SOLVENT ABUSE

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SUMMARY

The aims of this study were to provide information about the demographic characteristics of solvent sniffers in Lanarkshire, to investigate the extent of the practice, to determine the sociological factors associated with it and to provide details concerning the effects, particularly the toxic effects, of adhesives and other substances, the vapours of which could be deliberately inhaled. In order to achieve this end, information from a wide variety of sources had to be collected and collated.

A retrospective study was conducted in 1975 of 102 consecutive police cases referred to Community Involvement personnel between 1st May 197[illegible] and 31st December 1973 and 102 non-sniffing police controls who had been involved in anti-social activities. The relevant information was collected by means of structured questionnaires completed by the investigator. After the answers had been post-coded, the data were punched on to 80 column cards, handled by an I.B.M. computer and the results obtained by means of a Fortran program. Results indicated that solvent abuse occurred sporadically in deviant careers and that solvent sniffers were more likely than control subjects to abuse alcohol or drugs at a later date. The significance of this has been fully discussed.

Most of the remaining information for the period 1970-1975 was collected retrospectively from police files, Social Work Department returns, Assessment Centre case-records and hospital case-sheets by means of simple questionnaires completed in each case by the investigator. Data

handling was conducted manually.

Simultaneously, a study was undertaken of 84 solvent sniffers consecutively referred to the investigator by police, social agencies and parents between 1st January 1975 and 31st July 1975. 84 non-sniffing delinquent children admitted to Lanarkshire's Assessment Centre during the same period were chosen to form a suitable control group and matching was carried out on an individual basis for age, sex, area of residence and nominal religious affiliation. Information was collected by means of structured though informal interviews conducted by the investigator. The answers obtained were then used to complete questionnaires in respect of each case. After the answers had been post-coded, the data were punched on to 80 column cards handled by an I.B.M. computer and the results obtained by means of a standard Fortran program.

Analyses of these indicated that only 20% of delinquent children studied had ever been involved in the practice of solvent abuse. Low socio-economic status, family instability, overcrowding and parental employment were found not to be associated factors in solvent abuse but both paternal and maternal drunkenness were. It was impossible within the context of the study to determine the extent to which alcoholism, as such, occurred among parents of the sniffers.

Clinical and laboratory studies were conducted on the same 84 sniffers with a view to determining details of the practice. Information was collected by means of informal interviews and the answers used to

complete questionnaires. Data were handled manually.

The degree of involvement in the abuse of solvents was found to vary considerably and it became evident that the practice had remained largely undetected not only by the community agencies but also by parents. The methods employed for inhalation also varied but in many cases reached a high degree of sophistication. Acute effects of participation were found to resemble those of acute alcoholic intoxication. No toxic damage to organic systems was found in any of the subjects examined but it was not possible to state categorically whether long-term damage resulting from the practice would be likely to occur. 45 deaths have already resulted from the practice in various parts of Britain since 1970.

It became evident when the information from all sources was collated that solvent abuse tended to involve young teenage males, particularly those resident in highly industrialised urban areas. There was also found to be a definite clustering of cases in specific schools within these areas.

Solvent abuse could be identified as a group practice involving either groups of males or mixed groups of males and females. Solitary sniffing proved to be very unusual.

The vapours deliberately inhaled were drawn from a wide variety of substances including trichloroethylene, paint-thinners, dry-cleaning agents and adhesives. Characteristically these were all cheap and

readily available to the subjects.

A marked increase in the number of children and young people involved in the practice was found to have occurred in Lanarkshire between 1970 and 1975 and the impact of newspaper reporting on the situation was assessed and discussed.

While solvent abuse must surely be accepted as an integral part of the wider aspect of drug abuse, it is essential to keep always firmly in mind the inescapable fact that most children and young people will never at any time, in any circumstances, experiment with substances containing solvents. It is also reassuring to reflect that for the most part, those who do so, will regard it more in the light of a passing phase, something to be tried and tested and hopefully to be found wanting, rather than as a pernicious prank which could lead in time to damage or death.

CHAPTER 1

In the first chapter of his book "The Ascent of Man" Dr. Bronowski has this to say:

> "Nature - that is, biological evolution - has not fitted man to any specific environment. On the contrary, by comparison with the grunion, he has a rather crude survival kit; and yet - this is the paradox of the human condition - one that fits him to all environments. His imagination, his reason, his emotional subtlety and toughness make it possible for him not to accept the environment but to change it".

This resourcefulness has manifest itself in a wide variety of skills throughout the ages and it is many thousands of years since man first experimented with the naturally occurring substances in the environment in an attempt to relieve pain, overcome anxiety or alter his psychological state. In the acquisition of his experience he has encountered some substances which profoundly affect his nervous system.

Opium, for example, has been used extensively and continuously since the time of Homer and as recently as during the last century in Britain, it was still widely used in the form of laudanum as a sleeping draught or pain-killer. Among the most vivid accounts of the effects of opiate abuse ever written was that by Thomas de Quincy in his book "Confessions of an Opium Eater". It describes the alternating sensations of pleasure and despair with a degree of conviction which could only stem from hard-won experience.

Cannabis too was known in Central Asia and China as early as 3000 BC

and first received mention in the herbal of the Chinese Emperor Shen Nung about 2740 B.C.(Russell Taylor, 1971).

Mexican cactus buttons, whose active chemical constituent is believed to be mescaline, were used for centuries by the American Indians and coca leaves were chewed by some South American tribes hundreds of years prior to their acceptance into medical practice on account of the local anaesthetic properties of cocaine.

Alcohol, worshipped in ancient times as a god under a variety of names, has been and indeed continues to be used and abused as a source of chemical comfort by many cultures. The drinking of ether as a substitute for alcohol has also been mentioned in the literature in situations of deprivation during the nineteenth century in Europe, Great Britain and North America and again much more recently in Germany during the Second World War (Blatherwick, 1972). One of the most successful temperance crusades of all time was that conducted throughout Scotland, England and Ireland in 1840 by a Roman Catholic priest named Father Matthew (Nagle, 1968). It led some people, however, in an effort to keep the pledge they had made, to drink ether instead as a cheap and moral substitute. The intoxicating effect of ether was found to be similar to that achieved by drinking alcohol with the added advantage of enabling those who sampled it to be drunk and sober several times over, in less time than it would have taken them to become intoxicated once on alcohol (Kerr, 1969). This practice continued therefore in popularity for some eighty years or so, only dying out finally in

the nineteen twenties (Nagle, 1968).

With the exception of opium and cannabis, both of which could be smoked, the aforementioned drugs were all originally taken by mouth though sometimes, more recently, by injection. Another method of introducing chemicals into the body, however, is by inhalation of the vapours of a wide range of substances. The large surface area of the lungs provides easy access and ensures a rapid onset of sensation. As in the case of those substances previously mentioned, the deliberate inhalation of volatile substances has a long if not always honourable history.

Throughout the length and breadth of the ancient Greek world people venerated the Pythia who sat on a tripod at Delphi inhaling the cold vapours which emanated from a cleft in the Earth's crust. The practice induced an ecstatic state of mind during which she uttered mystical observations that were duly noted down by the listening prophet and in turn delivered as the famous Delphic Oracle. There were other similar examples such as the Sybilla in Cumae (Voegele and Dietze, 1963) and indeed in a more general sense the inhalation of vapours from burning spices and aromatic gums formed part of ancient Hebrew worship (Preble and Laury, 1967). All through the social and religious history of most cultures there runs a distinct thread of mysticism, prophecy and worship, incorporating in many of them the practical use of vapour inhalation. It appears in the religious cults of Assyria, Babylon, Judah and Egypt to name but a few, and even today incense continues to be used in certain churches

as an integral and accepted part of religious worship.

Many substances, therefore, have been variously exploited by man through the centuries and no age can boast an immunity from their abuse, from the priestesses of Appollo down through the years to the "ether frolics" and "chloroform jags" of a more modern student population. It is significant as well as interesting to note that the intoxicating properties of a great many substances were exploited long before their usefulness as anaesthetic agents was accepted.

During the present century, the deliberate misuse of volatile agents by adults has not disappeared entirely but seems to have occurred only sporadically. Isolated reports of individual cases of chloroform inhalation (Weinraub, Groce and Karno, 1972), gasoline sniffing (Durden and Chipman, 1967; Karani, 1966; Malcolm, 1968), and nitrous oxide sniffing (Danto, 1964) have all appeared in the medical literature. The type of individual most often involved has proved to be one with easy access to substances at work, for example in industry (Alha, Korte and Naeminen, 1974; Ikeda, et al.,1971), in laboratories (Bartholomew, 1962) or in the operating theatres of hospitals. Worthy also of inclusion in any objective study of participants are those serving prison sentences (Cohen, 1973; Greenberg and Lustig, 1966) and/or those suffering from emotional or psychiatric disorders (Ahmed, 1971; Grabski, 1961; Man, 1969; Merry and Zachariadis, 1962; Satran and Dodson, 1963). The choice of substances used has almost always depended on their immediate

availability. This present study, however deals with the deliberate misuse of volatile substances not by industrial workers or laboratory technicians nor by persons incarcerated by the state for one reason or another but by children and young people.

The first cases described were those dealing with inhalation of gasoline fumes in America and indeed reports of gasoline sniffing, not only in the United States of America but also in Australia, Great Britain and India, were published throughout the nineteen fifties, sixties and seventies. Despite the fact that gasoline or petrol was then and still is readily available at little or no cost, only 20 - 30 cases have been written up in the literature during the twenty years since the practice was initially reported.

The meagre literature available offers information gleaned from case-reports on small numbers of sniffers referred for psychiatric assessment and treatment on other grounds, for example uncharacteristic outbursts of temper, strange behavioural patterns or hallucinations, mostly visual (Bethell, 1965; Black, 1967; Garrett and Johnson, 1967; Gold, 1963; Grant, 1962; Oldham, 1961) but occasionally auditory (Lawton and Malmquist, 1961). Other cases developed a model psychosis similar to that evoked by the hallucinogenic drugs (Tolan and Lingl, 1964). One case was wrongly diagnosed as schizophrenia whereas in fact the symptoms were directly attributable to gasoline inhalation. An aspect worthy of attention is the length of time, admittedly sometimes only five months, but in other cases as long as seven years during which time the sniffers had

managed to remain undetected although indulging in regular sessions.

In the majority of cases reported, discovery by the young people of the intoxicating effects of gasoline inhalation would appear to have been largely accidental (Durden and Chipman, 1967; Karani, 1966; Nitsche and Robinson, 1959; Tolan and Lingl, 1964) while for instance they were working with cars (Black, 1967) or siphoning petrol from one lawnmower to another (Edwards, 1960). Some had been initiated into the practice by friends (Gold, 1963; Tolan et al.,1964; Voegele and Dietze, 1963) but it is significant that they continued the activity long after others in their peer group had stopped. There was one case-record of a child addicted to the eating of rubber erasers who deliberately adopted gasoline inhalation as an acceptable alternative (Grant, 1962) and another whose supply of trichloro-ethylene ceased and who then turned quite intentionally to the sniffing of gasoline as a substitute (Oldham, 1961). For most participants the inhalation of gasoline vapours was a solitary activity (Black, 1967; Edwards, 1960; Karani, 1966; Nitsche and Robinson, 1959), although occasional cases involved associates (Schmitt, Goolishian and Abston, 1972; Tolan et al.,1964) and one report revealed the existence of a group of chronic gasoline sniffers which held parties to promote the practice (Durden et al., 1967).

There can be no doubt that gasoline or petrol sniffing was predominantly a male activity as only 3 cases involving females were reported (Lawton et al.,1961; Oldham, 1961; Schmitt et al.,1972)

and although it has been stated that it was particulary prevalent in rural areas because of its availability and a possible lack of other diversions (Edwards, 1960; Nitsche et al.,1959; Voegele et al., 1963), most of the reported cases occurred in fact in urban areas.

The age range of cases at the time of referral was found to vary between 6 and 20 years although one boy had begun sniffing even earlier, as a pre-school child (Voegele et al.,1963).

Although exact information is frequently omitted by authors, the degree of involvement in the practice appears to have varied considerably - from once every few months to 3 or 4 times weekly. Not only did the frequency of abuse vary, but so also did the amount of petrol required. While the term addiction has been applied by some authors to chronic sniffers of gasoline (Black, 1967; Faucett and Jensen, 1952; Pruitt, 1959), no withdrawal symptoms in fact occurred when the patients stopped the practice.

The method of inhalation employed usually involved direct inhalation from the petrol tanks of cars or motor cycles (Black, 1967; Edwards, 1960; Gold, 1963) although in 2 of the reported cases the petrol vapour was inhaled from the hand (Oldham, 1961) or from a soaked rag (Karani, 1966). Without exception the incidents occurred in the open air.

The home environment of many gasoline sniffers would appear to have been unstable and often characterised by parental absence, family

discord (Black, 1967; Grant, 1962; Nitsche et al.,1959) and alcoholism in one or other or both parents (Faucett et al, 1952).

In view of the fact that gasoline or petrol is a mixture of saturated and unsaturated hydrocarbons with tetraethyl lead and tricresyl phosphate added, it was perhaps surprising to find that toxic systemic damage resulting from gasoline sniffing occurred infrequently. However, the absence of such damage may be partially explained by the very crude method of inhalation and the fact that the practice was intermittent and carried on in the open air.

In one of the cases reported, the sniffer developed peripheral neuritis thought to be due to the tricresyl phosphate component of petrol (Karani, 1966) and in a further 2 cases there was clinical evidence of a chronic brain syndrome, thought to be caused by the toxic effects of petrol (Voegele et al.,1963). In addition to these, 4 teenagers were reported as having suffered severe burn injury as a result of gasoline sniffing, thus demonstrating very clearly the dangers of misusing a flammable substance (Schmitt et al., 1972).

Although the information available on gasoline sniffing has been largely based on case-records without control cases or long term follow-up data, 2 surveys were undertaken to determine the prevalence of the practice and the significant factors involved.

In 1968 on Elcho Island, 22 known male petrol sniffers and 22

matched controls were studied (Nurcombe et al., 1970). The results indicated that petrol sniffing in that context was a group activity used to facilitate tension discharge in Aboriginal adolescents, who had been encouraged by their particular social patterns into adopting aggressive postures. These petrol sniffers tended to be less competent at school than their counterparts, the control cases. They also tended to have been deprived of a father's influence for various social reasons but the difference between the 2 groups was not so marked as to be statistically significant.

The second study involved 72 boys and girls, aged 6 - 12 years, attending a Pueblo Indian village school in New Mexico, who were asked to complete a questionnaire on gasoline sniffing and the use of drugs (Kaufman, 1973). 42 of these children admitted that they had inhaled gasoline at least once and 93% of them had done so in a group context and out of doors. Evidence of family instability was not any more marked among the sniffers than the control cases.

While there has been reference to the extensive misuse of gasoline or petrol by young people (Nitsche et al., 1959; Pruitt, 1959; Tolan et al., 1964), it is clear that it occurred only infrequently, was confined to a very few areas and did not at any point constitute a numerically significant problem.

In 1959 glue sniffing or, more specifically, the inhalation of vapours from glues or plastic cements made its appearance. The first cases were reported in California and thereafter the practice seems to have

degree of involvement was subject to wide variation but it has been estimated that only one fifth of adolescents who dabbled with solvents later became regular users (Cohen, 1973).

Besides glues and cements a wide variety of other substances are reported as having been exploited. These include nail polish remover (Gellman, 1968; Wyse, 1973), antifreeze (Ahmed, 1971), trichloroethylene (Guaraldi et al., 1968; Luria et al., 1965), nitrous oxide (Danto, 1964; Dillon, 1967), chloroform (Weinraub et al., 1972), paint-thinner (Man, 1969), lacquer-thinner, marking pencils (Corliss, 1965), cleaning fluids (Baerg and Kimberg, 1970; Clearfield, 1970; New et al., 1962), amyl nitrite (Pearlman and Adams, 1970) and perfume (Ackerly et al., 1964).

The early clinical effects of solvent inhalation, regardless of the substance involved, are similar to those of alcohol consumption or anaesthesia brought about by using volatile agents. These are stimulation of the central nervous system followed by depression of varying intensity. Although the chronic sniffer may require several tubes of glue to achieve these progressive states, a few deep breaths might produce the desired effect within a matter of minutes or even seconds in the case of a novice (Malcolm, 1968). The resultant period of intoxication has been reported as lasting anything from a few minutes to 2 hours (Cohen, 1975) and any episode is liable to be followed by a hangover described as being less severe than the after effects of heavy alcohol consumption.

There are, however, clearly delineated differences between solvent

sniffing and alcohol drinking, perhaps the most striking being the brief duration of the period of intoxication following a sniffing session in contrast to the longer aftermath of alcohol drinking (Keeler and Reifler, 1967). Earlier in this chapter, a similar comparison was drawn between alcohol and ether drinking and the same degree of difference noted. Another vital distinction is that the occurrence of visual distortions and faulty space perception characterising the glue sniffer is quite unlike the impaired judgement of the alcohol drinker.

Information on solvent abuse has been largely based on case-reports of small isolated groups of sniffers who came to attention on account of some associated factor e.g. mortality, morbidity severe enough to justify hospital admission or anti-social acts of disorderly conduct directly linked with the glue sniffing episode.

Most of the original American referrals came from police or social agencies in urban areas and in view of the very wide field of legislation would almost certainly include a higher proportion of males than females and a greater number of less privileged groups. The pattern of male preponderance found among gasoline sniffers has, in fact, been found to be similar to that found in sniffers of other substances although there is often a considerable degree of variation in the ratios quoted ranging from 1:1 to 14:1 (Ackerly and Gibson, 1964; Corliss, 1965; Press and Done, 1967).

The methods of inhalation were subject to a wide variation, depending

on the particular substance chosen by the subject. Generally speaking, however, with the exception of nitrous oxide which raised specific difficulties owing to the fact that it had to be inhaled from a cylinder using either a mask or tube attachment, no elaborate or specialised equipment was required. Methods on the whole were less crude than those employed by gasoline sniffers and frequently made use of plastic or paper bags which acted as dispensers for adhesives (Kupperstein and Susman, 1968). In some cases, the participants, in an effort to increase and prolong the intoxicating effects, placed additional plastic bags over the head and even the entire body (Cohen, 1973).

At this stage it is important to point out that although the term "sniffing" has been applied to the practice, it in fact involved deep inhalation through the nose and/or mouth from the open end of the bag (Chapel and Taylor, 1970; Crooke, 1972).

Predominantly a group activity (Done, 1967), glue-sniffing may well have been rendered less hazardous by this very factor. There were obvious practical advantages in the arrangement, since some members could be available to alert the others to the possibility of detection. Again, in the event of over-reaction or sudden physical emergency involving any of the group, help could more easily be summoned and tragedy thereby averted.

It has been suggested that glue-sniffing does not lead to physical addiction (Allen, 1966; Ellison, 1965; Westermeyer, 1973) but it may

spread to the midwest in the early nineteen sixties. By 1965 it was reported to be occurring in every state of the United States of America (Corliss, 1965). Nor was the practice confined to the United States of America since, by the nineteen sixties, it had involved children and adolescents in countries as far scattered as Africa, Australia, Canada, Finland, Japan, Mexico, South America and Western Europe (Alha, Korte and Tenhu, 1973; Blatherwick, 1972; Cohen, 1973; Crooke, 1972; Goto et al., 1974; Guaraldi and Bonasegla, 1968; Luria and Meneghini, 1965; Shirabe et al., 1974). Indeed the cult of glue sniffing as such has proved so popular and so widespread that it is the name by which solvent abuse is most widely recognised.

In view of the fact that plastic cements and airplane glue frequently accompany model building kits used extensively by children, it is possible and even likely that their first experience of intoxication would be accidental (Glaser and Massengale, 1962; Musclow and Awen, 1971). Later, as involvement increased, the participants could always use the hobby as a plausible excuse for obtaining the necessary supplies. As glue was always easily and cheaply available either legitimately or by theft (Malcolm, 1968), its very accessibility, similar to that of gasoline, seems to have played a vital role in the spread of the glue sniffing practice. Undoubtedly many children or adolescents were initiated by friends (Ackerly and Gibson 1964; Borozovsky and Winkler, 1965; Chapel and Taylor, 1970) and went on to experiment out of a sense of curiosity (Yancy, Nader and Burnham, 1972) or bravado, yielding sometimes to peer pressure. The

commonly cause psychological addiction. If, however, a subject is sufficiently desperate to procure glue as to steal it, forge bank-notes in order to pay for it (Kupperstein et al., 1968) or require to be chained to a bed to prevent him getting out to obtain a supply (Ackerley et al., 1964), then the distinction between physical and psychological addiction surely becomes of academic importance only (Done, 1967).

In the literature available, one factor frequently mentioned in association with glue sniffing children is that of alcoholic, hostile or unloving parents (Cohen, 1973; Ellison, 1965; Gregg, 1971). The actual prevalence of alcoholism among the parents of glue sniffers is difficult to determine because much of the existing information is descriptive rather than analytic. In view of this, the extant literature on the children of alcoholics was carefully studied and the resultant information, once collated, indicated clearly that parental behaviour is of vital importance in determining the attitudes and values of children. Many of them, for instance, had taken their first drink at home (O'Rourke, Gough and Wilson-Davis, 1974) and had later adopted drinking patterns similar to those of their parents (Burk, 1972; Hecht, 1973; Prendergast and Schaefer, 1974; Sloboda, 1974). Marital instability tended to occur more frequently in homes where alcohol constituted a problem (Chafetz, Blane and Hill, 1971) and, quite apart from the parents themselves, the other members of the family were invariably affected in a number of ways (Kammeier, 1971). There was no submission in the literature that the children of alcoholics would sniff glue but, if there is any correlation, it

would surely be that all too often children are merely imitating their parents and turning to a readily available form of intoxication to help them cope with their problems.

