

MORTALITY ASSOCIATED WITH TESTING POSITIVE FOR MARIJUANA AT AN INSURANCE EXAMINATION



Michael Fulks, MD
fulksmd@volcano.net



Robert L. Stout, PhD
stoutr@crlcorp.com

Clinical Reference Laboratory

Introduction

The recent legalization of recreational use of marijuana in four states, with more likely, presents a conundrum to the life insurance industry. Historically, if use was discovered, insurers might have declined or, if admitted at the time of application, rated the applicant because marijuana use was illegal or related to a medical condition and potentially associated with increased mortality. But with legalization, the industry needs mortality data to help provide guidance on the degree of risk and prevalence of use in the life applicant pool.

The National Survey on Drug Use and Health from 2015 indicates 32% of Americans age 18-25 used marijuana in the past year and 10% of older adults did as well.¹ Opinions on marijuana and mortality are numerous but actual data is lacking. A review article published in 2010 found little definitive guidance for mortality risk in the general populations but did note two studies (Kaiser patients and military conscripts) that did not find increased risk when other factors were accounted for.^{2,3,4} Our own review found nothing published more recently to help with this question. A recent review article in *OTR* by C. Titcomb covers various issues and potential concerns regarding marijuana usage and includes many references, but does not identify a relative mortality associated with use.⁵ Some of the concerns noted in that article could translate into additional morbidity and mortality risk, but even alcohol, which is a more toxic drug with greater impact on motor vehicle operation, does not appear to increase overall mortality risk for the social or occasional user vs. matched non-users. In addition, the concerns regarding pulmonary toxicity are based on smoking far more marijuana than currently likely because the concentration of the primary psychoactive ingredient, THC (tetrahydrocannabinol), is now

Executive Summary *The relative risk of mortality was evaluated for insurance applicants testing positive for marijuana use (THC-COOH present in the urine) relative to those testing negative at CRL. Those tested represent a small portion of all applicants and those found positive are likely biased to heavy regular users. The relative risk for smokers was minimally increased, while the relative risk for nonsmokers was 1.6 to 1.9 depending on sex. Relative risk was lower for age >50 relative to ≤50. Smokers had a substantially higher likelihood of testing positive for THC-COOH.*

almost three times what it was in the 1980s (and climbing).⁶ With higher concentration and availability of THC-laced treats, oral intake may also be more prevalent.

We used the CRL experience with THC testing to better define the mortality risk in applicants. Such testing, however, has been quite limited and may have been focused on applicant pools deemed higher risk by insurers. In addition, THC is lipid soluble and the testing threshold (50 ng/mL) might be exceeded for up to 3 days for casual use but at least 7 days for chronic heavier use. This, plus the likelihood that occasional users may be more likely to forgo use prior to insurance testing, skews the applicant positive pool toward potentially higher risk applicants. Finally, heavy usage is (as it is for other drugs including nicotine) likely associated with other higher risk behaviors which may be apparent and handled separately during underwriting. But, that information (which might reduce the risk attributed to marijuana in a multivariate assessment) is not available to CRL. Because of all these factors, our data cannot be used

to identify the average risk for marijuana use by a life insurance applicant, but can provide a likely worst-case scenario associated with a positive test for THC.


How the Study Was Done

There were 574,471 applicants (2,369 recorded deaths) whose urine was tested for THC-COOH, a specific metabolite of THC, from 1995 through 2014 at CRL and for whom vital status was available through the Social Security Death Master File in June of 2015. This is a very small fraction of all applicants tested at CRL during this 20-year period. A mortality ratio was determined for those testing positive vs. those testing negative by the use of Cox regression methodology with 95% confidence intervals (95% CI) being provided. In addition to accounting for age, sex and smoking status as needed, splitting the pool by age, by sex and by smoking were all explored to determine if relative risk varied. Kaplan-Meier plotting of relative risk (not shown) was also performed by year out to 20 years showing a consistent relative risk by duration, allowing use of Cox regression methodology to estimate overall relative risk across different durations of exposure. Only applicants tested for THC were included in the pool, and applicants testing positive for other drugs were excluded from the primary analysis.

What the Study Found

For smokers (urine cotinine >200 ng/mL), 14.8% of men and 10.7% of women tested were positive for THC. For nonsmokers, 3.0% of men and 1.1% of women tested were positive for THC. Positivity decreased steadily by age from 5.9% age <30 to 1.7% age 61-70 (smokers and nonsmokers combined).

For those THC-positive, 3.4% were positive for cocaine, and for those THC-negative, 0.3% were positive for cocaine (0.4% overall). No other drug was tested for consistently enough to provide data similar to that for cocaine.


 When relative mortality (after excluding those with other drugs) was compared separately by sex and smoking status with age included as a covariate, we found for nonsmoking women, the presence of THC in the urine was associated with a risk of 1.9 (95% CI 1.0 to 3.7), and for nonsmoking men, a risk of 1.6 (95% CI 1.2 to 2.1) relative to those tested and THC-negative. For smokers (both sexes combined with sex as a covariate), a risk of 1.1 (95% CI 0.9 to 1.4) was found for those THC-positive.

