

# An Inverse Relationship Between Alcohol and Heroin Use in Heroin Users Post Detoxification

This article was published in the following Dove Press journal:  
*Substance Abuse and Rehabilitation*

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**Background:** Given that fewer than 50% of countries provide Opioid Agonist Maintenance Therapies (OAMT), it is important to assess whether other substances act as a substitute for heroin in recovering heroin users who receive detoxification models of treatment. There is a dearth of prospective studies from low-and-middle-income countries evaluating these patterns of substance use.

**Methods:** 300 heroin users from the Gauteng province of South Africa were assessed on entry into inpatient detoxification and then followed-up 3 and 9 months after leaving treatment. Treatment consisted of 1 week of detoxification followed by 6–8 weeks of psychosocial therapy. We measured the overall changes in the prevalence of heroin, alcohol and other drug use at baseline and postrehabilitation. Comparison of these outcomes at enrolment, 3 months and 9 months was performed by a Generalised Estimating Equation (GEE) with the outcome as the dependent variable, observation point as the independent variable, and participant as the repeated measure. Injecting status and treatment completion were included as covariates. We also measured the individual pathways between heroin and alcohol use in the 210 participants that were seen at all three timepoints.

**Results:** Of the original cohort, 252 (84.0%) were re-interviewed at 3 months and 225 (75.0%) at 9 months. From baseline to 3 months, the proportion of past month heroin users decreased significantly to 65.5%; however, during this time, the proportion of past month alcohol users increased from 16.3% to 55.2% ( $p < 0.0001$ ). When assessing the pathways between heroin and alcohol use at an individual level, 55.4% ( $n = 97$ ) of those who were past month alcohol abstinent prior to rehabilitation were using alcohol at 3 months. From 3 to 9 months the proportion of heroin users increased to 72.4% ( $p < 0.0001$ ), and during this time, the proportion of alcohol users decreased.

**Conclusion:** After detoxification, a significant reduction in heroin use was observed with a concomitant increase in alcohol consumption. Under these circumstances, alcohol may have acted as a substitute for heroin in the short term. The initial reduction in heroin use 3 months postrehabilitation was followed by increased consumption 6 months later. This observation supports the need for interventions to prevent, monitor and treat high levels of alcohol use in heroin users post detoxification. The provision of OAMT is a necessary consideration to address both the risk of increased alcohol intake as well as the decline in heroin abstinence rates.

**Keywords:** heroin, alcohol, cannabis, treatment outcomes, opioid substitution treatment

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## Introduction

Although several developed countries have prospectively studied the treatment outcomes of heroin users, there has been criticism that these studies focus only on changes in the primary drug of choice and fail to closely examine the complex

interactions between other licit and illicit substances, especially alcohol.<sup>1</sup> This analysis is important as polysubstance use in heroin users is high and there are concerns that there is insufficient screening and management of comorbid substance use disorders in heroin users seeking treatment.<sup>2</sup> There is ongoing debate regarding alcohol use among recovering heroin users receiving opioid agonist maintenance therapy (OAMT).<sup>3-6</sup> The main contentions are whether alcohol acts as a substitute for heroin, whether alcohol increases the risk of relapse to illicit substance use and whether opioid agonist treatment plays a causal role in increasing alcohol consumption. It has also been suggested that cravings during periods of heroin abstinence contribute to increasing levels of alcohol use and that increasing doses of OAMT may decrease alcohol consumption.<sup>7</sup> Although some studies evaluating detoxification-based models have reported on the overall prevalence of alcohol use post detoxification, the data exploring the relationship between heroin and alcohol use remain unclear.