Let us now turn to the effects of solvent abuse and the type and extent of damage likely to result from the practice. The organic solvent most often found in adhesives and plastic cements was toluene (National Clearinghouse, 1962), though of course there were others including benzene, cyclohexane, hexane, tricresyl phosphate and xylene in various combinations (Barman et al., 1964; Gellman, 1968; Malcolm, 1968). These were also likely to be present in lacquer thinners and enamels (Glaser and Massengale, 1962). Cleaning fluids, on the other hand usually contained at least one from the following - perchloroethylene, trichloroethane, trichloroethylene and carbon tetrachloride (Cohen, 1973; Malcolm, 1968).

Lighter fluids were found to contain a mixture of aliphatic hydrocarbons particularly naphtha (Ackerly et al., 1964), while nail polish removers contained acetone and aliphatic acetates (Gellman, 1968).

Freons, a series of fluorinated-chlorinated hydrocarbons, are used to propel aerosol contents and may also be used as refrigerants (Cohen, 1973).

Characteristically these solvents are readily soluble in fats, poorly soluble in water and have low boiling points which make them

volatile at room temperatures (Blatherwick, 1972). They affect the lipid components of cells, especially those of the central nervous system (Malcolm, 1968).

Many of the solvents used deliberately for inhalation were already all too familiar features of accidental poisoning, industrial exposure or animal experiment recognised as having serious toxic effects including fatalities and it was therefore logical to study these with a view to assessing the damage which might be expected.

Trichloroethylene is widely used as an industrial degreasing and dry-cleaning agent besides its more familiar role as an anaesthetic agent.

In 7 dogs anaesthetised using trichloroethylene, severe cardiac arrythmias were noted (Waters, Ortho and Gillespie, 1943) and in anaesthetised humans, the same phenomenon was observed (Lloyd, Moore and Breslin, 1975). In 4 cases involving people exposed industrially in a degreasing plant and one in a dry-cleaning establishment (Bell, 1951), ventricular fibrillation caused by the trichloroethylene was thought to have led to death (Kleinfeld and Tabershaw, 1954).

Permanent trigeminal neuropathy was reported in the case of a 33 year-old man following only 6 weeks of industrial exposure to trichloroethylene (Mitchell and Parsons-Smith, 1969). Another case involving accidental exposure to trichloroethylene resulted in a 41 year-old man developing renal failure but the patient subsequently

recovered (Gutch, Tomhave and Stevens, 1965).

Benzene, which is widely used in the manufacture of rubber, linoleum and plastics, is also a solvent for paints, lacquers and varnishes (Baker and Tichy, 1953). In man, acute exposures to it may cause headache, nausea, vomiting and even unconsciousness. Chronic poisoning by benzene is particularly harmful to the haemopoietic system and in one particular study of 4 shoemakers exposed to benzene for periods of 6 - 14 years, all had developed acute leukaemia (Aksoy et al., 1972).

Toluene, which is related chemically to benzene, exerts an even stronger narcotic action and can also cause depression of the bone marrow. In a study of 106 painters, who were exposed to toluene for periods varying from 2 weeks to 5 years, the abnormalities found to be present were liver enlargement, reduced erythrocyte counts and absolute lymphocytosis (Greenburg et al., 1942); and of 1000 workmen exposed for only 1 - 3 weeks to toluene fumes at concentrations varying from 50 to 1500 p.p.m., 1% showed changes consistent with aplastic anaemia (Wilson, 1943).

Mice, exposed to glue fumes containing toluene, developed sinus bradycardia and the heart was sensitised to asphyxia-induced atrio-ventricular block (Taylor and Harris, 1970).

Trichloroethane, which is widely used industrially as a solvent and cleaning agent, is noted for its low toxicity. However, in 6 cases,

death had occurred in situations where the substance had been used in enclosed spaces without ventilation and it was therefore concluded that the fatalities were due to respiratory arrest, shock or ventricular fibrillation (Stahl, Fatteh and Dominguez, 1969).

As a result of an animal experiment using dogs, a variety of volatile substances was found to sensitise the ventricle to the fibrillating effects of adrenaline. The solvents in question included benzene, carbon tetrachloride, chloroform, gasoline, toluene and xylene (Chenoweth, 1946).

In the human field 2 workmen, employed in the vicinity of a leaking tank used to store aviation spirit, were overcome by the petrol fumes and one unfortunately succumbed (Lawrence, 1945). Again, of 72 children accidentally exposed to gasoline and kerosene, 11% died and it was found the toxicity of these substances was greatest when they were inhaled or aspirated subsequent to being taken orally (Nunn and Martin, 1934).

n-hexane is a solvent widely used in Japan in printing and cleaning processes and also in vegetable oil extraction. A study of 1662 sandal makers, aged 10 - 75 years, continuously exposed to n-hexane, revealed 93 cases of polyneuropathy. The chief manifestation was sensory loss of the glove and stocking type, although optic nerve involvement occurred in 8 of the cases (Yamamura, 1969).

In a series of experiments on mice, rats and dogs, the fluoroalkaline

gases (used to propel aerosol contents) were found to cause cardiac sensitisation and arrythmias. The onset of the effects was found to be rapid, non-reversible and fatal (Kilen and Harris, 1972; Reinhardt et al., 1971; Taylor and Harris, 1970). This was considered to be a possible explanation of sudden sniffing deaths. Some opinion suggests it is also a cause of sudden deaths in asthma cases (Kilen and Harris, 1972; Reinhardt et al., 1971) but this has been refuted by other authors (Dollery, 1971; Jack, 1971; McClure, 1972).

Hair lacquer has been implicated as a possible cause of thesaurosis, a lung-storage disorder to which hairdressers are believed to be particularly prone (Taub, 1972; Ward, 1972), although this has been disputed (Gowdy and Wagstaff, 1972).

There emerge major differences between the deliberate inhalation of solvents and industrial exposure to such (Watson, 1976c). These are quite specific:-

(1) the agent is different in that industrial vapour is normally a single one, whereas the solvent sniffer tends to inhale a whole range of vapours

(2) the host is different, the one being an adult the other most often a child or young adolescent

(3) the exposure is different because in industry it represents a long period while the deliberate inhaler absorbs a high concentration over a relatively short period.

The Maximum Allowable Concentration of toluene for industrial

operations has been set at 200 parts per million. The concentration of toluene achieved during inhalation from a bag containing toluene-based glue has been estimated by the Illinois Bureau of Toxicology to be 50 times this allowable concentration (Press and Done, 1967).

Carbon tetrachloride and to a lesser extent the other halogenated hydrocarbons, such as tetrachloroethylene (perchloroethylene), trichloroethylene and trichloroethane, which are used in dry-cleaning substances, are capable of producing acute liver and/or kidney damage.

For example 19 cases of acute renal failure secondary to carbon tetrachloride intoxication were reported in 1962 (New et al., 1962). Haemodialysis with the artificial kidney was performed in the case of 8 patients, one of whom died from overwhelming pulmonary infection.

Again a 19 year-old with a history of repeated gasoline sniffing carried on over a 7 year period turned subsequently to carbon tetrachloride, whereupon he promptly became acutely unwell because of the development of pancreatitis, proteinuria and haematuria (Durden and Chipman, 1967).

On the other hand, a 24 year-old man habituated to chloroform for 7 years was found to have only minimal hepatic dysfunction (Weinraub et al., 1972).

However 6 glue sniffers, 5 of whom had homozygous sickle-cell disease,

developed erythrocytic aplastic crises secondary to the glue sniffing. Recovery was rapid and complete in 5 cases after the use of the offending agent was discontinued. The sixth patient, previously normal, died from aplastic anaemia (Powars, 1965).

A 16 year-old youth was diagnosed as having a brain tumour until his glue sniffing practice, which had extended over 6 - 8 months, came to light as the true cause of his malaise. Within a week he had completely recovered (Barman et al., 1964).

Electroencephalographic tracings have been studied in selected cases of glue sniffing and some abnormalities have been observed (Baerg and Kimberg, 1970; Borozovsky and Winkler, 1965; Satran and Dodson, 1963). These have generally been of a transient nature, however, and therefore of doubtful significance. Although in one case of chronic toluene sniffing, the subject, who had developed encephalopathy as a result of the practice, was found to have diffuse electroencephalographic slowing (Knox and Nelson, 1966).

Polyneuropathy, already known to have occurred in some cases where the subjects were working with glue containing n-hexane, has also been recorded in relation to glue sniffers. As in the cases of industrial exposure, the most obvious manifestation was a glove-stocking sensorimotor disturbance which did eventually recover (Gonzalez and Downey, 1972; Goto et al., 1974; Korobkin et al., 1975; Shirabe et al., 1974), although in one case the sensory function remained unimpaired but muscular atrophy developed (Suzuki, Shimbu

and Nishitani, 1974).

Though some doubts may linger regarding the possible toxicity of deliberate volatile inhalation, there can be no doubt about the fatalities. Over 100 people died from the effects of solvent sniffing in Japan in 1968 (Cohen, 1973). In 1969 the total rose to 161 (Alha, Korte and Naeminen, 1974). One author published a report of 110 sudden sniffing deaths, all of which had occurred in the United States of America during the 1960's (Bass, 1970) and another reported 65 deaths (Reinhardt et al., 1971). Twelve deaths occurred in Finland between 1968 and 1971 (Alha et al., 1974) and sporadic reports of individual deaths from glue sniffing have also appeared in Canada (Musclow and Awen, 1971), California (Baselt and Cravey, 1968) and Scotland (Ward, 1971).

Reference is made in the literature to the fact that the glue sniffing problem had spread not only geographically but also numerically, since the first incidents were noted in California in the late 1960's. It went even further and claimed that the practice constituted a considerable threat in many communities (Glaser and Massengale, 1962; Kupperstein and Susman, 1968; Winick, 1962), reaching even epidemic proportions in some places (Bass, 1970; Ellison, 1965; Press and Done, 1967). Reports that the size and scope of the problem seemed to be growing appeared not only in medical journals but also in the national press (Freer, 1963; National Clearinghouse, 1964; Wallace, 1967).

Despite all this it remains extremely difficult to find incidence and prevalence statistics relating to what was alleged to be a widespread

problem. However, sufficient concern about the far-reaching aspects of the problem had been engendered by the 1960's to lead to the introduction of legislation covering solvent abuse in California, Connecticut, Florida, Illinois, Louisiana, Maine, Maryland, Massachusetts, Michigan, New Jersey, New York, Puerto Rico and Rhode Island (Kupperstein et al., 1968).

This legislation expressly prohibits the 'sale, distribution, purchase and/or use of plastic cement or solvent-type glue for the purpose of inducing intoxication or otherwise altering the state of consciousness'. It thereby put solvent abuse effectively into the realms of adult crime punishable by terms of imprisonment (Mueller, 1967). The introduction of legislation rendered it possible to collect some statistics on the extent of the problem.

In New York, for instance, 2003 cases of glue sniffing were reported in 1963 (Allen, 1966). The number of arrests of glue sniffers increased in Denver from 30 in 1960 to 184 in 1964 (Corliss, 1965). Similarly in Los Angeles it rose from 41 in 1961 to 136 in 1962 (Barker and Adams, 1963) and in Chicago 47 glue sniffers came to the attention of the Police Department between May, 1962 and October, 1962 (Sterling, 1964).

By 1967 it was estimated that approximately 50% of Denver males aged between 10 and 17 years had experimented with glue on at least one occasion (Cohen, 1973) and in Winnipeg in Canada, it was estimated that by 1966 between 2% and 5% of all school children had been

involved at least once (Gellman, 1968). These were, of course, only estimates but more accurate information was returned from surveys of drug usage conducted in America, Canada, Denmark and Nova Scotia.

A survey of drug use was conducted by means of questionnaires circulated to 551 white middle-class Jewish adolescents attending private schools in New York. The results indicated that glue or cleaning fluid had been inhaled at some time by 3% of them (Milman and Su, 1973).

Another survey on drug use was carried out by means of questionnaires given to 56,745 students in 43 junior and senior high schools in Dallas in 1969. The questions contained in the questionnaire comprehensively covered every aspect of drug use including cigarettes and alcohol and employing separate categories for the various substances containing solvents (Gossett, Lewis and Phillips, 1971). In all, 29% of the students had inhaled solvents at least once and glue proved to be the most popular agent (10%) followed by nail polish remover (8%) lighter fluid (5%) and aerosol sprays (3%).

Between January and July, 1971 a questionnaire on previous drug use was completed by 19,948 consecutive male entrants to a military training centre in the midwest of America and 4% admitted previous indulgence in glue sniffing (Patterson, 1974).

A study to determine the patterns of drug use among college and university students in the State was conducted in Georgia in the spring of 1972. Of 24,609 students who completed the questionnaire,

9% were currently sniffing glue and 4% had experimented with it at least once (Strimbu and Sims, 1974).

Some of the studies, to which reference has been made, requested information on glue alone and did not include other substances. Again most of the surveys were aimed at determining point-prevalence only and therefore gave no information on trends of drug use with time, so the information thereby afforded is likely to be incomplete.

One study of drug use, however, was carried out by means of a questionnaire administered to 6,447 school students in Toronto between 1968 and 1970 and to 1,606 school students in Halifax between 1969 and 1970 and this proved to be much wider in scope. In Halifax it was found that use of most drugs including glue had significantly increased and the number of cases of glue sniffing rose from 3.1% in 1969 to 7.2% in 1970. Conversely, the percentage in Toronto fell from 5.7% to 3.8% between 1968 and 1970. The participants in glue sniffing episodes tended to be younger children which was quite unlike the pattern of drug use generally (Fejer, Smart and Whitehead, 1972). Follow-up studies on the trends of drug use were carried out in Toronto in 1972 and 1974 and the percentage of children involved was found to have increased from 2.9% in 1972 to 3.8% in 1974 (Smart and Fejer, 1975). No explanation was offered for this variation in prevalence.

In Anchorage, Alaska in 1971, 15,634 school students aged 10 - 20 years were invited to complete a widely based questionnaire on the

use of drugs and solvents. 16.6% reported solvent abuse on at least one occasion and 5.5% on 10 or more occasions (Porter et al., 1973).

An investigation into the prevalence of drug use in 2 areas of Denmark was carried out in 1972 by questionnaire or interview. From this the prevalence of glue sniffing was found to be 0.8% in the one area and 0.9% in the other (Boolsen, 1975).

Despite the very considerable variation in the prevalence of solvent sniffing geographically it is obvious that an impressive total of children and adolescents throughout the world had at least experimented with the practice and it was equally clear that the younger age groups were those mostly attracted.

Although reference to the practice in a general context has been made in the literature since the late nineteen fifties, it was not until 1970 that the police in Lanarkshire first commented on the existence of a similar problem occurring locally.

The incidents which alerted police personnel sometimes involved a disturbance of the peace or the use of threatening language, and the individuals who came to attention were teenagers of both sexes who had been deliberately inhaling the vapours of various substances in common domestic and industrial use. The condition which immediately follows an episode of solvent abuse most closely resembles acute alcoholic intoxication and was in fact initially mistaken for it. Indeed it was only during interview by the police that the real

reason for inebriation was identified. The police for their part feared that the resultant loss of inhibition might lead youngsters to commit such offences as robbery, vandalism or assault on innocent people. This however is to do less than justice to the attitude of the police who, from the outset, adopted a sympathetic approach to the problem in a constructive effort to prevent addiction, disorder, disease and even death, any one of which they realised could be the result of solvent abuse.

Initially solvent abusers were almost exclusively the problem of the police because of the antisocial activities preceding or resulting from the practice, but other community groups became increasingly involved, although some of these continued to consider the matter outwith the limits of their personal or professional responsibility.

The first study of solvent abuse in Lanarkshire was conducted between October, 1973 and May, 1974 while the investigator was currently studying within the Department of Community Medicine, University of Glasgow. It was based entirely on police statistics as representing the only data then available on the practice. Access to personal identifying details such as name, address and date of birth was not of course permitted.

Results indicated that solvent abuse in the area was largely a group activity, predominantly involving males between the ages of 9 and 17 years with antisocial tendencies (Watson, 1975). There tended to be a clustering of cases within certain schools and in specific geographical areas.

This research, although interesting, was severely limited in its scope since it relied wholly on statistics that were likely to be incomplete. They would not, for instance, include sniffers who, for various reasons, had escaped police detection e.g. those who remained law-abiding or who confined their sniffing practice to the home environment.

An attempt to conduct a survey in Lanarkshire, with a view to determining the prevalence of solvent abuse among school children, failed because of press coverage. From a subsequent opinion survey conducted among professional personnel and parents, it was obvious that all of the 48 participants were aware of the existence of solvent abuse. It was particularly disconcerting to find that the only 2 people who did not consider the practice harmful to health belonged, in fact, to the medical care group (Watson, 1977a).

The present study was undertaken in Lanarkshire (now the Lanark Division of Strathclyde Region) to provide detailed information about the effects and toxicity of glues and other solvent-based materials, the vapours of which could be misused; to establish further details of the epidemiological and sociological aspects of the practice; to investigate the extent of solvent abuse and its causal factors.

In order to compile all the available information on prevalence, trends and other details of the practice, it has been necessary to study statistics gleaned from the police (chapters 2 and 3), from Social Work Departments (chapter 4), from Lanarkshire's Assessment

Centre (chapters 5 and 6) and from hospital referrals (chapter 8). Each of these contributed a proportion of information the sum of which the investigator has tried to present as a unified whole (chapter 9).

CHAPTER 2

A RETROSPECTIVE STUDY OF SOLVENT ABUSE

2.1 INTRODUCTION

Sniffers in America frequently came to the attention of the law-enforcement agencies because of the disruptive behaviour associated with the practice. It was not always clear, however, whether the solvent sniffing itself had caused the delinquency or whether it was merely a symptom of it. Of 12 cases studied in Texas (Ackerly and Gibson, 1964) all had a history of anti-social activities prior to the onset of their sniffing practice and in a study of 47 glue sniffers referred to the police in Chicago (Sterling, 1964) all had previous offences.

A variety of age ranges have been quoted in different American series, although it has been pointed out that solvent sniffers form a more homogeneous group than other drug abusers. Age ranges of 7-17 years (Cohen, 1975), 8-18 years (Corliss, 1965), 12-16 years (Dodds and Santostefano, 1965), 13-17 years (Press and Done, 1967) and 9-17 years (Sterling, 1964) have been recorded.

The preponderance of males over females is a further characteristic of the case records and this is thought to reflect the nature of the agency involved i.e. the police whose activites would bring them into contact with more males than females.

Like their American prototypes solvent sniffers in Lanarkshire were often discovered by having been brought to the attention of the police. The previous study of recorded police cases of solvent sniffing also demonstrated a greater number of males involved than females, but only in the ratio of 3:1. This significant variation from American statistics is thought to be because of the total lack of legislation obtaining in this country in the field of solvent abuse.

Although the degree of involvement with solvents differed considerably,

it was stated by several authors that those individuals who had habitually sniffed glue or other substances would, in time, graduate from the habit to the abuse of alcohol or drugs (Cohen, 1973; Dodds and Santostefano, 1964; Editorial B.M.J., 1962). If solvent abuse is to be regarded as the symptom of a social, psychiatric or emotional problem rather than an entity (Ellison, 1965; Malcolm, 1968; Thomas, 1967), it would appear possible that sniffers might be predisposed to the misuse of substances generally, in an effort to provide themselves with a crutch.

Little information is available on the length of time involved in the progression from solvent abuse to drug and/or alcohol abuse, or again on the age of the individuals concerned although in a follow-up study of 468 cases of glue sniffing commenced in 1963 in New York 34, most of whom were under 16 years, were found to have progressed to the use of narcotics (Davis, 1967). Again in a study of 47 opiate addicts aged 16-43 years in Delaware in 1970, it became clear that almost half of the cases had originally experimented with glue sniffing (Kramer, 1972).

The present study was undertaken in Lanarkshire not only with a view to collecting demographic details regarding the individuals involved and information on the sniffing practice itself, but also to ascertain if an association existed between solvent sniffing and anti-social activities. It also attempted to determine whether or not those who sniffed solvents were any more likely to become involved in subsequent drug or alcohol abuse than were the control subjects.

2.2 LOCAL BACKGROUND

In the period prior to 1st May, 1971 solvent sniffers who came to the attention of police officers on a beat were duly reported to Lanarkshire Constabulary's Drug Squad, the nerve centre of which was

in Hamilton.

However on 1st May, 1971 there was formed within Lanarkshire Constabulary a Community Involvement Branch operating locally in Motherwell, Coatbridge, Hamilton and East Kilbride i.e. one office for each of the 4 Lanarkshire Constabulary Divisions - Central Division, Northern Division, Southern Division and Western Division (fig. 1). This Community Involvement Branch was designed to deal exclusively with all aspects of crime prevention and, with a view to this, its field workers received special instruction regarding not only the dangers of drug and solvent abuse but also their detection.

From 1st May, 1971, the supervision of all sniffers came within the responsibility of this Branch and its personnel followed up a number of cases on a regular home-visit basis. There were other cases, however, who had been earlier referred to the local Social Work Department on different grounds and though naturally they were brought to the attention of the Community Involvement Branch, their follow-up routine remained within the province of the Social Work Department.

The function of the follow-up process by the Community Involvement Branch personnel was purely a supportive one, attempting as it did to warn children about the dangers of solvent inhalation and offering them encouragement and help to abandon the practice. Further effort had to be restricted since no legislation on solvent abuse yet exists in this country.

Details of all children, including sniffers, who were brought to the attention of the Community Involvement Branch were recorded by Community Involvement Branch officers on Juvenile Supervision cards (fig. 2) and information was confined to name, address, age, school and date of referral on one side. On the reverse side of the card, further information was noted regarding the nature of referral and subsequent follow-up.

