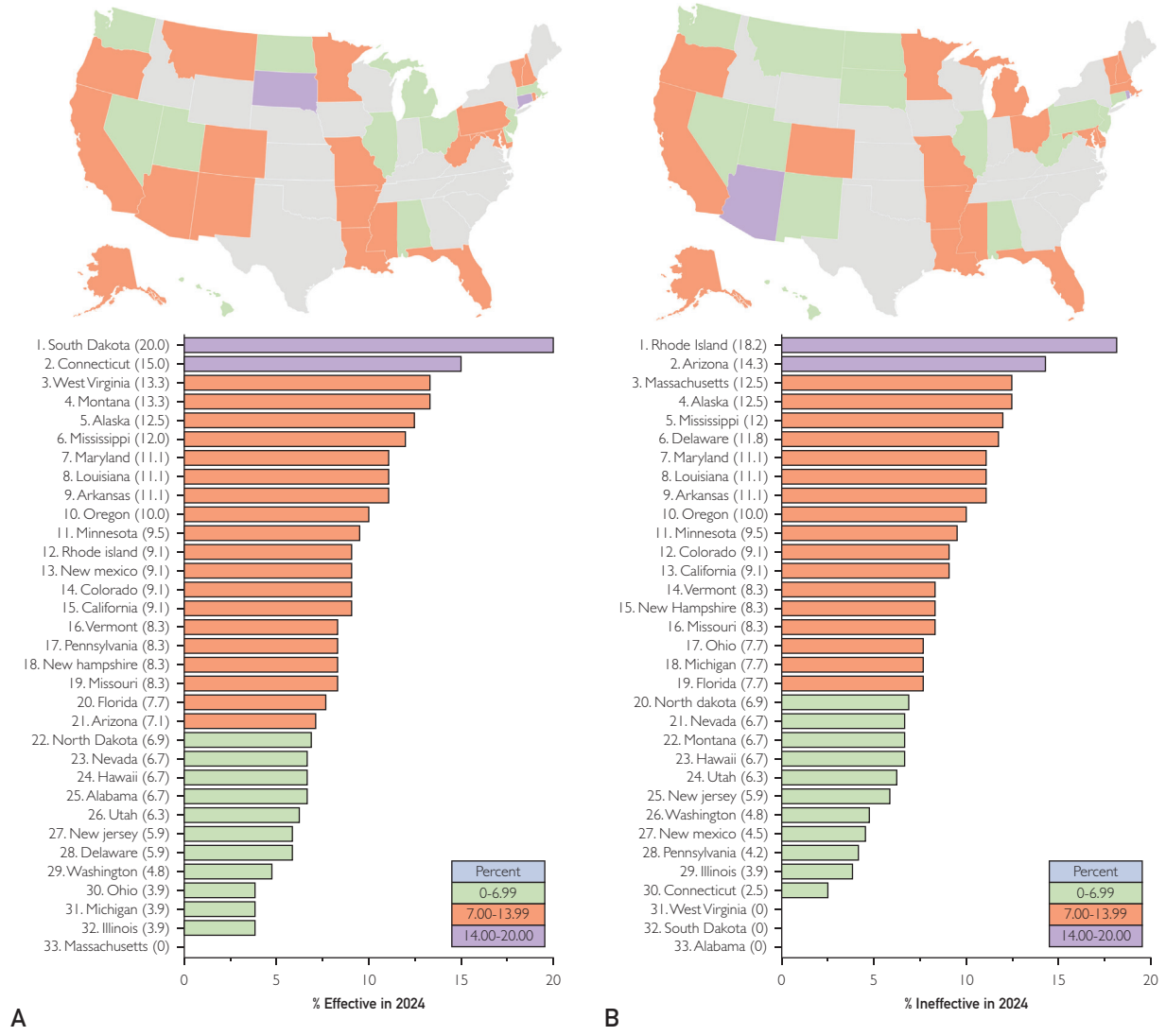

FIGURE 1. Percent of each state's qualifying conditions (QC) for medical cannabis (MC) that had conclusive/substantial evidence of effectiveness (A) and limited evidence of ineffectiveness (B) in 2024 according to the National Academies of Sciences (NAS) report.[11] The District of Columbia, Maine, New York, Oklahoma, and Virginia were not displayed because of lack of QC list. States that did not have MC in 2024 are shown in gray.

vomiting, and patient-reported multiple sclerosis spasticity) have conclusive or substantial evidence supporting the use of MC, which restricts the potential for states to base more of their QCs on conclusive evidence. However, this only reinforces that more research is needed on QCs being used in the United States.

