# The Future of Cannabis Labeling Is Digital

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*Leveraging QR codes to solve one of the greatest regulatory challenges affecting legal cannabis markets*

STRATEGIES 64

## Table of Contents


- Executive Summary . . . . . 3
- Stakeholder Perspectives: Labeling Challenges . . . . . 4
- The Broken State of Cannabis Labeling Policy . . . . . 4
- Comparison of Consumer Product Labels . . . . . 6
- Current Status Quo: Impacts on Stakeholders . . . . . 9
- Political Barriers to Reform . . . . . 11
- Embracing QR Codes to Move Cannabis Labeling Forward . . . . . 12
- Conclusion . . . . . 14
- Appendix A . . . . . 15
- Appendix B . . . . . 17


## About the Authors

This paper was prepared by Strategies 64, a national policy consulting firm specializing in cannabis, psychedelics, and the development of responsible legal markets. For over a decade, it has been shaping laws and regulations, informing public opinion, and guiding governments, industries, and other stakeholders through the transition from prohibition to regulation.


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## Executive Summary

Cannabis labeling policy is broken in the United States. Currently, it is characterized by three fundamental problems:

- **Overly voluminous** – Excessive amounts of information must be conveyed.
- **Constantly changing** – Requirements are often expanded and/or revised.
- **Lacking standardization** – Requirements are not uniform across states and product types.

This combination of overcrowded labels, shifting rules, and lack of a universally recognized format creates significant challenges for:

- **Consumers** – Crowded labels that differ from state to state, or between product types within the same state, lack clarity and create confusion
- **Regulators** – Regulations are created in each new market, face frequent calls for new provisions and revisions, and address subjects in which there is little or no expertise
- **Businesses** – Compliance with complex and inconsistent requirements are costly and complicated, especially for companies operating in multiple states

Asymmetrical stakeholder interests and the typical political realities surrounding cannabis policy make it relatively easy to create new labeling requirements but very difficult to remove existing requirements or modify them to align with best practices. As such, existing legislative and regulatory frameworks have failed to resolve this issue and currently appear ill-equipped to serve as viable pathways for resolution.

### *The Solution: QR Codes*

The most practical solution to current cannabis labeling challenges is to leverage Quick Response (QR) codes or similar technology to modernize cannabis labeling practices. Expanding the use of such technology would go a long way toward addressing the fundamental challenges associated with cannabis labeling:

- **Efficacy** – Digitally expanding label capacity will allow for critical information to be prioritized and presented clearly on product packaging, with less critical information accessible online via QR code. Costs would be reduced for businesses that no longer need to develop and apply complex labels or include multiple labels on each product.
- **Flexibility** – Allowing for most label revisions and additions to be implemented online rather than directly on product packaging will more effectively accommodate diverse and fluctuating stakeholder preferences and reduce the costs and complexity of compliance.
- **Uniformity** – Prioritizing critical information on product packaging and providing for more flexibility and efficiency with implementing other labeling requirements will advance efforts to develop uniform intrastate and interstate labeling standards.

## Stakeholder Perspectives: Labeling Challenges

The research process for this paper included interviews with a variety of stakeholders, including state regulators, cannabis business leaders, public health experts, and advocates. While there was consensus that the current state of cannabis labeling is suboptimal, there were differing views on why the system is problematic. These perspectives are reflected throughout the paper.

The interviews revealed a few key trends:

- **Public health** stakeholders expressed concern that the volume of information on cannabis labels negatively impacts consumer comprehension, especially when combined with inconsistent standards and practices from one state to another. Yet they also noted that current requirements may not convey all the necessary information to consumers and suggested additional labels could be warranted.

- **Regulators** acknowledged the challenges associated with labeling requirements but emphasized the importance of the information that must appear on labels. They were generally open to feedback on how to improve the situation.

- **Cannabis business** stakeholders highlighted the significant amount of time and resources that must be spent on compliance. Many reported that the complexity of labeling requirements forces them to use larger packaging than necessary, leading to increased material costs and environmental waste. They also noted that attaching multiple labels to a single product to accommodate all mandated information is both time-consuming and prone to error. Additionally, they reported that regular changes to labeling requirements are very costly, ranging from $80,000 to $200,000 per business each time a state changes them.

## The Broken State of Cannabis Labeling Policy

There is generally a consensus that current cannabis labeling policies are neither optimal nor efficient. While concerns vary among stakeholders, most relate to three fundamental problems associated with cannabis labeling:

- **Verbosity** – Excessive amounts of information must be included

- **Instability** – Rules are often revised and new requirements get added

- **Inconsistency** – Lack of standards and uniformity across states and product types

***Verbosity***

States generally require a large amount of information to be included on labels, with requirements often exceeding the amount of content that can fit plainly and clearly on product packaging. The volume of information required frequently exceeds requirements for typical consumer packaged goods and must be crowded onto packages that are often smaller than traditional consumer products. Voluminous requirements, paired with smaller packaging, frequently lead to labels that are difficult to read and/or comprehend.

### *Instability*

Policymakers and regulators frequently revisit labeling requirements based on their states' experiences, new information coming to light, or fluctuations in stakeholder interests and priorities. Additions and revisions to labeling rules create compliance challenges and add costs for businesses. Changes to label content or appearance also risk confusing consumers.