A review by Ottomanelli (1999)<sup>8</sup> suggested that alcohol use amongst patients in OAMT programs was higher than in the general population, but similar to individuals in high-stress situations. Another review aimed at evaluating problematic alcohol use in relation to the onset of OAMT concluded that alcohol consumption did not increase significantly after the initiation of OAMT.<sup>9</sup> However, a similar analysis found that alcohol consumption post drug treatment may increase the risk that an individual will relapse to their primary drug.<sup>1</sup> This study also found that there was no conclusive evidence to show that alcohol becomes a substitute during periods of heroin abstinence. Studies from the United States (US),<sup>10</sup> United Kingdom<sup>11</sup> and Switzerland<sup>12</sup> report decreases or unchanged prevalence of alcohol use 6 months post heroin detoxification. A study evaluating the expectations of illicit opioid users post detoxification, 53.6% had expectations of alcohol abstinence and just one in 10 patients expected that they would be abstinent from cocaine.<sup>13</sup>

A recent publication from the English National Drug Treatment Monitoring System (NDTMS) reported that 39% of heroin users receiving OAMT were using alcohol at 5-year follow-up.<sup>14</sup> Of those using alcohol, 17.1% had “continued high-level alcohol use”, 49.4% “continued low-level”, 0.9% “increasing” and 17.6% “decreasing alcohol use”. In Australia, at 2-year follow-up, decreases in heroin use were not associated with increases in other licit or illicit substance use.<sup>15</sup> In Germany, however, the frequency of alcohol use was found to be significantly higher amongst those receiving OAMT compared to untreated injecting-heroin users.<sup>16</sup>

Contrastingly, in Vietnam hazardous alcohol use in patients from a rural region receiving OAMT was low; even lower than alcohol use in the general male population.<sup>17</sup>

All the data included in the most recent systematic review by Staiger et al (2013) were prospective treatment outcome studies from developed countries where OAMT is the standard treatment modality. Notably, there is a dearth of longitudinal studies from low-and-middle-income countries (LAMIC) assessing the interaction between heroin and alcohol use. Additionally, there are limited data on the trends in alcohol and other drug consumption in detoxification-based models of treatment. Most studies report on the overall prevalence of substance use at various timepoints but fail to closely assess the pathway of use at an individual level, e.g., did users transition from heroin use only to alcohol or was the user dependent on alcohol prior to treatment?

An understanding of the role of other licit and illicit substances in the recovery stages of heroin users can provide guidance to clinicians regarding important screening and intervention. It may also assist with lobbying for public health initiatives to improve access to OAMT in areas where it is lacking. These data are critically important, as, despite evidence of the benefits of OAMT,<sup>18,19</sup> OAMT was available in just 86 countries globally in 2018.<sup>20</sup> Lastly, an evaluation of the interplay between heroin and alcohol in the absence of OAMT may provide a new perspective to the debate regarding alcohol use in patients attending OAMT programs. The objective of this study was, therefore, to measure consumption patterns of heroin, alcohol and other drugs in heroin users before treatment and 3 and 9 months after leaving inpatient rehabilitation.

## Materials and Methods

### Study Design

This was a longitudinal study of heroin users who were assessed on admission to detoxification and then followed-up 3 and 9 months after detoxification and psychosocial therapy. More details of the study protocol were previously reported.<sup>21</sup> The study was conducted from two state-funded inpatient drug and alcohol treatment centers in the Gauteng province of South Africa. Most patients were referred to the facilities by community-based social workers. A minority were referred by the court. The waiting time for admission ranged from 1 to 8 weeks. As South Africa does not have a national rollout of OAMT

clinics, patients from this region would have had the option to choose between outpatient detoxification and psychosocial therapy or inpatient detoxification and psychosocial therapy. These centers provided 1 week of methadone-assisted detoxification followed by 6 to 8 weeks of psychosocial therapy. One of the facilities offered weekly group therapy follow-up sessions. The study was approved by the University of Witwatersrand Human Research Ethics Committee (M1704100). This study was conducted in accordance with the Declaration of Helsinki.

## Study Procedures

Newly admitted patients who reported heroin as their main drug of choice were screened for inclusion and exclusion criteria. In order to be enrolled in the study patients had to be older than 18 years, be willing to provide locator information for follow-up to occur and be able to provide informed consent. Baseline and follow-up interviews were conducted between July 2017 and February 2019. All interviews were conducted face-to-face by the principal investigator (PI) who is a psychiatrist. The PI was not a member of the treating team at the rehabilitation centers.

