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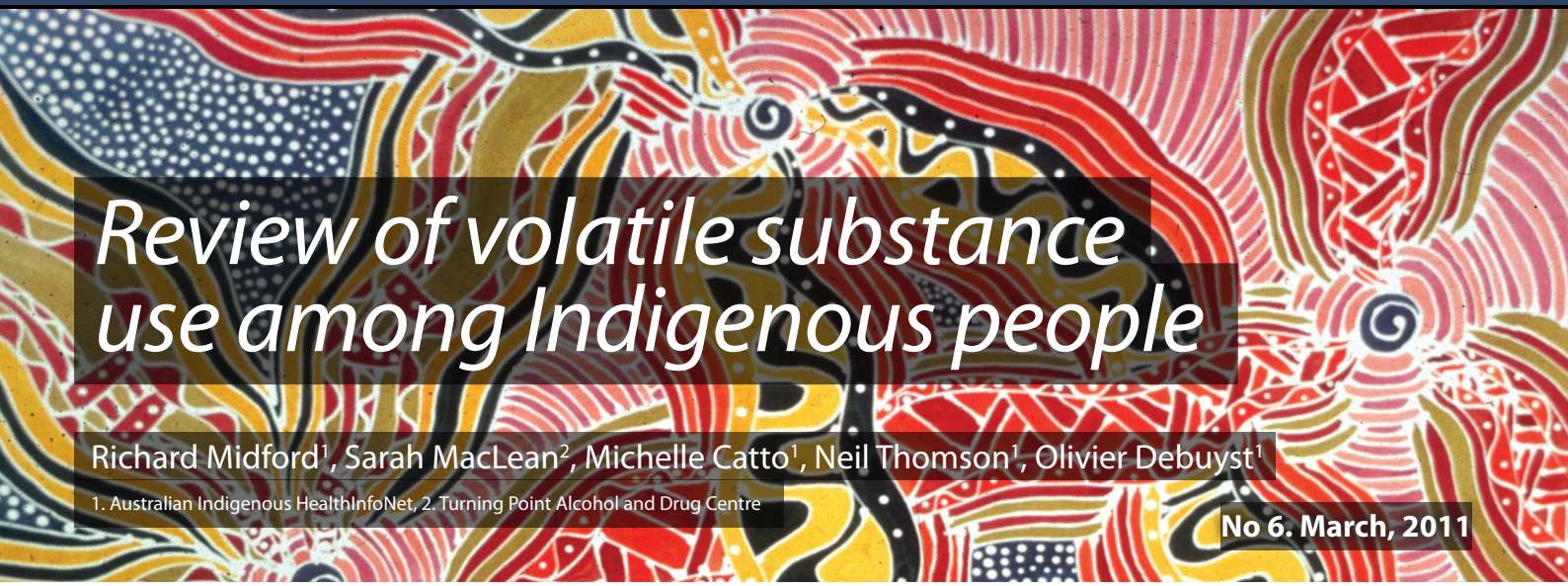

Review of volatile substance use among Indigenous people

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Introduction

A major national review in 2006 noted that volatile substance use (VSU) is 'an issue in both Indigenous and non-Indigenous communities in Australia' [1 p. i]. The review found that 'chroming' (inhaling spray paint) and petrol sniffing are two forms of inhalant abuse that are currently common in Australia, with the practice of chroming being more common in urban and rural areas, while petrol sniffing is more common in remote Indigenous communities' [1 p. i].

Most attention to VSU among Indigenous people in Australia has focused on petrol sniffing, which has been the subject of two recent inquiries by the Australian Senate, *Beyond petrol sniffing: renewing hope for Indigenous communities* [2], *and Grasping the opportunity of Opal: Assessing the impact of the Petrol Sniffing Strategy* [3].

The report of the first of these Senate inquiries concluded that

> Petrol sniffing causes devastation in Indigenous communities. The health impacts include chronic disability and the social impacts include violence, crime and the breakdown of community structures. Tragically, young Indigenous people are dying as a result of petrol sniffing [2 p. xv].

The report went on to note that petrol sniffing had been reported among Indigenous communities for many years. It has been the subject of 'many reports, reviews, coronial inquiries and research projects', but 'lack of progress in implementing recommendations' has 'created much frustration and despair in communities' [2 p. xv]. The report recommended that the issue was of such importance that 'the Council of Australian Governments must take responsibility for initiatives that address petrol sniffing' [2 p. xv].

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ABOUT THIS REVIEW

The purpose of this review is to summarise key information from a number of substantial reports and other documents to make it more accessible to people involved in Indigenous health in Australia. The review draws heavily on the work undertaken in the preparation of *Volatile substance misuse: a review of interventions.* That very important report was authored by Peter d'Abbs and Sarah MacLean, the latter a co-author of this review.

This review focuses on Australian Indigenous people, so no substantial attention is directed at the use of volatile substances among other indigenous peoples, or among other disadvantaged people in Australia or internationally. Also, reflecting the predominant emphasis on petrol sniffing among Indigenous people in Australia, this review focuses on that form of VSU.

After summarising briefly the nature of volatile substances and their impacts when inhaled by people, the review summarises the use both generally and among Indigenous people in Australia, and the impacts of their use among Indigenous people. Attention is then directed to methods for responding to their use in Indigenous communities, in terms of (1) supply reduction; (2) demand reduction; (3) harm reduction; and (4) law enforcement, before providing some concluding comments.

About volatile substances

THE NATURE OF VOLATILE SUBSTANCES

Volatile substances are chemical compounds that give off fumes at room temperature. They are also called 'inhalants' in recognition of their route of administration [4]. They are central nervous system depressants, and their use involves deliberate inhalation to produce a state of altered consciousness or intoxication. Onset of effect occurs rapidly because the extensive capillary surface of the lungs readily absorbs the vapour, causing blood levels to peak within minutes of use [5].

There are approximately 250 household, medical and industrial products that contain potentially intoxicating volatile substances [4]. Many of these are readily available.

Volatile substances are usually classified into four groups [6]:

- solvents - liquids or semi-liquids that vaporise at room temperature, such as glues and petrol
- gases - medical anaesthetics and fuel gases, such as lighter fuels
- aerosols - sprays containing propellants and solvents
- nitrites - amyl nitrite or cyclohexyl nitrite found in room deodorisers

Nitrites, however, do not directly affect the central nervous system and their use occurs primarily for enhancement of sexual pleasure, rather than intoxication.

The volatile substances most commonly used for intoxication are aliphatic, aromatic or halogenated hydrocarbons. These include toluene (found, for example, in glues, spray paints, and unleaded petrol) butane gas (in cigarette lighters), acetone (in nail polish remover), benzene (in petrol and varnish) and propane (in bottled fuel and as aerosol propellant)[1].

THE EFFECTS OF INHALING VOLATILE SUBSTANCES

Consideration of the effects of VSU needs to take account of short-term, long-term and pregnancy effects. These are listed in Table 1. Petrol sniffers, in particular, have also been identified as experiencing extreme mood swings and severe depression, but this may be more a consequence of their pre-existing psychological state than of petrol per se [7].

