

MILLIMAN CLIENT REPORT

# Mandated coverage of medical cannabis: Costs and implications

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# I. EXECUTIVE SUMMARY

## OVERVIEW

Greenwich Biosciences, Inc. (Greenwich) engaged Milliman to evaluate the potential costs and implications on the commercial insurance and Medicaid markets if states were to mandate the coverage of medical cannabis for patients enrolled in either of these two markets. Today, over half of all states permit the use of medical cannabis for certain qualifying conditions, even though it remains illegal as a Schedule I controlled substance under federal law. Under these state-run medical cannabis programs, patients are responsible for the full cost of any products they purchase at a licensed dispensary as these costs are generally not eligible for reimbursement through traditional health insurance arrangements.

At least five states—Hawaii, Maine, Massachusetts, New York, and Wisconsin—have recently proposed legislation that would mandate the coverage of medical cannabis in some form through the commercial insurance and/or Medicaid markets.<sup>1,2,3,4,5,6</sup> While these states acknowledge the logistical challenges, given that cannabis remains prohibited under federal law, the possibility of such a legislative change raises an interesting series of questions to consider. In particular:

- How much would coverage of medical cannabis cost commercial health insurers and state Medicaid programs? How might this cost vary by market?
- How could cannabis's current status under federal law affect a state's ability to enforce such a requirement on insurers?
- What other considerations—operational, regulatory, and otherwise—are relevant to understanding this issue?

This report examines both the quantitative and qualitative aspects of these and other key questions related to the mandated coverage of medical cannabis in the commercial and Medicaid markets. We present a range of possible outcomes and discuss considerations relevant to states and other stakeholders considering or affected by mandated coverage of medical cannabis.

## RESULTS

In our study, we estimate the costs per member per month (PMPM) of adding medical cannabis to the insurance benefit in a state's commercial and Medicaid markets. We do this for two categories of medical cannabis: Medical marijuana and cannabidiol (CBD) oil. Our estimates consider gross costs only and do not contemplate how these costs may be shared across stakeholders (e.g., member, insurer, and government). We employ three different estimation approaches an insurer may adopt, depending on its access to resources and data assets. We discuss each of these approaches in greater detail later in this report. Our estimates are summarized in Figure 1.

Figure 1: Estimated Medical Cannabis Costs PMPM Summary by Market			
Market	Approach	Medical Marijuana	CBD Oil
Medicaid	Top-Down	\$2.20 to \$5.90	
	Intermediate	\$3.10 to \$4.20	\$2.30 to \$3.10
	Bottom-Up	\$1.90 to \$2.50	\$1.50 to \$1.90
Commercial	Top-Down	\$2.20 to \$5.90	
	Intermediate	\$3.50 to \$4.70	\$1.40 to \$1.80
	Bottom-Up	\$2.40 to \$3.20	\$1.00 to \$1.40

These estimates are stated on a 2020 basis and do not include downstream impacts on medical or pharmacy costs, savings or otherwise. That is, they ignore, for example, reduced costs due to substitution of medical cannabis for existing prescription drugs, or additional costs due to unexpected side effects or complications. The estimates summarized in Figure 1 would put medical cannabis in line in terms of total gross costs with many of the top therapeutic classes of prescription drugs already covered by health insurance.

The estimates specific to medical marijuana and CBD oil should not be added together. We estimate coverage of medical marijuana and CBD oil separately—in the CBD oil cost estimates, we assume the entire medical cannabis population would use CBD oil, and in the medical marijuana cost estimates, we assume the entire medical cannabis population would use medical marijuana. We do not attempt to estimate which patients in our analysis would be more likely to use CBD oil versus medical marijuana if both were covered, as there is little public data on this split. In reality, both forms would be utilized to varying degrees due to such factors as patient preference, coverage status, and access, so costs would most likely lie somewhere between these two sets of estimates.

The estimates in Figure 1 are inclusive of all qualifying conditions permitted under state medical cannabis programs. Qualifying conditions are typically listed or defined in statute and allow patients to receive access to medical cannabis in states where medical cannabis is legal. While the prevalence of qualifying conditions varies between the Medicaid and commercial markets, we estimate approximately 40% of the population across both markets has at least one qualifying condition. For purposes of this analysis, we consider a condition to be a qualifying condition if at least one state medical cannabis program today identifies it as such. We used proprietary claims data to identify patients with each qualifying condition. Please refer to Appendix A for a full list of the conditions we included in our analysis.

We recognize medical cannabis—and cannabis, more broadly—is a passionately debated topic among many individuals with different points of view. There are myriad considerations related to medical cannabis, and to the extent possible, we limit our discussion to only those topics most relevant to insurance coverage.

*Please note that we are not attorneys or policy experts, and the information provided in this report should be supplemented by legal and policy experts to understand and interpret the legal and regulatory nuances of the issues discussed herein.*

## II. BACKGROUND

### OVERVIEW OF CANNABIS

The cannabis plant is made up of over 100 naturally occurring components, referred to as cannabinoids. The two most common cannabinoids are CBD and tetrahydrocannabinol (THC). In today's medical cannabis market, patients have access to cannabis-derived products with varying levels of CBD and THC. Pursuant to the Agricultural Improvement Act of 2018, also referred to as the 2018 Farm Bill, hemp constitutes cannabis plants with less than 0.3% THC content, while marijuana constitutes cannabis plants with greater than 0.3% THC content. Collectively, we refer to all such products as "medical cannabis" throughout this report. Where appropriate, however, we distinguish between traditional marijuana-derived products (medical marijuana) and concentrated CBD oil extracts (CBD oil).

CBD oil has become more widely available of late, with people often able to purchase it at grocery or convenience stores, thus making the distinction between CBD oil and medical marijuana all the more relevant. In states with medical cannabis programs, patients may choose medical marijuana or CBD oil for different purposes and conditions, which presents different implications if the state decides to mandate insurance coverage of one form or the other. As such, we developed separate cost estimates for both medical marijuana and CBD oil.

### REGULATORY HISTORY OF CANNABIS

The regulation of marijuana in the United States began in 1937 with the Marijuana Tax Act. This act gave the Drug Enforcement Agency (DEA) the ability to regulate the production and distribution of cannabis.<sup>7</sup> It was later found to be unconstitutional in 1969, as a result of U.S. Supreme Court case, *Leary v. United States*.<sup>8</sup> One year later, however, Congress passed the Controlled Substances Act of 1970, which classified marijuana as a Schedule I controlled substance. This remains marijuana's status today. According to the Act, Schedule I controlled substances meet the following criteria:

- Have a high potential for abuse
- Have no currently accepted medical use in treatment in the United States
- Have no accepted safety for use under medical supervision

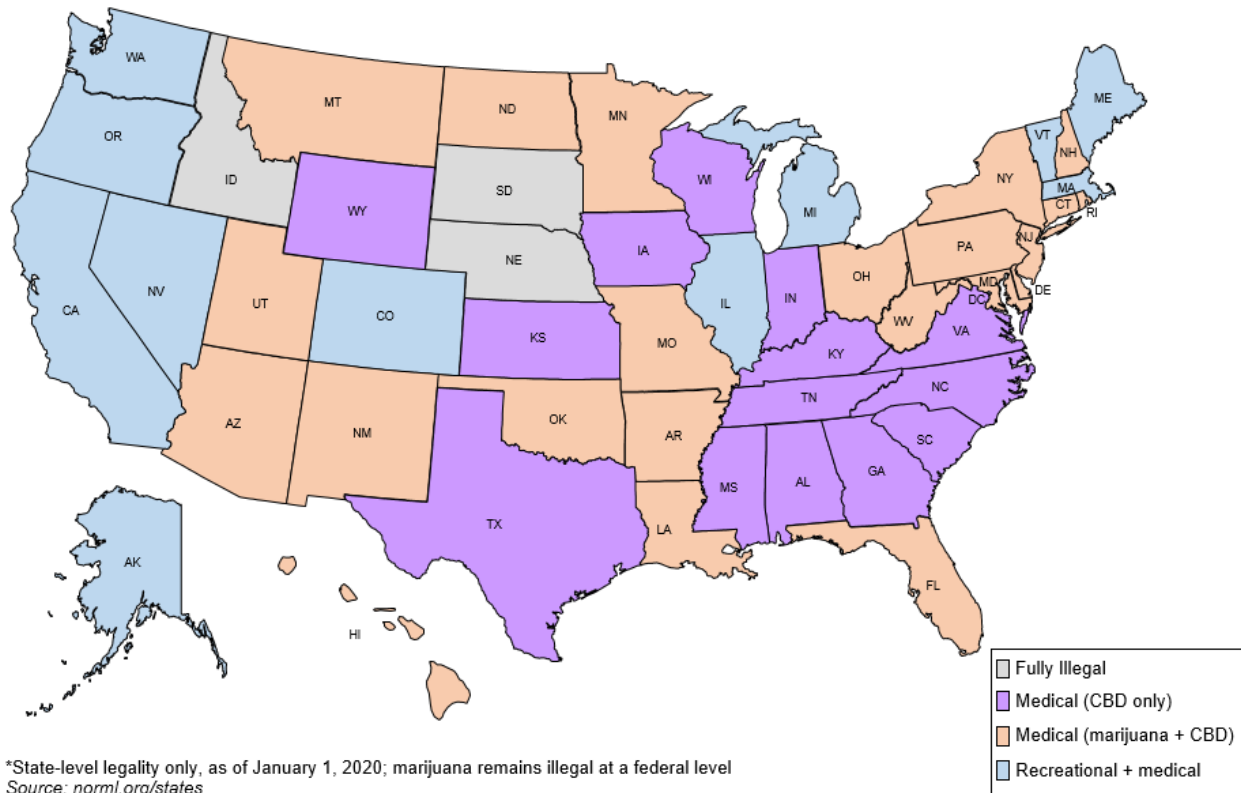
In the past several decades, many states have enacted legislation allowing the use of medical cannabis among patients who have one or more qualifying conditions and, in some states, who receive a recommendation from a physician. Currently, 33 states and the District of Columbia (D.C.) permit the use of medical cannabis. Of those 33 states and D.C., 11 states also permit recreational cannabis use. This amounts to an estimated 222.5 million U.S. citizens with access to state-legal medical cannabis in 2020, of which approximately 93.6 million also have access to state-legal recreational cannabis.<sup>9,10</sup>

At the federal level, there have been recent developments regarding the production and sale of hemp and hemp-derived products. In December 2018, Congress passed the Agriculture Improvement Act of 2018 (the 2018 Farm Bill). Among other provisions, the Farm Bill allows for the legal production of hemp, effectively making hemp-derived forms of CBD legal nationwide under the Controlled Substances Act. The Farm Bill also allows for the transfer of hemp and hemp-derived products across state lines, which alleviates concerns with shipping such products through states where marijuana is not currently legal.<sup>11</sup> Additionally, the bill preserves the authority of the U.S. Food and Drug Administration (FDA) to regulate hemp.