Sources of evidence-based medicine, which are generally congruent with the NAS report,[11] have also been ignored by states. For example, the American Glaucoma Society stated in 2009 that MC is not recommended for glaucoma due to its adverse effects and short duration of action, coupled with a lack of evidence that its use alters the course of glaucoma.[20] The PD foundation released the following consensus statement in 2020 regarding MC for PD: "Given the lack of any clear data supporting the use of cannabis in PD, the Foundation does not

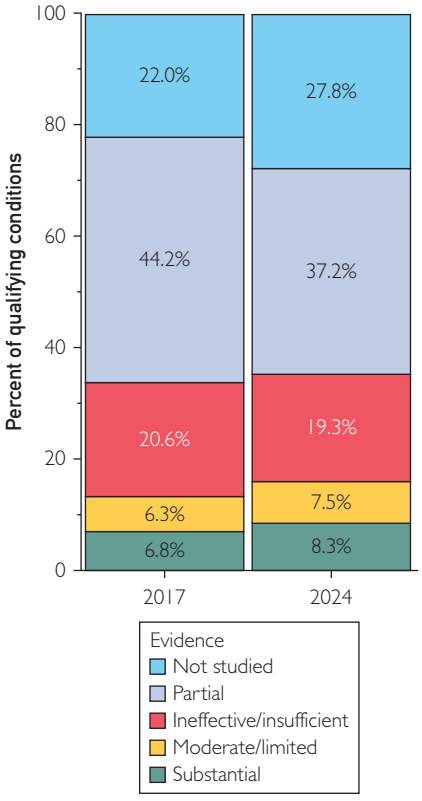

FIGURE 2. Number of total qualifying conditions (QC) for medical cannabis (MC) in all states in 2017 and 2024. Each year is divided into and color-coded by percent of QCs in each of the NAS-established categories. States that had no QCs, only blanket statements (District of Columbia, Maine, New York, Oklahoma, and Virginia), were excluded.

endorse their use for PD symptoms or to modify disease progression.[21]"

Public Health Implications

States recommending QCs that are ineffective is a potential public health concern. First, the money patients spend on MC may be better utilized for evidence-based interventions. Second, cannabis potentially possesses adverse effects and safety concerns.[8-10] Although MC is not associated with lethal overdose, the NAS report includes evidence for harms of MC, which found that smoking cannabis increases risk for respiratory symptoms and long-term bronchitis episodes.[11] They also reported on substantial evidence of an association between cannabis use and the development of schizophrenia (although see[22]), and moderate evidence of increased social anxiety disorder, increased suicidal ideation, and increased episodes of mania in bipolar disorder with regular use.[11] These risks should be carefully considered.

Limitations and Recent Research

First, not every QC exactly matches a condition or symptom studied by the NAS. Therefore, the authors took on the, sometimes challenging, responsibility of assigning those states to specific categories. Our categorization scheme may have some subjectivity that influenced our results.

Second, handling partial QCs proved especially difficult, and the requirement for a partial category represents a notable caveat of this study. The NAS focused on evidence for MC's effects on highly specific disease symptoms, mirroring the way research on MC is usually presented. Because lawmakers, not clinicians, are creating states' QC lists, their lists often simply state diseases, which could encompass a range of pathophysiology, symptoms, and treatments. For example, many states simply list cancer as a QC. According to evidence found by the NAS, cancer could be labeled as conclusive evidence of effectiveness for chemotherapy-induced nausea and vomiting but could also be labeled as insufficient evidence for cancer regression or cancer-associated anorexia/cachexia syndrome. Table 2 highlights the most common partial QCs and the various categories of evidence that each may fit into. This partial categorization is somewhat the consequence of nonmedical decision makers creating MC policy but could have been alleviated with an improved labeling system by the NAS report. However, the need for the partial category also supports the conclusion that QC list creation, being handled by politicians and typically not medical practitioners, lacks an objective and scientific process.