The psychoactive effects of inhaling volatile substances occur rapidly, but only last for a short period (5-45 minutes after ceasing use). However, the fat soluble nature of volatile substances means they can be stored in neurological tissue and affect the level of consciousness of users for several hours [4, 8, 9]. The most toxic consequence of chronic use is irreversible neurological damage, leading to cognitive impairment. The heart, lungs, liver and kidneys can also be affected, and use during pregnancy can affect the unborn child, with lifelong consequences.

Sudden sniffing death

Some inhalants can also indirectly cause sudden death by cardiac arrest in a syndrome known as 'sudden sniffing death.' The hydrocarbon gases present in the inhalants appear to sensitise the myocardium to adrenaline. In this state, a sudden surge of adrenaline (for example, from a frightening hallucination or pursuit by police) can cause a fatal cardiac arrhythmia [4, 10].

1 For more information, see d'Abbs and MacLean [4].

Table 1. Short-term, long-term and pregnancy effects of volatile substance use

Progressive short-term effects (low to high dose)	Long-term or chronic effects	Pregnancy effects
feeling of wellbeing	red, watery eyes	spontaneous abortion
disinhibition	nosebleeds	congenital malformation
hallucinations	indigestion	low birth weight
nausea and vomiting	dizziness	developmental delay
drowsiness	frequent cough	behavioural issues in later life
confusion	lack of energy	
aggression	shortness of breath	
slurred speech	tinnitus (ringing in the ears)	
loss of coordination	angina (temporary chest pain)	
blurred vision	stomach ulcers	
loss of consciousness	chronic headache	
death	sinusitis	
	cognitive deterioration (attention, memory and problem solving)	
Other immediate effects can include:	depression	
headache	ataxia (gross lack of coordination of muscle movements)	
abdominal pain	irreversible neurological damage	
hyper-salivation	seizures and epilepsy	
palpitations	loss of hearing and sight	
	loss of feeling	
	damage to the heart, lungs, liver and kidneys	
	reduced bone density	
	some forms of cancer	
	Parkinson's disease	

Source: Adapted from d'Abbs P, Maclean S, 2008 [4] and Parliament of Victoria, Drugs and Crime Prevention Committee, 2002 [7]

Asphyxiation

Petrol sniffers can also die as a result of asphyxiation, most commonly from falling asleep with containers against their faces or blankets over their heads, or as result of displacement of oxygen in the lungs by the inhaled petrol vapour [4, 8, 11]. This risk of death applies even to the recently introduced Opal fuel. It is also believed that spraying volatile substances directly into the mouth can cause asphyxia, due to the cooling agents in the aerosol propellant freezing the larynx [12].

Neurological and cognitive impairments

Chronic VSU has been linked to impairments of cognition and neurological damage. These cognitive impairments include changes to attention span and short-term memory, as well as impacting on the ability to solve problems and affecting visual-spatial skills. The severity of these impairments can range from mild impairment to severe dementia [13]. Brain injury associated with VSU appears to be cumulative, but this is contested in the literature. When controlling for socioeconomic disadvantages, one study found that the differences in cognitive skills among those reporting VSU were not statistically significant [14].

Forms of neurological disorder, including Parkinson's disease, appear to be linked to exposure to volatile substances [15, 16, 17]. The neurological damage caused by VSU is considered to be cumulative; chronic, long-term VSU is more likely to cause permanent brain injury or death than is infrequent VSU. One study found that the duration of VSU and blood lead levels correlated with the range and severity of impairment of cognition and neurological damage [18]. Early studies suggested that brain injury associated with VSU was permanent [18, 19], but recent evidence suggests that significant recovery from the

effects of VSU is possible where abstinence occurs prior to the development of cerebellar atrophy [20, 21, 22, 23].

It should be recognised that assessing cognitive and neurological impairment can be difficult in Indigenous Australian communities as the assessment tools used are largely reliant on a westernised system and do not take into account significant cultural and language barriers [24, 25]. Therefore, determining long-term effects of chronic VSU by Indigenous people can be complex.

Prenatal exposure to volatile substances

Volatile substances readily cross the placental barrier because of their fat solubility. Prenatal exposure is associated with low birthweight, prematurity, developmental delays, neurobehavioral problems and physical malformations [26].

Volatile substance use

A GLOBAL PERSPECTIVE

Volatile substance use is 'an under-recognised worldwide problem' [27 p. 441], and its use by young people is second only to cannabis in several countries [28].

A compilation of data from a variety of sources found that significant proportions of people had used a volatile substance at some stage in their lives, with the proportions being highest for Australia, the United Kingdom, the United States, Kenya, Malta and Lithuania [28]. The report acknowledged data limitations, but concluded that the use of volatile substances 'is widespread among youth and is reported from every region of the world'[28 p. 12].

The use of volatile substances is generally seen as higher-than-average among minority and marginalised young people, including Indigenous youth in Australia, New Zealand, the United States and Canada [4, 29]. The relatively high level of VSU in these groups is seen as due to their 'poverty and marginalisation, rather than cultural attributes' [4 p. xii].

VOLATILE SUBSTANCE USE IN AUSTRALIA

Volatile substance use (VSU) occurs predominantly among young people, both Indigenous and non-Indigenous [7]. In urban settings, inhalation of the vapours from spray paint, or 'chroming', is the most frequent form of VSU for both Indigenous and non-Indigenous young people. Use among the general population of young people has been recorded since the 1970s when a Queensland survey found that 6.5% of school students reported they had used a volatile substance [7]. During the 1990s, VSU in cities and towns became a matter of increasing concern and a number of studies documented use by Indigenous and non-Indigenous young people in a range of locations from large cities, such as Brisbane and Perth, to small regional towns, such as Alice Springs and Mount Isa [30, 31, 32, 33]. Indigenous young people in these settings are likely to use volatile substances in greater quantity and for a longer period, although non-Indigenous young people have also been identified as chronic users [1, 4, 33].

Marginalised young people, whether Indigenous or non-Indigenous, indicate they use volatile substances as a way of relieving boredom, to block hunger pains, and to cope with emotional distress [34, 35]. It is also important to acknowledge that VSU occurs because it can be exciting and pleasurable [4]. Many users have commented that they greatly enjoyed the hallucinogenic effects of VSU, reporting hallucinogenic experiences shared within groups of users [36]. In addition, VSU provides a way of communicating identity, control and power. Users of volatile substances frequently seek a non-conformist reputation [34]. In Indigenous communities, sniffing can be one of the few ways a young person can express their power. In part, this is through controlling their body weight by sniffing to suppress appetite. In part, it is through deliberately provoking outrage by their behaviour [36].

Rose considered there are two general risk factors – social disadvantage and family dysfunction – that are predictive of VSU [37]. In addition, VSU in Indigenous communities is influenced by cultural and situational circumstances including:

- degree of community cohesion
- cultural identification
- numbers engaged in use
- local patterns of use
- access to resources and supports
- other local influences

This provides a way of understanding Indigenous VSU that goes beyond individual pathology, and takes account of community level stress and the wider social and cultural impact of the dispossession and dislocation that has occurred since European colonisation.