The relatively high frequency and pace of changes to labeling rule stems from the nascent stage of the legal cannabis industry and the lack of national standards. Labeling requirements for food, alcohol, and other goods typically shift less frequently and at a slower pace.

***Four changes in six years***

*Labeling rule instability in California*

**2018**
Labeling requirements take effect following six-month "transition period" to new regulated market

**2021**
New regulations adopted expanding labeling requirements to include origin of cultivation

**2022**
New regulations take effect requiring new warning to appear on labels of products containing THC

**2024**
New labeling requirements take effect for integrated vaporizers and vape cartridges

### *Inconsistency*

Cannabis labeling requirements vary state by state, with each state establishing its own unique standards and format(s). Some states also apply unique standards and formats across different product types (e.g., cannabis flower vs. cannabis-infused edibles).

Even when states require similar information, it can be worded or appear differently across different jurisdictions. This leads to significant variations in information requirements and consumer experiences.

***Same product, same brand, five different states*** *– The consumer experience varies drastically due to the lack of uniformity in state packaging and labeling regulations.*

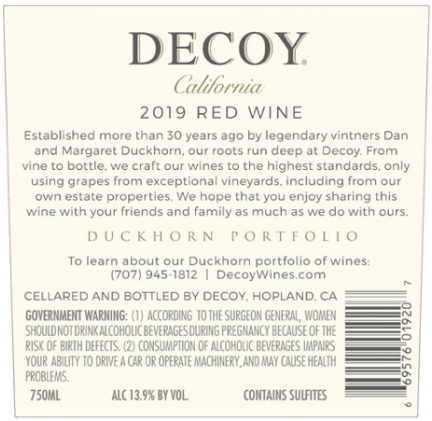
### *Lack of national standards*

Several challenges with cannabis labeling are associated with marijuana's federal classification under Schedule I of the U.S. Controlled Substances Act. Federal law prohibits the production and sale of Schedule I substances, so there is no federal law or regulatory structure to inform state marijuana laws and regulatory structures. Without federal guidelines, there are no national standards for cannabis labeling like there are for legal consumer products, such as food and alcohol. Labels for these products contain the most critical consumer information in an easy-to-read format developed by subject matter experts.

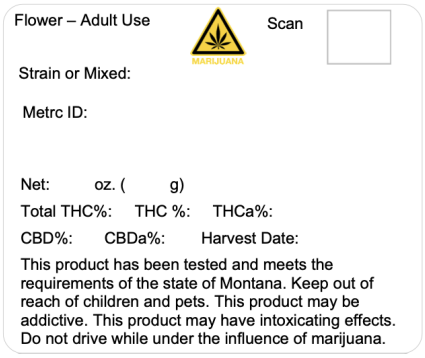
## Comparison of Consumable Product Labels

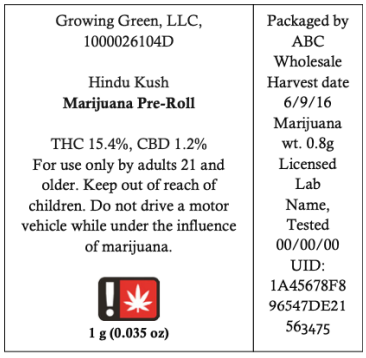
***Food*** *– Consistent formatting; easy to read*