LANARKSHIRE CONSTABULARY

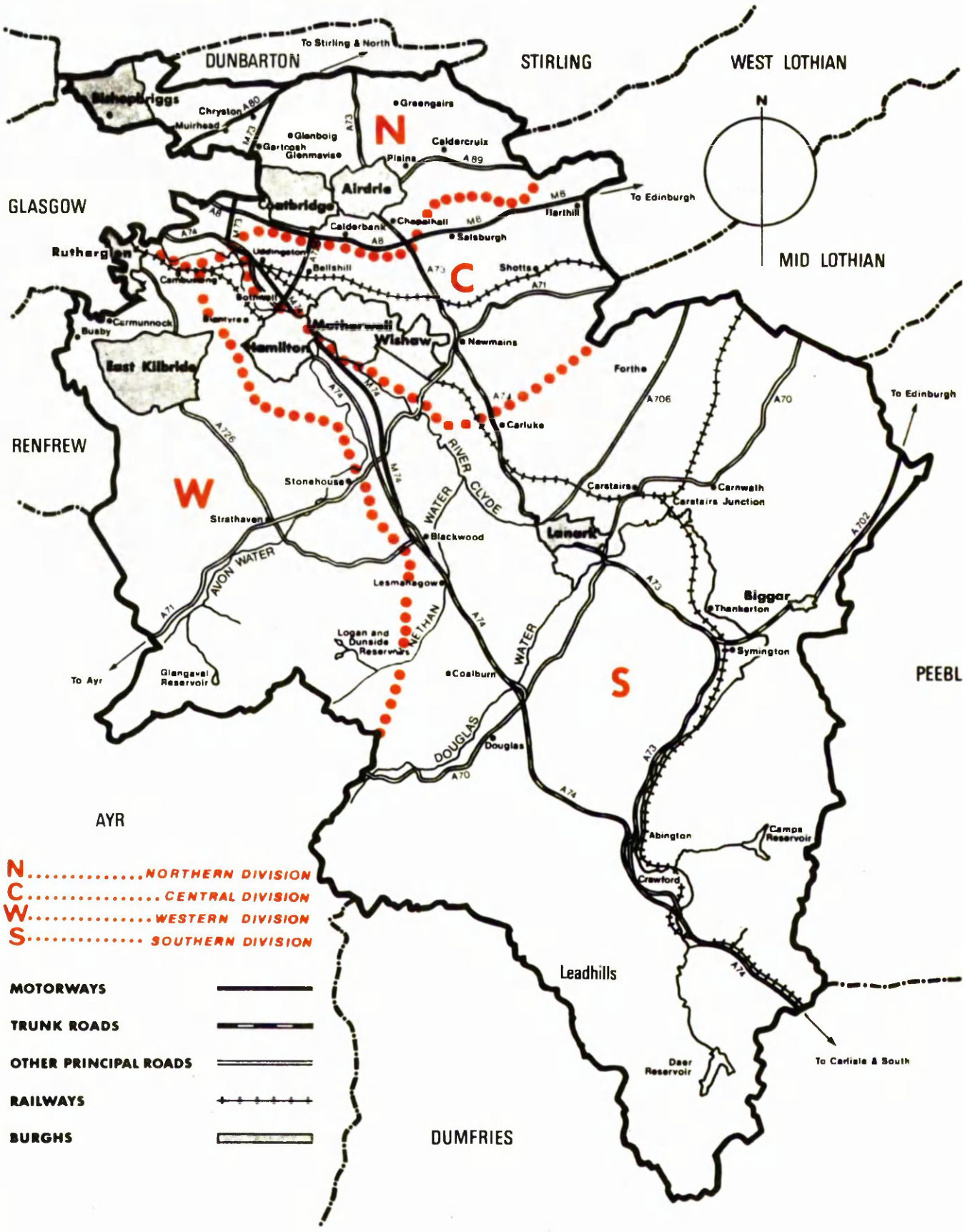


Fig. 1 Map giving details of areas covered by the divisions of Lanarkshire Constabulary.

FORM NO.J3

LANARKSHIRE CONSTABULARY

JUVENILE SUPERVISION CARD

NAME AGE

ADDRESS

SCHOOL NOW OR LAST ATTENDED

REFERRED TO C.I.BRANCH ON

Fig. 2(a) Juvenile Supervision Card - front.

DATE	ACTION BY C.I.BRANCH

Fig. 2(b) Juvenile Supervision Card - reverse side.

2.3 APPROACH AND METHODS

Permission was requested for access to the Juvenile Supervision cards and this was granted by the Chief Constable of Lanarkshire in November, 1974. The study was conducted between 1st February and 31st May, 1975.

2.3.1 Population Studied

The Juvenile Supervision cards of all solvent sniffers who had come to the attention of Community Involvement personnel in each of the 4 Divisions between 1st May, 1971 and 31st December, 1973 were studied and a questionnaire completed for each case.

2.3.2 Control Group

A control group was formed from 650 cases exclusive of sniffers, for whom Juvenile Supervision Cards had been completed during the same 32 month period. These latter cases covered a similar age and sex range and, like their counterparts among the sniffers, had been warned at the time of referral but not charged by the police on account of anti-social activities such as malicious mischief, breach of the peace or shoplifting. Since no evidence existed that these individuals had any experience of solvent abuse, they were deemed to be a suitable control group.

The two groups were matched on an individual basis for age, sex and exact place of residence but it was not found possible to match the cases for religion because the requisite information was not always available. Another factor which was considered important to match was the month and year of referral and all test cases, therefore, were matched on an individual basis with control cases which had been referred not more than 4 months before or after the date on which the test cases were referred. No suitable match could be found for 9 of the test cases and these were consequently excluded from the present study.

2.3.3 Questionnaire Design

A questionnaire was prepared to collect demographic data about the individuals involved in the practice of solvent abuse as well as detailed information on the practice itself; and to examine the possibility of an association between solvent abuse, anti-social activities and drug/alcohol abuse. The questions were phrased in such a way as to leave ample scope for including the maximum amount of detail and were not pre-coded. Answers to all questions were completed by the investigator for each individual test and control case. The questionnaires were then sorted by the investigator and the range of answers obtained for each question was then used to prepare a data coding sheet.

There were two reasons for post-coding, the main one being that it was not possible to predict the possible range of answers sufficiently accurately to be able to pre-code the range of replies. The other reason for post-coding was that the answers to specific questions i.e. on offences and drug abuse were not available at the time the questionnaires were completed.

Information obtained from the questionnaires was then transferred to the data coding sheets, one of which was prepared for each case and the appropriate box for each question was marked. Details of the questionnaire and post-coded categories are given in Appendix 1.

In order to protect the confidentiality of each of the individuals no name, address or school was included in the data coding sheets. Instead each subject was given a unique 3 figure code number which appeared in the boxes for the first 3 columns of the data coding sheet. Address was reduced to rural or urban area in the data coding sheet. Finally the answers were coded within the boxes in the right hand margin of each page opposite the relevant questions, the boxes being

numbered according to the columns of the 80 column punch card required for each case.

2.3.4 Data

The date of and reason for referral to the Community Involvement Branch was recorded in each case.

The demographic data consisted of details about age, sex, place of residence and school attended in each case.

Information about solvent abuse subsequent to the date of referral was directly available from the Juvenile Supervision cards along with relevant data about the practice.

Details of drug abuse subsequent to the date of referral were obtained from Drug Squad personnel, who checked the names of all test and control cases against the register of those charged with infringement of the Misuse of Drugs Act, 1971. No details were revealed except information as to whether or not an infringement of the Act had occurred and which drug was involved.

Details of alcohol abuse were less specific. For the purposes of this retrospective study alcohol abuse was defined as:- 'frequently noted by the police to be drunk'. It was assumed that any evidence of bias or selectivity would apply equally to the two groups as all were police cases living in the same areas.

Data concerning offences which had been committed either by test or control cases were obtained indirectly from Community Involvement personnel who checked the names against the register of Lanarkshire Constabulary's Convictions on Juvenile Crime to which the investigator had no access. In view of the number and complexity of classified crimes and offences and the lack of direct access to criminal records, the only information available was evidence of an offence, where applicable, and whether or not it was related to drink.

In 7 of these cases (4 being test cases and 3 controls) where there was some slight doubt as to the reliability of the information provided, owing to discrepancies in the details (such as address or date of birth) on the Juvenile Supervision card and these on the Criminal Record sheet, no cognisance was taken of any possible offences. For the purposes of this study therefore, these young persons, though included, were deemed not to have committed any offence.

2.3.5 Data Handling

Details from the fully coded questionnaires were punched directly on to 80 column cards using a hand punch machine. Only 1 card was required for each case. Data handling of information on actual place of residence and school attended was completed manually. Otherwise data handling was carried out by the Glasgow University computing service on an I.B.M. computer of the 370 series using standard Fortran programming language. The program consisted of standard Fortran procedures with specially written sub-routines. The resulting print-outs were studied, 5 errors being subsequently detected and corrected.

2.3.6 Data Analyses

The analyses consisted mainly of descriptive tables and histograms of age and sex distribution, urban and rural distribution and seasonal distribution relating to both test and control cases. The significance of differences between the 2 groups on many of the factors was assessed by means of chi-square tests. Completion of the statistical analyses was facilitated by means of a desk calculator.

2.4 RESULTS

General Data

A total of 761 persons had come to the attention of Lanarkshire Constabulary's Community Involvement personnel between May, 1971, and December, 1973, and of these 111 were referred because of their

solvent sniffing practices. This represented 14.6% of the total cases reported during that period and when the numbers for each of the Police Divisions had been considered independently, it was found that this represented 17.6% in the Central Division, 11.4% in the Northern Division and 15% in the Western Division (Table 1). No cases of solvent abuse came to the attention of personnel in the Southern Division during the period studied. The percentages have been corrected to 1 decimal place.

Police Division	Total No. of referrals	No. of sniffers	% of total
Central Division	336	59	17.6%
Northern Division	325	37	11.4%
Western Division	100	15	15%
Total	761	111	14.6%

TABLE 1 : REFERRALS 1971-1973 BY POLICE DIVISION.

102 control cases and 102 of the 111 sniffers were carefully studied, the remaining 9, for whom no suitable controls could be found, being included in the statistics in chapter 3.

Demographic Data

There were 73 males and 29 females in each of the two groups and of these 63 of the males and all but one of the females lived in urban areas (Table 2). Irrespective of whether they lived in urban or rural area, however, all had confined their solvent sniffing activities to the town nearest their homes.

Area of residence	Test cases		Control cases	
	M	F	M	F
Urban	63	28	63	28
Rural	10	1	10	1
Total	73	29	73	29

TABLE 2 : NO. OF CASES BY AREA OF RESIDENCE.

In all, out of the total of 102 sniffers referred, there were 17 in 1971, 14 in 1972 and 71 in 1973 and, for the total period, the ages of the young people involved ranged between 9 and 17 years (Table 3). The mean age for the 32 month period was 13.8 years for both test and control cases and the median was 14 years for each group (figs. 3 and 4).

Year of referral	Total No. of cases	Age range (years)	Mean age (years)	Median age (years)	Sex Ratio M : F
1971	17	9-16	14.4	15	2.4:1
1972	14	13-17	14.5	15	2.5:1
1973	71	9-16	13.5	14	2.6:1

TABLE 3 : AGE AND SEX DISTRIBUTION OF TEST CASES BY YEAR OF REFERRAL.

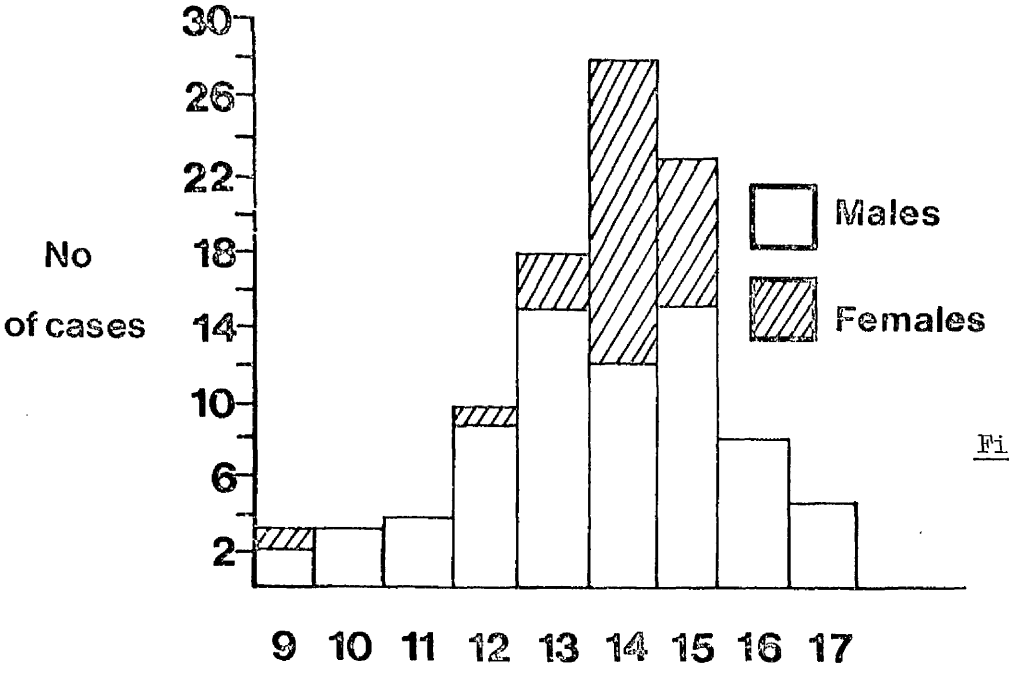


Fig. 3

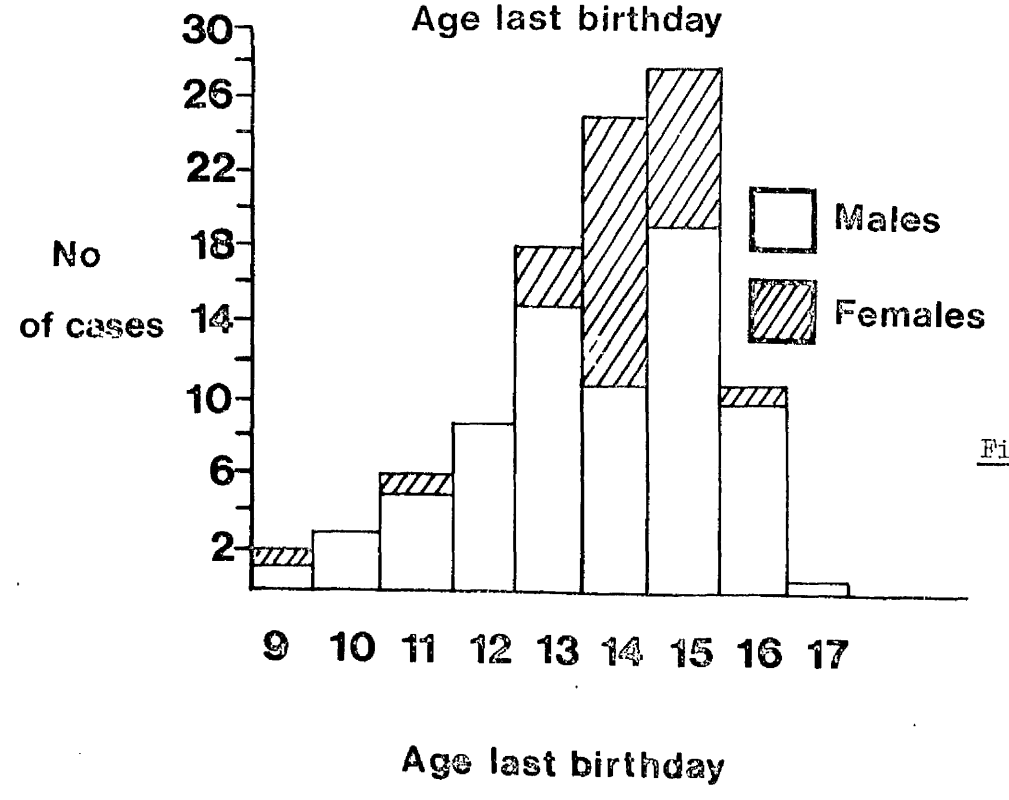


Fig. 4

Fig. 3 Age and sex distribution of test cases.

Fig. 4 Age and sex distribution of control cases.

Year of referral	Total No. of cases	Age range (years)	Mean age (years)	Median age (years)	Sex Ratio M : F
1971	19	9-17	14.4	15	1.7:1
1972	16	13-17	14.6	15	4.3:1
1973	67	9-17	13.5	14	2.5:1

TABLE 4 : AGE AND SEX DISTRIBUTION OF CONTROL CASES BY YEAR OF REFERRAL.

When all the referrals for each year had been considered separately, it was found that, despite a difference in age range in 1971 and 1972, there was little or no variation as regards mean or median. By 1973, however, the mean age for sniffers had fallen from 14.5 to 13.5 years and the median from 15 to 14 years (Table 4).

Seasonal Variation

The number of control cases referred monthly ranged from 2-13 but remained fairly evenly spread throughout the year (fig. 6). In the case of the sniffers, however, 29% of all cases were referred in February and a further 17% in November, these two together accounting for 46% of the total number. No sniffers came to attention in January (fig. 5).

Recurrent Solvent Abuse

No evidence of solvent abuse subsequent to the original date of referral to the Community Involvement Branches was noted in respect of any control cases. However, 28 (27%) of the sniffers had once more come to attention for the original reason, 23 (82%) of them within the first year and the remainder within the second. This represented 25 males and 3 females of whom all but 3 males were from urban areas. The subsequent solvent abuse according to the year of original report is demonstrated in Table 5 and the percentages of total referrals

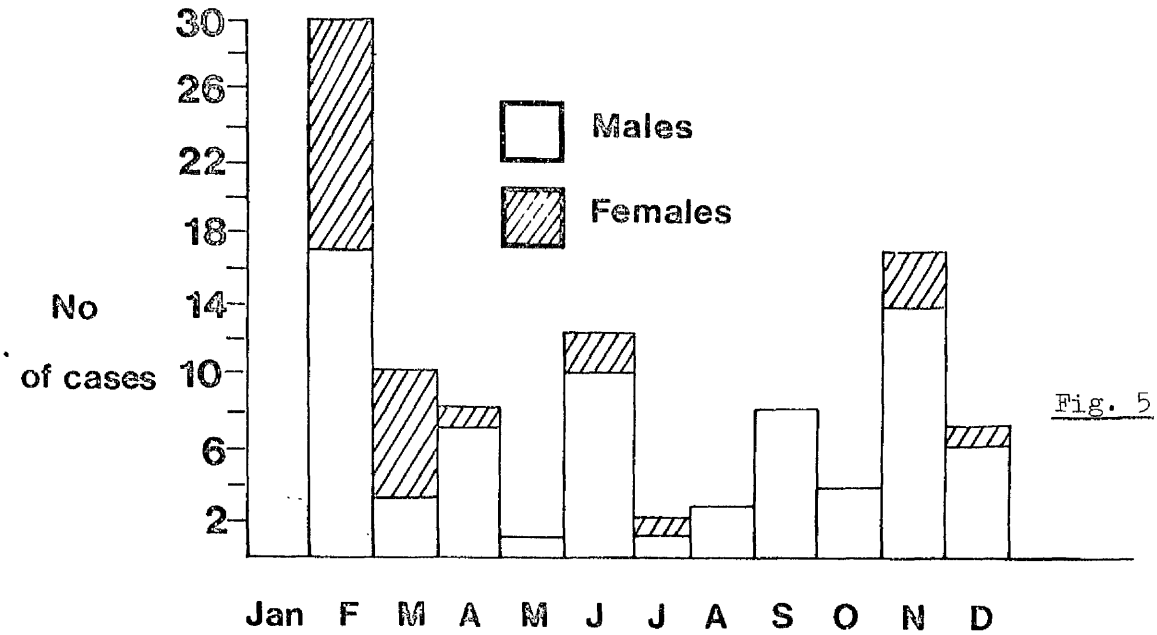


Fig. 5

Fig. 6

Fig. 5 Test cases:
seasonal variation in referrals.

Fig. 6 Control cases:
seasonal variation in referrals.

each year corrected to the nearest whole number and noted in brackets.

Year of original referral	Year of subsequent referral			
	1972	1973	1974	1975
1971	5 (29%)	-	-	-
1972	2 (14%)	2 (14%)	1 (7%)	-
1973	-	2 (3%)	12 (17%)	4 (6%)

TABLE 5 : YEAR OF RECURRENT SOLVENT ABUSE BY YEAR OF REFERRAL.

This demonstrates clearly that 29% of the 1971 referrals came to attention again the following year for the same reason while 29% of the 1972 referrals and 26% of the 1973 referrals came to attention again within the next two consecutive years.

27% of the male cases had recurred within the first year and 7% during the second year. All 3 females had relapsed within one year (Table 6).

Sex	Within 1st year No.	%	Within 2nd year No.	%
Male	20	27%	5	7%
Female	3	10%	-	-
Total	23	37%	5	7%

TABLE 6 : SEX DISTRIBUTION OF RECURRENT SOLVENT ABUSERS.

The total percentage of recurrences for all the years varied within each age-group from zero in the case of the 9 year-old children to 43% for the 15 year-old group with a significant peak of 50% in respect of the 11 year-olds.