Petrol sniffing remains the most prevalent form of VSU by Indigenous people living in remote communities. This form of VSU has occurred in some Northern Territory Indigenous communities since the early 1940s. One theory ascribes its introduction to American servicemen stationed in the Territory during the Second World War. This is supported by testimony given to the Legislative Assembly of the Northern Territory Select Committee on Substance Abuse [38]. A man from the Mutitjulu community, who grew up in Eastern Arnhem Land during World War II, reported American servicemen stationed on an airstrip there sniffing petrol. He recounted how he and others of his generation had 'socially' sniffed

petrol. On the other hand, Brady is very sceptical about this theory, quoting a person stationed at one of the communities at the time, who rejected the idea [36].

Unlike much urban VSU, which tends to be experimental, transitory use by younger adolescents, petrol sniffing in remote communities starts at a younger age and continues for a longer period of time [4, 7]. Most Indigenous petrol sniffers are between eight and 30 years of age, with a concentration in the 12-19 year age range, although there have been reports of sniffers as young as five years old [2, 39]. One study reported that the mean duration of use was eight years, which means Indigenous petrol sniffers are at considerable risk of becoming chronic users as they get older [4, 40].

PREVALENCE OF VSU

A recurring comment from researchers and service providers concerns the lack of prevalence data on volatile substance use [7]. There are two regular national surveys of drug use, the National Drug Strategy Household Survey (NDSHS) and the Australian School Students Alcohol and Drugs (ASSAD) Survey, but each has its limitations in terms of providing an accurate picture of use [41, 42]. The issue of age and Indigenous status are important factors when assessing the accuracy of survey data on volatile substance use and there are substantial deficiencies in both surveys on each count. The 2007 NDSHS indicated that 3.1% of Australians aged 14 years or older had ever used a volatile substance (see Table 2), but it provided no breakdown as to Indigenous status [41]. The survey also only reported volatile substance by those 14 years and older. This means that use by younger adolescents, which is known to comprise a substantial portion of total use, has been omitted [4, 37].

The 2005 ASSAD survey collected information on VSU by students as young as 12 years, which was the peak age for recent use [42]. In this age group, 6.4% had used in the previous week (see Table 3). Recent use progressively dropped in older age groups such that by 17 years only 2.1% had used in the previous week. This survey collected data from a larger and younger sample than the NDSHS, but it had its own limitations in the context of this review. As with the NDSHS it did not break prevalence data down by Indigenous status. Additionally, it only surveyed young people attending school. There is good reason to believe that chronic volatile substance users would be less likely to attend school and would therefore be missed by school-based surveys.

There is more information available about the prevalence of petrol sniffing. In the 1980s, the practice was mainly confined to Indigenous communities in Arnhem Land and Central Australia [36]. By the late 1990s, petrol sniffing was being reported in previously unaffected communities, which included the Katherine region of the NT, Cape York in Qld, south-west Qld, western NSW and northern Vic. A comprehensive survey of petrol sniffing, conducted in 2006-2007 with remote Indigenous communities that had introduced non-sniffable Opal fuel, found that just over 1,000 people in these communities were currently sniffing (see Table 4). This represented 4.8% of the population aged between five and 40 years [43]. A 2008 estimate of the petrol sniffing population across all major sniffing areas, undertaken as part of a cost benefit analysis of non-sniffable Opal fuel, produced a figure of 1,722 sniffers and a sniffing rate of 3% [44]. This 'analysis zone' included the remote Indigenous communities listed in Table 4, but added urban centres in the Top End of the NT, the Gulf area of Qld and the area in SA and WA along the Great Australian Bight. The sniffing population of Darwin was not calculated for reasons associated with the study's focus on areas where maximum benefit could be achieved.

Table 2. Percentages of people aged 14 years or older using volatile substance, by age group and sex, Australia, 2007

Period	Age group				Sex		
	14-19	20-29	30-39	40+	Males	Females	Persons
In lifetime	2.0	5.2	6.1	1.8	3.9	2.3	3.1
In the last 12 months	1.1	0.7	0.4	0.2	0.6	0.2	0.4
In the last month	0.6	0.4	0.3	0.1	0.4	0.1	0.2
In the last week	0.3	0.1	0.1	0.1	0.2	<0.1	0.1

Source: AIHW, 2008 [41]

Table 3. Percentage of 12-17 year old school students using volatile substances, by frequency of use, age group and sex, Australia, 2005

Age	Sex	Never	Ever	Previous year	Previous month	Previous week
12	Persons	79	21	16	10	6
	Male	77	24	18	11	7
	Female	82	18	14	9	5
13	Persons	81	19	15	10	6
	Male	81	19	15	9	6
	Female	80	20	16	10	6
14	Persons	79	21	17	9	6
	Male	81	19	15	7	5
	Female	77	23	19	10	6
15	Persons	84	17	13	7	4
	Male	83	17	12	7	4
	Female	84	16	13	7	3
16	Person	88	12	8	4	3
	Male	88	12	7	3	3
	Female	87	13	9	4	3
17	Persons	90	10	6	3	2
	Male	89	11	6	4	2
	Female	91	9	6	3	2
12-17	Persons	83	17	13	8	5
	Male	83	17	13	8	5
	Female	83	17	13	7	4

Source: White V, Hayman J, 2006 [42]

Table 4. Table 4 Estimated numbers and percentages of petrol sniffers, by region, Australia, 2005-2007

Region	Population	Number of users	Percentage of users
Anangu/Pitjantjatjara/Yankunytjatjara (APY) Lands (SA)	1,969 (10-40 yrs)	219	11.1
East Kimberley (WA)	547	32	5.8
Top End (NT)	12,985	266	2.0
Far North Queensland	1,861	96	5.2
Ngaanyatjarra Lands (WA)	1,035	145	13.9
Eastern Goldfields (WA)	92	5	5.4
Central Australia (NT)	4,418	244	5.5
Alice Springs Town Camps (NT)	3,300	30	0.9
All regions	26,207	1,037	4.0

Source: d'Abbs P and Shaw G (2007) [43]

PROBLEMS ASSOCIATED WITH VSU

The problems associated with VSU by Indigenous people are not just experienced by the users themselves; problems cascade to their families, their local community and the wider society [4]. The problems experienced at these four levels are summarised in Table 5. The problems are not experienced in all cases and they may be co-occurring rather than being caused by VSU.