***Alcohol*** *– Limited information required; standardized government warning*



***Cannabis*** *– Inconsistent formatting; poor readability*

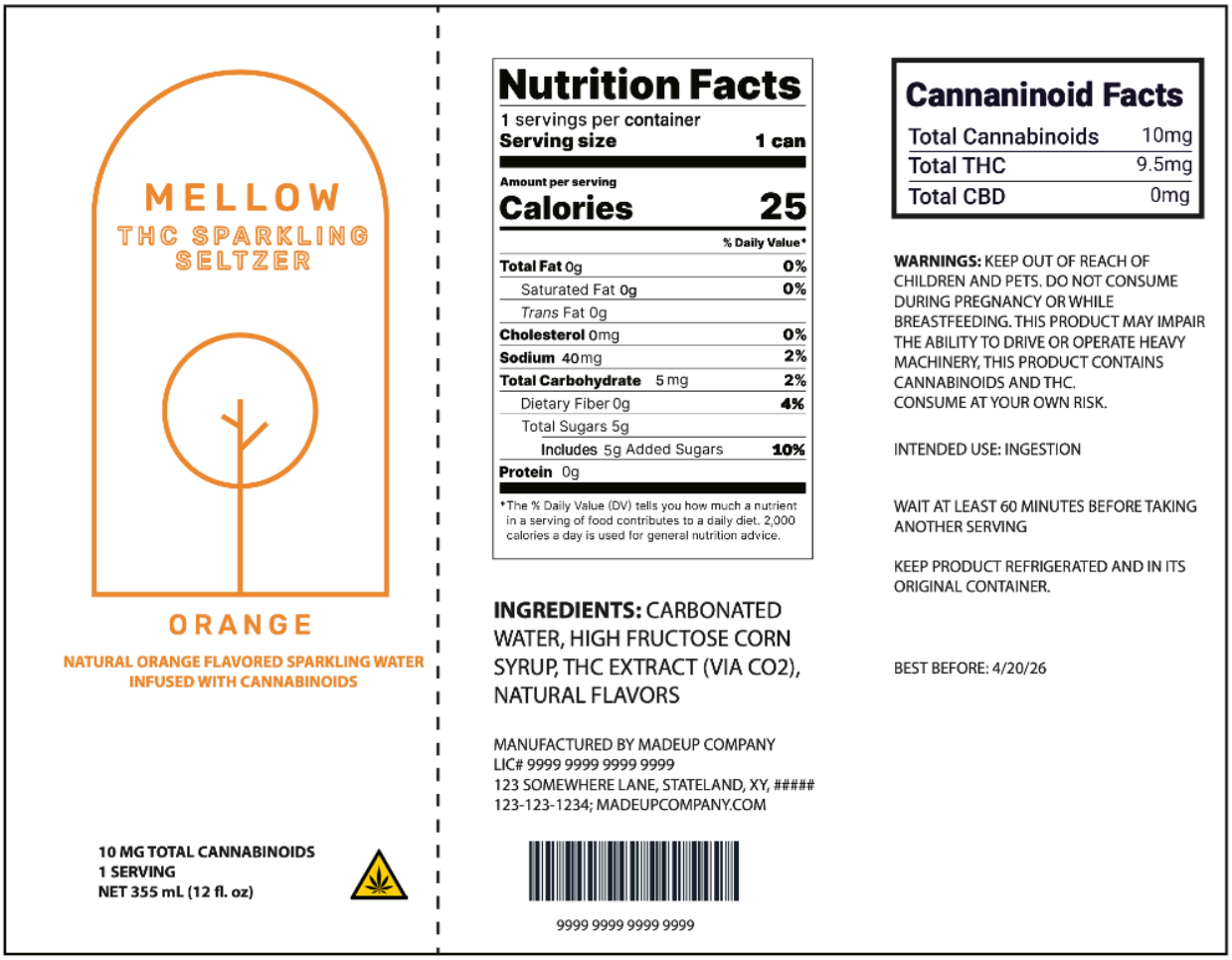


Non-governmental standards organizations, such as ASTM International, have sought to develop a national standard for cannabis labeling. ASTM created a label that looks very similar, both in content and format, to food and alcohol labels that are already familiar to consumers. To do this, it had to narrow down requirements to only the most critical information.

It is also worth noting ASTM has a unique policy development process managed entirely by volunteers and experts, rather than elected officials, government appointees, and bureaucrats. As a result, it can avoid political pitfalls commonly encountered during legislative and regulatory processes. Absent such unique conditions, legislators must balance the needs of local stakeholders, resulting in labeling requirements that differ from state to state and from other familiar product labels.

