

# Validity and utility of community health workers' estimation of kava use

## Abstract

**Objective:** Estimating illicit substance use in epidemiological studies is challenging, particularly across ethical, cultural and language barriers. While developing the methods for a case-control study of the effects of heavy kava consumption among Aboriginal people in remote Northern Territory (NT), we examined the validity and utility of alternative methods for estimating exposure.

**Methods:** We assessed the level of agreement between a consensus of Aboriginal health workers in two different communities using interviews conducted with community members and health workers and individuals' self-reported kava consumption. Exposure measures included history of kava use, current kava use and history of heavy use. Agreement between a health worker consensus classification and individuals' self-report was analysed and agreement among several health workers in a consensus classification without self-report was assessed.

**Results:** Health workers concurred about an individual's history of kava use ( $k=0.83$ ), current use ( $k=0.43$ ) and also level of use ( $k=0.33$ ). There was very good agreement between health workers' consensus and self-reported history of use ( $k=0.77$ ). Agreement among health workers about current kava use was poor ( $k=0.08$ ), while there was fair agreement between health workers and self-reported heavy kava users ( $k=0.36$ ). Data from review of clinic patient notes supported agreement between consensus classification and self-reported history and level of use ( $k=0.39$ ).

**Conclusions:** Self-reported kava use may be a poor estimate of current use especially when obtained from interviews away from a confidential clinic setting. Consensus classification by knowledgeable Aboriginal health workers provided comprehensive coverage, efficiently and with greater reliability and assisted to identify 'excessive' kava use.

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The eastern Arnhem Land region of the Northern Territory (NT) includes 10 Aboriginal townships and associated homeland areas each with from 200 to 1,500 people. These are dispersed across 37,997 square kilometres with a total Aboriginal population of 7,130 as well as two mining centres where the majority of the non-Aboriginal population (5,983 people) reside.<sup>1</sup>

Kava is consumed here as an infusion with cold water of dried, powdered parts of the plant *Piper methysticum* Forst. f. imported from South Pacific countries. Its widespread use by Aboriginal people in this 'Top End' region of the NT began in 1982.<sup>2,3</sup> We seek to develop reliable methods to estimate an individual's kava consumption, particularly 'excessive' consumption, for use in epidemiological studies of kava's health effects and to assist to monitor and minimise harm from kava abuse. This research is part of a case-control study of the possible increased risk of admission to the regional hospital for pneumonia or ischaemic heart disease among kava users.

'Heavy' and 'very heavy' kava use has been associated with indicators of ill health: scaly skin, weight loss, abnormal liver function, pulmonary hypertension, decreased platelets and blood lymphocytes along with other effects on blood biochemistry, haematuria and a urine of low specific gravity and a high pH.<sup>4</sup> Recent research and clinical reports suggest heavy kava use is a risk factor for sudden cardiac deaths<sup>5</sup> and, coupled with heavy alcohol use, is a risk factor for sudden deaths among young Aboriginal sportsmen.<sup>6</sup> Kava use as a risk factor for melioidosis has also been proposed.<sup>7</sup> In the context of these research findings, and of perceived excessive kava consumption within some Aboriginal communities, policies and strategies have been developed to minimise excessive use and resultant harm. But 'excessive' use has not been adequately described.

Measuring exposure to kava consumption faces particular challenges. The way in which kava is consumed is one. Drinking kava is usually a group activity where each brew

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is shared.<sup>8,9</sup> Kava powder used in infusions is neither of a standard quality nor does it contain uniform amounts of active constituents.<sup>10</sup>

A greater challenge for our regional study is that some communities required that we work within the local health centre and not approach individuals in the community.<sup>11</sup> With this ethical constraint on research procedures we could not rely on systematic collection in our regional case-control study of self-reported kava consumption from interviews. Because of recent legislated controls, direct or participant observation is problematic legally and kava users may, understandably, be unwilling to disclose their current consumption patterns. While the possession of up to two kilograms of kava is a misdemeanour, amounts above this are 'traffickable' or 'commercial' quantities under the Kava Management Act (1998).<sup>12</sup>

Previous methods of estimating kava consumption relied on the availability of accurate figures from licensed suppliers to corroborate self-report and consensus classification.<sup>13</sup> This kind of information was not available after 1994 when the NT Government relaxed controls set in place in 1990 on the supply and sale of kava.<sup>14</sup> The expansion of the informal trade after 1994 and the banning of kava in 1998 made it even more difficult to acquire reliable information, further limiting the capacity to verify estimates.<sup>15,16</sup>

An important result of an earlier study reporting on participant observations from 1989-91 was that an individual's weekly kava consumption is related closely to the time spent drinking and, in turn, to the range of social situations experienced where kava is consumed.<sup>3</sup> In addition, it was found that 20% of the population in that community drank kava at a level of 425 g/week or more, a level which corresponded to spending over 14 hours/week drinking kava.<sup>3</sup> This result was corroborated by community supply information over a period of 30 months. To try to overcome some of the aforementioned constraints, we use this result combined with consensus classifications provided by Aboriginal health workers and self-reported data.