In Indigenous communities, it is particularly important to look beyond the health consequences of VSU for the individual user to the broader social costs. A study of petrol sniffing in a Pitjantjatjara community found that many chronic sniffers were socially isolated [45]. They lived outside their families in gangs that perpetrated much of the crime in the community. The burden on families, many already suffering hardship, can be enormous both in emotional and financial terms. Parents typically feel helpless to stop the use, while at the same time they often have to look after a son or daughter who is becoming increasingly debilitated [4]. VSU can create intense and unrelenting disruption in remote Indigenous communities out of all proportion to the number of users. Property crime, violence, friction between families, physical and mental health problems and youth suicides often accompany VSU [4]. Constantly coping with these problems debilitates a community, sapping its ability to function cohesively [38]. VSU is also a drain on wider Australian society in that it decreases productivity, and the resultant problems require the intervention of various government services. In 2005, the estimated total cost of petrol sniffing in Central Australia was $78.9 million, which included the following major component costs [46]:

- $38.1 million cost of burden of disease
- $16.2 million crime and judicial costs
- $8.3 million loss of productivity
- $4.2 million long-term care
- $4.1 million health costs
- $3.7 million rehabilitation

The cost benefit study of Opal fuel calculated the long-term

Table 5. Problems associated with volatile substance use

Where the problem is experienced	Nature of the problem
Volatile substance users	Acute physiological and toxicological consequences, including intoxication, hallucinations, disinhibition, confusion, blurred vision, poor coordination, headaches, poor memory, slurred speech, vomiting,
	Chronic physiological and toxicological consequences, including neurological injury, leading to impairment in cognition, vision, hearing and movement, damage to heart, lungs liver and kidneys
	Effects on the foetus if use occurs during pregnancy
	Poor school attendance and performance
	Less cultural learning
	Alienation from family and community
	Social stigma
	Increased likelihood of homelessness, future drug use and criminal activity
	Death
Families of volatile substance users	Disruption to family life
	Hardship and stress of caring for family members disabled by use
	Threat of violence
Local community	Inter-familial conflict and blaming
	Social disruption and damage to property
	Flouting of Indigenous and secular authority
	Loss of community contribution from the users
Wider society	Demands on health system
	Long-term care for those disabled by use
	Demands of the criminal justice system

Source: Adapted from d'Abbs P, Maclean S, 2008 [4]

costs of sniffing within the 'analysis zone' of major sniffing areas (except Darwin) [44]. In then current value terms the 25-year cost of petrol sniffing in these locations was calculated at $1,708 million. Of this, $1,014 million was the cost to sniffers, mainly in the form of morbidity and mortality costs, but also in lost earnings. Four hundred and seventy one million dollars was the cost to government and $223 million was the cost to the communities in which the sniffers live.

Morbidity and mortality

At present, there is no systematic collection of VSU-associated mortality or morbidity data in Australia at either the national or state and territory level [4]. Users typically present to health facilities with illnesses, such as pneumonia, or injuries, such as burns, which are caused by VSU, but the record only reflects the presenting problem. Similarly in the case of deaths, the practice is to list the medical explanation rather than the use of volatile substances that led to it [7]. For example, the cause of death of a chronic petrol sniffer may be recorded as end stage renal failure rather than the petrol sniffing that precipitated the renal failure.

Some state-wide data estimate the morbidity associated VSU. Victoria data collected on drug use and harm in 2003-04 indicated that VSU was the main presenting drug problem in 1.5% (726) of clients undertaking courses of treatment delivered by specialist alcohol and drug services [47]. In the same year, 35 VSU-related hospitalisations resulted in 214 bed days. In WA, between 1994 and 2000, there was an average of 32 VSU-related hospital admissions per year [1].

The aetiological fraction methodology provides another way of calculating Indigenous hospital admissions attributable to petrol sniffing [44]. This uses epidemiological studies to determine the proportion of a health condition attributable to various risk factors. Petrol sniffing is a risk factor in the following Australian Refined Diagnosis Related Group (DRG) codes, which provides information on the diagnosis/intervention for that hospital admission:

- C91 Lymphoid Leukaemia
- C92 Myeloid Leukaemia
- F18 Mental and behavioural disorders due to use of volatile solvents
- T52 Toxic effect of organic solvents
- G92 Toxic encephalopathy
- X46 Accidental poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapours

When the relevant aetiological fractions are applied to the 282 Indigenous hospital admissions in 2007-08 for these six conditions, 77.4 can be attributed wholly to petrol sniffing [44].

Table 6. Numbers of deaths from petrol sniffing, by region, Australia, 1998–2003

Region	Number of deaths
Ngaanyatjarra Lands	5
Pitjantjatjara Lands	11
Central Northern Territory	16
East Kimberley	3
Top End	2

Source: Shaw G, Biven A, Gray D, Mosey A, Stearne A, Perry J, [49]

Table 7. Immediate causes of death attributed to petrol sniffing, Australia, 1998-2003

Reported cause of death	Number of deaths
Respiratory failure/asphyxia	10
Homicide	3
Cumulative impact of sniffing	3
Chronic obstructive airways disease	2
Burns	1
Suicide	9
Cardiac arrest	2
Motor vehicle crash	4
Fall from height	1
Lost in bush	1
Not reported	1

Source: The South Australian Centre for Economic Studies, 2010 [44]

Data on mortality linked to VSU of all types are scant. A national study indicated that 121 deaths from VSU occurred between 1980 and 1987 [48]. Seventeen of these deaths were attributable to petrol sniffing. At the time, petrol contained lead: this means cumulative neurological damage was much more likely. In turn, this increases the likelihood of death. More recent state-level morbidity data have been collected in Victoria [7]. Coronial files indicated that, between 1991 and 2000, 44 deaths were associated with VSU. In both instances no information was published as to Indigenous status, but it can be reasonably assumed that the petrol sniffing deaths were of Indigenous people.

There is more information available at a regional level on mortality associated with petrol sniffing, and in all cases those who died were Indigenous [4, 49]. Coronial and other evidence were used to estimate that 63 Indigenous people died from causes related to petrol sniffing between 1981 and 1991: two-thirds (42) of those who died were from desert communities that straddled the border region of WA and SA; 12 were from communities in the Goldfields region of WA; and nine deaths occurred in the Central and Top End of the NT. Only three of those who died were female. More

recent research using a combination of coronial and government reports, community death registers and personal communication identified 37 petrol sniffing deaths between 1998 and 2003. The geographic distribution of these deaths is provided in Table 6.

Compared with the 1981-91 data, there was a decrease in deaths in the desert regions of WA and SA, and in the Goldfields region, but deaths increased in the central area of the NT and in the East Kimberley region of WA [4, 49]. The immediate cause of these petrol sniffing deaths is listed in Table 7.

Responding to VSU in Indigenous communities

SUPPLY REDUCTION

There are four methods of supply reduction designed to curb VSU: product modification; restricting physical access; statutory sales restrictions; and voluntary sales restrictions [4].

Product modification

Three ways of altering volatile substances so as to deter VSU have been identified [4]. These are: modification of packaging to reduce opportunity for misuse; addition of a deterrent chemical; and replacement of the toxic or psychoactive components to reduce harm and make use less attractive.

The first strategy of modifying packaging so as to deter use for intoxication has little support in the literature [4]. Modification to the nozzles of aerosol cans was trialled in the UK, but determined users still accessed the content to get intoxicated by puncturing the can or removing the nozzle [7]. The second strategy of adding deterrent chemicals is only viable when it cannot be circumvented and does not adversely affect legitimate users [50]. Four Indigenous communities added ethyl mercaptan, which has a strong offensive smell, to petrol, but the strategy proved unsuccessful. In one community, the residents objected to the smell; in the second, parents were distressed by their children vomiting; in the third, there was no community support for the intervention; and in the fourth, chronic sniffers continued to sniff the petrol containing the additive after discovering that the ethyl mercaptan would evaporate if the petrol was left in the open [4].