***ASTM International standardized label for marijuana products***

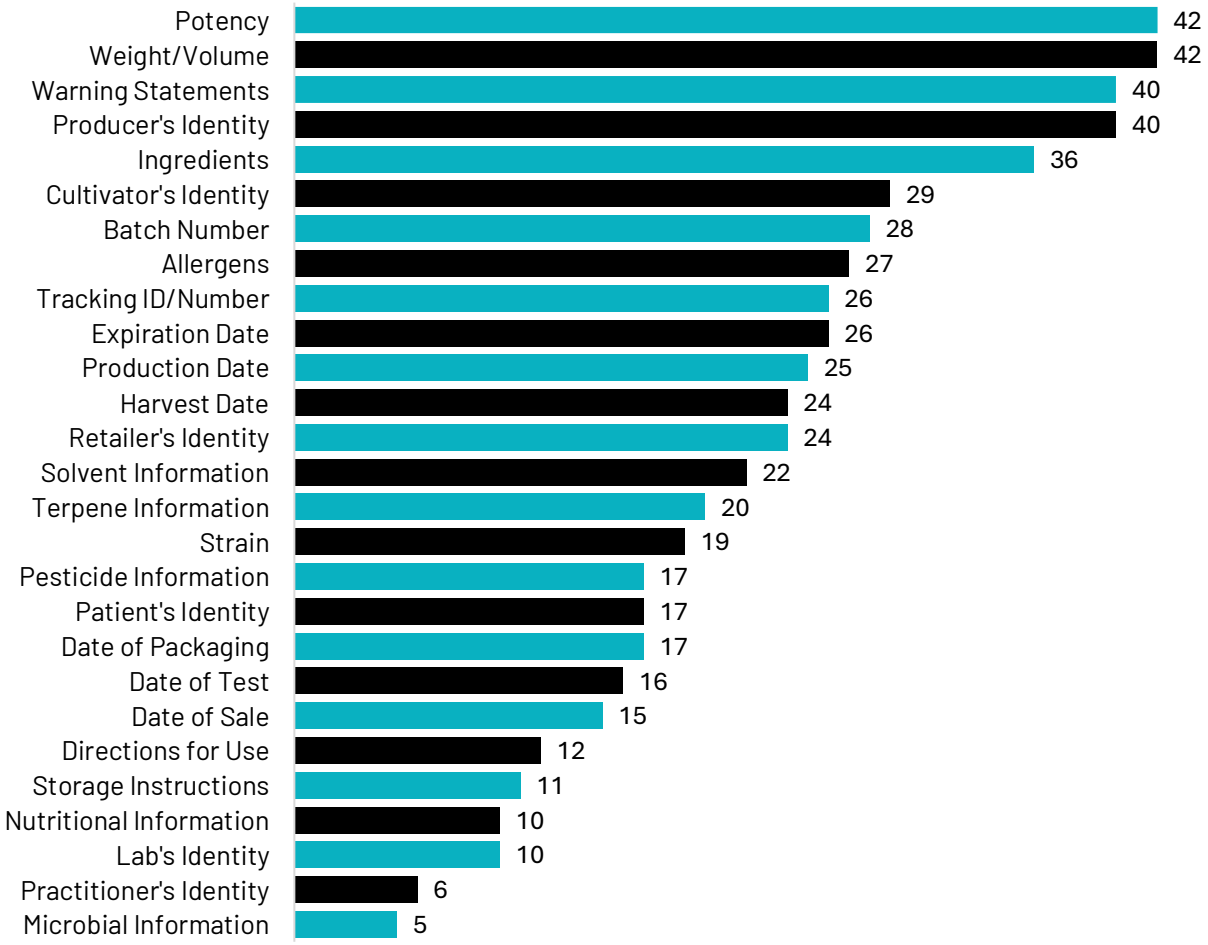


The lack of uniformity across cannabis product labels is dramatic. A 2022 study of 29 different types of labeling requirements across 31 state cannabis markets found that only THC content and manufacturer contact information were universally required.[1] The vast majority of provisions reviewed were required in 15% to 75% of states.[2]

For this paper, we performed a similar review and found little improvement. We reviewed 27 types of labeling requirements across 42 state cannabis markets, and we found only five types of requirements were addressed in more than 75% of those states: a warning statement, ingredients, potency (including THC content), weight/volume, and producer's identity. Even when states addressed the same type of requirement, its wording and implementation often differed significantly. Using potency as an example, five out of 42 states require only THC potency to be included on labels, 15 require THC and CBD potency, and the remaining 22 states require three or more cannabinoid potencies to be labeled.

***State Labeling Requirements***

*Number of states with specific labeling requirements (out of 42 states)*




[1] Kruger DJ, Korach NJ, Kruger JS. *Requirements for Cannabis Product Labeling by U.S. State*. Cannabis and Cannabinoid Research. 2022 Apr, 7(2): 156-160. https://pmc.ncbi.nlm.nih.gov/articles/PMC9070747/

[2] *Id.*

## Current Status Quo: Impacts on Stakeholders

***Impacts on consumers***

Current problems with cannabis labeling negatively impact cannabis consumers and broader public health outcomes. Labels are often overcrowded and applied to small products where physical space is limited, especially for products like vape cartridges and concentrates. This overcrowding creates a "white noise" effect, drowning out critical safety information with less relevant content and making it difficult for consumers to discern essential details. Overwhelmingly detailed labels do not effectively highlight the most important safety information, often leaving consumers confused about product content and proper usage. This issue is particularly acute for older adults and individuals with disabilities, who may struggle to read small fonts or navigate multi-layered labels.

Cannabis consumers must also navigate unique challenges that do not apply to other consumer goods. Consumers, in general, are very accustomed to the appearance of standardized labels, which typically follow best practices, rarely change, and are consistent from state to state. Cannabis labeling is the opposite. Consumers are confronted with different label information and formatting in each state, labels do not always follow best practices, and consumers must often modify their expectations because cannabis labeling regulations change far more frequently than for other legal products. This all creates confusion for consumers, especially those who are less experienced with cannabis and most in need of clear and consistent information.

The current lack of uniform standards also creates opportunities for potentially problematic policy creativity by elected officials. Oftentimes, especially when facing pressure from stakeholders, policymakers are tempted to insert novel concepts into cannabis labeling policies, when leveraging consistent, existing best practices would result in better outcomes for consumers.

***Impacts on businesses***

The lack of uniformity in labeling requirements is problematic for businesses, especially those operating in multiple states. Companies invest significant time and resources in complying with labeling requirements, and those costs must be replicated to account for each state's unique rules.

Many companies are forced to create custom labeling solutions or use complex, multi-layer labels, which are both costly and operationally inefficient. In some markets, employees are needed at retail locations for the sole purpose of attaching stickers to packages when they are sold. Some businesses use unnecessarily large packaging that includes more space for required labels, which not only increases production costs but also has negative environmental impacts. This is a source of significant frustration for all the operators we interviewed for this paper.

The operational challenges extend beyond mere compliance. Businesses are often forced to allocate substantial resources to adapt to changing regulations. Labels are typically ordered in bulk to reduce costs, so even minor regulatory updates can render these orders obsolete, requiring expensive reprints, as well as product re-labeling, recalls, and disposal. The cost of making these changes varies significantly based upon the circumstances involved, but a single round of implementing these changes can cost upwards of $200,000 or more for a single business.

***Impacts on regulators***

Cannabis regulators are forced to make a variety of tough decisions about technical issues that frequently fall outside their scope of expertise. State policymakers are deciding everything from which warning labels are most impactful to what novel cannabinoid testing results should be listed, while factoring in how it may affect licensees and whether the information will fit on smaller packages. These decisions can complicate regulators' ongoing relationships with stakeholders. They also frequently reflect complicated or emerging research, which often goes beyond regulators' immediate expertise.