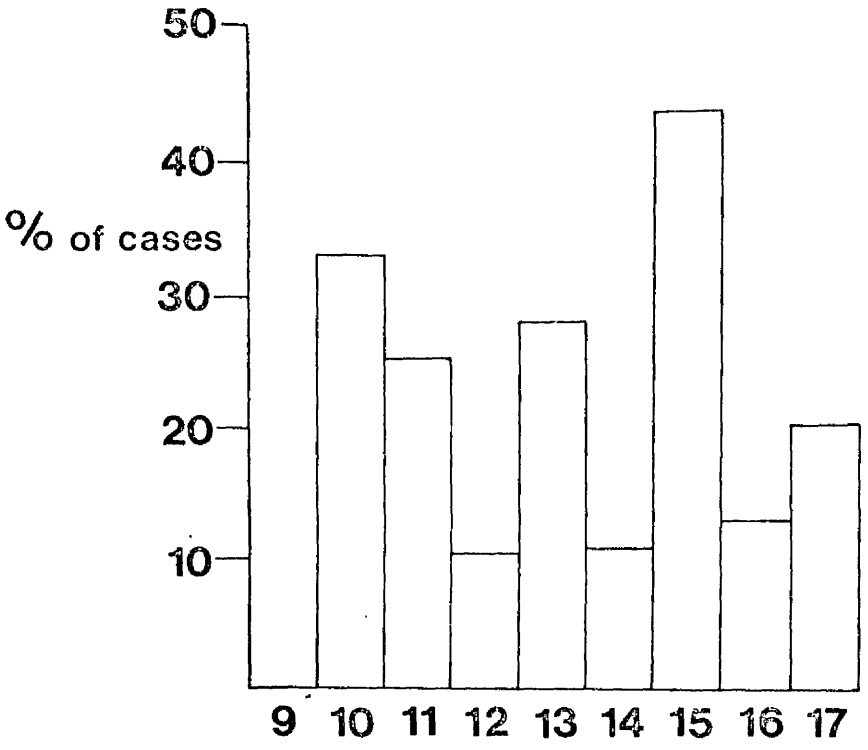


Fig. 7

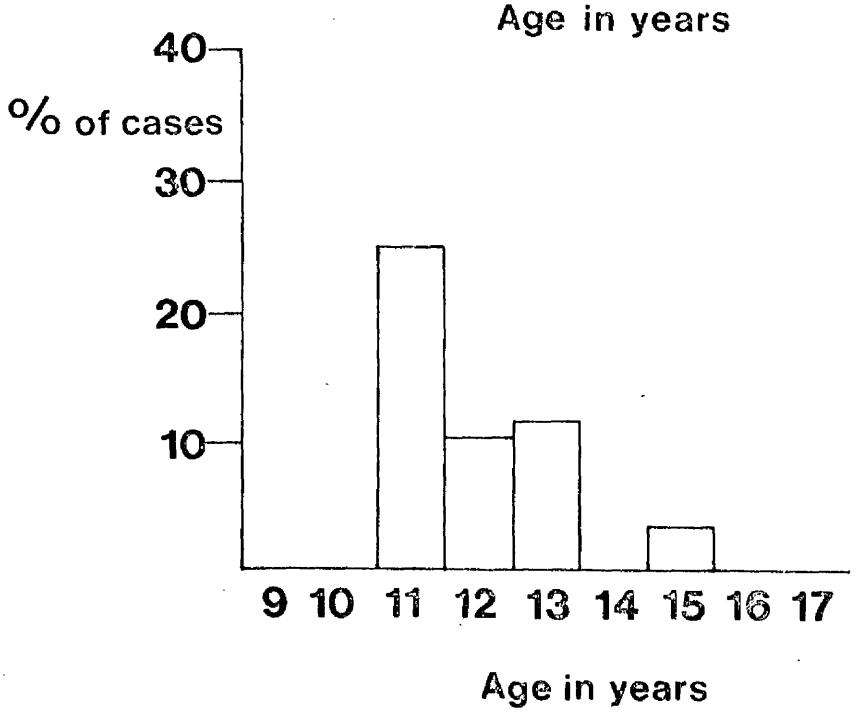


Fig. 8

Fig. 7 Percentage recurrence of solvent abuse within 1 year.

Fig. 8 Percentage recurrence of solvent abuse within 2 years.

When the cases which had recurred within one year were studied separately from those recurring within 2 years, the age-group showing the highest proportion of relapses was that of the 15 year-olds. Within each age-group the percentage of cases which recurred is corrected to 1 decimal place and demonstrated in Table 7 and figs. 7 and 8 .

Age in years	Total no. in age group	Recurrence within 1st year		Recurrence within 2nd year		Total	
		No.	%	No.	%	No.	%
9	3	-	-	-	-	-	-
10	3	1	33.3%	-	-	1	33.3%
11	4	1	25%	1	25%	2	50%
12	10	1	10%	1	10%	2	20%
13	18	5	27.8%	2	11.1%	7	38.9%
14	28	3	10.7%	-	-	3	10.7%
15	23	10	43.4%	1	4.3%	11	47.7%
16	8	1	12.5%	-	-	1	12.5%
17	5	1	20%	-	-	1	20%
Total	102	23		5			

TABLE 7 : AGE DISTRIBUTION OF RECURRENT SOLVENT ABUSERS.

Subsequent Drug Abuse

In 101 of the control cases and 96 of the sniffers, no drug abuse subsequent to the initial referral was reported to have occurred. All of the 6 cases (5 males and 1 female) in whom subsequent drug abuse had been detected lived in urban areas. In each of the 5 cases involving males the drug abused was Cannabis and in the case of the female it was Mandrax. Of the cases involved in subsequent drug abuse the fact that 2 had been referred initially in 1972 and 4 in 1973 i.e. within the short span of 2 - 3 years was particularly disturbing. The only control case where any evidence of drug abuse had been detected was

that of a male living in an urban area and the drug involved was Cannabis.

The percentage of cases within each age-group which had been involved in drug abuse varied between 4% in the 14 year-old group and 80% in the 17 year-old group (Table 8 and fig. 9). The age at initial referral varied from 14-17 years with a mean of 16.3 years which was greater than the mean of 13.8 years found for the total period of the study. It is significant that the control case was also in an older age-group (16 years) at the original time of referral.

Owing to the very small numbers involved, a chi-square test (requiring expected values of greater than 5) was not carried out but the statistics on drug abuse were combined with those on alcohol abuse and a chi-square test completed.

Subsequent Alcohol Abuse

Alcohol abuse has been defined for the purposes of this study as 'frequently noted by the police to be drunk'. None of the control cases, however, had come to attention in this way although 10 (9.8%) of the test cases had come within this definition. All these were males, 5 of them from an urban environment and 5 from rural areas and all had been referred originally during 1973. This represented 8% of the males from urban areas and 50% of those from rural areas.

Their age range at initial referral was 11-16 years with a mean of 13.2 years and a median of 13 years. The percentage within each age group, corrected to 1 decimal place, was found to vary between 4% and 25% (Table 8 and fig. 10). The fact that it was not higher in the older age-groups but more evenly spread is quite unlike the pattern found for drug abuse.

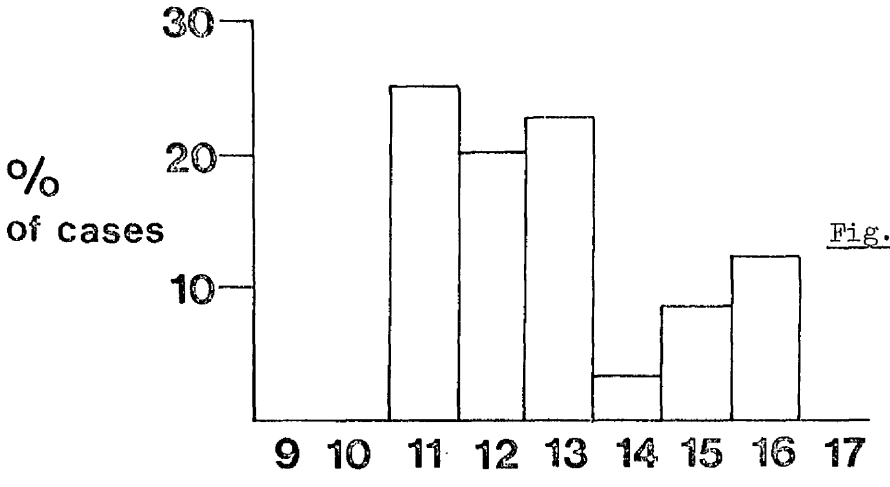


Fig. 10

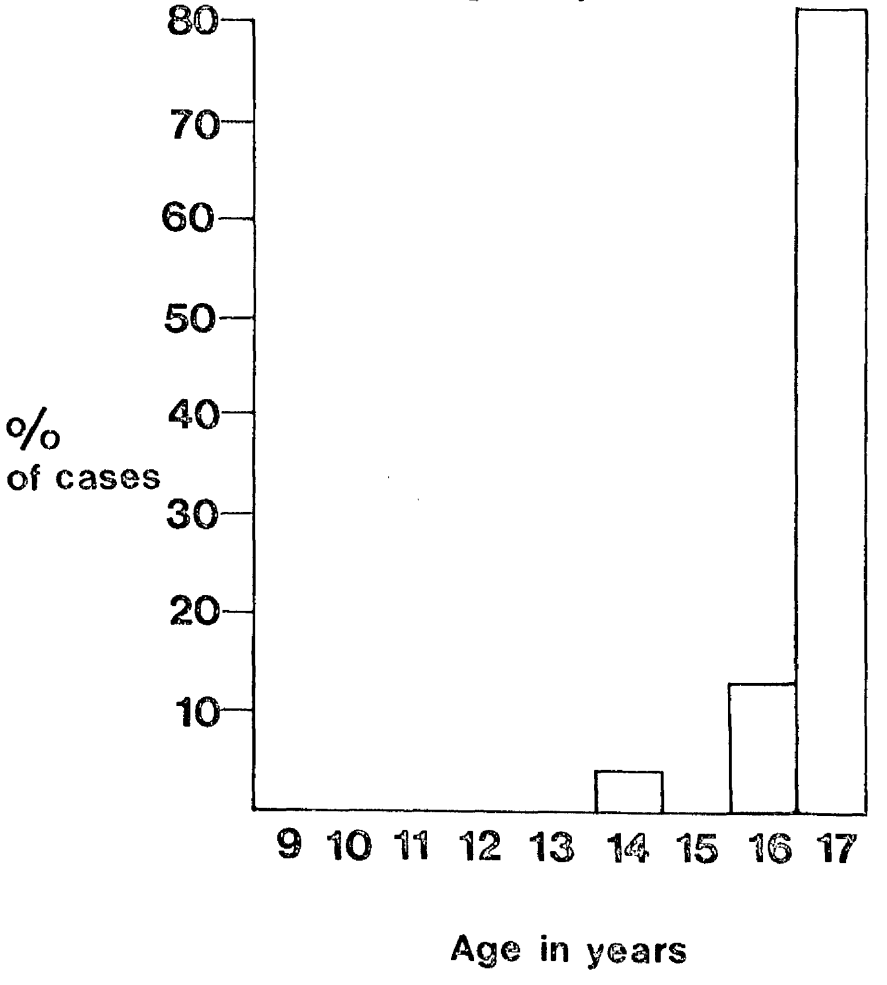


Fig. 9

Fig. 9 Test cases: subsequent drug abuse.

Fig. 10 Test cases: subsequent alcohol abuse.

Age in Years	Total No. in age group	Subsequent alcohol abuse No.	%	Subsequent drug abuse No.	%	Total No.	%
9	3	-	-	-	-	-	-
10	3	-	-	-	-	-	-
11	4	1	25%	-	-	1	25%
12	10	2	20%	-	-	2	20%
13	18	4	22.2%	-	-	4	22.2%
14	28	1	3.6%	1	3.6%	2	7.2%
15	23	1	4.3%	-	-	1	4.3%
16	8	1	12.5%	1	12.5%	2	25%
17	5	-	-	4	80%	4	80%
Total	102	10		6			

TABLE 8 : AGE DISTRIBUTION OF ALCOHOL AND DRUG ABUSERS.

It was found that there was in fact an association between alcohol and drug abuse which was significant at 1% (Table 9). Since 50% of the males from rural areas had been subsequently involved in alcohol abuse, this was considered to be significant but because of the small numbers involved no chi-square test was undertaken.

Cases	Subsequent alcohol abuse	No subsequent alcohol abuse	Total
Sniffers	10	92	102
Controls	-	102	102
Total	10	194	204

$X^2 = 10.5156$ with 1 degree of freedom ($p < 0.01$)

TABLE 9 : SOLVENT ABUSE AND SUBSEQUENT ALCOHOL ABUSE.

When the statistics for drug and alcohol abuse were collated, there was found to be an association between solvent abuse and subsequent drug or alcohol abuse and this was also significant at 1% (Table 10).

Drug abuse and alcohol abuse appeared to be mutually exclusive as no cases studied had subsequently abused both.

Cases	Subsequent drug or alcohol abuse	No subsequent drug or alcohol abuse	Total
Sniffers	16	86	102
Controls	1	101	102
Total	17	187	204

$X^2 = 14.4384$ with 1 degree of freedom ($p < 0.01$)

TABLE 10 : SUBSEQUENT ALCOHOL OR DRUG ABUSE AND SOLVENT ABUSE.

Offences

(a) Prior to present referral

In 32 (31.3%) of the test cases and 47 (46%) of the control cases some offence had occurred prior to the date of the present referral. Evidence of an association between the control cases and offences was found to be significant at 5% but not at 1% (Table 11) and a larger sample would have been required to draw definite conclusions from this.

Cases	Prior offence	No prior offence	Total
Sniffers	32	70	102
Controls	47	55	102
Total	79	125	204

$X^2 = 4.64$ with 1 degree of freedom ($0.01 < p < 0.05$)

TABLE 11 : SOLVENT ABUSE AND PRIOR OFFENCES.

Offences

(b) Subsequent to the present referral

In 53 (54%) of test cases and 64 (62.8%) of control cases, some offence had been committed subsequent to the referral but the degree of variation between the 2 groups was not found to be significantly different (Table 12).

Cases	Subsequent offence	No subsequent offence	Total
Sniffers	53	49	102
Controls	64	38	102
Total	117	87	204

$X^2 = 2.4248$ with 1 degree of freedom ($p > 0.05$)

TABLE 12 : SOLVENT ABUSE AND SUBSEQUENT OFFENCES.

In the case of one sniffer the offence was related to drink only, in 2 cases drink was again involved as well as other offences, and in the case of 1 control both were involved.

Offences

(c) Related to solvent abuse

Leaving aside the offences committed either prior to or subsequent to the present referral, 38 (37%) of the test group had committed offences directly linked to the abuse of solvents, which had in fact brought them to the attention of the authorities. 33 of them, for instance, had committed theft to obtain substances for inhalation, 4 had committed a disturbance of the peace while under the influence and 1 had been involved in both (Table 13).

Percentages have been corrected to the nearest whole number.

Offences related to episodes of solvent abuse	No.	%
None	64	63%
Theft of substances	33	32%
Breach of the Peace	4	4%
Theft and Breach of the Peace	1	1%
Total	102	100%

TABLE 13: OFFENCES RELATED TO SOLVENT ABUSE EPISODES.

The Substances

A wide variety of substances had been used by the young people but, by far the strongest favourites among the agents used were adhesives, which accounted for 47% of all choices. It is clear from the following table that there were definite trends in the popularity of some substances used over the period of time studied (Table 14). Percentages have been corrected to 1 decimal place.

Year	Substances abused	No. of cases	%
1971	Trichloroethylene (industrial)	14	13.7%
1972	paint-thinners	7	6.9%
1972	ether	2	2.0%
1972-1973	dry-cleaning agents	21	20.6%
1973	acetone	3	2.9%
1973	chloroform	6	5.9%
1973	adhesives	48	47.0%
1973	paint-thinner + rubber cement	1	1.0%
Total		102	100.0%

TABLE 14: SUBSTANCES ABUSED BY YEAR OF REFERRAL.

From the above Table, it will be evident that in 1972 industrial trichloroethylene gave way in popularity to paint-thinners. This is explained by the fact that the trichloroethylene, which had been

siphoned into empty lemonade bottles from outside vats at local steelworks in 1971, was, at the request of Lanarkshire's Chief Constable put under lock and key and thereby placed beyond the reasonable reach of the subjects. By 1972 both paint-thinners and dry-cleaning agents were being used and these were largely supplanted in turn by adhesives in 1973. Ether, acetone and chloroform had by this time appeared in the same context and these had all been obtained in school situations when opportunity rendered them temporarily available to the individuals concerned.

The Practice

In only 4.9% of the total cases reported was solvent abuse described as a solitary practice. In the remaining 95.1% it was carried on as a group activity, 55.9% of the total being wholly male groups and 27.4% comprising mixed groups of males and females (Table 15). Note the smaller percentage of purely female groups indulging in the practice.

The practice of solvent abuse	No. of cases	%
Group of males only	57	55.9%
Group of females only	12	11.8%
Group of males and females	28	27.4%
Alone	5	4.9%
Total	102	100.0%

TABLE 15: SOLVENT ABUSE PRACTICE.

Prevalence

For the purposes of collecting the maximum amount of available information on the prevalence of the practice within the community as a whole, the subject's actual place of residence was carefully studied in each case.

The following table makes it clear that solvent abuse was particularly prevalent among young people in urban areas (Table 16).

Urban or rural area	Place of residence	Total no. referred 1971	1972	1973
Urban	Airdrie	-	-	4
	Bellshill	-	3	8
Rural	Caldercruix	-	-	3
Urban	Cambuslang	-	-	3
	Coatbridge	-	-	22
	East Kilbride	-	5	3
Rural	Glenboig	-	-	8
Urban	Motherwell	17	-	8
	Rutherglen	-	-	4
	Wishaw	-	6	8
Total		17	14	71

TABLE16 : TOTAL NO. OF SOLVENT SNIFFERS 1971-1973 BY AREA OF RESIDENCE.

Place of residence	1971		1972		1973	
	M.	F.	M.	F.	M.	F.
Airdrie	-	-	-	-	3	1
Bellsnill	-	-	3	-	7	1
Caldercruix	-	-	-	-	2	1
Cambuslang	-	-	-	-	-	3
Coatbridge	-	-	-	-	19	3
East Kilbride	-	-	2	3	3	-
Glenboig	-	-	-	-	8	-
Motherwell	12	5	-	-	1	7
Rutherglen	-	-	-	-	1	3
Wishaw	-	-	5	1	7	1
Total	12	5	10	4	51	20

TABLE 17 : SEX DISTRIBUTION OF SOLVENT SNIFFERS BY PLACE OF RESIDENCE.

It is obvious from Table 17 that in most areas male participants significantly outnumbered females although this trend was reversed in East Kilbride in 1972 and in Rutherglen, Motherwell and Cambuslang in 1973.

The age group most likely to be involved in any industrial area is 13-15 year-olds of both sexes, but boys as young as 9 became involved in Motherwell in 1971 and Glenboig in 1973 while cases of girls aged 9 were reported in Motherwell in 1973 (Tables 18 and 19). Coatbridge and Motherwell had the highest number of cases, totals of 22 and 25 respectively indicating some clustering of cases in these areas.

Place of residence	1971 Age range (years)	1972 Age range (years)	1973 Age range (years)
Airdrie	-	-	14-16
Bellshill	-	13	13-17
Caldercruix	-	-	13
Cambuslang	-	-	-
Coatbridge	-	-	10-15
East Kilbride	-	13-15	14-16
Glenboig	-	-	9-14
Motherwell	9-16	-	15
Rutherglen	-	-	14
Wishaw	-	14-17	10-17

TABLE 18: AGE DISTRIBUTION OF MALE SNIFFERS BY PLACE OF RESIDENCE.

Place of residence	1971 Age range (years)	1972 Age range (years)	1973 Age range (years)
Airdrie	-	-	14
Bellshill	-	-	13
Caldercruix	-	-	14
Cambuslang	-	-	14
Coatbridge	-	-	14
East Kilbride	-	13-15	-
Glenboig	-	-	-
Motherwell	14-15	-	9-14
Rutherglen	-	-	14-15
Wishaw	-	15	14

TABLE 19: AGE DISTRIBUTION OF FEMALE SNIFFERS BY PLACE OF RESIDENCE.

Schools Attended

Information as to school attended was not available in 27 cases, either because the individuals involved were no longer attending school or alternatively because the information had not been recorded. Details of schools attended is presented however for 75 cases in Table 20. The primary school or schools appear first in alphabetical order followed by the comprehensive/secondary schools, also in alphabetical order.

It is worth noting that in some cases, e.g. Caldercruix, Glenboig and Cambuslang the subjects were obliged to attend schools at some distance from their homes because of the zoning of the educational areas (Table 21).

Town	School attended	1971	1972	1973
Airdrie	Caldervale High	-	-	7
Bellshill	Bellshill Academy	-	-	7
	St. Saviour's R.C. High	-	-	1
Coatbridge	St. Bernard's R.C. Primary	-	-	2
	Clifton High	-	-	9
	Coatbridge High	-	-	1
	Columba R.C. High	-	-	11
	Rosehall High	-	-	2
	St. Patrick's R.C. High	-	-	3
East Kilbride	Duncanrigg Senior Secondary	-	-	1
Glenboig	Our Lady and St. Joseph's R.C. Primary	-	-	2
Motherwell	Ladywell Primary	2	-	-
	St. Brendan's R.C. Primary	-	-	1
	Braidhurst High	-	-	3
	Our Lady's R.C. High	-	-	4
Rutherglen	Cathkin High	-	-	7
Wishaw	St. Aidan's R.C. Primary	-	-	4
	Coltness High	-	-	1
	Garrion Academy	-	-	1
	St. Aidan's R.C. High	-	3	1
	Wishaw High	-	1	1

TABLE 20: SCHOOLS ATTENDED BY YEAR OF REFERRAL.

Place of residence	Schools attended
Airdrie	Airdrie
Bellshill	Bellshill
Caldercruix	Airdrie
Cambuslang	Cambuslang or Rutherglen
Coatbridge	Coatbridge
East Kilbride	East Kilbride
Glenboig	Glenboig or Coatbridge
Motherwell	Motherwell
Rutherglen	Rutherglen
Wishaw	Wishaw

TABLE 21: SCHOOLS ATTENDED BY AREA OF RESIDENCE.

It was clear that within certain towns there occurred significant variations in the numbers of cases attending different local schools, partly explained by the influx of children from rural areas.

2.5 DISCUSSION

Between 1st May, 1971 and 31st December, 1973 Community Involvement personnel of the Lanarkshire Police received 111 referrals for solvent abuse representing 14.6% of all referrals for that period. This was comprised of 17.6% of referrals within the Central Division, 11.4% within the Northern Division and 15% in the Western Division. No referrals for solvent abuse occurred in the Southern Division and this variation in the pattern, though interesting, is difficult to explain. Altogether 102 sniffers were studied. 17 of these, including 5 females, had come to attention in 1971, 14, including 4 females in 1972 and 71 including 20 females in 1973.