Attempts at more sweeping cannabis legalization have occurred intermittently for the last several years. Most recently, the Marijuana Opportunity Reinvestment and Expungement Act of 2019 (MORE Act) passed the House Judiciary Committee in November 2019.<sup>12</sup> This act would remove cannabis from the list of federally controlled substances and establish a 5% sales tax on cannabis, among other changes.

### CURRENT SNAPSHOT

The map in Figure 2 summarizes the status of cannabis products by state: recreational and medical, medical (both marijuana and CBD), medical (CBD only), and fully illegal. Among states with medical cannabis programs, we estimate just over 1% of the population actively uses medical cannabis products. This estimate is based on multiple state-reported data sources, which we list in Appendix C. The U.S. Census Bureau also estimates the full U.S. population to be approximately 330 million in 2020, meaning approximately 3.4 million people would actively use medical cannabis if legalized nationwide.<sup>13</sup>

**Figure 2: Legal Status of Cannabis by State**

Throughout this report, we refer to the legal status of marijuana and CBD in the United States. We acknowledge marijuana is illegal at the federal level, and the status of both marijuana and CBD varies by state, as illustrated in the map in Figure 2. Unless otherwise noted, use of the word "legal" in this report refers to state-level legality and is intended to be informational only. The current federal and state-level legal statuses of cannabis products do not impact the results of our analysis.

## RATE SETTING IN COMMERCIAL INSURANCE AND MEDICAID MARKETS

At its most fundamental level, rate setting is very similar in the commercial and Medicaid markets. The process starts with historical claims experience and applies a series of adjustment factors to account for anticipated changes in utilization, cost, and enrollment between the experience period and projection period. These adjustment factors differ based on the type of coverage offered (i.e., medical versus pharmacy, commercial versus Medicaid), but the primary purpose is to estimate the overall costs in a future period. Making accurate estimates helps to set rates at the appropriate level to ensure there will be sufficient funds to provide services for the covered members.

In the commercial market, approximately 90% of people receive health insurance through their employers, which might directly fund and bear the insurance risk (self-insured) or work with a private insurer (fully insured).<sup>14</sup> Approximately 13.8 million individuals receive private health insurance through state or federally run exchanges, in addition to other off-exchange channels (i.e., individual market).<sup>15</sup> In general, private insurers in the fully insured commercial market estimate costs to set member premium rates, and then submit their proposed rates to state Departments of Insurance for approval. Members are able to enroll in these policies, and they are generally responsible for paying both a fixed premium and a portion of the medical and/or pharmacy claims costs they incur (i.e., member cost sharing). A member's cost sharing may include deductibles, coinsurance, or fixed copayments. In some cases, members may also use a health savings account (HSA) or health reimbursement arrangement (HRA) to help cover some of their medical and pharmacy costs.

Under Medicaid, states provide a range of mandatory and optional benefits for certain eligible populations (e.g., low-income children, disabled) and receive partial funding from the federal government through federal matching dollars, the level of which varies from state to state. Several states provide Medicaid benefits on a fee-for-service (FFS) basis,

though most states contract directly with managed care organizations (MCOs) to provide services to beneficiaries.<sup>16</sup> In states where Medicaid benefits are provided through MCOs, the state is responsible for setting the rates they pay to each MCO for the provision of Medicaid services. The operation and structure of these Medicaid managed care programs are state-specific, but in general the state uses historical program data from the contracted MCOs to develop capitation payment rates it will pay each MCO in exchange for providing coverage. This capitation rate only accounts for the benefits required by the state, meaning the MCO is responsible for the cost of any benefits it chooses to offer above and beyond this requirement.

The exercise of setting member premium and capitation payment rates in these markets is relatively straightforward for benefits and services that have existed in the past. However, insurers and states in the commercial and Medicaid markets must occasionally develop estimates for the cost of new services or products, and this oftentimes must be done with little to no data. Several years ago, for example, when the first curative therapies for the hepatitis C virus (HCV) became available, insurers had to incorporate estimates of the utilization and cost of these treatments in rates for the upcoming plan year. Due to the novelty of these treatments, states and insurers had limited data to use, particularly on the number of potential utilizers, and many had to rely at least partially on publicly available information. States and insurers will likely need to take a similar approach if new benefits are introduced in the future, such as the coverage of medical cannabis.

### III. RESULTS

#### SUMMARY OF ESTIMATED GROSS COSTS AND KEY ASSUMPTIONS

In developing our cost estimates for medical cannabis, we focus on the total gross claims cost of coverage and do not separately consider the costs among insurers, members, and other stakeholders, as they will vary widely by organization and individual benefit design. We also do not estimate impacts to member premiums, as this would require additional considerations beyond the scope of this analysis (e.g., benefit design, price concessions, administrative expenses, and margin). We explore possible approaches insurers may use to estimate costs in the event medical cannabis coverage is mandated by the state. In particular, we contemplate three separate approaches, which demonstrate different levels of complexity and reliance on publicly sourced data:

- **Top-Down Approach:** This is a high-level estimate that begins with aggregate medical cannabis sales data, extrapolates across the entire U.S. population, and applies adjustments to reflect the anticipated impacts of mandated coverage.
- **Bottom-Up Approach:** In contrast to the top-down approach, this method begins with detailed claims data for patients with qualifying conditions and builds up a total cost estimate from this detailed data.
- **Intermediate Approach:** This is effectively a middle ground between the top-down and bottom-up approaches, as it relies on publicly available data but develops separate estimates for key qualifying conditions.

Under the bottom-up and intermediate approaches, we present separate cost estimates for medical marijuana and CBD oil. The purpose of providing separate estimates is to show how cost impacts may vary if a state mandates coverage of one form of medical cannabis and not the other. If a state mandates coverage of both, the estimated cost would lie somewhere in between these two estimates, as some people would choose to use medical marijuana and others would choose to use CBD oil. We do not attempt to estimate this split in our analysis. Across all three approaches, we rely on sales and cost information derived from public sources and do not account for the possibility of insurers contracting with dispensaries at rates that differ from historical levels. We discuss and summarize results for each approach in the sections that follow.

#### Top-down approach results

In the top-down approach, we use aggregate medical cannabis sales data from states where it is available today to estimate the overall average cost across the entire market. To the extent this estimate is applied to states where medical cannabis is not currently legal, this approach implicitly assumes that the average cost and utilization of medical cannabis will be similar to places where it is currently legal. This is the simplest of the three approaches we use, as it relies exclusively on high-level publicly available information and does not differentiate by qualifying condition or market. Additionally, because states generally do not distinguish among the forms of medical cannabis purchased by patients when reporting sales data, we are unable to provide separate estimates for medical marijuana and CBD oil under this approach. The table in Figure 3 summarizes our top-down estimates under three different levels of annual cannabis sales per patient. The low sales level relies on data from the state of Oregon; the moderate sales level relies on data from the state of Colorado; and the high sales level relies on the results of an analysis of national consumer data by New Frontier Data.<sup>17,18,19,20,21</sup> We adjust all three estimates to a 2020 basis. Note that the PMPM estimates in Figure 3 and all subsequent tables in this Results section are rounded to the nearest \$0.10.

**Figure 3:  
Estimated Medical Cannabis Costs PMPM  
Top-Down Approach**

Level of Sales	Cost PMPM
Low	\$2.20
Moderate	\$4.60
High	\$5.90

Under the top-down approach, we estimate the coverage of medical cannabis could cost between approximately \$2 and \$6 PMPM in 2020. The range is driven by the different levels of sales per patient in publicly reported data. The variance in medical cannabis sales by geography is due to a number of different factors, including: percentage of the



population using medical cannabis, mix of conditions cannabis is being used to treat (i.e., chronic vs. acute), patient adherence, and operational differences across states' medical cannabis programs, among other factors. Depending on where a particular insurer operates geographically, a different level of sales may be more appropriate.

Because the top-down approach does not readily allow for separate estimates by market, the estimated costs above would apply equally to the commercial and Medicaid markets. While we acknowledge there are demographic and socioeconomic differences between these two markets that may affect costs, we do not account for them here. These estimates can be thought of as a composite average across all markets, because they are based on the entire medical cannabis population in areas where such sales data is available.

To put these estimates in context, total gross prescription drug costs in the commercial insurance market are estimated to be approximately \$114 PMPM in 2020, per Milliman's Commercial 2020 Health Cost Guidelines™ (HCGs). The table in Figure 4 summarizes estimated 2020 costs PMPM for the top 10 therapeutic classes by total spend. This table is not being used to draw clinical or therapeutic comparisons between medical cannabis and a particular class, but rather to offer context and provide comparison points in estimated costs for treatments traditionally covered under insurance.