## Warning Statements in Cannabis Labeling

*A case study in inefficiency*

The warning statements currently required on cannabis product labels exemplify the broken state of cannabis labeling policy.

States prioritize different warnings, so they are not consistent from state to state. Warnings are also often "vague" and "verbose," with a mean word count of 57, according to a 2024 study published in the American Journal of Public Health.[3]

- Most states (28) require four or more unique warning statements.
- The combination of multiple long warning statements creates space constraints and white noise that drowns out important information.
- Warning statements vary among states (even when addressing the same concern), requiring different labels for the same product in each state where it is available.
- Consumer experience and education varies significantly from one state to another, even when the same product is being consumed in each state.

As a result, warning statements are often confusing for consumers, complicated and expensive for businesses, and frustrating for regulators. The process for providing health warnings to consumers is ripe for improvement.

*See Appendix A for more details.*

[3] Meek CJ, Ranney LM, Clark SA, Jarman KL, Callanan R, Kowitt SD. *Regulatory Landscape of Cannabis Warning Labels in US States with Legal Retail Nonmedical Cannabis, 2024*. American Journal of Public Health. 2024 Nov, 114(S8): S681-S684. https://pmc.ncbi.nlm.nih.gov/articles/PMC11499700/

## Political Barriers to Reform

Despite the complexity and problems associated with current cannabis labeling policy, labeling requirements continue to expand and rarely contract. This is a natural outgrowth of the asymmetrical interests of participating stakeholders.

The inclusion of each requirement is typically supported by one or more stakeholders, such as public health advocates, regulators, industry representatives, or consumer protection organizations. Opposition to labeling requirements tends to be more amorphous: Concerns usually lie with the volume of requirements rather than with specific individual requirements. This is because individual requirements are generally innocuous, but cumulatively they become burdensome. Also, support for creating individual labeling requirements is often narrowly focused and intense, whereas concerns about labeling tend to be broader and less intense.

This results in two related and compounding problems:

- First, when initial labeling rules are being drafted, it is politically expedient for policymakers to prioritize accommodating diverse interests over creating clear, functional labels. If a policymaker can fulfill a stakeholder's request with minimal and diffuse pushback, they will typically do so. Further, these are not single-issue or single-party negotiations. Because stakeholders and policymakers have multiple priorities and ongoing relationships, policymakers will often agree to stakeholder requests if there is limited opposition because it improves the relationship and their negotiating position on other, more contentious issues.

- Second, policymakers have little incentive to streamline cannabis labeling after initial rules have been adopted. For each labeling requirement, there is usually at least one stakeholder who wanted it included, so fighting to remove even a single requirement typically requires substantial political capital. For cannabis businesses, it is easier and less expensive to comply with existing requirements than it is to invest the time and resources necessary to lobby for reform. While changes to labeling requirements would benefit operators in the long run, they would require significant upfront investment to adjust to the new standard. The potential benefits are often too marginal and long-term to justify the expense.

This dynamic plays out at the legislative and regulatory levels each year, often resulting in longer and more complex labeling requirements. As of March 31, 2025, 19 bills proposing new labeling requirements have been filed in state legislatures, while just one bill has been filed to remove an existing requirement. Several of these bills would force businesses to redesign all their product labels, and some propose entirely novel concepts that are inconsistent with current labeling practices for cannabis and all other consumable products nationwide. For example, Colorado Senate Bill 25-076 would have required inhaled marijuana product labels to display the number of milligrams of THC per serving and per package, whereas most of the nation's cannabis regulatory structures require inhalable product labels to indicate THC levels as a percentage. It would have also mandated an unnecessarily confusing color-coding scheme (to indicate THC potency) that is unlike anything seen with other consumable products.

While SB 25-076 failed in Colorado, it is highly likely that 2025 will end with more cannabis labeling requirements than when it began, with no viable path to reduce or improve them through normal political channels.

## Embracing QR Codes to Move Cannabis Labeling Forward

Quick Response codes, commonly known as QR codes, are two-dimensional matrix codes that can be scanned by smartphones and other devices to immediately access websites and other resources hosted online. They started gaining traction with the proliferation of smartphones and mobile internet in the late 2010s, then experienced a major surge in use during the covid-19 pandemic. Today, they are relatively ubiquitous and familiar to most adult consumers throughout the country.

This widely accessible, user-friendly technology, or similar technologies, could go a long way toward resolving the fundamental problems associated with cannabis labeling.

***QR codes*** *– A practical solution to critical problems associated with cannabis labeling*

***Efficacy***

QR codes digitally expand the amount of information that can be delivered to consumers by product labels, offering important benefits to key stakeholders.

- Critical information for consumers can remain on the package, while less critical information can be accessed via the QR code, making labels easier to read and more effective at conveying the critical information.

- Reducing the amount of printed information on the package will save operators significant time and resources and could eliminate the need for complicated, multi-layer labels and dedicated personnel solely for applying stickers to packages.

- If regulators are pressed to create new labeling requirements, they will have greater flexibility to accommodate stakeholder demands without negatively impacting consumers or businesses with additional or overcrowded labels.