Third, the NAS report is a snapshot of the accumulated evidence of medical science on MC in 2017. As a variety of QCs are investigated, new evidence will emerge for the use of MC. In a 2024 National Academies of Sciences, Engineering, and Medicine report concerning cannabis policy,[23] the Chair and Vice

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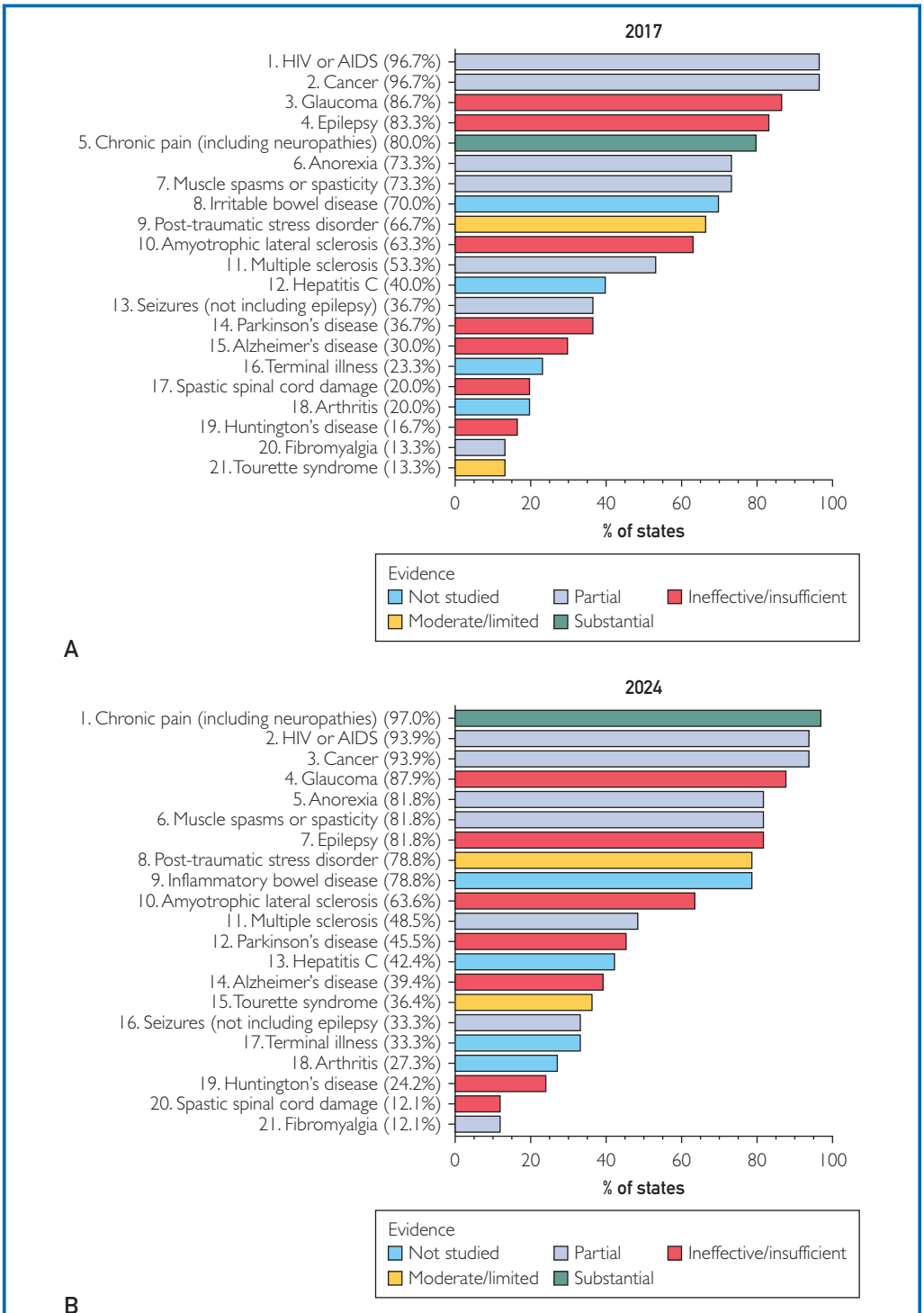

FIGURE 3. Percentage of states that include the mentioned qualifying conditions (QC) in their list in 2017 (A) and 2024 (B). Each QC is color-coded by its NAS evidence rating.