Despite the fact that the initial cases, which occurred in Motherwell, were referred as early as 1971, no new cases were identified there until 1973. In Bellshill and East Kilbride cases first came to attention in 1972 and by 1973 the problem had been recognised in many

different areas. This would suggest that cases occurred simultaneously in geographically distant places but it may also reflect a greater awareness of the problem existing in these areas on the part of the police authorities.

A careful study of the actual months of referral yielded some interesting results. The number of referrals of control cases, for instance, remained relatively constant throughout the months of the year. In respect of the test cases, however, although there were referrals each month throughout the year, with the exception of January, the numbers fluctuated considerably. 30% were reported in February and in November a further 16% were reported. This would suggest that the practice of solvent inhalation was subject to seasonal variation of one kind or another, bearing in mind that all were police cases.

Of the 102 cases from each group that was studied, 73 (72%) were male, 86% of whom lived in urban areas, while 14% came from rural areas. 29 of the cases were female and with one exception their homes were in urban areas. Irrespective of where the participants lived, all the solvent sniffing episodes had occurred within urban areas, which exactly parallels the findings made in America.

The age range of cases was similar to those quoted by American authors (Cohen, 1973; Corliss, 1965; Sterling, 1964) and was in fact 9-16 years for both groups with a mean age of 13.8 years and a median of 14 years. The mean age for male sniffers at 13.7 years was less than that for females, which was 14.9 years although the median of 14 years was common to both sexes.

The mean, median and age range remained almost constant in respect of both sexes throughout 1971 and 1972 but by 1973 the mean had fallen from 14.5 years to 13.5 years and the median from 15 years to 14 years, indicating perhaps that the practice was spreading to involve younger

children. The ratio of males to females also remained constant around 2.5:1 for the period studied and was similar to that of 3:1 found in the previous Lanarkshire study (Watson, 1975).

In 27% of all cases referred a recurrence of the practice had been noted by the police, 89% of those who relapsed being male. This would indicate that solvent abuse tended to be repetitive for a proportion of participants particularly those in the 11 year-old (50%) and 15 year-old (47.7%) groups. It is also worth noting that most (82%) had in fact recurred within 12 months of the initial referral. Altogether 27% of sniffers living in urban areas and 27% of rural sniffers recurred within 2 years. This would suggest that recurrence was likely to occur irrespective of the area of residence and could be related to the fact that children living in rural areas were often required to attend school in an urban area. It would also point to the important influence wielded by school friends.

Of those cases initially reported in 1971 or 1972 29% recurred, but later referrals i.e. those reported initially in 1973 showed only a 26% relapse rate but, as less than 2 years had passed since initial referral in some cases, this could be of limited significance. According to police records, no case had relapsed more than once. Although it was stated in the introduction that habitual sniffers might be in danger of graduating to drug or alcohol abuse there was no way of gauging, within the scope of the present study, either the number of cases which could be placed in the category of chronic sniffers, or indeed the extent to which they had become involved in the practice.

It was clear, however, that a much higher proportion of test cases than control cases was involved in drug abuse subsequent to initial referral, the ratio being 6:1 and the time lapse being 2-3 years in each category. Drug abuse was without doubt twice as likely to occur in respect of

males than females. The number of males involved in the practice was found to be 6.8% as against 3.4%. Cannabis was implicated in respect of all but one of the test cases and the only control case which was reported. Mandrax accounted for the only test case not involved with Cannabis.

10 (9.8%) other test cases, all males, had been frequently noted since initial referral as being drunk. This represented 5 out of the 63 (8%) male sniffers living in urban environments and 5 out of 10 (50%) male sniffers living in rural areas, thus indicating that sniffers who lived out of town were much more likely to become involved.

There was clear evidence of an association between solvent abuse and subsequent alcohol abuse and again between solvent abuse and subsequent alcohol/drug abuse. It is possible that the individuals concerned were pre-disposed to intoxication in general or that experimentation with solvents at any early age had later led them to explore the effects of other substances.

There was a considerable difference between the ages of subsequent alcohol abusers and these of subsequent drug abusers. Drug abuse only occurred in cases where the subjects had been within the age range of 14-17 years at the time of original referral and this also applied in the case of the only control subject.

On the other hand the age range for alcohol abusers at the time of the original referral was found to vary from 11-16 years and a possible explanation for this might be that drugs would not be readily available except to older children and therefore, for the others, alcohol would prove to be a more accessible panacea for their ills.

The relationship between antisocial activities and solvent abuse was studied. 31.3% of test cases and 46% of the control cases had had previous offences and here there was evidence that the control cases

had indulged in previous antisocial activities more than sniffers although a larger sample would have been required to confirm this trend. The percentages of antisocial activities among sniffers were significantly less than those noted in America (Ackerly and Gibson, 1964; Sterling, 1964) where all had had a previous history of delinquency.

Within the present study 54% of test cases and 62.8% of controls were subsequently involved in antisocial activities but these differences were not found to be statistically significant. It must be concluded that in general solvent abuse occurred sporadically in the course of a delinquent career and might even be considered to be a symptom of deviant behaviour.

A wide variety of substances had been exploited by children and young people in the course of their solvent abuse and definite trends in popularity had been noted e.g. industrial trichloroethylene and paint-thinners in 1971, then later dry-cleaning agents and finally adhesives. Reasons for the original use of trichloroethylene are not easy to find and indeed the only one which readily presents itself is that of availability to older members of families employed in industry. On the other hand the reason for its decline in favour is quite specific, being the result of plea from the Chief Constable of Lanarkshire to managers of local industry asking them to render it inaccessible. No such explanation, however, can account for the substitution of adhesives for dry-cleaning substances. Ether, acetone, and chloroform were used only when they became temporarily available to would-be sniffers, forming an unreliable source of supply. The choice would therefore appear to be arbitrary with the participants demonstrating not only their ability to take advantage of opportunities presented but also a degree of flexibility in adopting

new agents whenever previous supplies become unavailable.

Like their American prototypes solvent sniffers for the most part indulged their taste in groups (Press et al., 1967) and only in 5 cases was solvent abuse reported as a solitary activity. It is possible, however, that this was an under-representation of the facts and that any type of group activity per se was more likely to attract police attention. This group under discussion was also more likely to consist of males (55.9%) or of males and females (27.4%) rather than of females alone.

37% of the sniffers had in fact committed an offence in direct relation to solvents and this in many cases explained the reason for referral. There would appear to have been definite clustering of cases within certain areas, notably Motherwell and Coatbridge, both of which are heavily industrial and also within specific schools in these towns, aspects which are considered in greater detail in chapter 9.

Finally it would seem admissible to state quite unequivocally that solvent inhalation at the time of the study formed a significant proportion of the police authority's total case-load. Evidence of an association between solvent abuse as such and alcohol/drug abuse occurring with 2-3 years is also not in doubt. What is more difficult to determine is whether the alcohol/drug abuse would have manifested itself independently or whether it appears as a sobering corollary to a more youthful, but no less damaging, practice.

CHAPTER 3

A STUDY OF THE POLICE STATISTICS ON SOLVENT ABUSE

3.1 INTRODUCTION

It was obvious from the retrospective study that the problem of solvent abuse was growing apace. In Lanarkshire the police authorities had demonstrated not only a professional interest in the problem, but also an attitude of concern towards the sniffers as evidenced by the follow-up procedures set up to deal with their after-care. It was, therefore, quite obviously necessary to study further the police statistics on the problem in order to complete the information available on the practice, the participants and the prevalence (completed in chapter 9).

3.2 LOCAL BACKGROUND

Prior to the formation of Community Involvement Branches within the Lanarkshire Constabulary in May, 1971 solvent sniffers were referred to personnel of Lanarkshire's Drug Squad and were not, therefore, included within the retrospective study.

Following the establishment of Community Involvement Branches, the responsibility for all juveniles known to be involved in solvent abuse came within their remit. Despite reorganisation of the Lanarkshire Constabulary on 16th May, 1975, when the various divisions of Lanarkshire became divisions of Strathclyde Police under different names, this system remained relatively unchanged. The same officers who had been based in Motherwell, Coatbridge, Hamilton and East Kilbride continued, therefore, to collate the statistics and apply

their expertise to the problem locally.

Community Involvement personnel continued to follow up cases of solvent abuse and paid home visits where possible although those already known to Social Work Departments were referred back there for further supportive measures.

3.3 APPROACH AND METHODS

Permission for access to Juvenile Supervision cards had been granted by the then Chief Constable of Lanarkshire in November, 1974. Following reorganisation of police departments in May, 1975, permission for continued access to this information was requested from Superintendents of Strathclyde Police for the appropriate areas and this was granted in May, 1975.

Sniffers brought to the attention of Community Involvement personnel between 1st May, 1971 and 31st December, 1973 had already been studied (chapter 2) apart from 9 for whom no suitable controls could be found. Those who came to the attention of Community Involvement personnel between 1st January and 31st July, 1975, were studied in the case control study (chapter 6). Leaving these aside, therefore, this study covers the periods 1st November, 1970 to 30th April 1971, 1st January to 31st December, 1974 and 1st August to 31st December, 1975. It was conducted throughout June and July, 1975 and in June, 1976.

3.3.1 Population Studied

The Juvenile Supervision cards in respect of all solvent sniffers who had come to the attention of Community Involvement personnel during the periods detailed above were closely studied and in addition those belonging to the 9 for whom no suitable controls could be found (chapter 2). All information relevant to the study was abstracted on a separate form one for each individual by the investigator (Appendix 2).

3.3.2 Data

The date of referral to the Community Involvement Branch was recorded in each case.

Demographic data consisted of details regarding age, sex, place of residence and school attended.

Information was also collected on the practice of solvent abuse including details of the substances involved, the nature of the sessions, whether undertaken alone or as a group activity and the locations used for the activities.

3.3.3 Data Handling

Data handling was conducted manually by the investigator.

3.3.4 Data Analyses

These consisted mainly of descriptive tables and histograms of age and sex distribution, seasonal distribution, place of residence, school attended and substances involved. Completion of the

statistical analyses was facilitated by means of a desk calculator.

3.4 RESULTS

General Data

Within the periods studied there were 204 referrals involving 180 different persons. Altogether 163 were referred once, 11 were referred twice, 5 were referred 3 times and one child on 4 occasions. There were 11 referrals in 1970, 32 in 1971, 5 in 1972, 4 in 1973 and 119 in 1975.

Demographic Data

Of the 180 young people who had come to the attention of the police, 161 (89%) were males and 19 (11%) were females.

The age range was 6-17 years for males and 13-16 years for females. The mean age for males (13.8 years) was less than that for females (14.2 years) but the median for both sexes was 14 years (fig. 11). The ratio of males to females was 1.8:1 in 1970 but by 1975 it had risen to 22.8:1 (Table 22).

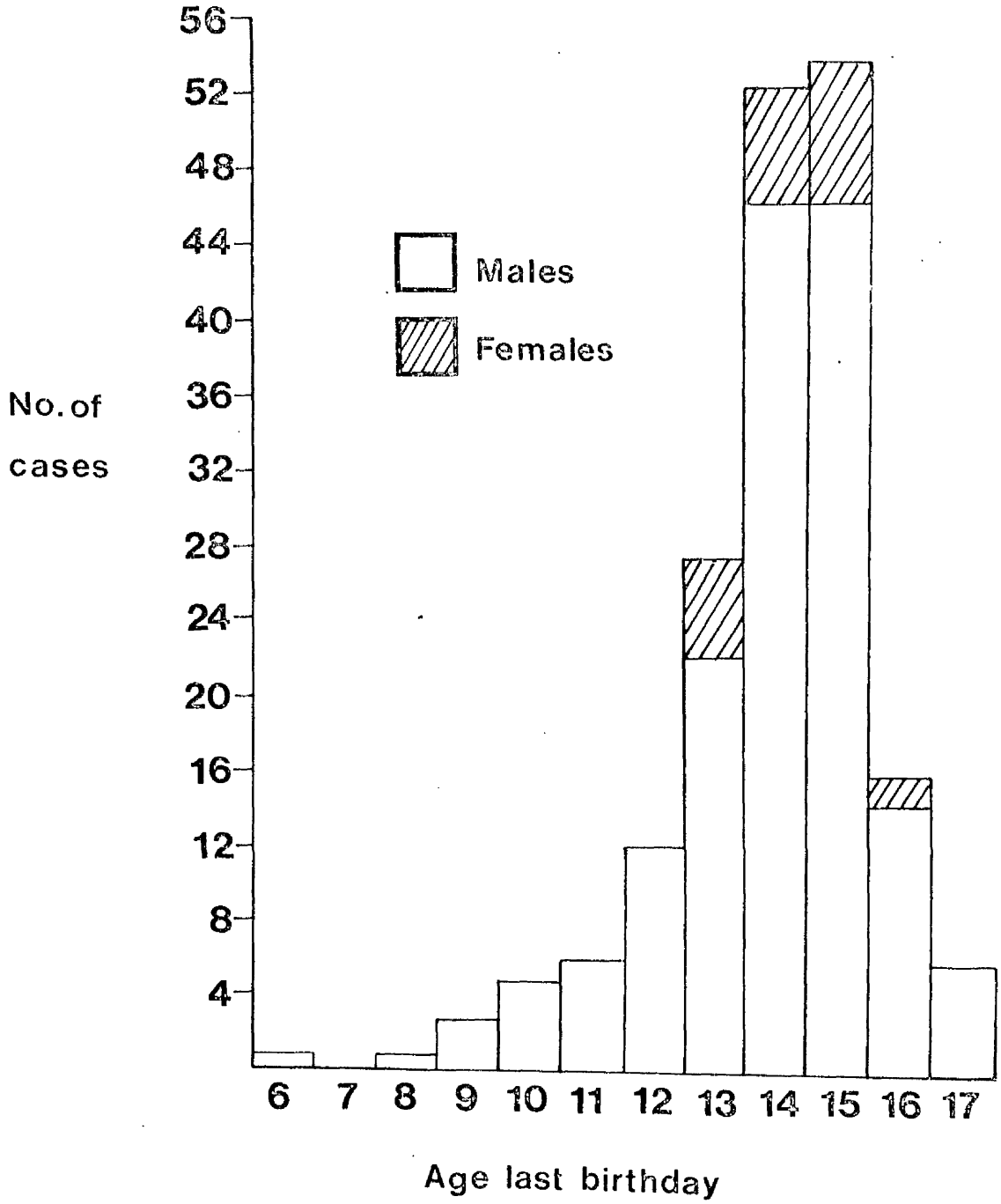


Fig. 11 Age and sex distribution of police cases of solvent abuse.

Year of referral	No. of cases		Sex ratio
	M.	F.	M:F
1970	7	4	1.8:1
1971	26	6	4.3:1
1972	5	-	5:0
1973	2	2	1:1
1974	7	2	3.5:1
1975	114	5	22.8:1

TABLE 22 :NO. OF CASES BY YEAR OF REFERRAL.

When details of the individuals concerned were examined by year of referral, there were variations and although the mean age for females remained reasonably constant, there was some fluctuation of the mean for males. The median for males fell from 15 in 1970 to 14 in 1975. These results are presented in Table 23 , figures being corrected to 1 decimal place.

Year of referral	Age range (years)		Mean Age (years)		Median Age (years)	
	M	F	M	F	M	F
1970	14-17	14-15	15.6	14.3	15	14
1971	16-17	14-16	13.8	15	15	15
1972	12-14	-	13.4	-	14	-
1973	13-14	13	13.5	13	13.5	13
1974	10-16	13	12.8	13	13	13
1975	9-17	13-15	13.5	14.2	14	14

TABLE 23 :AGE RANGE, MEAN AND MEDIAN BY YEAR OF REFERRAL.

Seasonal Variation

There had been in all 204 referrals during the periods studied. The number per month had ranged from 1-52 (fig. 12). The highest peak of 52 referrals reached in November represented 25% of the total. 12% were reported in September, 17% in October and 13% in December. It would appear once again that the practice of solvent abuse was subject to some kind of seasonal variation since 67% of the cases were referred between September and December, although the pattern differed significantly from that noted in the retrospective study.

Substances Abused

It was clear that, although a wide variety of substances had been involved, in most cases (69.6%) various proprietary brands of adhesives had been used. It was equally obvious that many substances had enjoyed temporary popularity only to be replaced by others as fashions waxed and waned (Table 24).

Year of referral	Substances abused	No. of referrals	%
Nov 1970 - Apr 1971	Trichloroethylene	37	18.1%
Apr 1971 and Feb 1974	Shoe conditioner	18	8.8%
Sept/Oct 1972	Rubber cement	6	3%
May 1972	Perchloroethylene (tetrachloroethylene)	1	0.5%
Apr 1973 - Dec 1975	Adhesives	142	69.6%
Total		204	100%

TABLE 24 :SUBSTANCES ABUSED BY YEAR OF REFERRAL

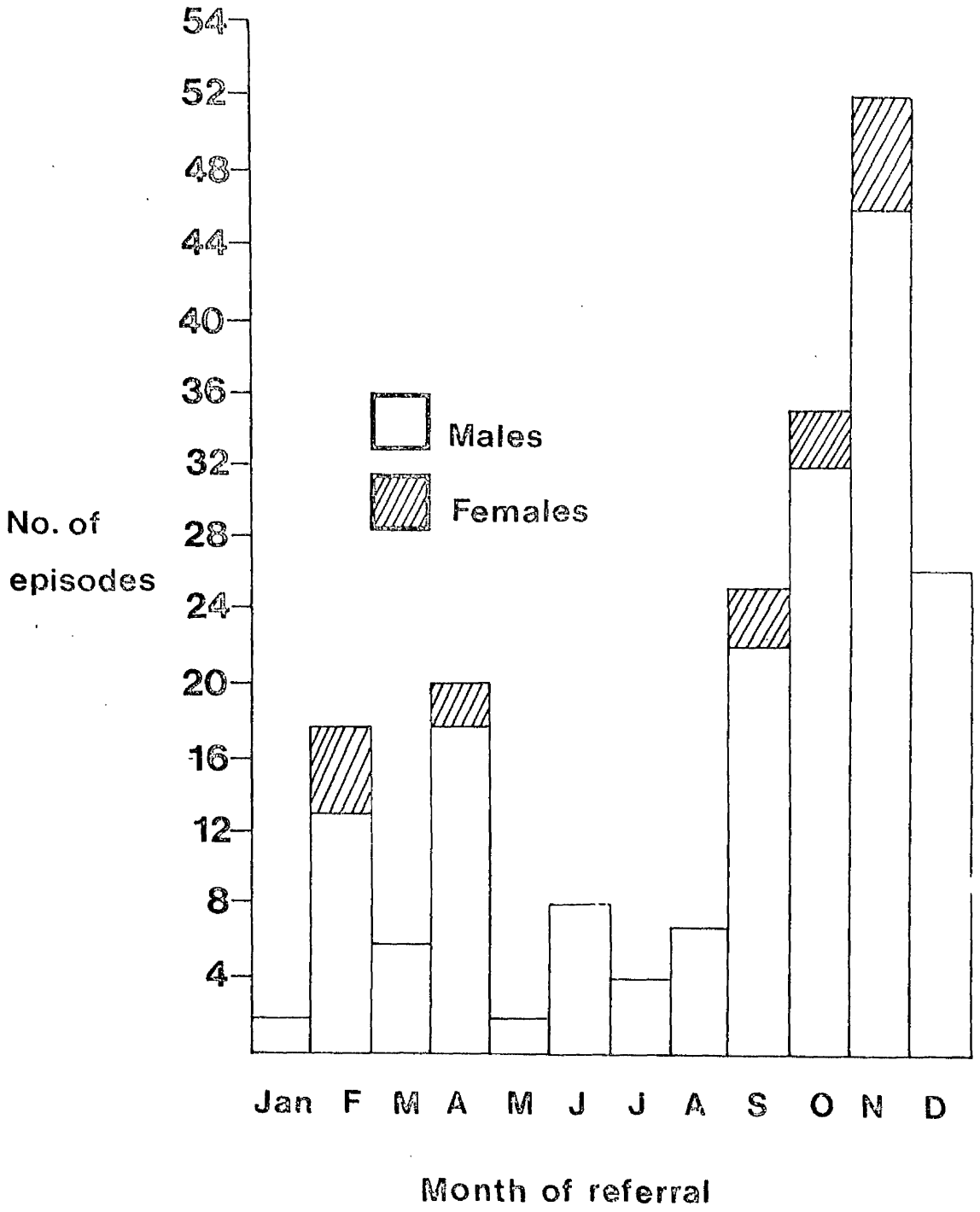


Fig. 12 Police cases: seasonal variation in referrals.

The Practice

In 27.9% of cases there was no record as to whether solvent abuse had involved a group activity or not and in 2.5% of cases, it was known to have occurred in isolation. However in 69.6% it had been practised as a group activity involving predominantly males (51%) or a mixed group of males and females (16.7%). These results, corrected to 1 decimal place, are presented in Table 25 .

The Practice	No of referrals	%
group of males only	104	51%
group of males and females	34	16.7%
group of females only	4	1.9%
alone	5	2.5%
not recorded	57	27.9%
Total.	204	100%

TABLE 25 :SOLVENT ABUSE PRACTICE.

In 89.4% of the cases, the participants were detected on only one occasion, but the remaining 11% were detected on 2-4 occasions. The exact location of the sniffing sessions had not been recorded in 69% of the referrals and the type of places chosen varied considerably (Table 26), but it was quite obvious that their selection had been dictated by a need to avoid detection, although 34% of the sniffers had been found in schools (Appendix 3), 2% in a youth club and 0.5% in public swimming baths.

Places chosen	No of referrals	%
railway guard's van	11	5.4%
railway yard	1	0.5%
unoccupied house	11	5.4%
steelworks	4	2.0%
school	7	3.4%
youth club	4	2.0%
public swimming baths	1	0.5%
derelict buildings	6	2.9%
woods	18	8.8%
not recorded	141	69.1%
Total	204	100%

TABLE 26 :PLACES CHOSEN FOR SNIFFING SESSIONS.