## Methods

### Exposure measures

Participants interviewed (Group 1 and Group 5, below) were asked whether they had ever used kava ('Yes' or 'No') and if they were current (continuing) users of kava ('Yes' or 'No'). Health workers were asked to rate participants similarly. We also asked health workers and participants to describe the estimated time in a week a subject usually spent drinking kava and the time spent in activities where kava was consumed.

Flip charts were prepared to assist in the interviews conducted by one of us (AC) with the assistance of junior health workers. English and Djambarrpuyngu, a local language spoken by a majority of community residents, were used.

### Data collected

Data can be classified into five groups.

#### Group 1:

- **self-report** data, n=101 people interviewed in a cross-sectional

study (March 2000) in a clinic environment.

- **consensus classification** for each of these 101 individuals by two health workers working in conference. Two health workers who were not in the community at the time (and who therefore could not have known of the 101 responses) were asked to classify individuals with respect to exposure measures. Agreement between self-report and consensus classification was analysed.

**Group 2:** (n=91) Includes consensus classification with respect to exposure measures for each individual in a group selected from the same community for a case-control study of relative risks of hospital admissions among kava users and non-users. Between June and October 1999 up to four Aboriginal health workers were interviewed independently from each other in order to assess exposure to kava use for participants in this study.

**Group 3:** Chart review data was available for n=24 out of 101 individuals in Group 1 and for n=25 out of 91 individuals in Group 2. Discharge summaries for cases in the case-control study (Group 2) were reviewed and data on exposure to kava use were recorded where available. Comparisons were made with health worker consensus classifications in each of Group 1 and Group 2.

**Group 4:** Sixteen individuals appeared in both Group 1 and Group 2, i.e. they appeared as participants in both the cross-sectional study and the case-control study. Agreement was assessed between the consensus classifications by health workers and self-report data and also among the group of health workers.

**Group 5:** Comprises data for individuals interviewed away from a confidential clinic situation. A random sample (n=20) of 120 individuals in a case-control group in another nearby community was selected. Consensus classification data was collected for these individuals. Additionally, the 20 individuals in the sample were approached in the community in the company of a health worker and interviews were attempted. The purpose of this was to compare data collected by interviewing individuals outside a clinic with both health worker consensus classification and interview data collected while working inside a clinic. But, as is discussed in the 'results' section, many of these individuals were, for a range of reasons, unavailable for interview.

### Approvals, data recording, storage and analysis

A memorandum of understanding between the local Aboriginal community council and the Menzies School of Health Research guided the research. Ethical approval was given by a local ethics committee that works to National Health and Medical Research Council guidelines and which includes an Aboriginal subcommittee with power of veto.

Data were coded for electronic storage and analysed using the Stata statistical analysis package (Version 6, Stata Corporation, College Station Texas). The kappa (*k*) statistic was used to measure the differences between observed frequencies of agreement

with those expected by chance.<sup>17-19</sup>

## Results

### Group 1: Cross-sectional data

Table 1a shows the frequency of agreement between the in-conference consensus of two female health workers and the self-reported information derived from interviews with 101 people in the cross-sectional study. Data for 98 individuals was ultimately available for comparison. Self-report agreed with health worker consensus on 89% of occasions. The agreement is good according to suggested guidelines ( $k=0.77, p<0.001$ ).<sup>20,21</sup> The two health workers (females) did not agree with self-report on 11 individuals. Ten of these were men. Among the women who were assessed (11), agreement between consensus and self-report occurred for all but two of them.

Data were available to compare consensus classification and self-report for 50 kava users with respect to their level of use. Table 1c shows that agreement identifying the heaviest kava users (estimated at 425 g/week or 14 hours of drinking) was fair (approaching moderate) at a rate of 72% ( $k=0.36, p=0.006$ ). But Table 1b shows that health workers did not agree with self-reported current kava use ( $k=0.08, p=0.144$ ).