When nonsmoking applicants were split by age ≤50 and >50 with age and sex used as covariates, the relative risk for age ≤50 was 1.8 (95% CI 1.4 to 2.4), and for age >50 the relative risk was 1.3 (95% CI 0.8 to 2.0).

What Do the Study Results Contribute to Risk Assessment?

The relative risks noted in the prior section and discussed below likely approach a worst-case scenario for marijuana use for the reasons previously discussed. However, because testing positive for marijuana on an insurance examination will be biased toward heavy users, and because other risks associated with heavy use may not be apparent at underwriting, these historical CRL results can provide some guidance as to actions when finding a positive THC test result for an applicant. Confidence intervals for all results in our study were also somewhat wide due to relatively small numbers of applicants tested and deaths; each mortality ratio shown might be somewhat higher or lower by chance.

THC-positive smoker applicants show minimal (MR 1.1) increased risk and that risk may fit within many available standard smoking classes if no other findings are apparent at underwriting review. Nonsmokers have a relative risk of 1.9 for women and 1.6 for men. Even after underwriting review to identify associated risks, there is likely some residual increased risk for THC positivity for nonsmokers. This increase falls below the relative risk (now close to 2-fold) usually attached to smoking classes (especially for age >50), but is potentially higher than allowed in a nonsmoker standard pool. The minimally increased relative risk for THC-positive smokers, as compared to a greater relative risk for nonsmokers, is consistent with the hypothesis that risk behaviors associated with both tobacco and marijuana use rather than marijuana use itself are responsible for much of the additional risk associated with a positive THC result.

Our results suggest that marijuana testing of applicants remains optional but potentially useful.  The increase in risk spread across all applicants is probably small enough that it can be accommodated without testing. But, perhaps because insurance testing is more likely to find the heavy regular user, THC-positivity appears to be associated with increased risk which could be avoided by identification of those THC positive and (perhaps as importantly) by a reduction in heavy users applying.

The impact to the insurance industry for the ongoing relaxation of societal prohibitions against marijuana use is unclear. The best case would be if only heavy use, but not recreational use, increases risk, and only recreational use increases substantially in prevalence. In that case, relative risk across insurance applicants testing positive may even decline (while total risk within the applicant pool remains stable or increases slightly). However, the increase in risk

directly attributable to various patterns of marijuana use, the likelihood of new “legal” users moving to heavy use, and any resulting increase in overall cost to the industry remain unclear and could be less favorable. Increased motor vehicle risk, as reviewed by C. Titcomb and an earlier meta-analysis (based on studies in various countries), remains a prime early-mortality concern.^{5,7}

References

1. National Institute on Drug Abuse. Marijuana. www.drugabuse.gov/drugs-abuse/marijuana.
2. Calabria B, Degenhardt L, Hall W, Lynskey M. Does cannabis use increase the risk of death? Systematic review of epidemiological evidence on adverse effects of cannabis use. *Drug Alcohol Rev.* 2010;29:318-30.
3. Sidney S, Beck JE, Tekawa IS, et al. Marijuana use and mortality. *Am J Public Health.* 1997;87:585-90.
4. Andreasson S, Allebeck P. Cannabis and mortality among young men: a longitudinal study of Swedish conscripts. *Scand J Soc Med.* 1990;18:9-15.
5. Titcomb C. Medical marijuana: where are we now? *ON THE RISK.* 2015;31:20-26.
6. Office of National Drug Control Policy. Marijuana: know the facts. www.whitehouse.gov/sites/default/files/page/files/marijuana_fact_sheet_3-28-12.pdf.
7. Li MC, Brady JE, DiMaggio CJ, et al. Marijuana Use and Motor Vehicle Crashes. *Epidemiol Rev.* 2012;34:65-72.

About the Authors

Michael Fulks, MD, Consulting Medical Director, is board-certified in internal and insurance medicine. After leaving practice, he served as a medical director, creating or editing several underwriting manuals and preferred programs. For the past 8 years, Dr. Fulks has consulted for CRL, participating in its mortality research on individual tests and all laboratory test results, BP and build in combination. He is also involved in the development and implementation of automated screening tools for non-laboratory data.

Robert L. Stout, PhD, is Chief Science Officer, Associate Laboratory Director and board member of the Clinical Reference Laboratory based in Lenexa, KS. He completed undergraduate studies at California State University (Fullerton) and obtained a PhD in Biological Chemistry from UCLA School of Medicine. Since 1978 he has been directly responsible for introducing many of the new tests and procedures used in risk assessment such as urine and saliva HIV. Dr. Stout has produced nine US patents and numerous papers on the relationship between laboratory testing and insurance applicant mortality.