

Mortality Impact of What-If Recreational Marijuana Use Scenarios

The marijuana use landscape is changing rapidly across North America. Canada became the first major nation to legalize cannabis in 2018.¹ As of year-end 2019, eleven states in the U.S. approved marijuana for recreational use – while only three states completely prohibit the use of medicinal marijuana. Increasing social acceptance with legalization over the past few years has resulted in an upward trend in marijuana use in the U.S. general population and, by extension, in the life insurance buying population. This increase in marijuana use may also be explained by a decrease in the overall stigma of use, prompting more honest answers. In the U.S., 34.8% of people between age 18 to 25 used marijuana in 2018 as well as 13.3% of people older than 25.² Given the increasing trend and growing concerns about excess mortality of heavy users, it is critical for life insurers to effectively assess the risk associated with marijuana use on their blocks of business.

Munich Re's North American Biometrics team performed a sensitivity analysis to estimate the mortality impact of extreme what-if marijuana use scenarios on its in force block and new business in the U.S.

Data Sources

Clinical Research Laboratories (CRL) published one of the few publicized studies regarding marijuana use in the U.S. life insurance buying population in 2016.³ An update to the study included 500,060 applicant urine samples tested for THC* metabolite at CRL between 1995 and 2015.⁴ This sample included 3,569 deaths. The same update estimated that greater than 4% of tested life applicants between 2017 to April 2019 were positive for THC vis-à-vis the original study with greater than 2% THC positive – confirming the upward trend in marijuana use.

Population studies, public data sources, and the CRL study were all used to develop assumptions for mortality relative risk (RR) and prevalence, the two primary building blocks for any mortality impact estimation exercise.

Relative Mortality Risk of Standalone Marijuana Use

Relative Risk (RR) assumptions based on internal research and Munich Re Medical Director feedback were set as follows:

The “heavy”*** users listed in Table 1 are most likely to be those who test THC positive in insurance lab testing. The RR estimates in Table 1 are chosen keeping in mind how debits solely for marijuana use would most likely be applied in a production underwriting environment. Additionally, these RR estimates assume recreational marijuana users. Medical marijuana, which has an additional level of complexity depending on the underlying impairment(s), is not in the scope of this exercise. Future updates can be based on a more granular RR structure – such as age or gender breakdowns – as more experience becomes available.

For the marijuana what-if scenarios described in this paper, we assume the RR as described in Table 1 will remain unchanged in the future. As a result, the overall mortality impact will be primarily driven by an increase in the prevalence of marijuana use.

Table 1. Relative Mortality Risk by Marijuana Frequency of Use

Use	Relative Risk
Never	100%
Former	100%
Light	100%
Moderate	150%
Heavy	200%

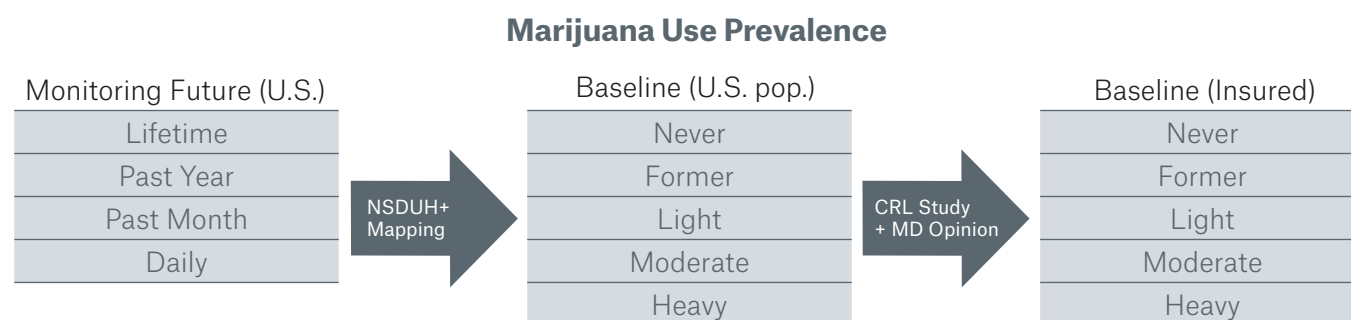
Baseline Prevalence

Given the lack of granular marijuana use data on insured lives, we focused on the U.S. population as a starting point and adjusted prevalence estimates using results from the CRL study to estimate baseline prevalence of marijuana use in an insured lives portfolio.

