

**INQUIRY INTO ROAD TRANSPORT AMENDMENT
(MEDICINAL CANNABIS-EXEMPTIONS FROM
OFFENCES) BILL 2021**

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Critique of Cameron's (2013) evaluation of Western Australia's roadside drug testing program

This is one of two submissions from me to the inquiry on the abolition of THC-positive driving penalties for medical users of cannabis. As both submissions are personal, rather than institutional, it seems appropriate to say a few words about myself. I am a 76-year-old retired South Australian (SA) public servant, with PhD in psychology from the University of Adelaide. While employed by the SA Department of Transport from 1987 to 2007, I had some responsibility for managing commissioned road-safety research projects; I twice chaired the committee responsible for hosting what is now the annual *Australasian Road Safety Conference*; and I was the SA-government's representative on the *Austroads Drug-Driving Working Group*. I am a current member of the *Australasian College of Road Safety*. I am the principal- or co-author of five peer-reviewed journal articles on the effects of cannabis on driving skills and/or crash risks. I distribute occasional (~ monthly) email research briefings to the *Friends of Research on Cannabis and Driving*, who are an international group of about 550 drug-driving researchers and policy-makers that I established some years ago. And, apart from sharing somebody else's marijuana cigarette on two occasions a few decades ago (where I *did* inhale), I have never used cannabis either recreationally or medically (which is not to say that I would have any moral qualms about doing so).

I strongly support the Bill to abolish THC-positive driving penalties for medical users of cannabis.

In this submission, I provide a critique of a 2013 paper by Professor Max Cameron from the Monash University Accident Research Centre (MUARC) that purports to show that the types of roadside drug testing (RDT) programs undertaken in Australia are very successful. I argue that Cameron's evaluation methodology is defective. I conclude that Australia's RDT programs have never been shown to be effective in reducing death and injury from road crashes.

Critique of Cameron's (2013) evaluation of Western Australia's roadside drug testing program

A chemist, a physicist and an economist are marooned on a desert island without food. Suddenly they discover a cache of canned goods, but there is no can-opener. The chemist begins looking about for chemicals in their natural state so he can make up a solution that will dissolve the tops of the cans. The physicist picks up a rock and begins calculating what angle, what force, what velocity he will need to strike the can with the rock in order to force it open. The economist merely picks up a can and says, "Let us assume we have a can-opener". (Dundes, 1977, p. 775)

Introduction

Professor Max Cameron from the Monash University Accident Research Centre (MUARC) presented a paper in Brisbane at the 2013 conference of the International Council on Alcohol, Drugs and Traffic Safety (ICADTS) in which he provided an economic assessment of costs and benefits (CBA) of Western Australia's roadside drug testing (RDT) program. The paper is at [Attachment A](#). Cameron concluded that the program had been very successful up to 2013 and that it should be substantially expanded. He used four assumptions in reaching those conclusions:

1. the downward-slope assumption
2. the equivalence assumption
3. the impairing-drugs assumption
4. the co-use of alcohol assumption

The assumptions are scrutinised in this critique.

Four assumptions in Cameron (2013)

1: The downward-slope assumption

Cameron's 2013 evaluation of the effectiveness of RDT in Western Australia was founded on the fact that there was an inverse relationship between the levels of RDT in Victoria for the five years from 2005 to 2009 (as measured by the annual number of roadside oral-fluid tests [ROFTs] for proscribed illegal drugs) and the prevalence of impairing (both legal and illegal) drugs in vehicle operators (drivers and riders) who were killed in Victorian road crashes over the same period. He describes this relationship in terms of a negative exponential function. There is a sense in which his positive evaluation of the Western Australian RDT program had already been achieved once the downward slope had been established, because the rest of Cameron's evaluation involved little more than inserting parametric values into the function.

Cameron could have argued from first principles for a downward slope, as was done in a recent cost-benefit analysis (CBA) of a proposed RDT program for New Zealand (Ministry of Transport, 2020). However, he apparently believed that his RDT evaluation would be more credible if the downward slope were derived empirically. In other words, he wanted his evaluation to appear

to be 'scientific' rather than merely exploratory. He did not want it to appear that he was simply assuming the truth of a desired outcome (as was done in the New Zealand CBA).