***Flexibility***

The online resources to which QR codes are linked can be updated without requiring changes to the labels themselves.

- Information accessed via QR codes can be updated almost instantly with minimal costs, minimizing the time between policy changes and industry compliance. New or revised warnings and product information can be pushed out to consumers quickly after requirement are adopted.

- Changes to physical labels are extremely costly and inefficient. Using QR codes, businesses could add or update certain types of product information without going through the costly and disruptive processes of redesigning and printing labels, stickering, relabeling existing stock, or waiting until all the currently packaged products are sold through.

***Uniformity***

QR codes provide an exceptional opportunity to develop labeling standards and promote uniformity, both within and between states.

- Reducing the amount of content that must physically appear on product labels would make it easier for regulators and stakeholders to agree upon standards that could be applied across product types and jurisdictions.

- Easing the process of applying label changes would reduce barriers to developing and implementing best practices.

In addition to addressing the fundamental labeling problems discussed in this paper, QR codes or similar technologies offer several other benefits to stakeholders, especially consumers.

- **Expanded content** – Greater detail could be provided for usage instructions, testing and supply chain information, product histories, and other educational content.

- **Visual content** – Videos, images, and other content could help inform consumers, demonstrate proper usage or dosage, and facilitate better user experiences. For example, QR codes can facilitate pictorial warnings, which may be more effective than text only.[4]

- **Better and broader warnings** – While some warning statements should always appear on product packages, the expanded real estate provided by a QR code would allow for additional and more detailed warnings. This could be particularly helpful in states that require rotating warnings, making all warnings available to consumers even when they are rotated off the physical package. If some warnings are found to be more critical or effective, they could be updated instantaneously.

- **Improved public health and product safety** – QR codes provide dynamic tools for regulators to manage recalls and notifications of other product safety issues. Certain messages could receive priority placement on QR code landing pages, ensuring critical information reaches consumers. For example, a landing page could feature a bright red alert indicating a product was recalled, along with step-by-step instructions on what consumers should do with the recalled products.

- **Reciprocal communication** - In addition to providing consumers with information, QR code landing pages can collect information from them. For example, they could prompt consumers to complete public health and safety surveys.

- **Product authentication** - QR codes can serve as product authentication so consumers can be sure that products are safe, regulated, and not coming from the illicit market.

The full list of potential benefits is significantly longer, including a wide range of possibilities for branding, gathering customer feedback, and more. Research on consumer interactions with edible cannabis products in Colorado and Washington further supports the potential of digital tools like

[4] Massey ZB, Hammond D, Froeliger B. *A Systematic Review of Cannabis Health Warning Research*. Preventive Medicine Reports. 2024 Jan, 37: 102573. https://www.sciencedirect.com/science/article/pii/S2211335523004643

QR codes to bridge gaps in label comprehension, offering a more engaging and dynamic consumer experience.[5]

***Accessibility concerns***

The use of QR codes may raise accessibility concerns for older consumers, consumers with disabilities, and consumers limited in their technology skills or access to QR code-scanning technology. These concerns were raised by some of the stakeholders we interviewed.

There was consensus that the most important information for consumers should remain on the package, ensuring it is immediately accessible without additional steps. Most stakeholders also agree that QR codes would benefit consumers with accessibility issues because it would improve the effectiveness of on-package labeling, and those consumers are more likely to be challenged by crowded labels, small text, and/or multi-layer labels.

Additionally, the proliferation of QR codes during the covid-19 pandemic significantly boosted consumers' familiarity with the technology, which is becoming increasingly accessible as mobile device technology continues to evolve.

## Conclusion

The current state of cannabis labeling policy is unsustainable and failing to meet the needs of stakeholders. While certain political dynamics have created barriers to comprehensive reform, QR codes and similar technologies offer a practical solution to the fundamental problems associated with cannabis labeling.

States have already begun to embrace QR code technology, with 17 currently referencing QR codes in their regulatory frameworks:

- Two states specify certain types of information must be provided through QR codes.
- Four states require certain types of information to be provided through QR codes, URLs, or similar technology.
- Six states allow the use of QR codes to satisfy certain labeling requirements if those requirements are not fulfilled on the physical label.
- Five states authorize the use of QR codes to provide additional, optional information, such as the product's certificate of analysis (COA).

*See Appendix B for more details.*

Policymakers, regulators, businesses, and other stakeholders would be wise to look to the experiences of these states for insight and continue to collaborate on legislation and rules that seize this opportunity for meaningful reform.