Prevalence assumptions used the following data sources, as shown in Figure 1:

1. Monitoring the future survey⁵
2. National Survey for Drug Use and Health (NSDUH) study⁶
3. CRL mortality study
4. Medical Director expert opinion on insured prevalence

Figure 1. Transition From Public Data Sources to Match Relative Risk Categories



Relative Risk was specified for “never”, “former”, “light”, “moderate” and “heavy” user categories. The U.S. population prevalence (monitoring the future) is available in “lifetime”, “past year”, “past month” and “daily” categories. Simplifying assumptions were made to sync the categories for RR and prevalence. Marijuana use prevalence estimates were based on attained age at a given point in time. No allowance was made for the fact that an individual’s marijuana use may vary across time.

The baseline prevalence of marijuana use in insured lives indicated in Figure 1 was calculated on a non-tobacco (NT) / tobacco (TB) basis for different attained ages.

Table 2 lists the prevalence estimates for the U.S. population after making adjustments for the NSDUH survey and shows the prevalence of “heavy” use grading off with age after peaking at 21-22 – as highlighted in below.

Table 2. Grading Off of Marijuana Usage With Age (Baseline Adjusted U.S. Population Prevalence)

Ages	Never	Former	Light	Moderate	Heavy
18	55.0%	8.0%	23.7%	9.7%	3.6%
19-20	50.0%	12.0%	25.2%	9.2%	3.6%
21-22	42.0%	17.0%	25.3%	10.3%	5.4%
23-24	39.0%	22.0%	23.8%	9.8%	5.4%
25-26	37.0%	28.0%	21.6%	8.6%	4.8%
27-28	35.0%	30.0%	22.4%	8.4%	4.2%
29-30	35.0%	35.0%	18.9%	6.9%	4.2%
35	34.0%	42.0%	15.5%	5.5%	3.0%
40	33.5%	48.0%	11.0%	4.0%	3.0%
45	33.0%	52.0%	10.1%	3.1%	1.8%
50	31.0%	55.0%	8.6%	3.6%	1.8%
55	25.0%	60.0%	9.1%	4.1%	1.8%

Grading off with age

Marijuana Use Prevalence What-If Scenarios

We tested a wide range of changing prevalence scenarios to estimate the mortality impact of increasing marijuana use relative to the baseline scenario. It is important to note while interpreting the results, that we developed the scenarios specifically to represent extreme events, and not best estimates.

The two test scenarios analyzed include:

1. Legalization shock causes an increase in current (any of “heavy”, “moderate”, “light”) users assuming that illegality of marijuana is a barrier to use. Post legalization assumes that a constant 27%⁷ of “never” and “former” users now start using marijuana in this scenario. This shift in prevalence due to legalization shock is assumed to occur immediately in projection year one.
2. Data consistently shows that percent of marijuana users is highest in young adults. This scenario assumes that the prevalence of marijuana use for any age group reaches the levels of use for people between ages 21 to 22 from the U.S. population by year ten – starting at age specific baseline levels in year one. This assumes widespread acceptance of marijuana use results in a societal shift with users of all ages smoking marijuana at levels of 21 to 22-years-old by year ten.

Table 3 illustrates the above two scenarios (assuming 100% non-disclosure among additional users) for a 35-year-old male NT user – with the different marijuana use category percentages in projection years 1 and 20.