The most effective product modification approach is replacement of harmful and psychoactive chemicals with more benign alternatives [51]. Research in the UK indicates that reformulating products to reduce their intoxicating qualities has reduced deaths associated with their use [52]. In Australia, leaded petrol was phased out nationally on 1 January 2002 because of the risk it posed to health [53]. Lead affects neurological development and is therefore particularly toxic to children [54]. Sufficient exposure causes permanent learning and behaviour disorders. The introduction of unleaded petrol did not reduce petrol sniffing, but it did seem to reduce the morbidity associated with sniffing [49]. Sniffing unleaded petrol did not cause morbidity necessitating hospitalisation in the medium term. Fitting, one consequence of petrol sniffing, was only identified in three instances by the 2004 Comgas Scheme study. Eleven years earlier, when leaded petrol was being sniffed, Nganampa Health had reported 70 fitting-related consultations [55].

Introduction of non-sniffable fuels: aviation fuel (Avgas) and Opal

In the early 1990s, several Indigenous communities in the Top End of the NT started to use Avgas instead of petrol. Avgas has a higher lead content, but was not sufficiently volatile to cause intoxication. In one of these communities, Maningrida, Avgas was a critical element in eliminating petrol sniffing [56]. While some sniffers tried Avgas, they did not persist. Following this initial success, more than 20 Anangu Pitjantjatjara Yankunytjatjara (APY) communities changed to Avgas as part of a regional prevention strategy [57]. A subsequent evaluation found there was a steep decline in sniffing in these communities following the introduction of Avgas in 1994. There was some rebound in later years, but never to the pre-Avgas levels [58].

The Australian Government subsidised Avgas for communities from 1998 under the Comgas scheme, and there were 30 participating communities in 2004 [49]. The evaluation of the scheme concluded communities that used Avgas over a sustained period had eliminated regular petrol sniffing and related harms. Where the strength of effect varied, this was associated with consistency of application and proximity to alternative sources of sniffable fuels.

The scheme was popular with the participating communities because it effectively reduced sniffing [49]. However, the high lead content of Avgas eventually required its replacement for the same environmental health reasons behind the replacement of leaded petrol. The replacement Avgas had higher levels of aromatic hydrocarbons and would produce intoxication if sniffed. Initially this was cause of considerable consternation, but it also drove the development of a new fuel that could replace the old leaded Avgas in Indigenous communities.

The new fuel, known as Opal, was launched in February 2005 [4]. Later in the same year, the Australian Government expanded its commitment to the prevention of petrol sniffing by enlisting the support of the WA, SA, and NT governments in an 'Eight Point Plan' committed to the following actions [4]:

- adopting consistent legislation with strong penalties for offences relating to sale or supply of volatile substances for sniffing
- appropriate levels of policing
- further rollout of Opal fuel
- developing diversionary activities for young people
- providing treatment and respite facilities
- developing communication and education strategies
- strengthening and supporting communities
- evaluating interventions

This more comprehensive approach was renamed the Petrol Sniffing Prevention Program (PSPP), but supply of non-sniffable Opal fuel remained the core component [4]. In July 2008, there were 117 sites supplying Opal fuel, predominantly located in Indigenous communities [3]. Of these sites, 72 were in the NT, 20 in WA, 18 in SA and 7 in Qld. In the APY Lands in SA, all Indigenous communities now only have diesel and Opal fuel available for retail sale.

A recent review of the PSPP noted the empirical and anecdotal evidence of substantial reductions in the prevalence of petrol sniffing following the introduction of Opal fuel [59]. A prevalence survey of petrol sniffing conducted by Nganampa Health Council on the APY Lands in 2004 found that 224 people (8.4% of the total APY Lands population) were identified as having sniffed petrol over the previous 12 months. A similar survey conducted by the Council in May 2007, subsequent to the introduction of Opal fuel, identified only 38 people (1.3% of the total APY Lands population) as having sniffed petrol in the previous eight months, and of these only 18 were regular sniffers. The report noted that petrol sniffing was rare and sporadic between October 2006 and May 2007 and had occurred at only two communities. The report concluded that the replacement of sniffable fuels with Opal was likely to have been a significant contributor to this substantial and sustained reduction in petrol sniffing [59].

Further evidence of the impact of the roll-out of Opal petrol is provided by a report commissioned by the Australian Department of Health and Ageing [60]. The study analysed the impact in 20 of the 74 communities across remote Australia that had been surveyed in 2005 and 2006 because they were in the process of moving to the use of Opal petrol.

The study found that, between baseline and follow-up:

- the number of people sniffing had decreased by 431 (70%)
- the prevalence of sniffing had declined in 17 out of the 20 of communities, but had increased in two;
- the numbers of people sniffing at regular heavy levels had decreased by 90%, those at regular light levels by 85% and those occasionally by 60% [60].

It also found that there was a statistically significant relationship between the distance from each community to the nearest ULP outlet and the size of the decrease in the prevalence of sniffing at each community [60]. ULP was easily available in the communities where the prevalence of sniffing had increased.

The report noted that the results 'point to a positive change in the number of people sniffing, and the frequency with which they sniff in most communities in the sample' [60 p. 2]. It is also noted that 'many residents of the sample communities believed that Opal fuel had played a significant role in the reduction of sniffing in their community'[60 p. 2].

There seems little doubt as to the success of Opal fuel in reducing petrol sniffing, but there is concern that unless it is complemented by programs that tackle the underlying social, educational and economic disadvantage experienced by remote Indigenous communities relapse or drug substitution will occur [59, 61].

Physical prevention of access

The strategy of physically preventing access to petrol by locking up petrol supplies has been tried in just about every location where sniffing was a problem [4]. The measures taken have included surrounding pumps with weldmesh cages and using patrol men and guard dogs, but nothing completely stopped petrol being accessed. d'Abbs and MacLean [4] indicated that this does not mean sniffable petrol should be left unsecured where VSU is a problem, but they considered physical security an inadequate prevention strategy by itself.

Statutory restrictions on sales

The benefit of legislating to restrict sales of volatile substances has not been clearly demonstrated. There is evidence from the UK that when legislation was introduced restricting the sale of certain glues containing volatile substances users switched to more dangerous products such as butane and aerosols [62]. There is also evidence that a ban on the sale of cigarette lighter refills to people aged under 18 years reduced misuse deaths in this age group [52].

In most Australian jurisdictions it is an offence to sell volatile substances where the seller could reasonably be expected to know that the product was going to be used as an intoxicant [4]. It is, however, difficult to enforce this legislation and the decision making of some retailers has been driven by concerns that refusing sale to Indigenous people could leave them vulnerable to charges of racial discrimination [63]. Some states also restrict the sale of products containing volatile substances [4]. In SA it is illegal to sell spray paint cans to under 18 year olds and such products have to be kept in locked cabinets. In 2007, the state extended these sales restrictions to wide-tip markers and required retailers to maintain

a register of volatile product sales. The state also prohibits the sale of petrol to people aged less than 16 years. NSW and Qld are the two other states that prohibit the sale of spray paint cans to under 18 year olds.