At baseline, a detailed socio-demographic questionnaire was administered. The Opioid Treatment Index (OTI),<sup>22</sup> an internationally recognized and validated open-access tool, was also administered. Drug use estimates were collected for the following substances: heroin, cannabis, alcohol, other opiates, tranquilizers, amphetamines, cocaine, methaqualone, hallucinogens and tobacco. The OTI was administered at baseline (entry into treatment) and 3 and 9 months after leaving rehabilitation. A follow-up interview was also administered at 3 and 9 months.

A HOMEMED 6-panel Multi-Drug Urine Test (MDUT) was administered to participants who were able to provide a sample. Continued heroin use (CHU) and continued use of other substance/s were defined by results from the drug use section of the OTI and/or a positive result on the MDUT. In the absence of the MDUT, self-report data alone (from the OTI) were used to determine substance use. MDUTs were done on 196 (76.6%) of participants at 3 months and 199 (88.4%) at 9 months. The concordance between self-report and MDUT (where data were available for both) was 65% at 3 months and 71% at 9 months.

## Sample Size Estimations

Based on worst-case (for sample size) estimates of 50%, 5% precision and the 95% confidence level, a sample size

of 385 is required.<sup>23</sup> A sample size of 300 for this project corresponds to a precision of 5.7% (rather than 5.0%), which is considered adequate.

## Data Analysis

Comparison of continuous outcomes at enrolment, 3 months and 9 months was carried out by a mixed model with the outcome as the dependent variable, observation point as the independent variable, and participant as the repeated measure. Comparison of binary outcomes at enrolment, 3 months and 9 months was performed by a Generalised Estimating Equation (GEE) with the outcome as the dependent variable, observation point as the independent variable, and participant as the repeated measure. Injecting status and treatment completion were included as covariates. Data analysis was carried out using SAS version 9.4 for Windows.<sup>24</sup> The 5% significance level was used.

## Results

Over the recruitment period, 317 clients were screened. Eight did not fit the inclusion and exclusion criteria and five refused participation. A total of 304 participants signed consent and were enrolled in the study; however, four were withdrawn during baseline interviews as they were assessed as actively suicidal. The final sample thus consisted of 300 participants. Of the total sample, 256 (84.0%) were re-interviewed at 3 months and 225 (75.0%) at 9 months. From the time of study enrolment to 9 months, four participants demised. At 9 months, seven participants were incarcerated at the time of follow-up interview. Of those lost to follow-up at 9 months, the chief reason (46%) was that the family reported that the participant was on the street and could not be found. Two hundred and ten participants were seen at all three timepoints.

At enrolment, the sample comprised 256 (85.3%) males and 44 females. The median age at enrolment was 27 years (y) (IQR 23–30y, range 18–47y), and 93.0% of the participants were Black/African South Africans. Of the total, 200 (66.6%) smoked heroin in combination with cannabis, 89 (29.7%) were injecting heroin and 11 (3.6%) used heroin only by chasing. The median duration of heroin use was 7 years (IQR 4–9 y). The median length of stay in rehabilitation was 43 days (IQR 13–44). A detailed description of the cohort has been described in a previous report.<sup>21</sup>

## Interventions Received Between 3- and 9-Month Follow-Up

Of the 225 participants seen at 9 months, one was in a residential facility, four had received individual sessions with a social worker, seven received individual sessions with a social worker and attended group sessions, 24 were attending Narcotics Anonymous Groups and 24 were readmitted for inpatient detoxification (of which 13 did not complete the program). Five participants were receiving intermittent opioid substitution therapy prescribed by a private general practitioner. Twenty-six participants (11.6%) reported that they were currently receiving any form of interventions at the time of 9-month interview.