**Figure 4:**  
**Estimated Prescription Drug Costs PMPM**  
**Milliman Commercial 2020 HCGs**

<b>Therapeutic Class</b>	<b>PMPM</b>	<b>Percent of Total</b>
Autoimmune Agents	\$20.20	18%
Anti-Diabetic Agents (Non-Insulin)	\$8.90	8%
Antineoplastic Agents	\$8.10	7%
Antiretrovirals	\$6.20	5%
Multiple Sclerosis Agents	\$5.60	5%
Topical Dermatologic Agents	\$4.50	4%
Gastrointestinal Agents	\$3.70	3%
Short/Intermediate Acting Insulins	\$3.60	3%
Long Acting Insulins	\$3.00	3%
Antidepressants	\$2.50	2%
All Other Classes	\$47.70	42%
<b>Total</b>	<b>\$114.00</b>	<b>100%</b>

A therapeutic class represents a group of prescription drugs used to treat similar conditions or symptoms (e.g., inflammation, diabetes, cancer). As shown in Figure 4, these top 10 therapeutic classes range from \$2.50 to \$20.20 PMPM. Together, they make up nearly 60% of total prescription drug costs in the commercial insurance market, with each class representing at least 2% of total costs. As shown in Figure 3 above, we estimate medical cannabis would represent an increase in commercial prescription drug spend of between 2% and 5%. This magnitude would put it in line with gross costs for many of the top therapeutic classes shown above. As an additional point of comparison, estimated costs for treatments in the hepatitis C virus therapeutic class—a class familiar to many healthcare industry experts and policy makers in recent years—were about \$2 to \$3 PMPM in the commercial market in 2015 and 2016, after the first curative therapies were introduced.

### Bottom-up approach results

The bottom-up approach is the most complex of the three approaches and relies heavily on proprietary data, so it is an option more likely to be used by organizations with substantial internal data resources. In this approach, we start with detailed medical and pharmacy claims data from Milliman's proprietary Health Cost Guidelines Sources Database (CHSD), separated by market (i.e., commercial and Medicaid). Please refer to the Methodology and Assumptions section for more detail regarding this data source. We partition the data set into mutually exclusive populations for 66 qualifying conditions based on diagnosis and procedure codes (e.g., epilepsy, cancer, chronic pain, etc.) and use publicly available unit cost and dosing information to build up the estimated cost separately for each condition. We selected these 66 qualifying conditions based on a review of statutes across all states with medical cannabis programs, and we included any condition identified as qualifying in at least one state today. Please refer to Appendix A for the full

list of qualifying conditions we included in our analysis. We summarize our estimated costs PMPM for medical marijuana and CBD oil under the bottom-up approach in the tables in Figures 5 and 6.

<b>Figure 5: Estimated Medical Cannabis Costs PMPM Bottom-Up Approach, Medical Marijuana</b>				
<b>Market</b>	<b>Unadjusted Cost PMPM</b>	<b>Estimate</b>	<b>Adherence Adjustment</b>	<b>Adjusted Cost PMPM</b>
<b>Medicaid</b>	\$3.20	Low	0.600	\$1.90
		Middle	0.700	\$2.20
		High	0.800	\$2.50
<b>Commercial</b>	\$3.90	Low	0.600	\$2.40
		Middle	0.700	\$2.80
		High	0.800	\$3.20

<b>Figure 6: Estimated Medical Cannabis Costs PMPM Bottom-Up Approach, CBD Oil</b>				
<b>Market</b>	<b>Unadjusted Cost PMPM</b>	<b>Estimate</b>	<b>Adherence Adjustment</b>	<b>Adjusted Cost PMPM</b>
<b>Medicaid</b>	\$2.40	Low	0.600	\$1.50
		Middle	0.700	\$1.70
		High	0.800	\$1.90
<b>Commercial</b>	\$1.70	Low	0.600	\$1.00
		Middle	0.700	\$1.20
		High	0.800	\$1.40

In both tables, we include explicit adjustments for patient adherence. In short, the adherence adjustment reflects the tendency to use cannabis for only a portion of the year. While the “Unadjusted Cost PMPM” reflects full adherence (i.e., using every day for all 12 months), the “Adjusted Cost PMPM” reflects three alternate levels of patient adherence—60%, 70%, and 80%. We selected these adherence levels based on general observations regarding patient adherence with prescription drugs. These values are not meant to suggest what we think is likely or appropriate for medical cannabis, but rather to provide a range of possible outcomes. We also account for this adjustment in the intermediate approach and discuss it in more detail later in this Results section.

Figure 5 shows that we estimate medical marijuana costs to be lower in the Medicaid market than in the commercial market. This is primarily driven by a demographic adjustment we make to the Medicaid estimates to account for a much higher concentration of children, who are less likely than adults to use medical marijuana. We discuss the demographic differences and the development of this particular adjustment in the Market-specific Dynamics section below. We do not make this adjustment for CBD oil, however, given the evidence of CBD use among children in today’s medical cannabis market.<sup>22</sup> With CBD oil, we see the relationship between the commercial and Medicaid markets reversed—estimated CBD oil costs in Medicaid exceed those for the commercial market (Figure 6). Estimated daily costs for CBD oil are generally lower than for medical marijuana. Based on our analysis of Milliman’s CHSD, however, Medicaid tends to have a higher concentration of members with certain conditions we assume to require higher average doses per day of CBD oil (e.g., epilepsy, Parkinson’s disease, cerebral palsy).

These estimates exclude any potential cost savings or downstream impacts on patients’ medical and pharmacy costs. We use both state-reported cannabis data and drug utilization in the data set to help identify the patients who would be eligible and likely to begin using cannabis. They may begin using cannabis either by substituting for one or more of their existing prescription drugs, or as an adjunctive treatment (i.e., in addition to their existing prescription drug regimen).

### Intermediate approach results

The intermediate approach is intended to be a blend between the simplicity of the top-down approach and the data-driven rigor of the bottom-up approach. We separately consider qualifying conditions and leverage publicly available prevalence and medical cannabis utilization data to develop separate cost estimates by condition. We also account for how the prevalence of each condition varies by market to develop separate estimates for commercial and Medicaid. This approach allows for making condition and market-specific estimates, like the bottom-up approach, while still primarily leveraging publicly available data to do so, as we do in the top-down approach (albeit using more detailed public data by medical condition). The tables in Figures 7 and 8 summarize our estimated costs for medical marijuana and CBD oil, respectively, under the intermediate approach.

Figure 7: Estimated Medical Cannabis Costs PMPM Intermediate Approach, Medical Marijuana				
Market	Unadjusted Cost PMPM	Estimate	Adherence Adjustment	Adjusted Cost PMPM
Medicaid	\$5.20	Low	0.600	\$3.10
		Middle	0.700	\$3.70
		High	0.800	\$4.20
Commercial	\$5.90	Low	0.600	\$3.50
		Middle	0.700	\$4.10
		High	0.800	\$4.70

Figure 8: Estimated Medical Cannabis Costs PMPM Intermediate Approach, CBD Oil				
Market	Unadjusted Cost PMPM	Estimate	Adherence Adjustment	Adjusted Cost PMPM
Medicaid	\$3.90	Low	0.600	\$2.30
		Middle	0.700	\$2.70
		High	0.800	\$3.10
Commercial	\$2.30	Low	0.600	\$1.40
		Middle	0.700	\$1.60
		High	0.800	\$1.80

Similar to our bottom-up estimates, estimated costs in the Medicaid market are lower than in the commercial market if only medical marijuana is covered, but higher than the commercial market if only CBD oil is covered. Again, this is primarily driven by the proportion of children in Medicaid, as discussed in the Market-specific Dynamics section below.

We note that estimated costs under the intermediate approach are generally higher than corresponding cost estimates under the bottom-up approach. While the detailed claims data used in the bottom-up approach allows us to ensure members with more than one qualifying condition are not double-counted (e.g., members with diagnoses for both anxiety and multiple sclerosis), the public prevalence rates used in the intermediate approach do not allow us to do the same. *While we try to minimize this dynamic to the extent possible, there is likely some amount of overstatement still present in the intermediate approach, which is a limitation of relying on publicly available data.*

### Key assumptions

In the development of these estimates, we make several key assumptions. Across all three approaches, we adjust for induced utilization and pent-up demand. Induced utilization captures patients' sensitivity to cost, as they will be gaining access to medical cannabis through their insurance at a lower cost than they have access to today. Pent-up demand accounts for the fact that some people may try to use their insurance coverage to gain access to cannabis for nonmedical purposes. As a result, the use of medical cannabis we would expect to see in a mandated coverage environment is above that experienced in today's medical cannabis market. The table in Figure 9 summarizes these two assumptions by market.

**Figure 9:  
Key Assumptions, All Approaches**

<b>Assumption</b>	<b>Medicaid</b>	<b>Commercial</b>
<b>Induced Utilization Factor</b>	1.30 to 1.36	1.22 to 1.28
<b>Pent-up Demand Factor</b>	1.02 to 1.04	

These utilization impacts, and the pent-up demand component in particular, are challenging dynamics to quantify. Together, they constitute one of the biggest questions insurers will likely face in the event coverage of medical cannabis is mandated. State-reported data suggests a certain level of “gaming” already takes place in today’s medical cannabis market—a state’s medical cannabis use tends to decline once recreational use is made legal (i.e., some medical use is likely recreational or nonmedical in nature). This dynamic and the extent to which it affects overall utilization is likely to be state-specific and population-specific, though our use of publicly available data points establishes a reasonable estimate for pent-up demand in the estimated costs discussed above. We developed the induced utilization factor using Milliman research on utilization impacts of changes in patient cost sharing for traditional pharmacy benefit coverage. We discuss these factors in greater detail in the Methodology and Assumptions section below. On the other hand, insurers may adjust benefits to have more restrictive prior authorization criteria than states employ in their medical cannabis programs today. While this could offset increased demand, we do not attempt to quantify how insurers would restrict coverage, as the ability to do so may be outlined in any new legislation.