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[5] Kosa KM, Giombi KC, Rains CB, Cates SC. *Consumer Use and Understanding of Labeling Information on Edibles.* International Journal of Drug Policy. 2017 May, 43: 57-66. https://www.sciencedirect.com/science/article/abs/pii/S0955395917300087

*Appendix A*

# Warning Statements in Cannabis Labeling

*A case study in inefficiency*

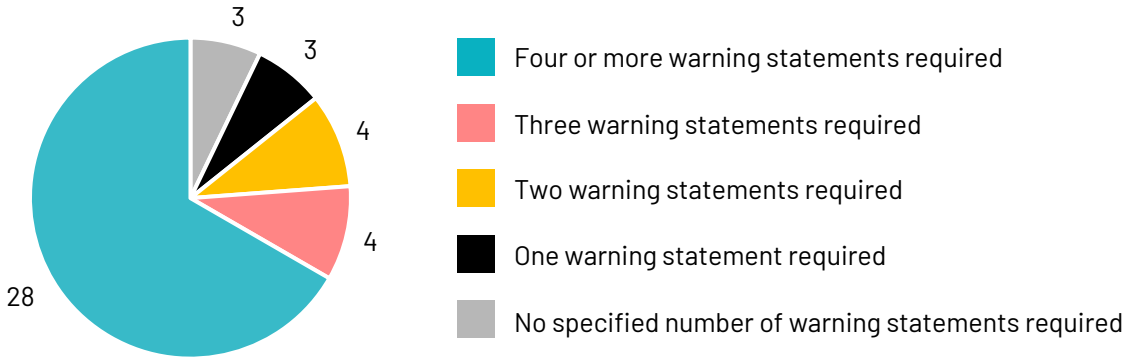
Few elements of cannabis labeling are more important and in need of reform than warning statements. Almost all states require warning statements to ensure consumers get information about the most critical public health and safety issues.[6] But current practices are too wordy, lacking any semblance of uniformity across states, and do not follow best practices.

### *Too voluminous*

Most states require four or more distinct warning statements, which take up significant real estate on product labels, potentially creating a white noise effect that drowns out critical information.

***Warning Statement Requirements***

*Number of states with specified quantities of required warning statements (of 42 states)*




### *Not adopting best practices*

Warning statements are often "verbose" and "vague," according to research published in the American Journal of Public Health in November 2024.[7] There is also emerging research on how to best design labels to convey important health information, including the most effective use of colors, images, and textual enhancements.[8] The current system makes it difficult to change suboptimal language and evolve as new research shows a better path.

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[6] Georgia, Louisiana, and Virginia do not require specifically worded warning statements, but operators often include widely accepted warnings on their products.

[7] Meek CJ, Ranney LM, Clark SA, Jarman KL, Callanan R, Kowitt SD. *Regulatory Landscape of Cannabis Warning Labels in US States with Legal Retail Nonmedical Cannabis, 2024*. American Journal of Public Health. 2024 Nov, 114(S8): S681-S684. https://pmc.ncbi.nlm.nih.gov/articles/PMC11499700/

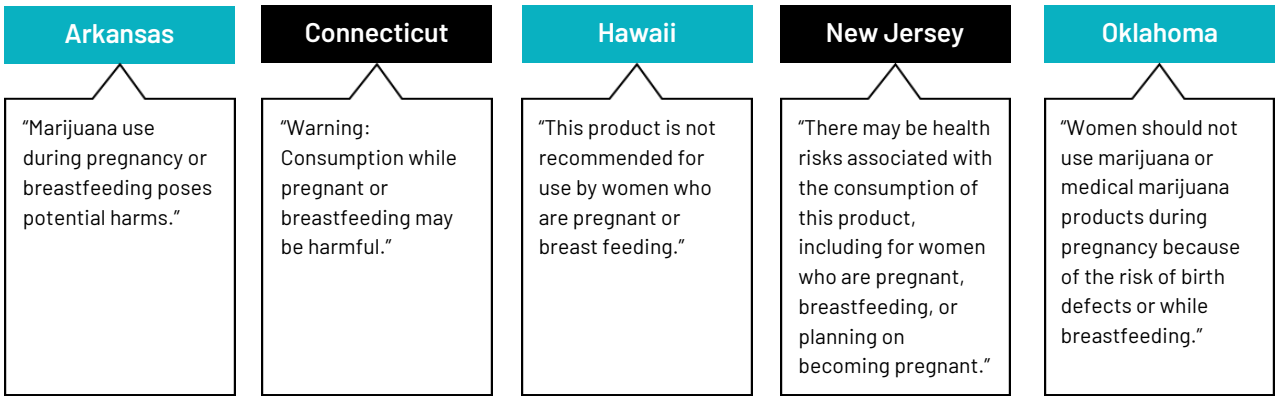
[8] See, for example, Gantiva C, Illidge-Cortes J, González-Millares D, Maldonado-Hoyos V, Valencia L. *Health warning labels on cannabis products. What is the best design?* International Journal of Drug Policy. 2024 Apr, 126: 104355. https://doi.org/10.1016/j.drugpo.2024.104355; Kim SJ, Minich M, Tveleneva A, Liu J, Padon AA, Silver LD, Yang S. *Textual and pictorial enhancement of cannabis warning labels: An online experiment among at-risk U.S. young adults*. Drug and Alcohol Dependence. 2022 Aug, 237: 109520. https://doi.org/10.1016/j.drugalcdep.2022.109520

***No uniformity across states***

The content and language of warnings varies significantly from state to state, even when addressing the same public safety concern.

***Same subject, different warnings***

*Variations in state-mandated warnings regarding cannabis use while pregnant or breastfeeding*




***The situation is getting worse, not better***

From January to April 2025, seven bills were filed to require new warning statements on cannabis labels, including warnings about marijuana use during pregnancy (Oregon SB 917), the delayed effects of edible products (Connecticut SB 748), and impaired driving (Oklahoma SB 518). No bills have been filed to remove or adjust any existing warning statements, nor have any bills been introduced to align language between states.