Follow-up of cases

15 (8%) of the 180 individuals who had come to attention were already known to Social Work Departments and subsequently referred there for follow-up procedures. At a later date a further 7 cases were assigned to this agency.

Prevalence

The actual place of residence for each case was studied and the results presented in Tables 27-30 . The practice would appear to have been sporadic although on the other hand it could have been the detection which was sporadic. Throughout the periods of the study there was a preponderance of cases in certain urban areas, notably Motherwell (37%), Airdrie (11%), Bellshill (11%), Coatbridge (12%) and 5.6% in the small rural area of Glenboig.

Urban or rural area	Place of residence	Total no. referred 1970	1971	1972	1973	1974	1975
urban	Airdrie	-	-	-	-	-	21
rural	Bargeddie	-	-	-	-	-	1
urban	(Bellshill	-	-	1	-	-	20
	(Blantyre	-	-	-	-	1	2
rural	Calderbank	-	-	-	-	-	6
urban	(Coatbridge	-	-	-	4	-	18
	(East Kilbride	-	-	1	-	-	-
rural	Glenboig	-	-	-	-	-	10
	(Motherwell	11	31	3	-	-	22
	(Rutherglen	-	-	-	-	5	-
urban	(Uddingston	-	-	-	-	-	1
	(Wishaw	-	1	-	-	3	18
	Total	11	32	45	4	9	119

TABLE 27 :TOTAL NO. OF SOLVENT SNIFFERS 1970-1975 BY AREA OF RESIDENCE.

There would appear to have been a greater number of males than females engaged in solvent sniffing practices during any of the periods studied and this held true for almost all the areas under discussion (Table 28).

Place of residence	1970 M	F	1971 M	F	1972 M	F	1973 M	F	1974 M	F	1975 M	F
Airdrie	-	-	-	-	-	-	-	-	-	-	19	2
Bargeddie	-	-	-	-	-	-	-	-	-	-	-	1
Bellshill	-	-	-	-	1	-	-	-	-	-	20	-
Blantyre	-	-	-	-	-	-	-	-	1	-	2	-
Calderbank	-	-	-	-	-	-	-	-	-	-	6	-
Coatbridge	-	-	-	-	-	-	2	2	-	-	17	1
East Kilbride	-	-	-	-	1	-	-	-	-	-	-	-
Glenboig	-	-	-	-	-	-	-	-	-	-	10	-
Motherwell	7	4	26	5	3	-	-	-	-	-	21	1
Rutherglen	-	-	-	-	-	-	-	-	3	2	-	-
Uddingston	-	-	-	-	-	-	-	-	-	-	1	-
Wishaw	-	-	-	1	-	-	-	-	3	-	18	-
Total	7	4	26	6	5	-	2	2	7	2	114	5

TABLE 28 : SEX DISTRIBUTION OF SOLVENT SNIFFERS BY PLACE OF RESIDENCE.

The age-range of boys involved showed wide variations from one area to another and between one period of time and another (Table 29). The ages of the girls involved, on the other hand, remained consistently between 13 and 16 years irrespective of time or place (Table 30).

Place of residence	1970 Age range (years)	1971 Age range (years)	1972 Age range (years)	1973 Age range (years)	1974 Age range (years)	1975 Age range (years)
Airdrie	-	-	-	-	-	15
Bargeddie	-	-	-	-	-	-
Bellshill	-	-	13	-	-	12-16
Blantyre	-	-	-	-	11	12-13
Calderbank	-	-	-	-	-	9-14
Coatbridge	-	-	-	13-14	-	9-15
East Kilbride	-	-	12	-	-	-
Glenboig	-	-	-	-	-	12-15
Motherwell	14-17	6-17	14	-	-	10-17
Rutherglen	-	-	-	-	13-14	-
Uddingston	-	-	-	-	-	14
Wishaw	-	-	-	-	10-16	10-17

TABLE 29 : AGE DISTRIBUTION OF MALE SNIFFERS BY PLACE OF RESIDENCE

Place of residence	1970 Age range (years)	1971 Age range (years)	1972 Age range (years)	1973 Age range (years)	1974 Age range (years)	1975 Age range (years)
Airdrie	-	-	-	-	-	15
Bargeddie	-	-	-	-	-	14
Bellshill	-	-	-	-	-	-
Blantyre	-	-	-	-	-	-
Calderbank	-	-	-	-	-	-
Coatbridge	-	-	-	13	-	13
East Kilbride	-	-	-	-	-	-
Glenboig	-	-	-	-	-	-
Motherwell	14-15	14-16	-	-	-	14
Rutherglen	-	-	-	-	13	-
Uddingston	-	-	-	-	-	-
Wishaw	-	15	-	-	-	-

TABLE 30 : AGE DISTRIBUTION OF FEMALE SNIFFERS BY PLACE OF RESIDENCE

Schools attended

Information as to schools attended was not available in 56 of the investigated subjects, 20 having left school and the information in respect of the remaining 36 not having been recorded. Data which were available are presented in Table 31 . The primary school or schools appear first in alphabetical order, followed by the comprehensive/secondary schools, also in alphabetical order.

Town	School attended	1970	1971	1972	1973	1974	1975
Airdrie	Airdrie Academy	-	-	-	-	-	2
	Caldervale High	-	-	-	-	-	23
Bellshill	Bellshill Academy	-	-	1	-	-	13
	St. Saviour's R.C. High	-	-	-	-	-	10
Blantyre	Blantyre High	-	-	-	-	-	2
	John Ogilvie High	-	-	-	-	1	-
Coatbridge	Coatbridge High	-	-	-	-	-	4
	Columba R.C. High	-	-	-	3	-	3
	Rosehall High	-	-	-	-	-	1
	St. Patrick's R.C. High	-	-	-	1	-	22
Motherwell	Ladywell Primary	-	7	-	-	-	-
	Muir Street Primary	-	-	-	-	-	1
	Braidhurst High	-	-	-	-	-	5
	Our Lady's R.C. High	-	-	-	-	-	6
Rutherglen	Stonelaw High	-	-	-	-	5	-
Wishaw	Thornly Primary	-	-	-	-	2	-
	St. Aidan's R.C. Primary	-	-	-	-	-	3
	Garrion Academy	-	-	-	-	-	5
	St. Aidan's R.C. High	-	1	-	-	-	3
Total		-	8	1	4	8	103

TABLE 31 : SCHOOLS ATTENDED BY YEAR OF REFERRAL.

In some cases, usually those in urban areas, the school attended could be sited in a different place from the place of residence (Table 32).

Place of residence	Schools attended
Airdrie	Airdrie
Bargeddie	Coatbridge
Bellshill	Bellshill
Blantyre	Blantyre
Calderbank	Airdrie
Coatbridge	Coatbridge
East Kilbride	East Kilbride
Glenboig	Coatbridge
Motherwell	Motherwell
Rutherglen	Rutherglen
Uddingston	Uddingston
Wishaw	Wishaw

TABLE 32 : SCHOOLS ATTENDED BY AREA OF RESIDENCE.

3.5 DISCUSSION

During the total periods studied between November, 1970 and December, 1975, 204 referrals representing 180 persons had come to the attention of Community Involvement Branch personnel and of these 89% were males. A total of 161 had been referred on only one occasion but 19 had been reported two, three or even four times.

The age range of 6-17 years in the case of males involved was much wider than that of females which was between 13 and 16 years but the median age was 14 years in respect of both sexes. Similarly the mean age for females at 13-15 years fluctuated little from year to year whereas that for males varied from 12.8 - 15.6 years.

While the practice appeared from the outset to have attracted a greater proportion of males than females, the ratio showed a sudden increase to 22.8 : 1 in 1975, indicating an even greater male participation than before.

There was further evidence of some seasonal variation in the pattern of solvent abuse, 67% of the 204 referrals occurring between September and December. No immediate explanation for this could be found.

In the course of their solvent sniffing activities a wide variety of substances had been abused by the young people, although adhesives were undoubtedly the most popular agents. Once again there was ample evidence of trends occurring in the popularity of certain substances, for which it proved impossible to provide adequate explanation.

The impression that solvent abuse was a practice largely involving groups of males was confirmed. In 51% of the 204 referrals the participants had been involved in groups consisting of males only and 16.7% in mixed groups. Exclusively female groups accounted for only 1.9% of the total referrals and in 2.5% of cases the solvent abuse was carried on as a solitary activity. However, as is pointed out in the previous chapter, the very nature of the group activity might invite detection and would almost certainly give an overall impression that solvent abuse was a practice, mainly involving groups of young persons.

The sites chosen for solvent sniffing sessions were not always recorded and in any case varied considerably. Most were isolated,

having been chosen presumably for that very reason and all were situated in urban areas. Although some of the subjects had chosen to abuse solvents in school, youth club or swimming baths in situations which had led presumably to their detection, it is possible that other young people who had chosen more isolated areas did not come to attention at all.

The urban areas, particularly those of Airdrie, Bellshill, Coatbridge, Motherwell and Wishaw appeared to have claimed most of the cases although a proportion did occur in rural areas such as Bargeddie, Calderbank and Glenboig.

Even within these areas there would appear to have been significantly more cases in one school than in another, although it must be borne in mind that children resident in rural areas would often be required to attend one or other of the schools in question, thereby adding to the total number of participants quoted for them. Clustering of cases in certain schools and specific areas is more fully discussed in chapter 9.

The results obtained indicated that in Lanarkshire the abuse of a wide variety of substances, readily and cheaply available, was a sporadic activity occurring mainly in urban areas and attracting for the most part groups of young males. Some of the participants were facing multiple family problems and, as a result had been referred to social workers for follow-up and supportive measures.

CHAPTER 4

4.1 INTRODUCTION

There is one feature common to all the literature on solvent abuse, which remains consistent throughout and that is the frequently recurring theme of home instability. In a study of 12 sniffers carried out in San Antonio, Texas (Ackerly and Gibson, 1964), it was clearly demonstrated that 4 of the families were beset by multiple problems. Again, in the cases of 16 boys studied in Salt Lake City (Press et al., 1967) an absent father was in each instance a relevant factor. Death, divorce, separation or institutionalisation, for one reason or another, accounted for 5 of the cases while in the remainder it was obvious that the father/son relationship was badly impaired.

It has even been stated that many sniffers were already known to the social agencies, sniffing being simply symptomatic of a wider range of social problems (Ellison, 1965).

Although too in Lanarkshire solvent sniffers seemed to have been the concern of the Community Involvement Branches rather than the Social Work Departments, some were in fact referred to the latter on account of a multiplicity of family problems. It seemed reasonable, therefore, in the circumstances to approach the various Social Work Departments with a view to collecting information about children who inhaled solvents and determining what proportion of the total caseload this represented.

4.2 LOCAL BACKGROUND

Prior to local government reorganisation on 16 May 1975, Social Work in Lanarkshire was administered by means of the following system.

Each of the 5 Burghs of Airdrie, Coatbridge, East Kilbride, Hamilton and Motherwell had a Director of Social Work Services, who operated within a central department and who was responsible for all Social Work Services within that Burgh. His office, therefore, dealt with the collation of all information and statistics.

The landward areas of Lanarkshire - outwith the areas covered by the 5 Burghs - were administered by a Director of Social Work for Lanark County Council who operated from a central office in Hamilton and was responsible not only for the small local Social Work Departments but also for information and statistics.

Subsequent to reorganisation on 16 May 1975, a 3 tier structure was established comprising a Regional Director of Social Work for Strathclyde Region with 3 Deputy Directors and 6 Divisional Directors.

One of the newly created divisions was that of Lanark Division within the Strathclyde Region and it comprised the area previously covered by the 5 Burghs and the whole of the landward areas. It was divided into 5 districts, the boundaries of which were almost contiguous with those of the previous Burgh areas. Statistics and other information for the Lanark Division of Strathclyde Region are processed at Hamilton in a central office.

4.3 APPROACH AND METHODS

Each of the 6 Directors of Social Work within Lanarkshire was approached personally in March, 1975, with a view to collecting information on the problem of solvent abuse. All of them promised

to give their assistance and co-operation and willingly agreed to provide the relevant information by using the resources of the social workers in their departments.

The Director of Strathclyde Region's Social Work Department was approached in May 1976 and he also agreed to provide the relevant information, if found to be available.

The information requested was as follows:-

1. an estimate of total Social Work caseload for each area 1970-1975;
2. demographic data about sniffers 1970-1975; and
3. the maximum possible information on the practice of solvent abuse.

It was important to know what proportion of the participants were already known to the police.

Both before and after regionalisation each Director of Social Work explained that precise details about the practice were likely to prove difficult to procure since solvent sniffing as such is not included in any section of the Social Work Scotland Act of 1968 (Appendix 16). It was also made clear that in order to protect the confidentiality of the individuals concerned no details of names or addresses would be given.

Relevant information obtained from the various Directors was abstracted on a separate form for each case (Appendix 2).

4.3.1 Data

The date of referral in respect of each sniffer was recorded, but nothing beyond the actual year of referral was available.

The demographic data consisted of details of age, sex and place of residence. No information about school attended or home circumstances was offered.

Details about the actual practice of solvent abuse were restricted to naming the substance. There was no available information regarding the degree of involvement of each subject, the extent of group activity or the range of methods employed.

4.3.2 Data Handling

Data handling was conducted manually by the investigator.

4.3.3 Data Analyses

Owing to the lack of available information, data analyses were confined to descriptive tables of age and sex distribution, place of residence and substances misused.

4.4 RESULTS

Total Social Work Cases

There were no details available on the total number of cases of the Social Work Departments in respect of the years studied.

Solvent Sniffers

A total of 88 children involved in solvent abuse had come to the attention of social workers in Lanarkshire between 1973 and 1975 and 25 of these were believed, but not proved, to be known to the police. Details of the remaining 63 only are considered.

Demographic Data

Of the 63 individuals, whose involvement in solvent abuse had come to the attention of the social workers during routine casework, 58 (92%) were males and 5 were females. This represented 20 cases in 1973, 8 in 1974 and 35 in 1975 (Table 33). The age range was 14-15 years for males and 16-18 years for females.

Year of referral	No of cases		Sex Ratio
	M	F	M : F
1973	17	3	5.7: 1
1974	8	0	8 : 0
1975	33	2	16.5: 1
Total	58	5	

TABLE 33: SOCIAL WORK DEPARTMENT CASES OF SOLVENT ABUSE.

When the referrals for each year were considered independently the number of males was found to be greatly in excess of the number of females in each case.

The mean age for males for each successive year remained constant around 14-14.8 years (Table 34) but that for females showed considerable fluctuation from 14-17 years (Table 35).

The median value for males was lower than that for females in 1975 although the value for both sexes was 14 years in 1973.

Year of referral	Age range (years)	Mean age (years)	Median age (years)
1973	14 - 15	14.1	14
1974	14 - 15	14.8	15
1975	14	14	14

TABLE 34: AGE RANGE, MEAN AND MEDIAN OF MALE SNIFFERS.

Year of referral	Age range (years)	Mean age (years)	Median age (years)
1973	14	14	14
1974	-	-	-
1975	16 - 18	17	17

TABLE 35: AGE RANGE, MEAN AND MEDIAN OF FEMALE SNIFFERS.

Substances Abused

Although adhesives were found to be the substances most commonly chosen for solvent abuse, other agents such as petrol and shoe

conditioner were also in evidence until 1973, after which only adhesives featured (Table36).

Year	Substances abused	No	%
1973	adhesives	16	25.4%
	petrol	1	1.5%
	shoe conditioner	3	4.8%
1974	adhesives	8	12.7%
1975	adhesives	35	55.6%
Total		63	100%

TABLE 36: SUBSTANCES ABUSED BY YEAR OF REFERRAL.

No further information was available on the details of the practice.

Prevalence

The area of residence of each of the young people involved was carefully studied. All of the participants lived in urban areas and most of them in areas previously associated with solvent abusers, although cases had also occurred in Chryston, Bishopbriggs and Hamilton, none of which had been mentioned before in this connection (Table 37).

	Place of residence	1973	1974	1975
Urban	Airdrie	-	-	3
	Bishopbriggs	-	-	1
Rural	Chryston	-	-	2
Urban	Coatbridge	-	-	9
	East Kilbride	4	-	-
	Hamilton	2	2	2
	Motherwell	7	-	8
	Wishaw	7	6	10
	TOTAL	20	8	35

TABLE 37: PLACE OF RESIDENCE BY YEAR OF REFERRAL.

Males predominated in all areas except that of East Kilbride (Table38) where the male : female ratio was reversed (1 : 3).

Place of residence	1973		1974		1975	
	M	F	M	F	M	F
Airdrie	-	-	-	-	2	1
Bishopbriggs	-	-	-	-	1	-
Chryston	-	-	-	-	2	-
Coatbridge	-	-	-	-	9	-
East Kilbride	1	3	-	-	-	-
Hamilton	2	-	2	-	2	-
Motherwell	7	-	-	-	7	1
Wishaw	7	-	6	-	10	-
Total	17	3	8	-	33	2

TABLE38: SEX DISTRIBUTION BY YEAR OF REFERRAL.

It was obvious that in each of the areas except East Kilbride a greater number of children were involved from 1973 onwards and also that the age range was similar for each area (Table39), except in the case of a 16 year-old girl in Motherwell and an 18 year-old in Airdrie (Table 40).

Place of residence	1973	1974	1975
Airdrie	-	-	15-16
Bishopbriggs	-	-	14
Chryston	-	-	14-15
Coatbridge	-	-	14-15
East Kilbride	14	-	-
Hamilton	15	14	14
Motherwell	14	-	14-15
Wishaw	14	15	14

TABLE 39: AGE DISTRIBUTION OF MALE SNIFFERS BY PLACE OF RESIDENCE.

Place of residence	1973	1974	1975
Airdrie	-	-	18
Bishopbriggs	-	-	-
Chryston	-	-	-
Coatbridge	-	-	-
East Kilbride	14	-	-
Hamilton	-	-	-
Motherwell	-	-	16
Wishaw	-	-	-

TABLE 40: AGE DISTRIBUTION OF FEMALE SNIFFERS BY PLACE OF RESIDENCE.

Schools Attended

There was no information on the schools attended.

4.4 DISCUSSION

It was disturbing to find that no statistics were available regarding the total caseload of Social Work Departments for any area of Lanarkshire, for any year from 1970 to 1975. As a result, it was quite impossible to calculate to what extent solvent sniffing had occurred among children with social problems.

Altogether only 88 sniffers had come to attention in various parts of Lanarkshire in the 6 year period studied and 25 of them were thought to be known to the police. It was interesting to find that social workers were quite unaware of the existence of such cases prior to 1973 and yet it was obvious from the police statistics that some cases in 1971 and 1972 had been referred to social workers as part of a follow-up system or were, in fact, already found to be in the care of the Social Work Department.

It seems very possible that since solvent sniffing does not feature per se in the Social Work Scotland Act, then social workers would regard these activities generally as forming a very insignificant part of the child's problems. This in turn would result in their complete omission from the social work records. By the same token, it would also seem possible that solvent abuse may have been a feature of other cases which failed to come to the notice of social workers during the course of their case-work.

There was, however, a marked increase in the number of sniffers known to social workers between 1973 when 17 were known and 1975 when there was a total of 35, which might represent an actual increase in the practice or could, alternatively, be explained by an increase of awareness on the part of social workers.

It was obvious once again that solvent abuse was a practice largely involving males (92%), particularly those living in urban areas, although 2 cases reported in 1975 involved children who lived in Chryston, which is a rural area. No explanation could be found for the interesting fact that in East Kilbride female participants outnumbered males by 3 : 1.

The places of residence were those noted previously, apart from Chryston, Bishopbriggs and Hamilton.

The age range, mean and median values for males in this study were found to be within the limits of those detected in the police cases, but older girls, one of 16 years and another of 18 years predominated, which was an unusual feature.

Details of the practice itself were restricted to naming the substances used and once again adhesives (93.7%) proved to be the most popular over the 3 year period, although petrol and shoe conditioner had also been used in 1973. No further information on the practice or of the people involved was available although solvent inhalation would appear to have formed only a very small part of the total sum of social misery surrounding certain individuals.

CHAPTER 5

A RETROSPECTIVE STUDY OF ASSESSMENT CENTRE STATISTICS ON SOLVENT ABUSE

5.1 INTRODUCTION

In view of the fact that both police authorities and social workers in Lanarkshire were not only aware of the problem of solvent abuse, but had indeed been involved in the detection and/or follow-up, it seemed possible that at least some of the sniffers had at one time or another been admitted to Lanarkshire's Assessment Centre (formerly a Remand Home).

In addition to these, there would be a number of children admitted to the Centre on account of deviant behaviour, children who had never been referred for solvent abuse but who nevertheless had been involved in the practice.

This retrospective study of the Assessment Centre records was therefore undertaken with a view to determining the extent to which solvent abuse featured in a general pattern of deviant behaviour and at the same time to collect any further details pertaining to the practice and its prevalence within Lanarkshire.

5.2 LOCAL BACKGROUND

Calder House

Until the end of April 1971, Calder House in Blantyre served as the Remand Home for the entire Lanarkshire area under the Juvenile Court system. At the end of April 1971, however, the Social Work Scotland Act 1968 was implemented and as a result the Remand Home became an Assessment Centre for children, 16 years of age or less, who have been referred not from the Courts but following Juvenile Hearings. There are also a few young people over 16 years of age in the care of the Social Work Department for whom no other suitable arrangements can be made and who remain only until an alternative place can be found.

Ordinarily there are 36 places for boys and 10 for girls with 2 emergency places for each sex. These places are available for:-

(1) children in the care and protection of the Social Work Department.

(2) children awaiting assessment.

(3) children already assessed for treatment and disposal who are awaiting List D school facilities.

(4) children on remand from or committed by the Sheriff.