For the bottom-up and intermediate approaches, we also make assumptions for an average dose of medical cannabis per day, cost per dose, and level of patient adherence. Significant variation exists in average dosing and cost by condition and geography, so we select values that represent an average across the entire medical cannabis market, based on available sources.

Patient adherence accounts for the fact users will likely not use their medical cannabis consistently throughout the entire year. Patients often take their medications for less than a full year for a variety of reasons, including: cost, access, prescription expiration, side effects, and nature of condition being treated, among other factors. Many of these same reasons likely translate to medical cannabis, so we select a range of values for this assumption based on general observations regarding patient adherence with prescription drugs.

The table in Figure 10 summarizes the average dose, average cost, and the three adherence levels we assume in our bottom-up and hybrid cost estimates.

**Figure 10:  
Key Assumptions: Hybrid and Bottom-up Approaches**

<b>Assumption</b>	<b>Medical Marijuana</b>	<b>CBD Oil</b>
<b>Dose Per Day*</b>	1.8 grams	50 mgs
<b>Unit Cost</b>	\$9.35 per gram	\$0.16 per mg
<b>Adherence - Low</b>	60%	
<b>Adherence - Middle</b>	70%	
<b>Adherence - High</b>	80%	

\* For CBD oil, this value reflects an average, as we vary the assumed dose by condition, where such information exists.

Please refer to the Methodology and Assumptions section below for additional discussion of these and other key assumptions made in our analysis, including sources used. We also discuss another key adjustment we account for in our cost estimates in the following section.

## MARKET-SPECIFIC DYNAMICS

One of the distinguishing features of the Medicaid market is its demographic distribution. Nearly 50% of Medicaid enrollees nationwide are children (i.e., ages 0 to 18), due in large part to the Children’s Health Insurance Program (CHIP). The commercially insured population, on the other hand, is more similar to the general population, with

approximately 25% children. These relative proportions are consistent with the Medicaid and commercial data sets we use in developing our bottom-up cost estimates.

The demographic composition of each market, particularly its relative age distributions, is a critical factor in understanding the potential impacts of medical cannabis on insurance costs. For example, many states currently place restrictions on access to medical marijuana for patients under age 18.<sup>23</sup> To the extent a particular market has a higher concentration of children, such as Medicaid, we would expect lower uptake of medical marijuana, all else being equal. We use publicly available data to develop a factor to adjust Medicaid's estimated medical marijuana costs accordingly. We do not reflect a similar adjustment in our commercial estimates, given that market's similarity to the overall population. Please refer to Appendix B, which summarizes the demographic composition of the overall population, the Medicaid and commercial markets separately, and illustrates the development of the demographic adjustment factor.

As Appendix B shows, we apply an adjustment factor of 0.75 to the Medicaid cost estimates for medical marijuana. We rely on a combination of publicly available population estimates by market and state-reported medical cannabis use by age for the most recent period available to derive this adjustment factor. Based on Medicaid's demographic distribution, we would expect an overall medical marijuana penetration rate in Medicaid of 0.78%, which is considerably lower than the 1.04% average we observe across state medical cannabis programs today.

While relatively more patients are diagnosed with many severe qualifying conditions in the Medicaid market—e.g., epilepsy, post-traumatic stress disorder (PTSD), Parkinson's disease—the higher concentration of children in Medicaid means fewer of them are likely to have access to medical marijuana. Ultimately, this drives lower estimated costs for medical marijuana in Medicaid, relative to the commercial market. We do not include the Medicare market in our analysis, but similar considerations would need to be given to that market's demographics, where there is a much higher concentration of older adults, many of whom have one or more qualifying conditions.

#### OTHER IMPACTS ON ESTIMATED COSTS

The cost estimates discussed above likely represent only a portion of the total cost of introducing medical cannabis to insurance benefits in a state's commercial insurance and Medicaid markets. The cost estimates above only represent claims costs, though there are other factors insurers and other stakeholders would need to consider in the implementation of mandated medical cannabis coverage, such as:

- **One-time start-up costs:** Commercial insurers and Medicaid programs would have initial start-up expenses prior to incorporating medical cannabis into their benefits. There would likely be costs associated with initial research and projection of claims to appropriately set premiums or capitation rates, potentially substantial costs to enhance existing claims systems to integrate with dispensaries and medical cannabis transactions, costs to expand utilization management programs to monitor patient use of medical cannabis, and costs to ensure compliance with state legal requirements with respect to medical cannabis regulation.
- **Ongoing administrative expenses:** There could be additional costs for insurers to administer a medical cannabis benefit going forward. They may include salaries and overhead of employees hired to lead efforts to negotiate with dispensaries, costs to adjudicate and track claimants, costs for staff training, and costs for meeting licensing requirements deemed necessary by state regulations.
- **Ongoing patient and clinician education:** There may be costs associated with educating both patients and clinicians on how the benefit would be administered. For example, patients and clinicians would need to be informed as to the applicability of medical necessity guidelines, prior authorization requirements, benefit limits, and whether purchases would be limited to certain dispensaries to be eligible for coverage.
- **Equipment and supplies:** Certain forms of cannabis require additional materials to administer properly, such as rolling papers or vaporizers. States may require (or insurers may voluntarily include) coverage of equipment and supplies, which would add to the estimated costs discussed above. Furthermore, the manner in which any additional equipment and supplies are incorporated into the benefit design may affect how much of the cost is covered by the plan versus the patient. For example, medical cannabis could be covered similar to a pharmacy benefit, a medical benefit, or under a separate annual allowance.
- **Potential cost offsets:** The introduction of medical cannabis to insurance benefits in the commercial and Medicaid markets may reduce or eliminate some existing costs, such as the utilization of existing prescription drugs or physician services. This could serve as an offset to the additional costs for medical cannabis outlined above. For example, a patient today may take a traditional prescription drug to manage chronic pain. If this patient were to begin using medical cannabis, there may be less need for the current prescription drug and

fewer prescriptions could be filled as a result, thus offsetting a portion of the additional cost of medical cannabis.

- **Potential additional costs:** Conversely, introducing medical cannabis to insurance coverage may result in additional medical costs due to adverse reactions or impacts to patient health that emerge over time. For example, some studies suggest prolonged cannabis use affects the structure and function of the brain.<sup>24,25</sup> Such long-term effects could increase costs above what we contemplate in our analysis. Due to the limited number of studies suggesting adverse impacts, however, the extent of any additional costs is unknown.

## IV. DISCUSSION

### OPERATIONAL CONSIDERATIONS

#### Role of the physician

Physician instructions are at the center of most insurer coverage decisions and benefit administration. A primary example is a prescription, which allows patients to receive a particular product or service for medical reasons. Prescription requirements and who can issue them is governed by both state and federal law. Under the Controlled Substances Act, however, physicians are prohibited from issuing prescriptions for Schedule I controlled substances, such as cannabis.<sup>26</sup> For medical cannabis, physicians may instead provide what is commonly referred to as a recommendation to patients, which allows patients to consider marijuana or CBD oil for treatment of a specified condition, as permitted under state law.

The concept of a recommendation is not codified in law, but instead comes from a 2002 United States court case, *Conant v. Walters*, which affirmed the First Amendment right of physicians to recommend medical cannabis to patients.<sup>27</sup> While some state medical cannabis programs may require certain information be included in a medical cannabis recommendation to facilitate the transaction, a recommendation has no formal definition and therefore does not hold the same weight as a prescription.

The lack of a traditional prescription mechanism for medical cannabis may present a hurdle for mandating the coverage of it, because insurance coverage decisions today are so heavily premised on physician guidance. For example, medical necessity determinations, prior authorizations, step therapies, and clinical exceptions in an insurer's utilization management programs are all contingent on physician approval. At present, it is unclear whether a recommendation would satisfy an insurer's requirements for granting coverage in a situation such as this; and even if it does, many physicians may be hesitant to participate in an insurance program covering medical cannabis until marijuana is moved from its Schedule I status and/or they are legally permitted to write traditional prescriptions as they do with other controlled substances and prescription drugs.

#### Insurer operations

To operate effectively in an environment where the coverage of medical cannabis is mandatory, insurers will need to contend with many of the same decisions they currently must consider for traditional services and treatments already covered through their existing insurance plans. In particular, insurers and self-insured employers must decide whether to cover medical cannabis under the pharmacy or medical benefit.

Under most commercial market plans, the pharmacy benefit separates prescription drugs into different cost-sharing levels (i.e., tiers) and specifies the drugs covered at each level through a formulary. Cost sharing may also vary by pharmacy; plans use pharmacy networks in conjunction with formularies to minimize costs by steering patients to the most cost-effective treatment options. Currently, pharmacy benefits rely heavily on standardized systems of identification—from the development of a formulary to the adjudication of individual pharmacy claims—and currently marketed medical cannabis products do not have one.

Insurers may also consider covering medical cannabis under the medical benefit. Traditional medical benefits typically include a deductible, coinsurance, or copayment, in addition to a maximum out-of-pocket limit. In Canada, several private insurance providers offer coverage for medical cannabis up to a certain annual dollar allowance under a medical benefit (e.g., \$1,500 to \$6,000).<sup>28</sup> Sun Life Assurance Co. was the first to offer this coverage to its group benefit plans in February 2018. The carrier cited the lack of drug identification numbers (DINs) and approval process with Health Canada under the Food and Drugs Act as the reasons for covering medical cannabis as “medical services and equipment.”<sup>29</sup> Covering medical cannabis under the medical benefit through something like a maximum allowance per year could allow plan sponsors and patients to combine the costs of both the cannabis itself and related supplies under a single benefit, while also limiting total costs.