However, finding an empirical basis for the downward slope was not an easy task. Over the years from 2004 (when RDT was introduced into Victoria) to 2013 (the date of Cameron's paper) the level of RDT was steadily increasing across Australia (e.g., Newstead et al., 2020, Figure 2; Rowden et al., 2011, Table 1; Thompson, 2012). At the same time, the proportion of road-crash victims who tested positive for illegal drugs was also generally increasing, and especially for methamphetamine (e.g., Baldock & Lindsay, 2020; Centre for Road Safety, 2017, Section 1.1.2; Davey et al., 2020; Newstead et al., 2020, Figures 6 & 7; Schumann et al., 2021). So, for most of the empirical functions that Cameron might have uncovered, the slope would not have been in the 'right' direction. Nevertheless, Cameron discovered that if he selected data from Victoria, for the five years from 2005 to 2009, he would obtain the felicitous downward slope. If he had included Victorian data for four additional years (i.e., from 2005 to 2013), he would have found an infelicitous upward slope (White, 2017; see [Attachment B](#)), and his positive evaluation would have collapsed. And if he had used any five years of data from any other state he would also, most probably, have found the 'wrong' slope.

Despite creating the appearance of an empirical basis for his evaluation, Cameron had effectively based it on the speculative existence of a downward slope. But the real slope might actually *not* be downward. It is perfectly feasible that RDT is ineffective (and the 'slope', all other things being equal, is therefore horizontal). It is feasible that the tight analogy with roadside breath testing for alcohol (RBT), as proffered by Cameron (2013), simply does not hold. It is possible that illegal drug users, who are already breaking the law, are not deterred by RDT.

While Cameron's pseudo-empirical downward-slope guaranteed the success of his Western Australian RDT evaluation, the *extent* of that success, in terms of lives saved and costs reduced, depended critically on three other assumptions. While the specific shape of the downward-slope function as identified by Cameron could conceivably be more-or-less correct, it will be shown that his three other assumptions make extravagant claims. As a consequence, Cameron has considerably over-estimated the potential success of Western Australia's RDT program.

2: The equivalence assumption

The second of Cameron's (2013) assumptions, in a nutshell, is that *prevalence* is equivalent to *causality*. More specifically, the assumption is that presence of an impairing drug in a fatally injured vehicle operator *always* indicates that the drug caused the crash. Consequently, a reduction in prevalence is equivalent to a reduction in the number of fatal crashes. The evidence that Cameron (2013) makes this extraordinary assumption can be seen in his Table 1, where he describes the numbers in the third column as "driver fatalities saved", when what he actually provides is "driver fatalities who are now drug-free". The assumption is obviously false: The prevalence of an impairing drug in crashed vehicle operators is clearly not equivalent to the drug's level of causality for the crashes. In other words, the fact that a drug is present in x% of fatally injured vehicle operators does not mean that the drug caused all x% of those crashes. The equivalence assumption might hold true for very high levels of alcohol, but, as discussed below, it does not hold for the psychoactive drugs of interest (cannabis, methamphetamine, ecstasy and some medical drugs).

The relationship between the prevalence of a drug in crashed drivers and the causal role of the drug in those crashes is mediated by the drug-crash odds ratio (OR). I have described this well-

known relationship in an unpublished working paper (White, 2018; see [Attachment C](#)). White and Burns (2021) argue that the cannabis-crash OR could be as low as 1.00, in which case *none* of the crashes involving THC-positive drivers would have been caused by cannabis. However, White and Burns admit that most researchers in the field would probably still estimate the cannabis-crash OR at up to 1.50, in which case (by reference to White, 2018) one third (33.3%) of the crashes involving THC-positive drivers would have been caused by cannabis. That is still far less than the 100% assumed by Cameron.

Drummer et al. (2004) investigated the role of psychoactive drugs in fatal Australian road crashes. They estimated that the OR for *any* psychoactive drug (apart from alcohol) was 1.80, in which case (by reference to White, 2018) only 44% of the fatal crashes in their study involving drug-positive drivers would have been caused by those drugs. By ignoring the fact that prevalence is not equivalent to causation, Cameron (2013) has over-estimated the benefits to be obtained from RDT by at least a factor of two. So, to account for Cameron's failure in relation to Assumption 2, any benefits found for the Western Australian RDT program would have to be at least halved.

Evaluators, and especially economic-evaluators, have an ethical obligation to clearly state all of their assumptions. Cameron (2013) failed to do so. While his first assumption was described clearly, his second (as discussed above) and the following two would probably not have been noticed by many of his intended audience (including policy-makers).