In practice, over 90% of the places available are occupied either by children for assessment whose reports are pending or by those awaiting List D school placement; the exact proportion of each being dependent on the length of the current waiting list for List D schools. A few places are required for children in need of care and protection. Nowadays only rarely is a place required for a child on remand.

Staffing

Calder House is normally staffed by an officer in charge, a depute officer in charge, a third officer, a matron and a depute matron. These senior members of staff, all of whom are trained social workers, are resident and there are also 6 members of care staff who work on a three-shift basis, being resident only during spells of duty. These consist of 3 day supervisors and 3 night supervisors. In addition, there are 2 remedial teachers, 2 instructors, 1 secretary and various members of ancillary staff.

Facilities

Children may be admitted to Calder House on an arranged basis following a Juvenile Hearing for assessment or to await List D placement. They may also be admitted on an emergency basis following an emergency Hearing or for overnight stay to await an emergency Hearing on the following day. Those children, admitted on an arranged basis for assessment, are normally taken to Calder House by their social worker

for a period of approximately 21 days during which time they take their turn of helping with the general chores of the Home such as helping in the kitchen, laundry or garden. Those who are persistent truants are introduced immediately into the classroom situation, but are also obliged to take their full share of other chores. Every week decisions are made regarding the content of curriculum for each child. Children who have been admitted for care and protection usually attend one of the local Blantyre schools but take their meals in Calder House and of course remain there at nights.

Assessment

Internal assessment of a child by the staff of Calder House is usually made in the third week of his/her stay there. By this stage, there has been opportunity to study the child, his character, temperament, relationships with others and educational ability. There has usually been time also to obtain psychometric test results and even psychiatric reports. If these have not been obtained but are deemed to be necessary, the child is normally returned after 21 days by the social worker to another children's Hearing with the plea that a further assessment of 21 days would be required. In many cases, of course, the first period of assessment proves sufficiently adequate to allow the Calder House staff to make its recommendations regarding treatment and follow-up.

It is only fair to point out that while theoretically a good close liaison between child and social worker is actively encouraged during his/her stay in Calder House, it is in practice not often possible to sustain. This is due to the size of the case-load which makes it difficult, if not impossible, for the social worker to see the child in care between visits to the Juvenile Panel.

Admissions

Each child must be formally admitted to Calder House by a member of the care staff who enters the relevant particulars of name, address, age, date of and reason for admission etc. in the Admission Register. Height and weight are measured on admission and these details along with those of parents are entered in the child's case-record. Although Calder House does not boast a full-time Medical Officer it does have a doctor on a part-time basis who is available to carry out a full medical examination within 48 hours of admission.

Records

Unlike the prior arrangement, from 1st May, 1971 onwards case-records of all children admitted to Calder House were stored in alphabetical order.

5.3 APPROACH AND METHODS

Permission for access to the Calder House records was requested from the officer in charge to whom an explanation regarding the nature of the study was given and, as a result of this approach, permission was duly granted in September 1974. A study of the records for the period covering 1st May 1971 to December 1974 was carried out between September 1974 and January 1975. Subsequently the records for the period 1st August to 31st December 1975 were studied in August 1976. Children admitted between 1st January and 31st July 1975 were included in the case control study, details of which appear in chapter 6 of this dissertation.

5.3.1 Population Studied

Case-records of all children admitted to Calder House between 1st May 1971 and 31st December 1974 and also between 1st August and 31st December 1975 were studied. Unfortunately 39 were found to be missing and could not be traced.

In view of the fact that solvent sniffing does not constitute an infringement of the Social Work Scotland Act of 1968, it was unlikely to feature in the 'reasons for admission', thereby rendering it necessary for the investigator to read thoroughly the complete record of each child for mention of solvent activities. Details relevant to the study were abstracted from case-records and entered on a separate form, one for each individual case (Appendix 2) and these included name, address and age.

5.3.2 Data

The total number of admissions to Calder House between 1970 and 1975 was obtained from the Admission Register as was information on the age and sex of the individuals concerned.

In the case of each sniffer the date of admission was recorded along with demographic data (obtained from the case-record) consisting of details as to age, sex, address and school normally attended.

The only available information regarding the actual practice of solvent abuse was restricted to mention of the substance involved.

5.3.3 Data Handling

Data handling was conducted manually by the investigator.

5.3.4 Data Analyses

These consisted of:-

(1) descriptive tables of age and sex distribution.

(2) place of residence and school normally attended.

(3) the substances abused.

5.4 RESULTS

General Data

There were 2268 (1963 male and 305 female) total admissions (Table 41) to Calder House between 1st January 1970 and 31st December 1975 (including the period 1st January to 31st July 1975). Taking

	1970		1971		1972		1973		1974		1975	
	M	F	M	F	M	F	M	F	M	F	M	F
Jan	74	-	44	-	32	5	21	6	20	5	18	4
Feb	51	-	51	-	33	8	20	8	12	5	15	5
Mar	35	-	78	-	26	9	34	6	13	8	9	6
Apr	52	-	25	-	31	8	20	10	12	5	16	5
May	67	-	24	1	54	15	28	6	13	3	11	1
June	44	-	16	3	38	7	18	8	15	6	14	6
July	37	-	21	6	26	7	16	3	11	2	15	3
Aug	47	-	26	2	31	6	20	4	17	3	15	7
Sept	58	-	26	5	23	6	18	8	12	3	15	5
Oct	49	-	23	7	35	8	14	4	19	4	18	5
Nov	64	-	16	10	25	5	18	2	11	5	15	8
Dec	46	-	42	4	19	4	14	2	6	3	11	5
TOTALS	624	-	392	38	373	88	241	67	161	52	172	60

TABLE 41: CALDER HOUSE, BLANTYRE : TOTAL ADMISSIONS 1970-1975

Number of 1st and subsequent admissions																								
	1970				1971				1972				1973				1974				1975			
	1st		Ret		1st		Ret		1st		Ret		1st		Ret		1st		Ret		1st		Ret	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Jan	67	-	7	-	33	-	11	-	27	5	5	-	12	6	9	-	14	5	6	-	15	3	3	1
Feb	45	-	6	-	34	-	17	-	28	8	5	-	18	7	2	1	10	5	2	-	13	4	2	1
Mar	30	-	5	-	57	-	21	-	24	9	2	-	31	6	3	-	12	6	1	2	7	4	2	2
Apr	48	-	4	-	18	-	7	-	26	8	5	-	18	8	2	2	9	3	3	2	15	5	1	-
May	62	-	5	-	17	1	7	-	47	12	7	3	22	5	6	1	13	2	-	1	10	1	1	-
June	34	-	10	-	11	3	5	-	29	7	9	-	15	5	3	3	12	5	3	1	9	6	5	-
July	33	-	4	-	18	6	3	-	19	5	7	2	14	2	2	1	11	1	-	1	15	-	3	-
Aug	36	-	11	-	18	2	8	-	22	5	9	1	17	3	3	1	15	2	2	1	12	6	3	1
Sept	46	-	12	-	19	5	7	-	19	6	4	-	13	5	5	3	9	2	3	1	9	4	6	1
Oct	39	-	10	-	17	7	6	-	26	6	9	2	12	3	2	1	19	3	-	1	14	5	4	-
Nov	51	-	13	-	13	10	3	-	22	4	3	1	15	2	3	-	9	4	2	1	12	7	3	1
Dec	38	-	8	-	38	4	4	-	15	3	4	1	7	1	7	1	5	3	1	-	11	4	-	1
TOTALS	529	-	95	-	293	38	99	-	304	78	69	10	194	53	47	14	138	41	23	11	142	49	33	8

TABLE 42 CALDER HOUSE, BLANTYRE: NUMBER OF FIRST & SUBSEQUENT ADMISSIONS 1970-1975

cognisance of re-admission this represented a sum total of 1859 actual persons admitted to Calder House (Table 42). Of these 1600 (86%) were males and 259 were females.

Despite a consistent fall in the total number of admissions to Calder House from 1970 onwards and concurrently the significant rise in female admissions from May 1971, the age range, mean and median all remained relatively constant from 1970 to 1975 although the sex ratio of males to females showed a wide variation initially (Table 43).

Year	Age range (years) M.	F.	Mean age (years) M.	F.	Median age (years) M.	F.	Sex ratio M.	F.
1970	8-17	-	14.3	-	15		624	: 0
1971	8-16	9-17	13.7	14.6	14	14	10.3	: 1
1972	8-17	8-17	14.3	12.4	15	14	4.2	: 1
1973	8-16	11-17	13.8	14.4	15	14	3.6	: 1
1974	10-16	9-16	13.7	14.1	14	14	5.8	: 1
1975	9-16	10-16	14.1	14.0	14	14	2.9	: 1

TABLE 43: AGE RANGE MEAN AND MEDIAN OF ADMISSIONS TO CALDER HOUSE 1970-1975.

During the periods studied i.e. 1st May 1971 - 31st December 1974 and 1st August - 31st December 1975, 1081 persons were admitted 78% of whom were males. Since 39 (3.6%) of these case-records were missing, as previously mentioned, the remaining 1042 were carefully studied.

Solvent Sniffers

Of the 1042 case-records studied only 18 contained any reference to the abuse of solvents. Since the subjects, all male, had been admitted to the Centre on account of deviant behaviour of one kind or another, unconnected with sniffing practices, it would appear that solvent abuse represented only a small facet of deviance. A significant increase in the percentage of children found to have been involved was noted between

1973 and 1975, rising as it did from 2.5% in 1973 to 9.5% in 1975 (Table 44).

Year of admission	No. of solvent sniffers	Total No. of admissions	%
1973	6	241	2.5%
1974	5	161	3.1%
1975 (Aug.-Dec.)	7	74	9.5%
Total	18	476	

TABLE 44: PERCENTAGES OF SOLVENT ABUSERS IN CALDER HOUSE BY YEAR OF ADMISSION.

All the subjects had been engaged in the practice within the same year as their admission to Calder House i.e. 1973 - 1975. However 4 of these sniffers, 2 of whom had been admitted in 1973 and 2 in 1975 were already known to the police (Table 45) and their details were not included in this particular context.

Year of admission	Total No. of solvent sniffers	No. known to police
1973	6	2
1974	5	-
1975	7	2
Total	18	4

TABLE 45: CALDER HOUSE SNIFFERS KNOWN TO POLICE.

Demographic Data

The mean age of the 14 sniffers still remaining in the scope of this study varied between 13.6 years and 14.4 years and the median was

equally variable, but the age range remained constant (Table 46). These results proved similar to demographic data found in the other studies.

Year of admission	Age range (years)	Mean age (years)	Median age (years)
1973	13-15	13.8	13.5
1974	13-15	14.4	15
1975	13-14	13.6	14

TABLE 46: AGE DISTRIBUTION OF SOLVENT SNIFFERS BY YEAR OF ADMISSION.

Substances Abused

In every case adhesives were found to be the substances favoured by sniffers. No information was available on the degree of involvement, evidence of any subsequent solvent abuse or on whether the practice had been a group activity.

Prevalence

The area of residence in respect of the individuals was carefully studied. All lived in urban areas in these same places noted previously as having cases of solvent abuse (Table 47). Most of the cases (71%) over the period studied came from Coatbridge.

Place of residence	1973	1974	1975
Coatbridge	3	4	3
Motherwell	-	-	1
Rutherglen	-	1	-
Wishaw	1	-	1
Total	4	5	5

TABLE47 : NO. OF SNIFFERS 1973-1975 BY PLACE OF RESIDENCE.

Schools Attended

The number of individuals who attended each school is demonstrated in Table 48. As the numbers involved are too small to detect any clustering they are useful only as a contribution to an overall picture.

Place of residence	School attended	1973	1974	1975
Coatbridge	Coatbridge High	-	3	1
	Columba R.C. High	1	-	1
	St. Patrick's R.C. High	2	1	1
Motherwell	Braidhurst High	-	-	1
Rutherglen	Stonelaw High	-	1	-
Wishaw	St. Aidan's R.C. High	1	-	1
Total		4	5	5

TABLE 48: SCHOOL ATTENDED BY YEAR OF REFERRAL.

5.5 DISCUSSION

The age range, mean and median of the children studied at Calder House were all very similar to these other solvent abusers who had come to the attention of the police.

Before May 1971 Calder House, being a Remand Home, did not admit females but from 1972 onwards it became possible to compare the relative proportions of male and female admissions and indeed the ratio of males to females was found to correspond very closely to that of the police cases of solvent sniffers.

During the periods reviewed, there were in all 1081 admissions to the Centre and of these 1042 case-records were studied. Among this number, 18 were recognised as having some acquaintance with solvent abuse. All were male and 4 were already known to the police. Since the information available was so very meagre, the degree of involvement could not be established and it is possible that others had also been implicated in the abuse of solvents but the fact had remained undetected, or was not

noted in the case-records. No case of female involvement was traced. All in all solvent abuse would appear to have formed only a relatively insignificant aspect of deviant behaviour.

The 14 sniffers, not recognised by the police as being implicated in solvent abuse, came within the same age range of those studied earlier and it was interesting to note that all of them had been reported as inhaling adhesive fumes, although this may not have been strictly accurate, unless the person making the report had made a clear distinction between the inhalation of adhesives specifically and that of a general range of agents available.

These subjects were resident in the same areas as the police cases and attended schools there. In view of the very small numbers under consideration, however, no further valid conclusions could be reached.

CHAPTER 6

A CASE CONTROL STUDY OF SOLVENT ABUSE

6.1 INTRODUCTION

It appeared from the literature that most sniffers belonged to the lower socio-economic groups in America (Barker and Adams, 1963; Ellison, 1965), although this was not found in the Salt Lake study (Press et al., 1967) nor in Winnipeg (Gellman, 1968), facts which gave rise to the speculation that solvent abuse might be just as common among middle-class children (Gregg, 1971; Malcolm, 1968).

In a study of 27 sniffers (Massengale et al., 1963) it was found that only 7 lived at home with both parents and in 13 cases either one or both parents were alcoholic. In another study of 28 solvent sniffers and 28 delinquent controls, all of whom were institutionalised, the backgrounds of both groups were characterised by unstable homes and the lack of a father figure. There was, however, more family deterioration among the sniffers (Barker et al., 1963).

Indeed this very family deterioration might have caused the child to turn to his peer group for support and in so doing might have required him/her to conform to its expectations in order to maintain the support. It has in fact been suggested that this could explain why many children sniff solvents (Ackerly et al., 1964; Kupperstein et al., 1968; Thomas, 1967).

Some authors have stated that some, if not all, juvenile sniffers are of low intelligence (Ackerly et al., 1964; Ellison, 1965) but others found a normal range of I.Q. (Barker et al., 1963; Blatherwick,

1972; Press et al., 1967). There is, however, no diversity of opinion about the fact that these youngsters are educationally retarded and that, in school, their social adjustment and scholastic achievement are uniformly poor. In a control study in which 47 solvent sniffers were compared with 50 juvenile alcohol drinkers, the degree of educational retardation was found to be greater among sniffers (Sterling, 1964) and in another study of 28 glue sniffers and 28 matched controls with similar I.Q.'s, the sniffers were more retarded educationally (Barker et al., 1963).

Overcrowded housing conditions have been found to be a relevant factor in social disadvantage and these are generally assessed by dividing the total number of persons in a household, irrespective of age or sex, by the total number of living rooms and bedrooms in the house. A child is considered to be in an overcrowded situation if he/she is living in a household supporting more than 1.5 persons per room (Crellin, Pringle and West, 1971; Wedge and Prosser, 1974).

The ordinal position of a child in the family is also believed to be important in relation to subsequent problems of social integration and delinquency (Adams, 1972).

Tattooing is often a symbol of gang membership and is said to be common among urban teenagers of both sexes. Many of the 27 glue sniffers studied in 1963 were found to be branded in this way (Massengale et al., 1963).

When the backgrounds of children involved in solvent abuse in

Lanarkshire came to be studied there was found to be a dearth of information available as regards Intelligence Quotient, aspects of Social Class, housing conditions, alcoholic parents, breakdown of family relationships and the like. This was due to the fact that the survey was being carried out retrospectively and drew heavily on reports made by the police and social agencies. It is not within the remit of the former to comment on social aspects and the latter are bound by a strict code of confidentiality.

6.2 OBJECTIVES

The objectives of this study are:-

(1) To determine the prevalence of solvent abuse among children admitted to Lanarkshire's Assessment Centre.

(2) To establish the age and sex incidence of all sniffers referred.

(3) To discover if low I.Q. was a significant factor in solvent abuse.

(4) To determine the possible influence of a lack of recreational activities on solvent abuse.

(5) To ascertain if there was an association between unstable homes and solvent abuse.

(6) To establish if there was an association between ordinal position in the family and solvent abuse.

(7) To examine the possibility of an association between solvent abuse and overcrowded housing conditions.

(8) To explore the possibility of an association between parental smoking and solvent abuse.

(9) To determine if there was an association between parental drinking and solvent abuse.

(10) To ascertain if there was an association between cigarette smoking and solvent abuse.

(11) To discover if there was an association between drinking alcohol beverages and solvent abuse.

(12) To find a possible association between drug abuse and solvent abuse.

(13) To determine the factors that may influence children to start sniffing glue and/or to continue the practice.

(14) To establish what proportion of participants had stopped sniffing and for what reasons.

(15) To discover what proportion of sniffers had committed any offence related to the practice.

(16) To find out whether or not children were aware of the health hazards of solvent abuse.

(17) To ascertain if there was an association between truancy and solvent abuse.

(18) To examine the possibility of an association between tattooing and solvent abuse.

6.3 APPROACH AND METHODS

Permission to conduct the study in Calder House was obtained from the officer in charge. Further permission to interview and examine children outwith Calder House was obtained from parent or parents in each individual case. The study was conducted between 1st January and 31st July 1975.

All children consecutively admitted to Calder House between

1st January and 31st July, 1975 were interviewed and medically examined by the investigator.

During the same 7 month period, the investigator also offered a medical service in respect of solvent sniffers to Community Involvement Branch personnel and social workers in Lanarkshire. Children referred were interviewed and examined at their homes, with parental consent and within 3-4 days. No parents refused their consent.

6.3.1 Population Studied

Cases of solvent abuse occurring either within or outwith Calder House between 1st January and 31st July, 1975 were studied and a questionnaire completed for each.

6.3.2 Control Group

A control group of 84 was formed from a possible 96 children, exclusive of sniffers, who were admitted to Calder House during the same 7 month period and these cases fell within a similar age and sex range as the test cases. A questionnaire was completed for each of the 96 control cases. Since no evidence existed that these individuals had had any experience of solvent abuse, this was deemed to be a suitable control group.

The two groups were matched on an individual basis as regards age, sex, religion and area of residence. In most cases it was also possible to match the exact place of residence, but in the remainder

it was found necessary to match only the same kind of area. Two sniffers living in rural areas had to be matched by two urban controls.

In view of the fact that 84 sniffers had come to attention during the period studied and 96 non-sniffers were concurrently admitted to Calder House, there was very little flexibility of choice in control cases if all the factors were to be matched.

6.3.3 Questionnaire Design

A questionnaire was prepared to collect demographic data about the individuals involved in the practice of solvent abuse and also to examine the possibility of associations between solvent abuse and ordinal position in the family, overcrowded housing conditions, family instability and parental smoking/drinking habits.

It was also designed to determine the intelligence status of solvent abusers, the effects of a lack of recreational activities, the reasons for starting and/or stopping the practice and whether or not the participants were, in fact, aware of the health hazards to which their implication exposed them.

Other questions were aimed at establishing associated factors such as smoking, drinking, tattooing and truanting from school.

None of the questions were pre-coded and the answers for every test and control case were completed and classified by the investigator. The answers were obtained by means of a structured, though informal,

interviewing technique. The questionnaires were then sorted by the investigator and the range of answers obtained for each question was then used to prepare a data coding sheet.

Since it was not possible to predict the possible range of answers with sufficient accuracy to pre-code the range of replies, post-coding had to be adopted instead.

Information obtained from the questionnaires was transferred to the data coding sheets, one of which was prepared for each case and the appropriate box for each case was marked. Details of the questionnaire and post-coded categories are given in Appendix 4.

In order to protect the confidentiality of each individual no name, address or school was included in the data coding sheets. As an alternative, each subject was given a unique 3 figure code number, which appeared in the first 3 columns of the data coding sheets. Address was reduced to urban or rural area of residence in the data coding sheets.

Finally, answers were coded within the boxes in the right hand margin of each page opposite to the relevant questions, the boxes being numbered according to the columns of the 80 column punch card required for each case.

6.3.4 The Interview

Interviewing was conducted on an informal basis and although questions

were structured throughout, every opportunity was given for free expression of opinions. All the answers were completed during the interview. If children expressed uncertainty about any of their answers, more specific questions elicited a definite response in every case so that no responses fell into the 'don't know' category.

6.3.5 Data

The dates of admission in respect of children who had been admitted to Calder House, were noted and in the case of those outwith the Centre, details of date and source of referral to the investigator were put on record for each individual.

The demographic data consisted of details about age, sex, religion, place of residence, school attended and parental occupations in each case. This last category was post-coded into Social Class using the 1970 'Classification of Occupations' (H.M.S.O.). No attempt was made to distinguish between active participation and purely nominal religious allegiance.

Information regarding Intelligence Quotients was only available in the cases of certain children admitted to Calder House, testing having been carried out, presumably, in order to determine if there was any relevance between I.Q. and lack of educational progress. No such information was available in the remainder of cases.

The participants were questioned directly as to their recreational activities. Table tennis, youth club and discotheque attendances

were post-coded as indoor activities, while swimming, football, golf and tennis were post-coded as outdoor pursuits.

Details about home and parents, ordinal position in the family, the total number in the family and the number of living rooms and bedrooms were all noted, thus enabling the person/room density to be assessed in each case. Further details about family included information as to whether children lived with parents, foster parents or grandparents. Information was also elicited on the question of whether parents were dead, separated, divorced or living together with a view to determining the presence of family instability.