### Group 2: Consensus classification data

Here, up to four health workers (male and female) commented on kava use history and use levels for each individual. They didn't always agree, as Table 2 shows. Entries in Table 2 take into account that there are more than two health workers assessing each individual with variable numbers of health workers making assessments but with just two possible ratings, positive or negative. Variables containing the number of positive ratings and the number of negative ratings are compared for each individual.<sup>22</sup> Agreement is very good with only three split decisions in a total of 90 about a history of kava use (see Table 2a) ( $k=0.83, p<0.001$ ). For current kava use (see Table 2b), agreement is moderate ( $k=0.43, p<0.001$ ) with a fair degree of agreement (see Table 2c) about heavy kava use ( $k=0.33, p=0.006$ ).

### Group 3: Chart reviews and discharge summaries

Data from chart reviews for 25 individuals from the case-control study (Group 2) were compared with the consensus of health workers. This was also done for the 24 individuals in the cross-sectional study (Group 1) (see Tables 3a and b). The individuals portrayed in each table include five of the 16 who were surveyed as part of both the cross-sectional and the case-control study. Two of these five were also hospital admissions, i.e. cases in the case-control study. The remainder were different individuals in each table. These tables show that the chart reviews supported the consensus classifications in both studies, with a fair level of agreement (60%) between charts and health worker consensus in Group 2 ( $k=0.28, p=0.022$ ). There is 67% agreement between health worker consensus and self-report in Group 1, a fair level approaching moderate agreement ( $k=0.39, p=0.004$ ).

It is informative to try to account for some of the discrepancy in Table 3a. In one case the male health worker described a man

**Table 1: Health workers' consensus and self reported kava use.**

(a) History of kava use Kappa=0.77, z=7.57, p<0.001	Self report		Totals
	Yes	No	
Consensus of two female health workers			
Yes	54	5	59
No	6	33	39
Total	60	38	98
(b) Currently using kava Kappa=0.08, z=1.06, p=0.144	Self report		Totals
	Yes	No	
Consensus of two female health workers			
Yes	32	18	50
No	1	2	3
Total	33	20	53
(c) Heavy kava use Kappa=0.36, z=2.52, p=0.006	Self report		Totals
	>14hrs (425 g)/ week	<14hrs (425 g)/ week	
Consensus of two female health workers			
>14hrs (425 g)/week	27	7	34
<14hrs (425 g)/week	7	9	16
Total	34	16	50

who, as he himself told us, had recently taken up drinking kava after a two-year break, but who had a record in charts of being a non-user. The health worker's information proved more current than the documentary information. In Table 3b one of the two non-users identified by the female health workers but whose charts contained a note that they were kava users was a woman who had recently reduced her kava consumption to occasional use. The other was a man whose chart recorded no kava use within the last two years, recent changes which may not have been noticed by the female health workers. Subsequently the senior male Aboriginal health worker in the community confirmed that this man,

**Table 2: Health worker consensus on kava use.**

(a) History of kava use Kappa=0.83, z=13.63, p<0.001	Number assessing 'No'					Totals
	0	1	2	3	4	
0	1	7	1	6	19	34
1	17	1	1	0	0	19
Number assessing 'Yes'	2	5	3	2	0	10
3	17	2	0	0	0	19
4	9	0	0	0	0	9
Total	49	13	4	6	19	91
(b) Currently using kava Kappa=0.43, z=3.72, p<0.001	Number assessing 'No'					Totals
	0	1	2	3	4	
0	0	3	0	2	0	5
1	15	4	2	1	0	22
Number assessing 'Yes'	2	8	3	0	0	11
3	13	0	0	0	0	13
4	6	0	0	0	0	6
Total	42	10	2	3	0	57

**Table 3: Consensus classification and chart review.**

(a) Case-control study Kappa=0.26, z=2.02, p=0.02	Chart review			Totals
	Heavy kava user	Kava user	Non user	
<b>Consensus of up to four health workers</b>				
Heavy kava user	13	4	0	17
Kava user	1	1	5	7
Non user	0	0	1	1
Total	14	5	6	25
(b) Cross-sectional study Kappa=0.39, z=2.63, p=0.004	Chart review			Totals
	Heavy kava user	Kava user	Non user	
<b>Consensus of two health workers</b>				
Heavy kava user	12	4	0	16
Kava user	2	2	0	4
Non user	0	2	2	4
Total	14	8	2	24

in fact, had a history of kava use.

Finally, just two individuals had a hospital discharge summary that could be inspected, notes which described both men as heavy users of kava, information that agreed with both the health worker consensus and their self-report.