Voluntary restrictions on sales

There have been a number of local programs that have attempted to reduce supply through voluntary agreements with retailers [63, 64]. While evaluations have been scarce, the limited evidence available indicates that convincing retailers to lock up misused products, such as spray paint, and refuse sale where misuse is suspected has been effective when introduced through a process involving community development and retailer education. A retailer education campaign in Alice Springs provides an example of this approach [64]. Here, a project officer visited all retail outlets that stocked spray paint. Staff were asked to keep the products in locked storage and were advised of legislation that made it an offence to knowingly sell products where misuse would occur. This intervention reduced spray can sales in Alice Springs by more than 600 a week and numbers of sniffers fell from an estimated 70 to 17. Those who persisted were generally chronic users and there was little displacement of use to other readily accessible volatile substances, such as deodorants and contact glues. These findings suggest that the strategy is likely to be effective with casual or opportunistic users who make up the majority of the using population. It is also likely to best suit smaller urban areas where all retail outlets can be included in the program.

DEMAND REDUCTION

There are a large number of products containing volatile substances, most of which are readily available and cheap to purchase. It is therefore unlikely that supply control, by itself, can ever be effective. Demand reduction measures that address the underlying causes of VSU are also needed. In the Indigenous context, this has to include measures that address the social determinants of health, such as housing, education, employment, access to services, social networks, connection with land, racism, and rates of imprisonment. Petrol sniffing, in particular, can be seen as a manifestation of social deterioration and its elimination is unlikely to be achieved without substantial commitment to the building of social capital in vulnerable communities [65].

Community–based approaches

There is a substantial body of literature on community-based approaches to Indigenous VSU, in both remote and urban settings. Some of these are summarised below, and more details are provided in *Volatile substance misuse: a review of interventions* [4].

HEALTHY ABORIGINAL LIFE TEAM (HALT)

The Healthy Aboriginal Life team (HALT) was an early example of a community-based petrol sniffing prevention program [66]. It was based on reciprocity rather than control, and aimed to work with extended Aboriginal families to help them recover their capacity to resolve problems. In the case of petrol sniffers, it sought to reintegrate sniffers with their family systems and to promote the nurturing and controlling capacities of those systems. Counselling and education were used to enable communities and families to redefine petrol sniffing as a problem which could be rectified by families.

HALT had some success with its original host community of Yuendumu, but when the model was applied throughout the APY Lands it failed to have an impact [67]. This suggests that orthodox counselling and community development techniques can be effective in reducing petrol sniffing if used with skill, cultural sensitivity and community support. However, the nature of the program seemed to work against ready transfer to other communities. Others who have reviewed HALT have expressed concern over its uncritical acceptance of cultural revival as effective prevention and its reliance on traditional child-rearing practices, which may have discouraged parents from disciplining petrol sniffers [68, 69].

PETROL LINK-UP AND THE CENTRAL AUSTRALIAN YOUTH LINK-UP SERVICE (CAYLUS)

Petrol link-up was a brief project that focused on supporting community action addressing petrol sniffing in the cross-border region of central Australia in 1994-1995 [4]. Its focus on sharing information between communities and on supporting community action reflected the belief that petrol sniffing could not be stopped by families alone.

Petrol link-up's 'three ways' model involved:

- substitution of Avgas for normal petrol
- removal of sniffers to outstations to help 'break' their behaviour and give their communities some respite
- providing some positive alternatives in communities (such as youth and recreational activities and employment) [4].

Despite its brief existence, two of *Petrol link-up*'s strategies – substitution of petrol with Avgas and outstation programs – have 'since been critical in reducing petrol sniffing' [4 p. 48].

The *Central Australian Youth Link-Up Service (CAYLUS)* was established in 2002, partly in response to calls to continue some of the work undertaken by *Petrol link-up* [4]. CAYLUS's approach to reducing petrol sniffing and its impacts focus on:

- community development to improve the lives of young people in central Australia
- responding to community requests for assistance
- providing case-work if necessary
- advocating for resources to address VSU (including the rollout of Opal fuel (see above)) [4]

Caylus has been successful in: (1) securing substantial funds for communities; (2) initiation of 22 youth programs and 36 school holiday programs; and (3) lobbying for the Opal fuel rollout and restrictions on sales of spray paints in Alice Springs [4 p. 50].

MAKIN' TRACKS

Makin' Tracks is a more recent program designed to operate across SA communities affected by petrol sniffing [70]. The objective of the program is to provide support, training and backup for individuals and agencies working with petrol sniffers and their communities. An evaluation noted the need for the program and identified the following strengths which could usefully be incorporated into other Indigenous substance programs [67]:

- the project employed well-qualified staff
- the project had clearly defined objectives based on community needs
- workers were able to respond to the changing needs of individual communities
- an evaluation framework linked to project objectives was established at the beginning of the project and supported by staff
- the project collaborated with other interventions
- staff were able to build community capacity through the training and support of local workers
- Indigenous staff members were highly aware of cultural issues such as kinship relations and took these into consideration in their work

CAIRNS INHALANT ACTION GROUP

The Cairns Inhalant Action Group (CIAG) provides an example of an urban program that focussed on VSU by Indigenous young people [71]. The group was coordinated by the Wuchopperen Health Service, an Aboriginal and Torres Strait Islander community-controlled health service in Cairns. Members were drawn from the Cairns City Council, Queensland Police and non-government and government agencies. A project officer was employed to coordinate responses to VSU. The CIAG implemented the following prevention measures [71]:

- working with retailers to restrict product supply
- staff development in agencies dealing with issues arising from VSU
- interagency case management of known users
- development of an information card and other resources
- conducting needs assessments among service providers and users
- monitoring changes in VSU prevalence
- educating and supporting communities and families about responding to VSU
- advocating to improve service responses for people who use volatile substances

Since the inception of the CIAG, VSU in Cairns has reduced substantially, to the point where the group has reduced its meetings from once a month to twice a year [71].

CRITICAL ELEMENTS IN SUCCESSFUL COMMUNITY PROGRAMS

There have been a number of other community-based programs that have targeted petrol sniffing in both remote and urban settings, with varying success [72]. All have contributed to a better understanding of what elements need to be incorporated if change is to be achieved. Mosey identified the following three elements as necessary for an intervention strategy to be successful in dealing with VSU in Indigenous communities:

- programs need enthusiastic support from non-Indigenous institutions, such as the council, school and police
- broad community and family support is required, with active involvement in roles such as becoming wardens, taking children to outstations and teaching them about their culture
- several strategies should be implemented as part of any one campaign, including both 'sticks' and 'carrots' [72]

The importance of these elements is also supported by Senior and Chenhall [73], who describe how one community's attempt to tackle VSU failed because of 'the nature of the engagement between the Aboriginal community, non-Aboriginal staff and external agencies' [73 p. 325]. They concluded that 'community resolve and determination to combat petrol sniffing is important, but not sufficient to develop interventions that are effective and sustainable' [73 p. 326].