Regardless of whether medical cannabis is covered under a pharmacy or medical benefit, insurers must also consider several other items related to the administration of the benefit:

- **Manual claims processing:** Cannabis dispensary transactions are generally all done in cash. This is because credit card companies are hesitant to involve themselves with the cannabis industry.<sup>30</sup> This means insurers may need to install processes to process medical cannabis claims manually.

- **Restricting coverage to certain routes of administration or strains:** For prescription drugs, plans may choose to cover only certain dosages, formulations, or manufacturers in the case of branded medications. If state legislation does not otherwise specify, insurers might elect to place similar restrictions on medical cannabis products and may also require a demonstration of medical necessity.
- **Utilization management programs:** Insurers commonly implement utilization management programs for certain drugs under a pharmacy benefit or medical services under a medical benefit. This is done to ensure medical necessity, appropriateness of treatment, and minimization of harm. For example, plans may require prior authorization for a particular medical procedure or that a patient try one or more treatments (i.e., step therapies) before covering a specific drug.
- **Dispensary credentialing and contracts:** All providers and facilities (e.g., pharmacies, hospitals, doctors' offices) must become credentialed with an insurer before they are able to participate in the insurer's network. Plans will need to develop similar credentialing standards for dispensaries. Additionally, under a pharmacy benefit, insurers or their pharmacy benefit managers (PBMs) typically negotiate contracts that affect the price paid for drugs at the point of sale. Under a medical benefit, insurers negotiate contracts with physicians and facilities that affect the cost of services. Plans may want to consider similar arrangements with dispensaries, where they would negotiate contracts to manage the costs of covering medical cannabis or to impose consumer protections for their members. Our analysis does not contemplate the impact such contract negotiations may have on the cost of covering medical cannabis.

### Cannabis industry operations

In deciding whether and how to mandate coverage of medical cannabis, states must consider what impacts introducing insurance coverage may have on the existing medical cannabis industry and medical cannabis users. For example:

- Medical cannabis supply chain entities are not currently bound by the 2013 Drug Supply Chain Security Act. This act requires: (1) all entities in the drug supply chain to share specific data about drug transactions with other involved entities; (2) each individual package to have a unique serial number; and (3) minimum standards with respect to wholesale distributors. By 2023, drug supply chain entities will need to implement an interoperable, electronic system to track each package through the supply chain.<sup>31</sup> We do not know whether entities in the medical cannabis supply chain would be bound by these same requirements, but if so, they will likely need to implement changes to comply with them.
- Although referred to in the context of "medical use," cannabis dispensaries generally operate separately from the healthcare sector. They also perform nearly all transactions on a cash basis. Other stakeholders in the healthcare delivery system (e.g., pharmacies, hospitals, doctors' offices) have contractual relationships with insurers and are connected to them to allow for electronic transaction processing and data sharing. If medical cannabis is covered under insurance, patients and plans will need a way to determine the coverage status of cannabis products, a way to adjudicate the medical or pharmacy benefit properly, and a method of payment that ensures proper reimbursement from the insurer. This may require additional technology on the part of the dispensary, such as computerized systems that integrate directly with insurer claims systems to allow for real-time coverage determination, or detailed receipts for patients to submit to their insurers for reimbursement. Any changes of significance may require an up-front investment or changes to dispensary cash flows and financing. This would likely be difficult, because dispensaries are generally not backed by banks, credit card companies, or other financial institutions, thereby restricting their access to traditional financing mechanisms like loans or lines of credit.<sup>32</sup> To the extent there are costs associated with satisfying insurer requirements, these costs may be passed down to patients in the form of higher purchase prices, which could increase the costs of covering medical cannabis beyond the estimated levels contemplated in our analysis.
- The production of cannabis is heavily dependent on farming and agriculture, unlike most traditional pharmaceutical agents. Different growers use different methods, depending on such factors as climate and desired cannabinoid content of the plant. However, these growers are likely accustomed to the level of demand present in today's market. In the event of significant increases in demand, growers may be overwhelmed without recourse to ensure sufficient supply. This would also magnify risks inherent in agriculture, including regional droughts, unfavorable yields, or crop shortages. This may incite some growers to consolidate to keep up with demand and mitigate their exposure to such risks, or it may encourage growers to shift to laboratory-controlled environments.



## GOVERNMENTAL AND REGULATORY CONSIDERATIONS

### Current landscape

Today, the lack of insurance coverage of medical cannabis is likely due in large part to marijuana's Schedule I status and insurers' subsequent exposure to legal liability under federal law.

Even though some states have legalized the use of marijuana for medical and/or recreational purposes, marijuana use of any kind is still currently prohibited under federal law. The Obama administration made a practice of not enforcing federal cannabis law in states where it is legal, provided the use of it was not associated with other illegal activities.<sup>33</sup> In January 2018, the Trump administration made a formal announcement suggesting the end of these non-enforcement practices.<sup>34</sup>

While there have been no significant changes in the operations of state medical cannabis programs since the Trump administration's announcement, insurers are likely still wary of the consequences they could face—both legal and financial—if they were to begin offering medical marijuana coverage. This may be especially true of larger national health plans, because they have operations spanning multiple states that vary widely in their treatments of medical marijuana.

The federal government has relaxed its posture regarding CBD oil through passage of the 2018 Farm Bill. The 2018 Farm Bill effectively legalized the production, distribution, and possession of hemp and hemp-derived products under the Controlled Substances Act, including CBD oil.<sup>35</sup> Despite these recent changes, insurers and self-insured employers are still likely hesitant to cover CBD oil given its close association with marijuana and the lack of FDA approval. In fact, following the passage of the 2018 Farm Bill, the FDA released a statement clarifying that any cannabis-derived product, including hemp, marketed as possessing therapeutic benefit must be approved by the FDA before it can be sold to the public.<sup>36</sup>

Several states have put forth proposals within the last 14 months to require coverage of medical cannabis in the commercial and/or Medicaid markets:

- **New York:** Bills (A2824, S2054) introduced in January 2019; would add coverage of medical marijuana to public insurance programs (i.e., Medicaid, Child Health Plus, Elderly Pharmaceutical Insurance Coverage, Essential Plan, and workers' compensation programs); for commercial insurance plans, coverage would be optional.<sup>37,38</sup>
- **Massachusetts:** Bill (H.3875) introduced in January 2019; would require coverage of medical marijuana under Medicaid and commercial health plans.<sup>39</sup>
- **Maine:** Bill (LD 942) introduced in March 2019; would require accidental injury and disability insurers to reimburse for medical marijuana if provided to a patient.<sup>40</sup>
- **Wisconsin:** Bill (SB 377) introduced in August 2019; would require disability insurance policies and self-insured health plans that already provide prescription drug coverage to cover the medical use of THC.<sup>41</sup>
- **Hawaii:** Bill (SB 2586) introduced in January 2020; would amend statutes governing the state's health insurance market to include medical cannabis as eligible for reimbursement up to a maximum limit each month.<sup>42</sup>

### Implications in commercial market

A portion of today's individual and small group market is governed primarily by provisions set forth under the Patient Protection and Affordable Care Act (ACA), signed into law on March 23, 2010. Generally speaking, the provisions under the ACA allow each state to maintain jurisdiction over its own individual and small group insurance market, provided it complies with federal rules and requirements. One key federal requirement all states and fully insured health plans must comply with is the coverage of 10 specified essential health benefits (EHBs).<sup>43</sup> Each state must select a "benchmark plan," which they use as a reference point for specifying the benefits covered by health plans in the state, inclusive of the 10 federal EHBs.<sup>44</sup>

In the individual and small group markets, states also have the option to mandate coverage of additional benefits above and beyond the 10 federal EHBs (i.e., additional state-mandated benefits). If a state mandates an additional benefit not included in the selected benchmark plan, the state must defray the cost of that benefit, including both member premium

and cost sharing.<sup>45</sup> This means if a state were to mandate coverage of medical cannabis in the fully insured individual and small group markets, it would in theory need to defray, or absorb, the costs to plans and members. As of today, however, no state has formalized a defrayal process by which the costs of an additional state-mandated benefit would be absorbed. At the time of writing, only Utah has even proposed a defrayal process, doing so very recently, so it remains unclear how such a process would work.<sup>46</sup>

Among large group employers (i.e., 50 or more employees), over 60% of employees are enrolled in self-funded plans.<sup>47</sup> Self-funded plans are not subject to many of the same federal and state requirements under the ACA and are instead primarily governed by ERISA. The primary responsibility of the employer under ERISA is to function as a fiduciary. This means the employer must administer the plan solely in the best interest of its employees and plan participants.<sup>48</sup> Employers would be free to offer medical cannabis coverage today (subject to the risk of federal legal action), just as they would be free to decline to offer such coverage in the event a state mandates it in its commercial market. The reality of having employees residing across multiple states notwithstanding, large employers may still object on moral grounds, similar to what occurred when the federal government mandated contraceptive coverage under the ACA.<sup>49</sup> Alternatively, some employers may see coverage of medical cannabis as a unique benefit to help with employee recruitment and retention.

### Implications in Medicaid market

The Medicaid program is jointly managed and funded by the states and the federal government. While there are services state Medicaid programs are required to cover by the federal government, similar to the commercial insurance market, states are allowed to cover additional services, and many states elect to do so. To formally add coverage for medical cannabis under its Medicaid program, a state would likely need to submit a waiver or a state plan amendment (SPA) to the federal government for approval.<sup>50</sup> In either case, the Centers for Medicare and Medicaid Services (CMS) would need to approve and opine that such a change supports Medicaid's objectives and budget. As it relates to Medicaid's budget, the state would need to demonstrate that such coverage is cost-effective (i.e., does not increase overall program costs).