3: The impairing-drugs assumption

There are different types of psychoactive drugs. The set of all impairing drugs includes the set of proscribed illegal drugs (cannabis, methamphetamine and ecstasy) as well as the set of prescribed medical drugs, such as benzodiazepines (for anxiety) and opioids (for pain).

In the first four columns of Table 2, Cameron (2013) shows how an increase in the level of RDT in Western Australia would, in accordance with the downward-sloping function *for all impairing drugs*, reduce the number of "driver fatalities with impairing drugs". It is important to note that the drivers being saved by the increasing levels of RDT are all of those who would otherwise have used *any* impairing drugs, and not just those who had used the illegal drugs that are targeted in the RDT program. In other words, Cameron has assumed that the RDT program will not only deter driving after using the targeted illegal drugs, but it will also deter driving after taking non-targeted prescribed psychoactive drugs for anxiety, pain and other conditions. That assumption does not pass the pub test. There is no evidence for it in the relevant literature. The only supporting evidence comes Cameron's five years of carefully selected Victorian data.

To summarise: the 'impairing drugs assumption' actually comprises two separate assumptions. The first is that, as for the proscribed illegal drugs, where a prescribed psychoactive drug is present in a crashed driver, the crash was always caused by the drug. The second is that, as well as being effective in reducing the prevalence of proscribed illegal drugs in drivers, RDT operations are also effective in reducing the prevalence of prescribed psychoactive drugs.

From Cameron's (2013) Figure 2, it can be seen that prescribed medical drugs comprise about 40% of all impairing drugs. If we assume that Cameron's third assumption is wrong, and that RDT operations do not deter driving after taking psychoactive medications, then Cameron's RDT evaluation will have over-estimated the number of fatalities saved by about 40%.

4: The co-use of alcohol assumption

On page 6 of his 2013 paper, Cameron says that he will evaluate the success of the Western Australian RDT program in terms of the saved lives of “all victims” involved in crashes where the killed drivers “had impairing drugs in their bloodstream”. He failed to make it explicit that the killed drivers were of two types: those who had used drugs alone, and those who had co-used drugs with alcohol.

Now, it is very well known that, where alcohol is involved in fatal crashes, the BACs are likely to be very high, such that the corresponding alcohol-crash ORs are also very high. For example, Drummer et al. (2003, p. 157) reported a median BAC of 0.17 for Australian road-crash fatalities. And most of the BACs were above 0.10 (see Drummer et al’s Figure 1). In other words, if alcohol is involved in a fatal crash, it will usually be at such a high BAC that the alcohol alone would have caused the crash. Again, Cameron’s attribution of 100% causality to the drugs involved in fatal crashes where the driver was a co-user of alcohol does not pass the pub test. It is perhaps not surprising that Cameron failed to state the assumption explicitly.

For the purpose of this investigation, it will be conservatively assumed that, where a driver in a fatal crash is a co-user of alcohol and another psychoactive drug, that it is the alcohol rather than the other drug that caused the crash for 80% of the crashes. In Drummer et al’s (2003, pp 157-158) study of fatal Australian crashes, 23.5% of the drivers were positive for impairing drugs (other than alcohol). Of those drivers, about 40% were also positive for alcohol. In making the incorrect assumption that co-use crashes can always be attributed to the drug involved, Cameron has therefore over-estimated the lives saved from RDT by 32% (80% of 40%). For the purpose of this investigation, that figure will be taken to be 30%.

Overview of Cameron (2013)