**Group 4: Overlaps between Group 1 and Group 2**

Sixteen individuals appeared in both the cross-sectional study and the case-control group. Therefore, information is available from several sources for comparisons. Assessments by up to four health workers in the case-control group, assessments by two health workers in the cross-sectional study and self-report in interview provided up to six estimates. Table 4 shows the raw data. While numbers are small, agreement on these ratings was very good for a history of kava use ( $k=0.82, p<0.001$ ), moderate for level of use ( $k=0.42, p<0.001$ ), but was poor for current kava use ( $k=0.06, p=0.300$ ).

When self-report data were removed from this analysis agreement among up to six health workers improved for both history of use ( $k=0.92, p<0.001$ ) and level of use ( $k=0.67, p<0.001$ ). Agreement among independent health worker assessments of current kava use was unanimous ( $k=1.00, p<0.001$ ).

**Group 5: Interviewing in a clinic compared with interviewing away from a clinic environment**

One of the 20 selected had passed away before interviewing commenced. For another eight of these it was impossible to conduct an interview. Two women were temporarily out of the community, another had moved semi-permanently to a nearby community, another was in Darwin having a baby. Two men were incapacitated and could not provide information in interview; an elderly man suffering from dementia, and another grieving from the recent death of a close family member. Two more refused or avoided an interview because of their stated discomfort with pro-

**Table 4: Sixteen participants: self report and health worker assessments (1='Yes', 0='No').**

Participant	Self report	Consensus of two health workers	Health worker 1	Health worker 2	Health worker 3	Health worker 4
	<b>History of kava use?</b>					
2	1	1	1	-	1	1
4	1	1	-	-	1	-
8	0	1	1	-	1	1
10	1	1	1	-	1	1
12	1	-	-	-	1	-
45	1	0	-	-	0	-
46	0	1	1	-	1	1
49	1	1	1	-	1	1
58	1	1	1	-	1	1
63	0	0	0	0	0	0
68	1	1	1	1	1	1
80	0	0	0	0	0	0
88	0	0	0	0	0	0
93	1	0	1	1	1	1
94	1	1	1	1	1	1
118	1	1	1	-	1	1
<b>Using kava now?</b>						
2	1	1	1	-	1	1
4	1	0	-	-	0	-
8	-	1	1	-	1	1
10	1	1	1	-	1	1
12	0	-	-	-	1	-
45	1	-	-	-	-	-
46	-	1	1	-	1	1
49	0	1	1	-	1	1
58	1	1	1	-	1	1
63	-	-	-	-	-	-
68	0	1	1	1	1	1
80	-	-	-	-	-	-
88	-	-	-	-	-	-
93	1	-	1	1	1	1
94	0	1	1	1	1	1
118	0	1	1	-	-	1
<b>Heavy kava user?</b>						
2	1	1	1	-	1	1
4	0	0	-	-	0	-
8	-	0	1	-	1	1
10	1	1	1	-	1	1
12	-	-	-	-	1	-
45	0	-	-	-	-	-
46	-	1	1	-	1	1
49	1	0	0	-	1	0
58	0	1	1	-	1	1
63	-	-	-	-	-	-
68	0	-	-	0	0	0
80	-	-	-	-	-	-
88	-	-	-	-	-	-
93	0	-	-	1	1	1
94	0	-	-	1	1	1
118	1	-	-	-	-	1

viding information about an illicit substance.

For the 11 out of the 20 interviewed, health workers confirmed for nine of them their self-reported history of use. They confirmed answers for all eight that described their current kava use, and for five of eight self-reported descriptions of their level of use. By contrast, health workers readily provided information on all of the 20 including the deceased person.

## Discussion

Health workers tended to agree among themselves about kava consumption for individual community members. Self-report was lower than health workers' estimates. Analysis of Group 5 data showed that it was more efficient and effective to conduct interviews and assessments with health workers in a clinic situation than to seek to interview individuals who may not have been available in the local community. But a discrepancy in estimated kava use, especially current kava use, is highlighted when the data from self-report is compared with health worker classification. Analysis of data from Group 1 shows the extent of this. A frequency of agreement between self-report and consensus classification of just 64% was achieved, a figure little different from expected ( $k=0.08$ ,  $p=0.144$ ). Under-reporting of substance use is well known,<sup>23,24</sup> a problem that was perhaps exacerbated in our research given kava's illegal and, accordingly, stigmatised status at the time. Health workers may have over-estimated kava use. But, while we cannot be certain without more comparative studies, it seems more plausible that participants under-reported their current use in interviews. It is also understandable that, since they concur about the data among themselves, in a confidential clinic setting health workers more readily disclose kava use information than individuals interviewed in a more public community setting about their personal substance use habits. Female health workers provided less reliable information about male kava users, which supports the reasonable notion that health workers know more about community members of the same gender, a result which does not detract from the plausibility of the information provided by health workers as a group.