Chair of the authoring committee state that although cannabis use has increased considerably since the 2017 NAS report, research on MC has unfortunately not. Cannabis remains a Schedule I drug under federal law (although this may change soon[24]), making research of MC more difficult[23] due to the considerable bureaucratic barriers (eg, obtaining a Schedule I license through the Drug Enforcement Agency) to studying these drugs and the limitations on potential sources of study drugs. Further, no products that are available in state MC retailers have gone through any Food and Drug Administration approval process.

Six conditions were classified with conclusive/substantial evidence or evidence of ineffectiveness in 2017—these categories are not likely to change now that that evidence has been found. Categories more likely to change with the accumulation of discovery are those with moderate/limited evidence and with insufficient evidence.

For example, in 2017, the NAS concluded that there was insufficient evidence for epilepsy, although in 2018 the FDA-approved Epidiolex, a cannabidiol used for certain seizure disorders.[25] This is the first and only CBD product approved by the FDA, and its approval contradicts the NAS conclusion. Two THC analog products have also been approved, dronabinol and nabilone, for post-chemotherapy nausea and vomiting and AIDS-induced anorexia (Supplemental Table 1, available online at http://www.mcpiqojournal.org). These cannabinoids approved by the FDA represent examples of how researchers will continue to collect evidence and some of these conclusions will change.

In many cases, more current research supports the findings in the NAS report. For example, long-term pain was rated by the NAS to be one of the few conditions for which MC has substantial evidence of effectiveness.[11] In a 2022 systematic review, high THC-to-CBD ratio products were found to have a moderate effect on pain symptoms,[26] and another in the same year found both dronabinol and nabiximols, which are cannabis products, to have moderate evidence of therapeutic effect for long-term pain.[27] Conclusions made by the NAS[11] for other QCs similarly remain true. A 2020 systematic review found potential effect of cannabis for PTSD but labeled those studies as small and having methodological weaknesses.[26,28] Another systematic review found a positive effect of MC for PTSD but could not come to a conclusion on the value of evidence.[29] These results uphold the NAS[11] finding that evidence for beneficial effects of MC for PTSD is limited. New information like this should be taken together with the findings of the NAS report rather than replacing established accumulation of evidence. Overall, although the NAS[11] reflects evidence at the time it was published, it largely mirrors many of the more recent systematic reviews and meta-analyses, and the 2023 Mayo Clinic report on medical marijuana.[6,26,30,31]

Notably, using the 2017 NAS report to compare evidence may limit study findings due to: (1) the specific conditions and symptoms studied by NAS being similar to but different from QCs approved by states, preventing clear categorization of QCs with an evidence level; and (2) the dated nature of the report and continued cannabis research means that it will need to be updated as new research emerges. Despite its challenges, the NAS report is widely cited as a reputable body of evidence.[17,32-36]

Conclusion and Future Directions

In conclusion, this study provides valuable insight into the incongruence between the 2017 NAS report and state policy. Our results support the notion that states use other information to guide QC selection, including voter initiatives and public opinion.[37] As new studies are completed, those findings should be added to the foundation that the NAS has provided.

Although more research into MC is necessary, clinical trials for MC are currently difficult to implement and progress slowly. For a clinical trial of MC to be approved in the United States, regulations restrict the type of cannabis product used (excluding those sold to patients at dispensaries). As such, some researchers are instead turning to observational studies, which can provide real-world data on the impacts of the range of MC products that are accessible to patients on the market. Although observational studies cannot replace randomized controlled trials, they may

alleviate some of the gaps between knowledge and legislation.

POTENTIAL COMPETING INTEREST

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ETHICS STATEMENT

This report was approved by the institutional review board of Geisinger as exempt.

SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at http://www.mcpiqojournal.org. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

Abbreviations and Acronyms: **MC,** medical cannabis; **NAS,** national academies of sciences; **QC,** qualifying conditions

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