To help with funding the Medicaid program, states receive matching dollars from CMS through Federal Medical Assistance Percentages (FMAP). These percentages vary by state, generally ranging between 50% (i.e., a state receives \$1 for every \$1 it spends on the program) and 77%.<sup>51</sup> Given cannabis remains illegal under federal law, it may be reasonable to assume the federal government would not provide matching dollars for medical cannabis coverage.

### Other regulatory implications

Under many commercial and employer-sponsored plans, members are able to use funds they accumulate in certain types of tax-favored accounts for qualified medical expenses: Health savings accounts (HSAs), flexible spending accounts (FSAs), and health reimbursement arrangements (HRAs). In many cases, employers contribute to these accounts and they represent part of an employee's overall health benefits package. Even if a product or service is not explicitly covered by the health plan, members may be able to use these funds to cover all or part of the expense. For example, these funds can be used for over-the-counter medications, medical supplies, or other out-of-pocket amounts like copayments and coinsurance. Because cannabis is illegal under federal law and not considered to have any medical use, however, members are not able to use these funds to purchase medical cannabis products.<sup>52</sup> Even if a state requires medical cannabis to be covered through insurance, it would remain prohibited under existing federal law, and thus it would remain ineligible for reimbursement under HSAs and similar accounts. While not federally illegal, CBD oil would likely not be eligible for reimbursement either, because it still cannot be marketed as a medical product.

In addition, as a Schedule I controlled substance, cannabis is considered to have no medical use and therefore must overcome significant regulatory hurdles for FDA approval. One outcome of FDA approval for traditional prescription drugs is the assignment of a unique identifier (i.e., National Drug Code). For a product covered as a pharmacy benefit, pharmacies and insurers use these unique identifiers to dispense the correct product to the patient, properly apply the insurance benefits, and ensure appropriate billing to each party involved in the transaction. However, there are products covered under both medical and pharmacy benefits today without FDA approval or standardized identification. One such example is compounded medications, which tend to be covered under a plan's pharmacy benefit. Compounded medications are combinations of ingredients, specifically mixed and tailored to meet the needs of individual patients (e.g., who may have allergies to specific ingredients in an FDA-approved medication). The resulting compounded medication is not FDA-approved, though the individual ingredients are (unlike medical cannabis, for which no component is FDA-approved).

The lack of a clear central approval process and authority has the potential to contribute to issues related to patient safety, costs of coverage, and fraud. In considering whether the coverage of medical cannabis ought to be mandated

through insurance, states should be cognizant of the potential risks associated with these outcomes. Given the amount of attention around cannabis and its propensity to be used in a nonmedical, recreational capacity, states will likely need to develop mechanisms to protect against these and similar risks.

## DEMOGRAPHIC AND GEOGRAPHIC CONSIDERATIONS

### Variations in cost and utilization in the current medical cannabis market

Our analysis provides an overall estimated cost of medical cannabis on an average nationwide basis. However, the utilization patterns for medical cannabis products vary significantly by state for a variety of reasons. For example:

1. **Range in qualifying conditions:** The list of qualifying conditions for medical cannabis use varies significantly by state. The list can be as broad as Maine, where it is basically left to the physician's discretion, or limited to a handful of specific conditions as in Montana.<sup>53</sup> This variation causes different utilization patterns, as patients with different qualifying conditions in different states are not equally likely to use medical cannabis products.
2. **Licensing and access:** Though many states have legalized medical cannabis products, states have operationalized the sale of these products in different ways. The variety of methods to operationalize sales and allow patients access to these products has likely contributed to higher use in states where dispensaries are more accessible and where there are fewer obstacles between production and sales to the consumer. For example, Oklahoma does not limit the number of dispensary licenses.<sup>54</sup> This has led to a very rapid uptake relative to other states, with over 200,000 citizens registered as of October 2019.<sup>55</sup> This represents over 5% of Oklahoma's total population, compared to most states, which have about 1% of their populations enrolled, on average. Illinois, on the other hand, was comparatively much more restrictive in the first several years of its medical cannabis program, both placing limits on dispensary licenses and requiring stronger evidence of valid patient-physician relationships.<sup>56</sup>
3. **Variations in demographics:** Each state has a different demographic distribution in terms of age, gender, and health status. For example, the estimated number of age-adjusted cancer deaths from the Centers for Disease Control and Prevention (CDC) in 2017 varies from 120 deaths per 100,000 in Utah to 186 deaths per 100,000 in Kentucky.<sup>57</sup> Differences in the prevalence of qualifying conditions likely plays a role in the different utilization rates across states where medical cannabis products are legal today. Additionally, studies have shown cannabis use also varies in accordance with other demographic factors, such as ethnicity, income, and education.<sup>58</sup> These factors may vary by state, and are even more likely to vary for specific populations, particularly between the commercial insurance and Medicaid markets. As such, within the same state and same market, different insurers and employers may experience differences in costs for medical cannabis.

In addition to utilization variation driven by the aforementioned factors and others, the unit cost of medical cannabis also varies substantially in today's marketplace by state. Although there are many factors affecting regional differences in unit cost, there are two factors, in particular, that play a critical role:

1. **Cost of living:** As with most other commoditized goods, medical cannabis products can vary depending on the average cost of living in a given region. Many costs that feed into the end-user sale price of cannabis products are contingent on the cost of living. For example, the rent of the dispensary location, the cost of the land to grow the plant itself, and the wages paid to employees involved in the growing, processing, packaging, and selling are likely to be influenced by the average purchasing power within each state. Of course, there will be exceptions to this, and costs of living are not uniform across an entire state.
2. **Taxation:** States with medical cannabis programs tax cannabis products differently. Some states tax the cultivation and distribution of cannabis, some states tax only the sales of cannabis, and other states have no cannabis tax system in place at all. Additionally, the level at which states tax cannabis can vary widely. In the state of Washington, for example, there is a 37% excise tax on all cannabis sales; however, the state of Massachusetts has an excise tax of only 10.75%.<sup>59</sup>
3. **Market maturity:** The maturity of the market can also have a substantial impact on the unit cost of medical cannabis. Oregon has shown that, as medical cannabis markets mature, prices have decreased. This is likely the result of slowly increasing demand on the part of consumers and patients. On the supply side, time is needed to gain efficiencies and figure out whether production costs can be reduced to increase competitiveness in the market. For example, the price per pound of marijuana flower in Oregon has decreased from \$4,440 in October 2016 to \$1,618 in March 2019, representing a 64% decrease in unit cost over a three-

year period.<sup>60</sup> In Oregon's case, however, this decrease may have been aided by the additional returns to scale caused by the legalization of recreational marijuana in November 2014.<sup>61</sup>

### Impacts to states that already allow recreational cannabis use

Several states have legalized recreational cannabis use, allowing people to purchase cannabis products legally without a qualifying medical condition. These states, with D.C., include Alaska, California, Colorado, Illinois, Maine, Massachusetts, Michigan, Nevada, Oregon, Vermont, and Washington.<sup>62</sup> Each introduced medical cannabis programs prior to legalizing its recreational use.

Several states that allow recreational use have seen significant drops in the percentage of the population who register for medical cannabis in the months following recreational legalization. For example, at the time of recreational legalization in Oregon, 1.9% of the population was registered for medical marijuana.<sup>63</sup> This number declined over the next several years to 0.7% of the population.<sup>64</sup> The state of Colorado experienced a similar decrease in its medical cannabis program following the legalization of recreational use. For states where the time between medical and recreational legalization was shorter, the decreases were relatively smaller, as these markets had likely not yet reached full saturation.<sup>65</sup>

When estimating the cost of medical cannabis as an insurance benefit, the interplay between the medical cannabis and the recreational cannabis markets produces a unique dynamic not usually observed in insurance markets. If medical cannabis were available through an insurance benefit, there may be a shift away from the recreational market and back to the medical market due to added financial incentives. Therefore, in states where recreational use is legal, the number of registered medical cannabis users may be lower today than in a future scenario where cannabis is covered under an insurance benefit.

This potential shift also has implications on state tax revenue. As discussed above, state taxation of cannabis products varies widely. Among states with both legal recreational cannabis and medical cannabis programs, recreational cannabis is taxed at higher rates than medical cannabis.<sup>66</sup> In Colorado, for example, medical cannabis is subject to a 2.9% sales tax, while recreational cannabis is subject to both a 15% sales tax and 15% excise tax.<sup>67</sup>

## V. METHODOLOGY AND ASSUMPTIONS

### DATA SOURCES

In preparing this analysis, we relied on the following primary data sources:

- **Milliman's Health Cost Guidelines Sources Database:** The Milliman Health Cost Guidelines Sources Database (CHSD) contains claims-level detail and demographic information for over 40 million lives across the commercial and managed Medicaid markets. We relied on calendar year 2017 data for medical and pharmacy benefit claims.
- **State-reported medical cannabis program statistics:** Many states with medical cannabis programs publish data on the number of registered patients and the conditions for which those patients are using medical cannabis. Some states publish this information monthly and others publish it annually. We relied on this data to estimate the number of patients who would use medical cannabis through an insurance benefit in both the bottom-up and intermediate approaches. Some states also report medical cannabis sales data, which we relied on for the top-down approach and unit cost development in the bottom-up and intermediate approaches. Please refer to Appendix C for a list of sources.
- **Condition prevalence rates:** For the intermediate approach, we relied on estimated prevalence rates from the CDC to determine the number of people nationwide who have each qualifying condition. Where CDC estimates were not available, we relied on estimates from patient advocacy organizations or published and peer-reviewed academic studies. Please refer to Appendix C for a list of sources.