Table 3. Marijuana Use Prevalence Shifts From Years 1 to 20 For a 35-Year-Old Male NT
(Insured Lives, 100% non-disclosure)

Marijuana Use	Baseline		Scenario #1 Immediate Legalization Shock		Scenario #2 Grade to highest rate by year 10, constant after	
	Year 1	Year 20	Year 1	Year 20	Year 1	Year 20
Light	6.4%	3.8%	22.1%	19.2%	6.4%	25.3%
Moderate	2.3%	1.7%	7.8%	8.5%	2.3%	10.3%
Heavy	1.2%	0.8%	4.3%	3.8%	1.2%	5.4%

Summary Results

We separately modeled the mortality impact of marijuana what-if scenarios assuming non-disclosure rates of 100% and 20%. The non-disclosure rate of 100% (an extreme scenario) would be applicable to a mature in-force block since we are not re-underwriting the policies, and those who change marijuana use status would not likely be classified in the correct risk class based on the current underwriting guidelines. Alternatively, a rate of 20% could be applicable in a new business context where applicants are being tested for marijuana use and the non-disclosure rates are closer to that of smokers, as the stigma of marijuana use is reduced. Individuals who are honest at the time of underwriting will be correctly classified into the appropriate risk class.

The mortality impact was estimated as the ratio of the present value of future death benefits (PVFDB) under the new scenario relative to the baseline scenario over a period of 20 years, minus one. Lapse and interest rate assumptions are incorporated into the calculations.

As previously mentioned, the results in the scenarios were calibrated to represent extreme events, and not best estimates results, as illustrated in Table 4. We did not run separate scenarios for smokers, as the RR of marijuana use for smokers was a little more than 100% and smokers are a small percentage of our portfolio.

Table 4. Additional Mortality Impact Due to Prevalence Shifts in Marijuana Use (Male NT)

Inforce (No opportunity to re-underwrite)			New Business (Assume 20% non-disclosure)		
Age	Scenario #1 Immediate Legalization Shock	Scenario #2 Grade to highest rate by year 10, constant after	Age	Scenario #1 Immediate Legalization Shock	Scenario #2 Grade to highest rate by year 10, constant after
25	5.4%	5.2%	25	1.1%	1.2%
35	5.6%	6.5%	35	1.1%	1.3%
45	5.4%	6.4%	45	1.1%	1.2%

Implications for Life Insurers

Overall, the mortality impact of marijuana use is heavily dependent on prevalence patterns – which can vary from carrier to carrier depending on the target market. If extreme prevalence scenarios were to play out, the adverse mortality impact for in-force blocks could be as high as 7%. For new business, the impact is around 1%.

The case for urine testing for the presence of THC is not as clear cut for new business, as the mortality impact is quite small, however; prevalence trends should be continuously monitored and testing should be considered if there is a strong uptick in marijuana use. At the same time, drug use questionnaires and tele-underwriting could be potential tools leveraged to address issues with the abuse of marijuana and other drugs. Changes in marijuana use prevalence trends should be considered when life insurers update future mortality improvement assumptions.

Marijuana mortality risk is heavily influenced by co-morbid factors, such as alcohol use, other substance abuse, depression, driving history, etc. All the above factors should be considered when underwriting individuals for marijuana use.

Even if marijuana use by itself may not always result in increased risk, it may be tied to other risky behaviors, such as smoking, irresponsible driving, and other forms of drug abuse. This is especially true at younger ages.

Insurers should study the long term impact of marijuana use on adolescents, as they will form a large proportion of future insurance buyers. Some early evidence indicates that marijuana has an adverse impact on people under the age of 25 and could lead to addiction or be a gateway to other drugs. The growing trend of increasing marijuana use among older adults (greater than 55-years-old) should also be closely monitored.

At this time, marijuana use is underwritten differently across a broad section of the life insurance industry. In some programs, a user could qualify for non-smoker (including preferred) rates, while in other programs the same insured may only be eligible for smoker rates – and if the frequency of use is high then some companies will decline the application. As more experience emerges, life insurers will be better positioned classify marijuana risk.

** The usual cut-off for a THC positive test is 50 ng/mL*

*** There is no standard definition of “heavy” users with regard to frequency of use*

References

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