## Substance Use from Enrolment to 3-Month

At enrolment 259 participants (86.3%) had used cannabis in the preceding month. The most common substances used, other than heroin and cannabis, were crack-cocaine (26.0%), crystal methamphetamine (19.3%) and methaqualone (18.3%) (Table 1). At 3-month follow-up, 65.5% had continued heroin use (CHU) (Figure 1). The proportion of past month alcohol users increased from 16.3% to 55.2% ( $p < 0.0001$ ) (Figure 1). There was a significant decrease in past month cannabis and crack-cocaine use from enrolment to 3 months (Table 1).

## Substance Use from 3 to 9-Month

At 9-month follow-up, the proportion of CHU increased to 72.4% (Table 1). Twenty-two percent continued to use

other substances (excluding tobacco) and 4.9% were abstinent of all substances.

The proportion of past month alcohol users decreased from 55.2% to 45.8% ( $p = 0.061$ ) (Figure 1 and Table 1). There was a significant increase in the proportion of past month cannabis users from 73.0% to 82.2% ( $p = 0.0028$ ). There were no significant differences in the proportion of crystal methamphetamine, crack-cocaine or methaqualone users from 3 to 9 months (Table 1).

## Pathways Between Heroin and Alcohol from Enrolment to 9 Months

For this analysis, we only used data from the 210 participants that were seen at all three timepoints. At enrolment 83.3% ( $n = 175$ ) were abstinent from alcohol in the past month (Table 2). Of those alcohol abstinent at enrolment, 55.4% ( $n = 97$ ) continued to use alcohol at 3-month follow-up. Of those consuming alcohol at 3 months, 45 (25.7%) used alcohol only and 52 (29.7%) used heroin and alcohol. By 9 months, of those who were alcohol abstinent at enrolment, 42.9% ( $n = 75$ ) used alcohol in the past month.

## Discussion

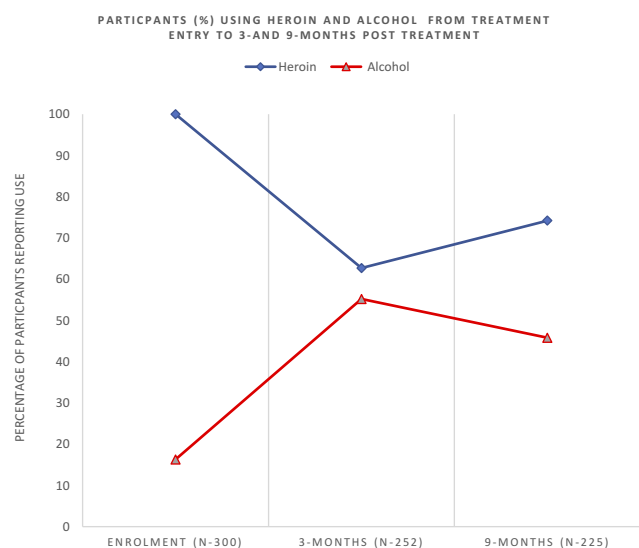
This study aimed to measure changes in the use of heroin, alcohol and other drugs in recovering heroin users who received detoxification-based treatment. Numerous studies have assessed alcohol use in heroin users receiving OAMT.<sup>3,6,15,16,25-29</sup> However, very few studies from LAMIC report on alcohol and other drug use in heroin users who have received detoxification and psychosocial

**Table 1** Past-Month Substance Use from Enrolment to 3 and 9 Months

	Enrolment		3m FU Data		9m FU Data		p-values	
	n	%	n	%	n	%	En to 3m	3m to 9m
OTI drug use	300		252		225			
Heroin	300	100.0	158	62.7	167	74.2	-	<0.0001
Cannabis	259	86.3	184	73.0	185	82.2	<0.0001	0.0004
Other opiates	22	7.3	9	3.6	13	5.8	0.14	0.22
Alcohol	49	16.3	139	55.2	103	45.8	<0.0001	0.061
Crystal meth	58	19.3	59	23.4	46	20.4	0.093	0.51
Crack-cocaine	78	26.0	43	17.1	51	22.7	0.017	0.088
Hallucinogens	0	0.0	0	0.0	0	0.0		
Tranquilisers	7	2.3	9	3.6	6	2.7	0.84	0.76
Methaqualone	55	18.3	43	17.1	47	20.9	0.98	0.48
Inhalants	1	0.3	1	0.4	0	0.0	0.90	0.85
Tobacco	297	99.0	246	97.6	220	97.8	0.42	0.95