When health worker assessment is the only available data source, in the absence of self-report or other corroborating information, i.e. when it must be relied upon as proxy<sup>24,25</sup> for more directly obtained data, our results suggest that we can do so with reasonable assurance. Consensus classification is available to us because of the detailed knowledge that Aboriginal health workers have of their communities, which are usually small and isolated with a population of interrelated clan and family groups and where domestic and public interactions are close and well known. This knowledge has limits in the kind of context we have described. Health workers are perhaps less accurate when describing current kava usage patterns but more reliable when they assess history of kava use and overall tendencies in levels of consumption. This may be because of limits on what it is possible to know about current events. On the other hand, it may be related to the dynamic legal and supply circumstances of kava already

mentioned. To illustrate this, out of 26 reformed kava drinkers who provided information in the cross-sectional study, 17 had given up since kava was banned 22 months prior to our study.

Health workers agreed among themselves ( $k=0.33$ ) and with self-report ( $k=0.36$ ) about levels of kava use. Chart review data, where available, corroborated this agreement ( $k=0.39$ ). In one community, Mathews et al. reported 'very heavy' (using 440 g kava powder/week), 'heavy' (310 g/week) 'occasional' drinkers (100 g/week) and 'extreme' use (perhaps 900 g/week) in 1987.<sup>4</sup> In another community nearby in 1989-91,<sup>3</sup> average consumption levels of 370 g/week were found with heaviest drinkers consuming more than 610 g/week. Participant observation established that these amounts were equivalent to 10 hours per week and more than 16 hours per week spent drinking kava respectively. Some 20% of kava drinkers in this same community drank at a level of >425 g/week, a figure that is equivalent to around 14 hours of drinking in a week and one that approximates the 'very heavy' category of Mathews et al. As in previous studies, data on the amount of kava delivered were used to verify these estimates.

In the present study, of the 34 people who described themselves as heavy drinkers (see Table 1c), a majority (26) said that they had also suffered kava rash in the past. Of the 16 lighter drinkers, just five had ever suffered kava rash. These data suggest that the level of consumption demarcating heavy use may be the level at which people begin to suffer kava dermopathy, a condition reported elsewhere as a characteristic of sustained heavy use.<sup>26</sup> Therefore, a level of 425 g/week may be regarded as a level upon which attention should be focused to further assess harmful health outcomes among Aboriginal populations who consume kava.

### **Suggested guidelines for using health worker consensus classification data**

With our approach, reliability accrued by applying the same procedure to different individuals with health workers using a similar approach to each assessment under repeatable conditions. These results suggest the following procedures in recording values of exposure to kava use in studies of kava's health effects using health worker consensus where it is not possible to obtain reliable self-report information.

- The value reported by the majority of the health workers who comment should take priority.
- A value reported by a health worker of the same gender as the individual in the study should be given greater weight if there is no majority view.
- If a decision cannot be made with respect to either current usage of kava or a history of use, then the consensus in one can inform a split decision in the other. For example, if by consensus, the person was considered to be a current user of kava, then a split decision about any history of kava use is resolved.
- Discharge summary or chart review data should be used to confirm the consensus, if available. With respect to level of use, the same guidelines apply.
- If a lone health worker provides comment and/or others are not sure, the view of the one should prevail after first checking

the chart review and discharge summary data.

- If no value can be decided upon, then the value should be recorded as 'no response/no information'.

Such an approach should ideally be taken to complement self-report information. Note that we do not reject evidence from a single health worker because of an inability to establish consensus. Reliability in this situation depends on health workers' profound ethnographic knowledge. While health workers are not necessarily objective and impartial observers, individually or in consensus, they can tell a great deal about their people, their health and their habits. At this level of detail, epidemiological research can be constructively informed by ethnographic knowledge, the depth and quality of which among health workers in remote Aboriginal communities is unparalleled and hitherto seldom explicitly recognised in published reports. The methods described here may have application to exposure assessment in epidemiological studies of the health effects of other substances and in similar settings around the world, namely in small rural and remote communities. The comparatively efficient methods developed here may be useful for community health workers to monitor the health effects of ongoing kava use in their communities.

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