### COST ESTIMATION METHODS

#### Bottom-up approach

This approach leverages detailed claims and membership information from the 2017 CHSD database to estimate the PMPM impact of adding medical cannabis coverage to the commercial insurance and Medicaid markets. This approach is more likely to be used by large insurers with sufficient resources and data to complete in-depth analyses.

The bottom-up approach uses Milliman's CHSD data to identify patients with conditions for which at least one state authorizes the use of medical cannabis today (i.e., qualifying conditions). For a full list of the 66 qualifying conditions included in our analysis, please see Appendix A. For most qualifying conditions, we identified patients as having a specific condition if there was at least one ICD-10 (i.e., International Statistical Classification of Diseases and Related Health Problems 10th Revision) code pertaining to that condition. Milliman clinicians determined the list of ICD-10 codes associated with each qualifying condition. For qualifying conditions not identifiable through ICD-10 codes (e.g., dialysis or terminal illness), we used Healthcare Common Procedure Coding System (HCPCS) codes instead. Patients identified as having multiple qualifying conditions were only included in a single category for purposes of our analysis, which ensured we did not double-count them in our final cost estimates.

We assumed the percentage of patients who use medical cannabis (i.e., penetration rates) varies by qualifying condition. To develop the assumed penetration rate by qualifying condition, we aggregated 2018 and 2019 state-reported medical cannabis data across 10 states. We focused on the number of registered patients by qualifying condition in these states and compared it to condition prevalence rates we compiled from the CDC to derive separate medical cannabis penetration rates by condition. We relied on these same penetration rates in the intermediate approach, as discussed below.

We assumed each patient would use 1.8 grams per day, at just under \$9.35 per gram, for the medical marijuana cost estimates. For the CBD oil cost estimates, we assumed a variable daily dose by condition, ranging from 11 milligrams per day to 826 milligrams per day, and a unit cost of \$0.16 per milligram. See the Daily Dose and Unit Cost sections below for more detail on the selection of these assumptions.

#### Top-down approach

This approach uses very high-level, publicly available information to estimate the cost of medical cannabis coverage in health insurance. This approach might be employed by smaller insurers with limited resources and data to assess the cost of covering medical cannabis.

We leveraged independent sources to provide low, medium, and high annual sales levels per patient. We determined what level of sales constituted each of these three points, based on an examination of multiple state reports and studies.

The low estimate relies on cannabis sales data in the state of Oregon; the middle estimate relies on cannabis sales data in the state of Colorado; and the high estimate is based on a recent annual report published by New Frontier Data, a company focused exclusively on global cannabis data and intelligence. We adjust all three estimates to a 2020 basis.

We extrapolate these sales estimates across the entire population by considering the percentage of the population that uses medical cannabis (i.e., the penetration rate). As described under the bottom-up approach above, we rely on counts of registered patients reported by state medical cannabis programs to estimate this penetration rate.

### Intermediate approach

The intermediate approach uses a combination of publicly available data and high-level claims information from Milliman's CHSD database. This approach could be used by organizations with access to less detailed membership and claims data and fewer resources to compile and review public sources. The 22 qualifying conditions explicitly modeled in the intermediate approach are identified in Appendix A.

To estimate the number of people eligible for medical cannabis use, we compiled recent nationwide prevalence estimates for key qualifying conditions from the CDC and peer-reviewed studies. The qualifying conditions explicitly modeled in the intermediate approach account for over 80% of the potential medical cannabis population across the full list of the 66 qualifying conditions modeled in the bottom-up approach. Where appropriate, we made additional adjustments to these national prevalence rates to better capture the population for each qualifying condition we expect would be eligible for medical cannabis use in 2020. We then accounted for the proportion of eligible patients who will actually use medical cannabis (i.e., the penetration rate). We used the same penetration rates by condition as the bottom-up approach, as discussed above.

We also relied on the same average daily dose and unit cost assumptions as the bottom-up approach. See the Daily Dose and Unit Cost sections below for more details on the development of dosing and unit cost assumptions for both medical marijuana and CBD oil.

As noted above, the intermediate approach explicitly models costs for 22 qualifying conditions. To account for the estimated costs associated with the other 44 qualifying conditions not explicitly modeled, we applied separate adjustment factors based on the observed prevalence of those 44 conditions in each market.

Please see Appendix C for the list of sources used in developing our prevalence estimates by qualifying condition for the intermediate approach.

## KEY ASSUMPTIONS

### Daily dose

Due to the variance between medical cannabis strains, formulations, and relative content of THC and CBD, there is no one-size-fits-all set of treatment guidelines. Depending on patient weight, prior cannabis use, formulation, strain, and many other factors, patients will need different amounts of cannabis to treat their medical conditions. Because many patients react differently to cannabis, much of the literature on the subject tends to recommend starting with a low dosage and increasing that dosage slowly.<sup>68</sup> This means most patients may begin treatment regimens with lower than optimal amounts and slowly increase the dosage to treat the condition. In our review of the literature and surveys, many patients eventually use 1 to 3 grams per day of cannabis flower, on average. For the bottom-up and intermediate approaches, we assume 1.8 grams per patient per day in our estimated costs of medical marijuana.<sup>69</sup> For CBD oil, our research suggests recommended dosing varies by condition, so we assume between 11 and 826 milligrams per day in our estimated costs of CBD oil, depending on the qualifying condition.<sup>70</sup>

### Unit cost

For medical marijuana in the intermediate and bottom-up approaches, we assume an average cost per ounce of \$265 in 2020. We base this estimate on the average cost per ounce derived from reported sales and survey data for several states.<sup>71,72,73,74,75,76</sup> The specific states we considered were: Colorado, Illinois, Michigan, New Jersey, and Oregon. For CBD oil in the intermediate and bottom-up approaches, we assume an average cost of \$0.16 per milligram. We considered the reported costs of CBD oil products available in the market to develop this assumption.<sup>77</sup>

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### Induced utilization

The induced utilization factor represents the projected increase in utilization of medical cannabis if it were to be covered as part of an insurance benefit. To calculate the induced utilization factor, we estimate the increase in similarly priced prescription drug products available today if member cost sharing were to decrease from 100% to some lower amount. If medical cannabis were to be covered under a medical or pharmacy insurance benefit, members would likely be responsible for less than 100% of the cost (as they are today). As a result, members would be more likely to use medical cannabis. To determine the appropriate induced utilization factor, we make an assumption for member cost sharing under insurance for each market and apply Milliman research regarding the utilization impacts of changes in member cost sharing for pharmacy benefit coverage. For the commercial market, we assume medical cannabis member cost sharing will become approximately equal to an average brand copayment in today's commercial market; for the Medicaid market, we assume member cost sharing will become 0%.

### Pent-up demand

The pent-up demand factor represents the projected increase in patients using medical cannabis through insurance who otherwise do not need it for medical purposes. When analyzing the impact of the introduction of recreational cannabis in several states, we observe the number of registered medical cannabis patients decreases substantially in the months and years following the legalization of recreational cannabis. To us, this suggests a portion of medical cannabis use is nonmedical in nature (i.e., some people access recreational marijuana through the medical cannabis distribution channel). By comparing the medical cannabis penetration rate across states with medical cannabis only against the medical cannabis penetration rate across states with both medical and recreational cannabis, we see the penetration rate in medical cannabis-only states is higher. We use this observation as the basis for our pent-up demand factor, which captures the expected utilization increase in the medical cannabis market under insurance, above and beyond the impact of induced utilization already captured above.

### Patient adherence

For the bottom-up and intermediate approaches, we account for the relative proportion of the year patients use medical cannabis (i.e., adherence). We know patients do not always exhibit full adherence in today's prescription drug market, and we assume a similar phenomenon would occur for medical cannabis. In order to estimate future medical cannabis adherence, we assume patients would use medical cannabis 70% of the year (about eight to nine months), which is consistent with observed adherence patterns in the current prescription drug market.<sup>78</sup> Given the variety of factors that contribute to patient adherence, such as administration route, immediacy of impact, and side effects, we also provide results assuming 60% and 80% patient adherence.

## VI. CAVEATS AND LIMITATIONS

The authors of this report are actuaries for Milliman, Inc. They are members of the American Academy of Actuaries and meet the qualification standards of the American Academy of Actuaries to render the actuarial opinion contained herein. To the best of their knowledge and belief, this information is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

The material in this report represents the opinion of the authors and is not representative of the views of Milliman. As such, Milliman is not advocating for, or endorsing, any specific policy changes related to medical cannabis coverage in the commercial, Medicaid, or other insurance markets. The authors are not lawyers and nothing within this report should be considered legal advice.

Greenwich Biosciences (Greenwich) may share this report with third parties in its entirety, subject to the terms of our Consulting Services Agreement (dated May 6, 2019) and our Statement of Work (dated March 6, 2020). Milliman does not intend to benefit and assumes no duty of liability to other parties that receive this work product. Any third party recipient of this work product that desires professional guidance should not rely upon Milliman's work product but should engage qualified professionals for advice appropriate to their own specific needs.

This report is designed to provide a quantitative analysis and qualitative discussion around the coverage of medical cannabis in the commercial insurance and Medicaid markets. The methodologies discussed are intended to be representative of approaches insurers may employ to evaluate the various impacts of medical cannabis coverage and are by no means prescriptive. In preparing this information, we relied on a proprietary claims database, as well as many public sources. To the extent this information is inaccurate or incomplete, our conclusions may change.

Actual outcomes will vary from the estimates provided in this report for a number of reasons, including but not limited to changes in the legislative and regulatory environment, continuing clinical research, and other market forces impacting the medical cannabis and pharmaceutical markets.