**Note:** p values <0.05 appear in bold and are statistically significant.

**Abbreviation:** En, enrolment.



**Figure 1** Participants (%) using heroin and alcohol from treatment entry to 3 and 9 months post treatment.

rehabilitation. Our study shows that initial decreases in heroin use were followed by a significant increase 6 months later. The majority of heroin users in our sample did not use any alcohol in the month prior to treatment however 55.2% were past month alcohol users at 3 months and 45.8% at 9 months post detoxification.

A large Swiss study of heroin users receiving OAMT found that 22.5% of patients on OAMT were frequent alcohol users.<sup>28</sup> A systematic review reported that approximately one-third of patients on methadone are assumed to have problems with alcohol.<sup>4</sup> A major challenge when comparing data are the use of different scales to measure alcohol use and different definitions of harmful or problematic alcohol use. Additionally, some studies assess patients who had an alcohol use disorder comorbid with heroin use prior to treatment while others do not make this distinction. In our sample interestingly, the majority were abstinent from alcohol prior to treatment. This finding may be in keeping with a German study that found that 16% of untreated injecting heroin users used more than 40 g of alcohol a day compared to 36.5% on methadone treatment.<sup>16</sup> Importantly, in our study just over half of those who were abstinent from alcohol prior to rehabilitation were past month alcohol users at follow-up and 14.7% were classified as daily alcohol users at 9 months. There is some evidence to show that screening and brief interventions such as short motivational interviewing may be effective in reducing alcohol use amongst recovering heroin users.<sup>4,30,31</sup> In South Africa, these interventions may assist with decreasing the steep increase in alcohol use.

In our study increases in alcohol use occurred concurrently with a significant decrease in heroin use. It appears that alcohol in the short term provided a substitute for heroin; however, it did not protect against increases in heroin use over time. This is evidenced by the 9-month data which showed a significant increase in heroin and decrease in alcohol use. An Italian study comparing heroin users who received methadone to those who received non-methadone-based treatment found that in the short-term alcohol use was significantly higher in those who did not receive methadone and concluded that OAMT may protect against short-term increases in alcohol use.<sup>32</sup> In our sample, it is difficult to know with certainty whether OAMT would protect against the rapid high spike in alcohol use; however, further South African studies comparing detoxification samples to those on OAMT may provide more insight.

Heroin use decreased significantly at 3 months; however, there was an upward trajectory thereafter. The proportion of heroin users increased from 65.5% at 3 months to 72.4% at 9 months. A London-based study that evaluated heroin use at baseline, 9 months and 1-year post treatment reported progressive reductions in heroin use over the study period. In the London cohort although cannabis and alcohol use decreased initially it remained unchanged from 9 months to 1 year.<sup>33</sup> Similarly, progressive reductions in heroin use over the first year were reported in the larger UK-based National Treatment Outcome (NTORS),<sup>34</sup> the US Drug Abuse Treatment Outcome Study (DATOS) and the Australian Treatment Outcome Study.<sup>35</sup> Therefore, in comparison to longitudinal data from developed countries offering OAMT, the South African cohort fared more poorly over time.