Important support for community-based interventions has been provided by the Northern Territory's 2005 *Volatile Substance Abuse Prevention Act*, which was enacted in early 2006 [74]. Using its provisions, a number of communities have already developed their

own local VSU 'management plans'.[2]

Education, recreation and training programs

There is little universal, school-based education about VSU in Australia on the basis that it draws attention to the practice and, in doing so, may encourage initiation [4]. There have, however, been a number of education programs that target known users and those likely to come into contact with VSU, such as parents, teachers, and health and welfare workers. In addition education programs have been provided for communities where VSU is a problem.

As with more general drug education for young people, scare tactics do not work and information based on the immediate needs and priorities of users prove most influential [4, 7, 56, 75]. In respect to what constitutes salient information for young Indigenous petrol sniffers, interviews with current and ex-sniffers in Maningrida suggested that neurological effects, such as impaired coordination, worried petrol sniffers, particularly when the point was made that such impairment would impact on their ability to play sport [56].

Education and other forms of support for parents can be useful, particularly as those who experimented with VSU in their own youth may not understand the consequences of more intensive use [76]. Programs for Indigenous parents have not been evaluated in Australia, but education campaigns in Native American communities have been linked with decreasing levels of VSU.

A resource kit, *Petrol sniffing and other solvents,* was published by the Aboriginal Drug and Alcohol Council (ADAC) of South Australia in 2000 [77]. Evaluation of the kit found that it was most useful to professionals and policy makers working indirectly with communities and least useful for community members and parents. The evaluators suggested that such resources would be more useful to Indigenous communities if they were designed specifically for their use and contained flipcharts, interactive games, videos, and a CD in local language [77].

A number of innovative programs have been developed using Indigenous cultural practices as vehicles for combating VSU. These programs have used art, storytelling and restoration of important caring relationships to redefine the problem of petrol sniffing in Indigenous terms.

The *Sniffing and the Brain* flipchart developed by Cairney and Fitz [78] is an example of a resource that uses images and stories with identifiable cultural associations to assist health and community workers explain the effects of petrol sniffing on the body to Indigenous audiences. Evaluation of the flipchart found that it was viewed positively by stakeholders, who emphasised that the storytelling format and use of images to explain the effects of petrol sniffing on the brain made it an effective tool [79].

Overall, the impact of cultural interventions is difficult to determine, as few have been evaluated. However, such interventions do offer the potential to influence ways in which people think about VSU by harnessing perspectives to be found within indigenous culture, as well as reinforcing traditional capacity to deal with the problem through family and community care.

The Victorian *Inquiry into inhalation of volatile substances* argued that recreation programs should form part of an overall strategy to combat VSU [7]. However, such programs are difficult to maintain, particularly in remote communities with large numbers of petrol sniffers, and little research is available that systematically examines their effect in either remote or urban settings [4].

Kaltukatjara (Docker River), a remote Indigenous community in south-western NT provides an example of a recreation program that achieved positive effects [80]. Petrol sniffing increased during a period when no organised activities were provided for youth. During this activity void, 'sniffer' parties organised by an influential adult became an attractive recreational option for a proportion of the community's youth. However, when a program of recreational activities was instituted in the community petrol sniffing declined.

In Alice Springs the 'BushMob' program adapted principles of adventure therapy to suit the needs of marginalised, mostly Indigenous, young people who find it difficult to engage with mainstream services. VSU is common among this group. Up to 10 young men or women are taken on trips which involve risk-taking activities, such as rock climbing, canoeing, and hiking. Subsequently they are provided with follow-up support for up to six months. The rationale of the program is that activities must be exciting if they are to compete with VSU [81].

Education, recreation and education programs that have been successful with Indigenous volatile substance users have included: measures to avoid stigmatising users; connection with culture; community involvement; the provision of alternative educational opportunities; the development of work skills; a range of activities; the provision of opportunities for challenge and risk-taking; and flexibility to suit local circumstances. Follow-up is also important for maintaining change, so for example, paid employment should follow from an employment program.

2 Electronic copies of these plans can be viewed through the *Volatile substances* section of the NT Department of Health and Families website: http://www.health.nt.gov.au/Alcohol_and_Other_Drugs/Volatile_Substances/index.aspx

Treatment and management

The literature on the treatment and management of VSU is limited and typically concludes that outcomes are poor, as users do not respond to treatment approaches that work with other drug users [82]. Over 80% of the 550 respondents to a survey of drug treatment practitioners in Canada assessed their volatile substance using clients' prospects of recovery as only 'poor' or 'very poor'.

Counselling is the form of treatment usually provided by Australian drug and alcohol treatment services in response to VSU, although there is little research as to the efficacy of this form of intervention [83]. The Drug and Alcohol Services Association (DASA) has provided a detoxification program in Alice Springs over a number of years for volatile substance users aged 17 years and over. This program provides treatment involving negotiated case-management, and structured after-care for people. Clients receive a medical examination within 48 hours of admittance. They then receive a series of counselling sessions based around a holistic program that also involves group activities and outings, and includes nutrition information, relaxation and exercise. Out of the initial group of 20 young people who attended the program, nine were regarded as having 'very positive outcomes' [84].

The Victorian Department of Human Services has produced guidelines for managing and treating users of volatile substances [85]. These recommend that a similar approach to other drug treatment should be taken, although they also suggest that the young age of many users should be a consideration when formulating treatment plans. The guidelines advise that clients should be told about the harms of VSU. Motivational interviewing, self-monitoring strategies and relapse prevention should form part of any long-term individual counselling strategy. Recommended therapeutic techniques include goal setting, developing contracts with clients as to consequences for VSU, and skill development in managing emotions, decision making and communication. Family-based interventions are recommended where possible, as is support to reduce social isolation. The Victorian guidelines stipulate that responses to VSU should be aimed at promoting abstinence and that services must not allow clients to use volatile substances on their premises.

In recognition that treatment options for other substances may not be generalisable to VSU, The Office for Aboriginal and Torres Strait Islander Health (OATSIH) in the Australian Department of Health and Ageing has commissioned the National Health and Medical Research Council to produce clinical practice guidelines specifically for volatile substance use (VSU) [86]. The guidelines will be designed for use by health professionals including: medical practitioners; nurses; Aboriginal health workers; alcohol and other drug workers; and allied mental health workers. The guidelines will be applicable in primary health, emergency, mental health, and alcohol and other drug service settings. They will be based primarily on a review of existing evidence, but expert opinion will also be sought. A draft will initially be made available for public comment, with the final version planned for release in 2011.

Regardless of what type of treatment is provided, it is important to note that there is now provision under the NT 2005 *Volatile Substance Abuse Prevention Act* for the mandatory treatment of people using volatile substances [74].

Homeland programs

Homeland or outstation programs, have been seen as a beneficial response to petrol sniffing in Indigenous communities in two ways: first, as prevention, in that families who move to outstations are less likely to be plagued by substance misuse; and second, as remediation, whereby petrol sniffers get away from petrol and get involved in more constructive activities [4]. Great hopes were held in the 1980s for the homeland movement as a solution to petrol sniffing. However, these hopes were not realised, and the only outstations that did make a difference were those that incorporated treatment or rehabilitation facilities, such as Mt Theo.