## APPENDICES

**Appendix A**  
**Greenwich Biosciences**  
**Modeled Conditions and Associated Prevalence Rates**  
**Bottom-up and Intermediate Approaches**

Condition	Condition Modeled		Prevalence	
	Intermediate	Bottom-up	Medicaid	Commercial
ALS	X	X	0.01%	0.01%
Alzheimer's	X	X	0.38%	0.09%
Anorexia		X	0.39%	0.15%
Anxiety	X	X	5.51%	7.06%
Arnold-Chiari syndrome		X	0.01%	0.01%
Arthritis	X	X	2.25%	2.87%
Ataxia		X	0.20%	0.08%
Autism		X	0.51%	0.22%
Cachexia		X	0.07%	0.02%
Cancer	X	X	0.51%	0.82%
Causalgia		X	0.02%	0.01%
Cerebral Palsy	X	X	0.25%	0.06%
Chronic pancreatitis		X	0.10%	0.04%
Chronic renal failure		X	0.48%	0.41%
Cystic fibrosis		X	0.01%	0.01%
Dialysis		X	0.08%	0.06%
Dyskinesia		X	0.86%	0.72%
Dystonia		X	0.05%	0.03%
Ehlers-Danlos syndrome		X	0.02%	0.02%
Elevated intraocular pressure		X	0.05%	0.09%
Epidermolysis bullosa		X	0.00%	0.00%
Epilepsy	X	X	1.29%	0.50%
Fibromyalgia	X*	X	0.81%	0.54%
Fibrous dysplasia		X	0.00%	0.00%
Glaucoma	X	X	0.32%	0.60%
Hepatitis C	X	X	0.53%	0.15%
HIV/AIDS	X	X	0.09%	0.08%
Huntington's	X*	X	0.01%	0.00%
Hydrocephalus		X	0.05%	0.03%
Hydromyelia		X	0.00%	0.00%
IBD	X	X	0.34%	0.53%
Idiopathic pulmonary fibrosis		X	0.00%	0.00%
Inclusion Body Myositis		X	0.00%	0.00%
Interstitial cystitis		X	0.05%	0.06%
Lupus		X	0.12%	0.12%
Migraine	X*	X	1.70%	2.17%
Mitochondrial disease		X	0.01%	0.01%
Multiple sclerosis	X	X	0.12%	0.15%
Muscle Spasm		X	0.62%	1.41%
Muscular Dystrophy		X	0.02%	0.01%
Myasthenia gravis		X	0.01%	0.01%
Myoclonus		X	0.02%	0.01%
Nausea		X	4.14%	2.01%
Neural tube defect		X	0.10%	0.05%
Neurofibromatosis		X	0.02%	0.01%
Neuropathy	X*	X	2.07%	1.31%
Obstructive sleep apnea	X	X	1.00%	1.96%
Osteogenesis imperfecta		X	0.01%	0.00%
Other Nervous System Disorders	X*	X	2.70%	2.39%
Other Neurodegenerative disease	X*	X	0.14%	0.06%
Pain	X	X	8.71%	10.91%
Parkinson's	X	X	0.23%	0.08%
Post-concussion syndrome		X	0.05%	0.05%
Postlaminectomy syndrome		X	0.24%	0.19%
PTSD	X	X	1.21%	0.42%
Reflex sympathetic dystrophy		X	0.00%	0.00%
Seizures		X	0.56%	0.21%
Sickle cell		X	0.04%	0.01%
Sjogren's syndrome		X	0.05%	0.08%
Spasticity		X	0.23%	0.19%
Spinal cord disease		X	0.06%	0.05%
Spinal cord injury		X	0.05%	0.02%
Syringomyelia		X	0.01%	0.01%
Terminal Illness		X	0.11%	0.05%
Tourette's		X	0.03%	0.03%
Traumatic brain injury		X	0.34%	0.27%

*\*Included under "Nervous System" condition category in the Intermediate Approach*

**Appendix B**  
**Greenwich Biosciences**  
**Development of Medicaid Demographic Adjustment**  
**Bottom-up and Intermediate Approaches**

**I. Estimated Total Population <sup>1</sup>**

Category	United States		Medicaid		Commercial	
	% of Total	People	% of Total	People	% of Total	People
Children	24%	79,152,000	46%	30,381,000	24%	43,174,000
Adults	76%	250,647,000	54%	36,245,000	76%	140,048,000
Total	100%	329,799,000	100%	66,626,000	100%	183,222,000

**II. Estimated Medical Marijuana Users (if all states were legal) <sup>2</sup>**

Category	United States		Medicaid		Commercial	
	% of Total	People	% of Total	People	% of Total	People
Children	3%	103,000	8%	40,000	3%	56,000
Adults	97%	3,322,000	92%	480,000	97%	1,856,000
Total	100%	3,425,000	100%	520,000	100%	1,912,000

**III. Medical Marijuana Penetration (as Percent of Total Population)**

Population	% of Total	Relativity
		Factor
United States	1.04%	-
Medicaid	0.78%	<b>0.75</b>
Commercial	1.04%	<b>1.00</b>

<sup>1</sup> Source: <https://www.kff.org/other/state-indicator/distribution-by-age>

<sup>2</sup> Source: child percent based on state-reported medical cannabis data in Oregon and Colorado

Appendix C  
Greenwich Biosciences  
Data Source List

State-reported Medical Cannabis Program Statistics and Condition Prevalence Rates

**I. State-reported Medical Cannabis Program Statistics**

<https://drive.google.com/file/d/19wkldifg3G4E84Be3ocMt7SW7geC792u/view>  
<https://www.health.state.mn.us/people/cannabis/docs/about/update1019.pdf>  
<https://azdhs.gov/documents/licensing/medical-marijuana/reports/2019/2019-sep-monthly-report.pdf>  
[https://www.michigan.gov/documents/lara/Quarterly\\_Report\\_thru\\_March\\_2019\\_DLH\\_655223\\_7.pdf](https://www.michigan.gov/documents/lara/Quarterly_Report_thru_March_2019_DLH_655223_7.pdf)  
[https://www.healthy.arkansas.gov/images/uploads/publications/FY\\_2019\\_MMJ\\_Report\\_V.11.7.2019.pdf](https://www.healthy.arkansas.gov/images/uploads/publications/FY_2019_MMJ_Report_V.11.7.2019.pdf)  
[https://www.oregon.gov/oha/PH/DISEASES/CONDITIONS/CHRONICDISEASE/MEDICALMARIJUANAPROGRAM/Documents/OMMP\\_Statistical\\_Snapshot\\_07-2019.pdf](https://www.oregon.gov/oha/PH/DISEASES/CONDITIONS/CHRONICDISEASE/MEDICALMARIJUANAPROGRAM/Documents/OMMP_Statistical_Snapshot_07-2019.pdf)  
<https://nmhealth.org/publication/view/report/4864/>  
[https://health.hawaii.gov/medicalcannabis/files/2019/10/September-19\\_ISP\\_Valid\\_26716.pdf](https://health.hawaii.gov/medicalcannabis/files/2019/10/September-19_ISP_Valid_26716.pdf)  
<https://www.dhhs.nh.gov/oos/tcp/documents/tcp-data-report-2019.pdf>  
[http://dpbh.nv.gov/uploadedFiles/dpbhngov/content/Reg/MM-Patient-Cardholder-Registry/dta/Monthly\\_Reports/MMR%20Monthly%20Statistics%20EOM%205-2019.pdf](http://dpbh.nv.gov/uploadedFiles/dpbhngov/content/Reg/MM-Patient-Cardholder-Registry/dta/Monthly_Reports/MMR%20Monthly%20Statistics%20EOM%205-2019.pdf)  
<https://dhss.delaware.gov/dhss/dph/hsp/files/mmpannrpt2018.pdf>

**II. Condition Prevalence Rates**

<https://www.hiv.gov/hiv-basics/overview/data-and-trends/statistics>  
<https://www.cdc.gov/epilepsy/data/index.html>  
<https://www.cancer.gov/about-cancer/understanding/statistics>  
<https://www.nationalmssociety.org/About-the-Society/News/Landmark-Study-Estimates-Nearly%2%A01-Million-in-the-U>  
<https://www.mayoclinic.org/medical-professionals/ophthalmology/news/incidence-and-probability-of-progression-to-blindness-due-to-open-angle-glaucoma-decreases-dramatically/mac-20430155>  
<https://www.ncbi.nlm.nih.gov/books/NBK224874/>  
<https://www.gikids.org/files/documents/digestive%20topics/english/IBD%20-%20Ulcerative%20colitis.pdf>  
<http://www.alsa.org/about-als/facts-you-should-know.html>  
<https://www.aans.org/Patients/Neurosurgical-Conditions-and-Treatments/Spasticity>  
<https://www.cdc.gov/mmwr/volumes/67/wr/mm6736a2.htm>  
<http://www.ncsddc.org/cdc-releases-new-hepatitis-c-prevalence-estimate/>  
<https://www.parkinson.org/Understanding-Parkinsons/Statistics>  
<https://www.alz.org/alzheimers-dementia/facts-figures>  
<https://adaa.org/about-adaa/press-room/facts-statistics>  
<https://gis.cdc.gov/Cancer/USCS/DataViz.html>  
<https://www.aans.org/Patients/Neurosurgical-Conditions-and-Treatments/Spasticity>  
<https://www.cdc.gov/ibd/IBD-epidemiology.html>  
<https://www.cerebralpalsyguidance.com/cerebral-palsy/research/facts-and-statistics/>  
<https://www.cdc.gov/chronicdisease/resources/publications/factsheets/arthritis.htm>  
<https://www.sleepapnea.org/learn/sleep-apnea-information-clinicians/>

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