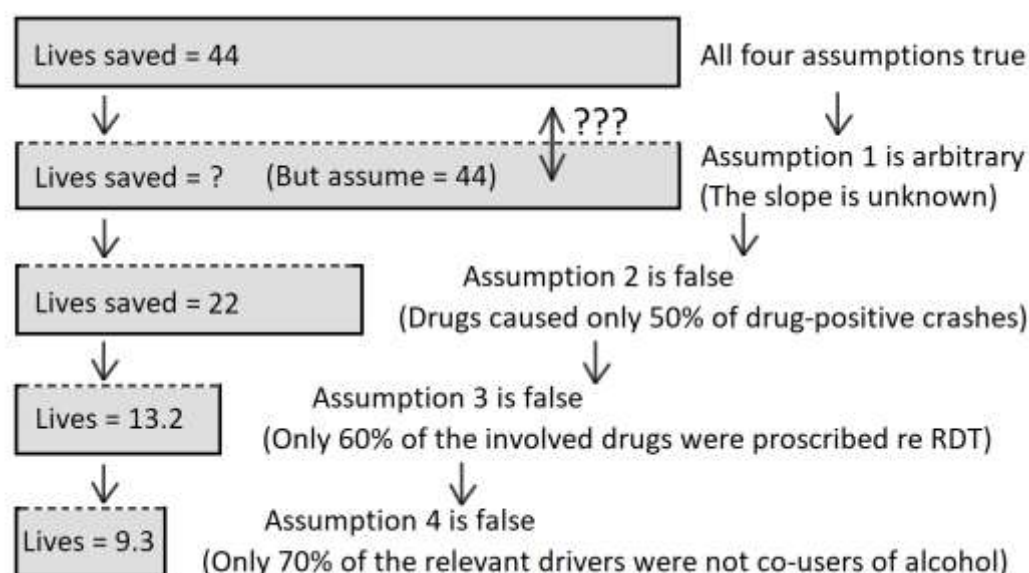


Figure 1: Accounting for the falsity of the assumptions in Cameron's (2013) evaluation of lives saved from an extension of Western Australia's RDT program

Figure 1 summarises the results of the above scrutiny of the four assumptions that are embedded in Cameron's (2013) estimation of the likely success of expanding Western Australia's RDT program. The greatest additional (above base-level) saving of lives would occur if all four assumptions were true. Assuming their truth, the maximum number of lives saved is set by the level of RDT, in accordance with the shape of the downward-sloping function. That number is represented by the size of the rectangle at the top of Figure 1. According to Cameron's Table 1, forty-four additional lives would be saved if the level of RDT were increased from 0.54% to 12.5% of all licenced drivers being tested at RDT sites per year.

Assumption 1 asserts that the 'seeding function' (on which the evaluation is grounded) has a downward slope of a particular shape. However, that function was carefully selected. The slope is probably too steep, resulting in an over-estimate of the number of lives saved. The arbitrariness of Assumption 1 is depicted by the unknown location of the dotted top side of the rectangle. So, the maximum number of lives saved, if Assumptions 2, 3 and 4 were true, is actually unknown. Assumptions 2, 3 and 4 all provide over-estimates the number of lives saved, to the extents indicated by the diminishing lengths of the rectangular boxes. Overall, Cameron's evaluation of the likely benefits from Western Australia's RDT program, if Assumption 1 were true, has produced at least a four-fold greater benefit than is realistic: the number of lives saved would be less than 10, rather than the 44 claimed.

Discussion

Cameron's (2013) evaluation of Western Australia's RDT program found that it had been very successful up to 2013, and that it would be even more successful if it were substantially expanded. The number of roadside drug tests in Western Australia more than tripled in the two years following his evaluation (BITRE, 2022), and it is very likely that his enthusiastic endorsement of the RDT program facilitated its expansion.

Cameron's (2013) evaluation of RDT in Western Australia was based on four assumptions. In this critique, I conclude that his foundational assumption is arbitrary, while his three supporting assumptions have the effect of grossly over-estimating any benefits of the program.

Cameron's (2013) approach to the evaluation of RDT has been influential beyond Western Australia. For example, he was invited by the New Zealand government in 2016 to provide advice on the possible introduction of an Australian-style RDT program. He applied his evaluation methodology to the New Zealand crash data, and concluded that the New Zealand program would be very successful. The New Zealand government has since introduced an RDT program, and it seems likely that Cameron's involvement was facilitative. However, as an aside, it should be noted that, while the New Zealand authorities at first accepted Cameron's evaluation methodology, they eventually came to understand that its assumptions were not valid, and they developed their own alternative approach (which also grossly over-estimated the potential benefits from the program - but that is a different story for another day).

In their recent economic evaluation of Victoria's RDT program, Stuart Newstead et al. (2020) conclude that the program so far has been very successful, and that it should be substantially expanded. Cameron was one of four members of Newstead et al's evaluation team, and had a strong influence on the design of the data analysis, including through the re-deployment of his fanciful assumptions.

Cameron's work has not passed any journal-level peer-review process, and his discredited analyses should not be allowed to provide further direction to policy-makers who are trying to understand the costs and benefits of Australia's RDT programs.

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