The Mt Theo program is widely recognised as a success story in preventing petrol sniffing at its associated community of Yuendumu. Yuendumu had 70 petrol sniffers when the program started in 1994, but is now generally free of VSU [87]. Mount Theo is considered a sacred healing place with strong *Jukurrpa* (dreaming) [88]. It is very isolated, making it almost impossible for young people to leave without adult assistance. Sniffers and other young people at risk are taken there and looked after by tribal elders until they have recovered from the effects of sniffing. Activities include gardening, work as part of the Community Development Employment Program (CDEP), traditional activities and training courses [87]. After a month young people are allowed to return to their community of origin, but if they recommence sniffing they are immediately taken back to Mt Theo. While the program caters for all Warlpiri young people, it has been particularly successful with children of families who are the traditional owners of that area. Here, their links to the country and their care by family members during their stay seem critical. While Mount Theo has received government funding, the program has always been supported by Aboriginal people from the Yuendumu community [88, 89, 90]. Senior Aboriginal people run the activities and the relations they forge with young people are critical to the program's success. The success of Mt Theo also depends on a range of complementary measures that have been implemented. These include working concurrently with all four Warlpiri communities and Alice Springs agencies.

HARM REDUCTION

Harm reduction as a response to drug use is contentious because its focus is not on stopping or reducing use, but rather on the adverse consequences associated with use. The approach derives from the premise that cessation is not always possible, and a practical response in such cases is to reduce harmful consequences [4]. The literature identifies two main strategies for reducing the harm from VSU. The first involves reducing the risks that come from the settings in which VSU occurs; the second involves changing what is used and how it is used.

There is a strong case for making inhalant users aware of harm reduction options because VSU entails such a high risk of serious consequences, including death. However, harm reduction strategies rarely feature in responses to VSU, because of the 'moral panic' such strategies, particularly supervised use, have engendered in the past [91].

A less controversial harm reduction strategy than facilitating supervised use is to educate users about strategies they can use to reduce the likelihood of death or injury. Several harm reduction practices for users are described in the literature [92, 93]. These include:

- using containers with small surface areas to allow more air to be inhaled with the volatile substance
- reducing the risk of suffocating from the container or coverings used to concentrate the fumes, such as blankets
- knowing that choking on vomit is a significant cause of VSU-associated death and ensuring that a person who passes out as a result of VSU can breathe before calling an ambulance
- avoiding the use of other drugs concurrently with volatile substances (particularly drugs such as alcohol and heroin which are also central nervous system depressants) so as to reduce the risk of overdose
- taking precautions against accidental burning: for example, cigarettes should not be smoked while using volatile substances
- not startling or chasing anyone affected by volatile substances, as sudden death appears more likely when a sniffer's heart rate is elevated

Some groups of young people who use volatile substances have developed their own harm reduction strategies. Incarcerated Indigenous volatile substance users in Western Australia reported that they practised harm reduction through their choice of inhalant. Where possible, they used contact glue rather than petrol as they saw this as less harmful, and this is actually supported by research evidence [94]. A study demonstrated that the less toxic components of contact glue would be inhaled from a sniffing bag because the most toxic substance in the cocktail, toluene, was less volatile and comprised a smaller proportion of the vapour [95].

LAW ENFORCEMENT

In Australia it is generally accepted that VSU is a health and welfare, rather than a criminal justice issue. VSU is not a criminal offence in any Australian jurisdiction, but it still poses a challenge for law enforcement agencies, as users are at high risk of harming themselves and others, damaging property and threatening family and community wellbeing. Furthermore, without police support, health and welfare agencies can find it difficult to intervene with users [4].

Some Australian jurisdictions have increased police powers to intervene in cases of VSU. In the case of Queensland, an evaluation concluded that the amended powers had served a useful role [96]. On the negative side, the evaluation reported a widely held perception that, as a result of the new legislation, police had been given primary responsibility for addressing VSU. This meant that cases were often left with police and not followed-up by health and welfare agencies

A number of Indigenous communities have imposed their own sanctions on VSU in the form of by-laws. However, in some places the effectiveness of these has been compromised by a lack of suitable places to which apprehended users can be taken, and/or an absence of police to enforce the by-laws [4].

Community patrols are increasingly a feature of Indigenous communities, where they provide transport and care for at-risk community members, especially those intoxicated by volatile substances or alcohol [97]. Common to all of these patrol programs is a high level of local Indigenous community ownership, and a reliance on volunteer staffing. Programs are more likely to succeed if there is adequate community consultation at the outset, the relationship with police is clear, the duties of patrollers are well defined, and a strong management structure is in place [30, 98].

Most of the evidence relating to law enforcement in relation to VSU is descriptive, but d'Abbs & MacLean [4], drawing from a major review on the topic, *Policing, volatile substance misuse, and Indigenous Australians* [99] identify a number of pre-conditions for effective policing of VSU. These are:

- legislation creating appropriate and adequate police powers
- an adequate police presence in VSU-affected areas
- trained and supported community-based agencies, including night patrols
- places of safety other than police cells
- referral options
- sentencing options
- clearly articulated linkages with health and welfare sectors

Concluding comments

Until about ten years ago government responses to VSU were largely uncoordinated and not that successful. Typically, responses occurred in reaction to a media-driven crisis, and involved one-off grants to non-government agencies dealing directly with users. Few interventions were strategic in nature or well evaluated, and the corporate sector had little involvement in preventing the misuse of products they manufactured or marketed [4]. In the last decade this had changed substantially. There has been increased commitment of government resources and in many cases these have been put into long-term VSU programs. There is co-operation between governments and a commitment to a coherent VSU policy framework. This culminated in 2006 in the adoption of a new policy articulated in *National directions on inhalant abuse* [1]. This document concluded:

> What is required is the long-term commitment of governments at all levels to work together with the community and private sectors to implement a comprehensive response [1 p. 79].

The role of BP Australia in developing Opal fuel demonstrates the important role that industry can play in combating VSU through the provision of safer products. Affected communities also continue to play an active role. Community patrols and outstation programs are important ways for communities themselves to manage petrol sniffing and other forms of VSU. As a result of this range of concurrent strategies that address supply, demand and to some extent harm, petrol sniffing in particular is much less of a problem.

Further work remains, however, as the focus of current programs has been on the proximal factors that influence use, rather than on the more distal social determinants of VSU and other deleterious health behaviours. There is little point in assisting someone to cease VSU if this is quickly replaced by other harmful practices such as use of cannabis [100]. In the long-term, the most effective strategies for combating VSU are those that improve young people's lives and the health and wellbeing of their families and communities. This involves taking measures to redress the socio-economic disadvantage experienced by Indigenous communities.

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The Australian Indigenous Health*InfoNet*'s mission is to contribute to improvements in Indigenous health by making relevant, high quality knowledge and information easily accessible to policy makers, health service providers, program managers, clinicians, researchers and the general community. We are helping to 'close the gap' by providing the evidence base to inform practice and policy in Aboriginal and Torres Strait Islander health.

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