Regulators do not have the flexibility to adequately adapt and embrace newly emerging best practices, and they must constantly balance the need for adequate public health warnings with the physical space limitations on product packages. Even if consensus emerged and a state adopted all the best practices, the new warnings would not appear on products for many months, as new labels would need to be designed, produced, and applied, or businesses would need to sell through their existing products.

***Solution: Embrace Technology Like QR Codes***

The most sensible path forward is to embrace technological solutions like QR codes, which digitally increase the space available for warnings and product information, allow for more efficient label changes, create opportunities to unify ideas across states, and provide more dynamic information to consumers.

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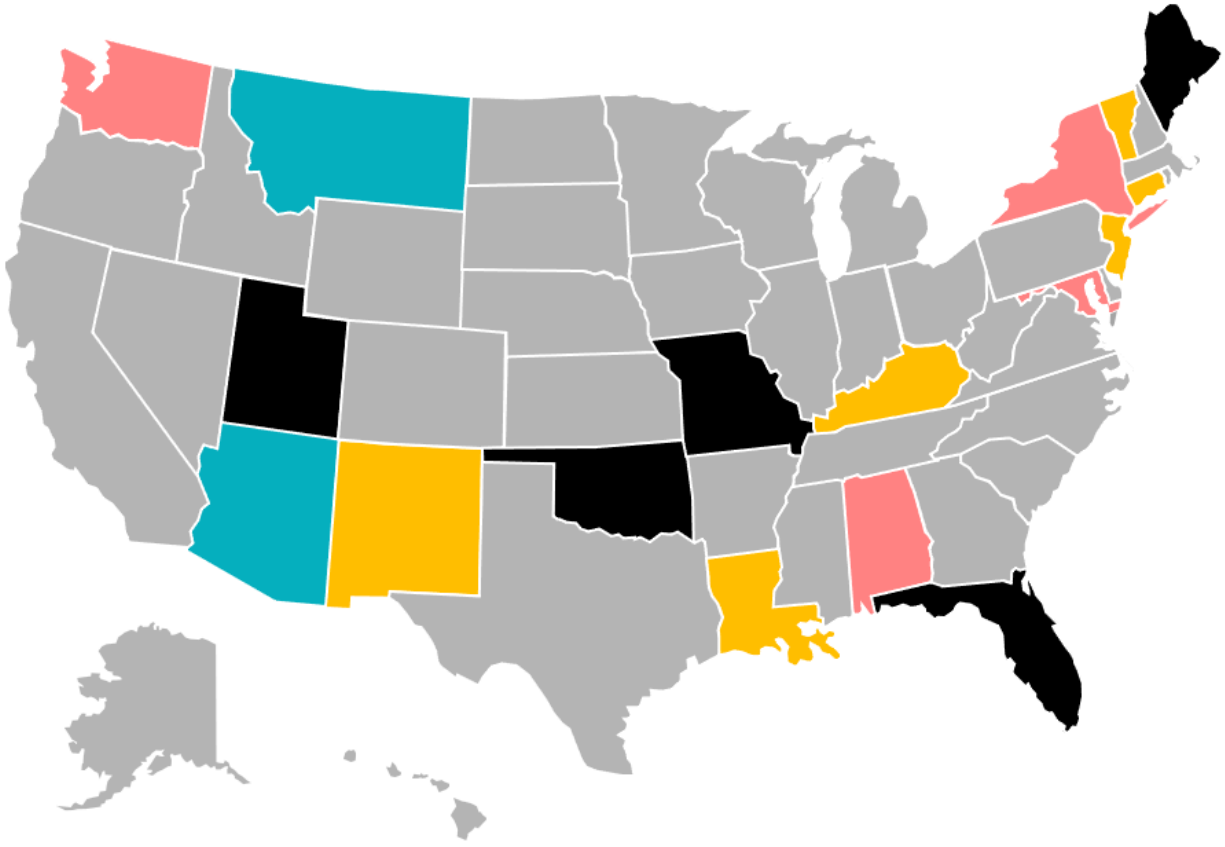
Leos-Toro C, Fong GT, Meyer SB, Hammond D. *Perceptions of effectiveness and believability of pictorial and text-only health warning labels for cannabis products among Canadian youth*. International Journal of Drug Policy. 2019 Nov, 73: 24–31. https://doi.org/10.1016/j.drugpo.2019.07.001

*Appendix B*

## QR Codes in Cannabis Labeling Policy

*States beginning to embrace QR code technology*

States have already begun to embrace QR code technology, with 17 currently referencing QR codes in their regulatory frameworks.

- Two states specifically require certain types of information to be provided through QR codes: Arizona and Montana.
- Four states require certain types of information to be provided through QR codes, URLs, or similar technology: Alabama, Maryland, New York, and Washington.
- Six states allow the use of QR codes to satisfy certain labeling requirements if those requirements are not fulfilled on the physical label: Connecticut, Kentucky, Louisiana, New Jersey, New Mexico, and Vermont.
- Five states authorize the use of QR codes to provide additional, optional information, such as the product's certificate of analysis (COA): Florida, Maine, Missouri, Oklahoma, and Utah.