The increasing trajectory of heroin use in this cohort may be explained by the absence of OAMT and the low number of participants receiving any form of treatment post inpatient detoxification and psychosocial therapy. Just 11.6% of participants at 9 months reported receiving any form of intervention and the majority of these were peer support groups. A systematic review on the topic of residential rehabilitation concluded that best practice residential care for any substance use disorder should include continuity of care postdischarge.<sup>36</sup> A review on group treatment for substance use disorders found that group treatment compared to no treatment had a small effect on abstinence however group treatment did not have a significant effect on the frequency of substance use or substance use disorder symptoms.<sup>37</sup> Additionally, with regard to opioid use disorder, it has been reported that

**Table 2** Pathways Between Heroin and Alcohol in the 210 Participants Seen at All Timepoints

Baseline		3m		9m	
n	210		210		210
% Heroin	100%		64%		75%
% Alcohol	17%		57%		44%
Heroin+ alcohol	n=35	Heroin + alcohol	16	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	9 7
		Heroin ONLY	10	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	2 7 1
		Alcohol ONLY	6	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	2 4
		Neither substance	3	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	2 1
Heroin ONLY	n=175	Heroin + alcohol	52	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	19 33
		Heroin ONLY	56	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	13 38 1 4
		Alcohol ONLY	45	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	12 5 21 7
		Neither substance	22	Heroin + alcohol Heroin ONLY Alcohol ONLY Neither substance	4 6 5 7

abstinence rates following psychosocial interventions hardly exceed 20–30%.<sup>38</sup> The low heroin abstinence rates and high levels of alcohol use in this study's cohort may, therefore, be explained by the low number receiving treatment.

The similar consumption trends in heroin and cannabis use in our study are expected due to the method of combination heroin-cannabis smoking. It may also be possible that the joint decrease in heroin and cannabis consumption

also contributed to significantly increased levels of alcohol use. Although crack-cocaine use decreased from enrolment to 3 months, the level of use remained the same 6 months later. The ATOS reported that at 3-, 12- and 24-month follow-ups, progressive reductions in heroin use were accompanied by overall reductions in cocaine and amphetamine use.<sup>15</sup> Notably, in most other prospective treatment outcome studies, substitution therapy is the main model of treatment, thereby suggesting that OAMT

may also contribute the decreases in the use of all substances.

Our study although robust in some of its findings has some limitations. The study did not include a control group of participants not entering treatment. A control group may have provided further insights into the impact of the interventions. The convenience sampling may have introduced a selection bias towards those more eager to participate in the study. The sampling method may have limited the recruitment of patients with more severe withdrawal symptoms. This study also only presents the results of past month substance use and does not include the frequency of use. Owing to the predominant method of combination heroin-cannabis smoking, there are limitations with regards to the generalizability of our findings. Lastly, the MDUT did not test for the presence of Methaqualone which was fairly common in our sample and we were unable to conduct MDUT on all participants. Alcohol use was based on self-report alone.

## Conclusion

In our cohort alcohol may act as a substitute for heroin in the short-term post detoxification. The initial decreases in heroin use were not sustained and at 9 months post inpatient detoxification and psychosocial therapy and there was an upward trend in heroin consumption. Specific interventions are needed to prevent and treat alcohol use in recovering heroin users. The provision of OAMT in South Africa may possibly prevent the increases in heroin consumption and decreasing abstinence rates over time.

## Acknowledgments

A sincere thanks to the research assistant, Ms Rachel Monedi for her dedication and support. We thank Dr Petra Gaylard (Data Management and Statistical Analysis (DMSA)) for the statistical analyses. This study was supported by the M and J Miller Foundation and a South African National Research Foundation grant.

## Author Contributions

All authors contributed to data analysis, drafting and revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

## Disclosure

Nirvana Morgan is a recipient of a Cassandra Miller-Butterworth Fellowship for a clinician-scientist PhD. This fellowship, from the M and J Miller foundation allowed Nirvana Morgan to conduct this study as

a fulltime PhD student and contributed to the running costs of the study. Dr Morgan is also a recipient of a South African National Research Foundation grant (TTK 170430229217) which further supported this study. Professor William Daniels reports grants from National Research Foundation of South Africa and M and J Miller Foundation, during the conduct of the study. These funding sources had no role in the design of the study, data collection, data analysis, the writing of the manuscript or the decision to submit this paper for publication. The authors report no other conflicts of interest in this work.

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