By asking each child it was possible to establish, with a degree of certitude, the smoking habits of parents. The pattern of parental drinking was much more difficult to assess since the children were often unaware what type of beverage was taken or the quantity consumed. What was not in doubt was the reality of parental drunkenness when that occurred and these statements were then post-coded into the four categories:-

(1) never drunk

(2) sometimes drunk

(3) frequently drunk

(4) drunk every day

Details regarding the personal habits of smoking, drinking and drug abuse were obtained in each case. Regular drinking on the part of children was defined, according to the 1974 'Scottish Drinking Habits'

(H.M.S.O.) as having at least 1 drink per week - for a period of not less than 8 weeks prior to interview.

Information was also requested as to the factors which had influenced the young people concerned to start and subsequently to continue or discontinue the practice of solvent inhalation and whether they were aware of the health hazards involved.

Inquiries were also made on the subjects of tattooing and also truanting from school. It was possible to check official details about truancy in the case of children admitted to Calder House, since these had been noted in each case-record, but not for the other children being studied. In the same way, it was also possible to check the veracity of answers to questions regarding solvent abuse among the Calder House admissions as all the children, who had indulged in the practice, knew the others who had done so. Members of Calder House staff were often in a position to confirm the information.

In some cases, particularly those of younger children, the initial question 'does the term "sniffing" mean anything to you' did not elicit any response and supplementary questions were required to determine if the child had (a) heard of solvent abuse and/or (b) indulged in the practice.

6.3.6 Data Handling

Details from the fully coded questionnaires were punched directly

on to 80 column cards using a hand punch machine. Data handling of information on actual place of residence and school attended was completed manually. Otherwise, data handling was carried out by the Glasgow University computing service on an I.B.M. computer of the 370 series, using standard Fortran programming language. The program consisted of standard Fortran procedures with specially written sub-routines. The resulting print-outs were studied, 7 errors being subsequently detected and corrected.

6.3.7 Data Analyses

These consisted mainly of descriptive tables and histograms of age and sex distribution, urban and rural distribution, ordinal position and person/room density. For some of the factors, the significance of differences between the 2 groups was assessed by means of chi-square tests and the overcrowding index was tested by means of the chi-square test for linear trends. Completion of the analyses was facilitated by means of a desk calculator.

6.4 RESULTS

Assessment Centre Admissions

There were 128 children (101 males and 27 females) consecutively admitted to Calder House between January and July 1975. Of these, 125 were admitted only once during the period of the study and 3 were readmitted once. From the 125 persons studied, 4 were found to live outwith Lanarkshire, one being normally resident in Edinburgh, 1 in Bannockburn and 2 in Glasgow and none of these had been involved in solvent abuse.

Out of the remaining total of 121 children, all of whom lived in Lanarkshire, 25 had been implicated in solvent sniffing. This represented 20.7% of the Lanarkshire children (Table 49) and they were included in the test group, while 84 of the remaining 96 Lanarkshire children were included in the control group.

Total no. of children admitted	Total no. resident in Lanarkshire	No. of sniffers	%
125	121	25	20.7%

TABLE 49 : NO. OF CHILDREN ADMITTED TO CALDER HOUSE JANUARY - JULY 1975.

Solvent Sniffers

Altogether 84 individuals came to attention in Lanarkshire on account of solvent abuse between January and July 1975. 25 (29.8%) had been admitted to Calder House, 7 (8.3%) were referred by social workers and 50 (59.5%) were referred by Community Involvement personnel. The remaining 2 (2.4%) were referred by parents who telephoned Calder House seeking help with the problem (Table 50).

Source of referral	No. of cases	%
Calder House admissions	25	29.8%
Central Division	18	21.4%
Northern Division	22	26.2%
Southern Division	7	8.3%
Western Division	3	3.6%
social workers	7	8.3%
parents	2	2.4%
Total	84	100%

TABLE 50: SOURCE OF REFERRAL OF 84 CASES OF SOLVENT ABUSE.

Although 50 were police referrals, there was a variation in the number referred by each police division. This represented 18 from the Central Division, 22 from the Northern Division, 7 from the Southern Division and 3 from the Western Division.

Demographic Data

There were 75 males and 9 females respectively in each of the test and control groups and of these, 59 of the males and all of the females in the test group lived in urban areas, while 61 of the males and all of the females in the control group lived in urban areas. This meant that 2 male sniffers from rural areas had to be matched by 2 male control cases living in urban areas (Table 51).

Area of residence	Test Cases		Control Cases	
	M	F	M	F
urban	59	9	61	9
rural	16	-	14	-
Total	75	9	75	9

TABLE 51 : NO. OF CASES BY AREA OF RESIDENCE.

Although care had been taken to match the actual place of residence, this was only possible in 57 (67.9%) of the 84 test cases, the remainder being matched also on an individual basis with control cases living in a similar type of area, often the nearest town or village (Table 52).

Place of residence	No. of sniffers	No. of perfect matches	No. of approx. matches
Airdrie	3	3	-
Bellshill	2	2	-
Blantyre	10	5	5
Calderbank	7	4	3
Cambuslang	2	2	-
Coatbridge	23	15	8
Glenboig	9	5	4
Motherwell	6	6	-
Rutherglen	3	3	-
Uddingston	1	1	-
Wishaw	18	11	7
Total	84	57	27

TABLE 52: NO. OF PERFECT AND APPROXIMATE MATCHES FOR PLACE OF RESIDENCE.

The ratio of males to females in each group was 8.3:1. The age range was 8-16 years for both groups and this represented a variation of 8-16 years in respect of males and 9-16 years in respect of females in each group (Tables 53and 54).

The mean age for the 7 month period was 13.8 years for both test and control cases and the median age was 14 years for each group (figs. 13 and 14). This represented a mean value of 13.6 years for male sniffers, 13.9 years for male controls and 14.4 years for females in each group (Tables 53and 54).

Cases	No. of cases	Age range (years)	Mean age (years)	Median age (years)
male sniffers	75	8-16	13.6	14
female sniffers	9	9-16	14.4	14
Total	84			

TABLE 53 : AGE RANGE, MEAN AND MEDIAN OF TEST CASES.

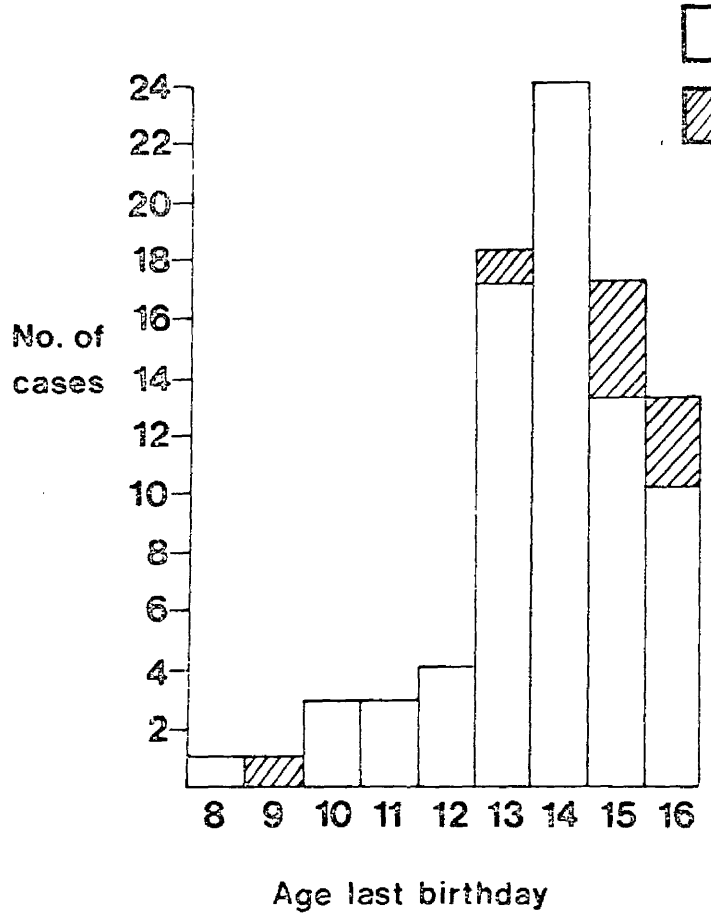


Fig. 13 Age and sex distribution of test cases.

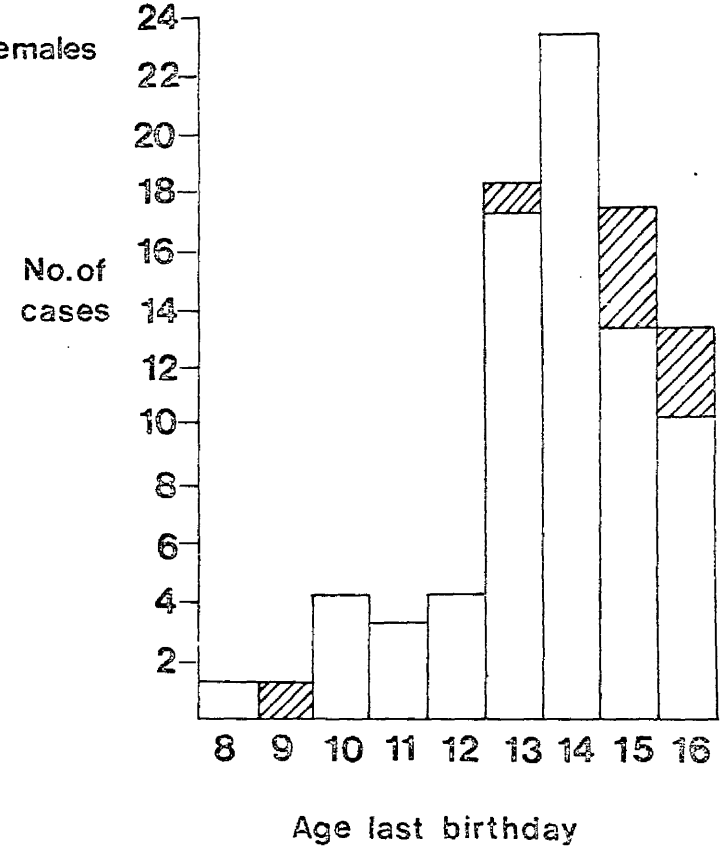


Fig. 14 Age and sex distribution of control cases.

Cases	No. of cases	Age range (years)	Mean age (years)	Median age (years)
male controls	75	8-16	13.9	14
female controls	9	9-16	14.4	14
Total	84			

TABLE 54 : AGE RANGE, MEAN AND MEDIAN OF CONTROL CASES.

Religious Affiliation

In 82 of the 84 cases a perfect match for religion had been achieved. 40 (47.6%) of the test cases and 42 (50%) of control cases being Protestant and the remainder in each group Roman Catholic (Table 55). No attempt was made to distinguish between active participation and nominal religious allegiance.

Religion	Test cases No.	%	Control cases No.	%
Protestant	40	47.6%	42	50%
Roman Catholic	44	52.4%	42	50%
Total	84	100%	84	100%

TABLE 55 : RELIGION OF TEST AND CONTROL CASES.

Intelligence Quotient

The Intelligence Quotient was only found to be available in respect of 13 of the children, consisting of sniffers and controls, who were admitted to Calder House. These are demonstrated in Table 56 .

I.Q.	Test cases	Control cases
<80	1	5
81-100	1	4
101-120	1	-
>120	1	-
unknown	80	75
Total	84	84

TABLE 56: INTELLIGENCE QUOTIENT OF TEST AND CONTROL CASES.

Recreation Activities

Inquiries were made into the extra-curricular activities of each child. Table tennis, youth club and discotheque attendances were classified as indoor activities while swimming, football, golf and tennis were classified as outdoor activities.

27.3% of the sniffers and 23% of the control cases were found to have no recreational activities, but the remainder did participate to some extent, particularly in outdoor activities (Table 57). Percentages have been corrected to 1 decimal place.

Recreation activities	Sniffers No.	%	Control cases No.	%
Indoor activities	4	4.8%	4	4.8%
Outdoor activities	37	44.0%	40	47.6%
Both	20	23.8%	20	23.8%
Neither	23	27.4%	20	23.8%
Total	84	100%	84	100%

TABLE 57 : RECREATION ACTIVITIES OF TEST AND CONTROL CASES.

There was no evidence of a statistical difference between the 2 groups in respect of recreational activities (Table 58).

Recreation activities	Sniffers	Controls	Total
recreation activities	61	64	125
no " "	23	20	43
Total	84	84	168

$x^2 = 0.2814$ with 1 degree of freedom ($p > 0.05$)

TABLE 58 : SOLVENT ABUSE AND RECREATION ACTIVITIES.

Home Factors

It was discovered that 83 (98.8%) of the sniffers and 81 (96.4%) of the control cases lived at home with one or both parents. The one remaining sniffer lived with grandparents, while the 3 remaining control cases lived with foster parents (Table 59). Percentages have been corrected to 1 decimal place.

Home characteristics	Sniffers No.	%	Control cases No.	%
parents	83	98.8%	81	96.4%
foster parents	-	-	3	3.6%
grandparents	1	1.2%	-	-
Total	84	100%	84	100%

TABLE 59: HOME CHARACTERISTICS OF TEST AND CONTROL CASES.

Parents

Inquiry as to whether parents were dead, divorced, separated or living together revealed that 64 (76.2%) of the parents of sniffers and 60 (71.4%) of the controls lived at home with parents. In 11.9% of the test cases and 10.9% of the control cases one or other or both parents were dead and in 11.9% of the test cases and 17.8% of the control cases, the parents were separated or divorced. (Table 60).

Parents	Sniffers No.	%	Controls No.	%
mother dead	4	4.8%	3	3.6%
father dead	6	7.1%	4	4.8%
both parents dead	-	-	2	2.4%
parents living together	64	76.2%	60	71.4%
parents separated	8	9.5%	5	5.9%
parents divorced	2	2.4%	10	11.9%
Total	84	100%	84	100%

TABLE 60 : DETAILS OF PARENTS OF TEST AND CONTROL CASES.

There was not a sufficient number of cases in each of the above categories to enable a chi-square test to be carried out, but when the categories were combined, this became possible (Table 61).

Parents	Sniffers	Control cases	Total
1 or both dead	10	9	19
living together	64	60	124
separated or divorced	10	15	25
Total	84	84	168

x^2 = 1.1806 with 2 degrees of freedom ($p > 0.05$)

TABLE 61: PARENTS OF TEST AND CONTROL CASES.

The degree of variation between the 2 groups was not found to be statistically different. Again, when a comparison was made of the live parents of children in each group, there was found to be no significant statistical difference (Table 62).

Parents	Sniffers	Controls	Total
living together	64	60	124
separated or divorced	10	15	25
Total	74	75	149

x^2 = 1.1259 with 1 degree of freedom ($p > 0.05$)

TABLE 62 : LIVE PARENTS OF TEST AND CONTROL CASES.

Ordinal Position

The ordinal position of each individual child was studied. 29.8% of the sniffers were found to be first-born compared to 16.7% of

control cases. Altogether 50% of test cases and 45.2% of controls were either first or second children in the family. Both groups seemed to be fairly similar in this respect except that 8.3% of controls as compared to 1.2% of test cases were 7th in the family (Table 63).

Ordinal position	Sniffers No.	%	Controls No.	%
1st	25	29.8%	14	16.7%
2nd	17	20.2%	24	28.6%
3rd	16	19.0%	12	14.3%
4th	12	14.3%	10	11.9%
5th	9	10.7%	10	11.9%
6th	3	3.6%	5	5.9%
7th	1	1.2%	7	8.3%
8th	1	1.2%	2	2.4%
Total	84	100%	84	100%

TABLE 63: ORDINAL POSITION OF TEST AND CONTROL CASES.

The mean was found to be 2.8th position for test cases and 3.4th position for control cases and the median was 3rd position for each group. The categories 5th-8th were combined and a chi-square test carried out (Table 64).

Ordinal position	Sniffers	Controls	Total
1	25	14	39
2	17	24	41
3	16	12	28
4	12	10	22
$\geqslant$ 5	14	24	38
Total	84	84	168

$x^2 = 7.6826$ with 4 degrees of freedom ($p > 0.05$)

TABLE 64: ORDINAL POSITION AND SOLVENT ABUSE.

No association was found between ordinal position in the family and involvement in solvent abuse.

Overcrowding Index

Overcrowding was assessed by dividing the number of persons in each household by the number of living rooms and bedrooms in the house. The range was 0.5 - 2.5 persons per room for sniffers and 0.5 - 3 persons per room for control cases. The results for test cases are presented in fig. 15 and those for control cases in fig. 16 . Those children in households supporting more than 1.5 people per room (Crellin et al., 1971; Wedge et al., 1974) were considered to be living in overcrowded conditions and this aspect was compared between the 2 groups (Table 65).

Cases	$\leqslant$ 1.5 persons per room	$>$ 1.5 persons per room	Total
sniffers	66	18	84
controls	68	16	84
Total	134	34	168

$x^2 = 0.1474$ with 1 degree of freedom $(p>0.05)$

TABLE 65: OVERCROWDING INDEX OF TEST AND CONTROL CASES.

There was found to be no statistically significant difference between the 2 groups in respect of overcrowding.

However, it was possible that there could be differences between the groups as overcrowding increased beyond 1.5 persons per room. A chi-square test for linear trend was carried out with a view to

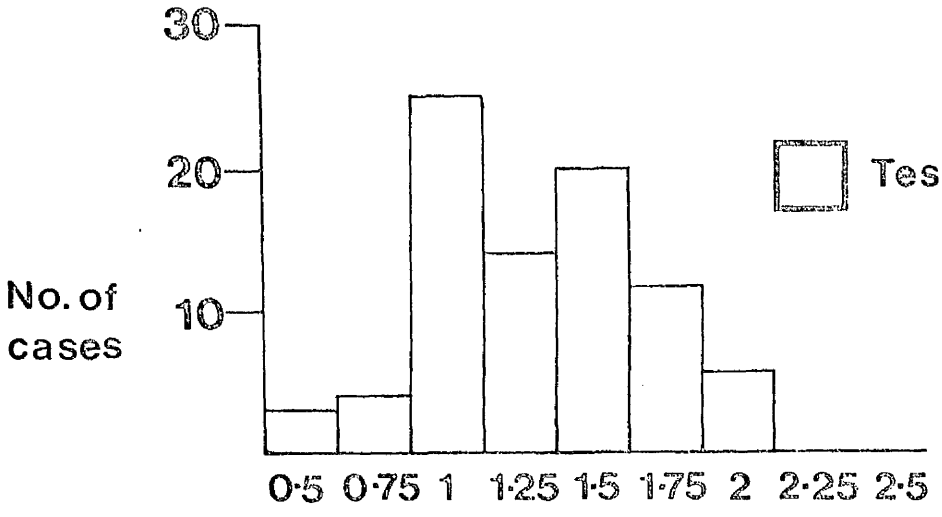


Fig. 15

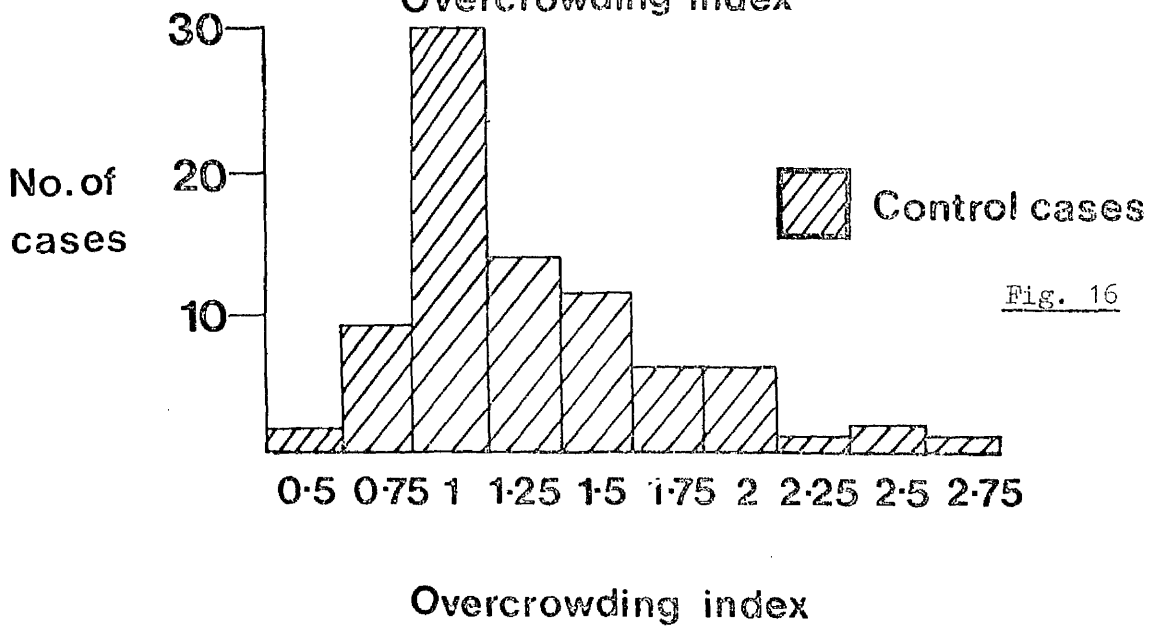


Fig. 16

Fig. 15 Test cases: overcrowding index.

Fig. 16 Control cases: overcrowding index.

testing this hypothesis. In view of the fact that there were so few children in the categories 2.25-3 persons per room, these were combined (Table 66).

Cases	1.75 persons/room	2.0 persons/room	2.5 - 3 persons/room	Total
sniffers	12	6	-	18
controls	6	6	4	16
Total	18	12	4	34

$x^2 = 5.86$ with 1 degree of freedom (for linear trend)$(0.01<p<0.25)$

TABLE 66: INCREASING OVERCROWDING OF TEST AND CONTROL CASES.

It was found that there was a significant decrease in the proportion of test cases with increasing overcrowding and no association between this trend and solvent abuse. The test was significant at the 2.5% level and indicated an association between the control cases and increasing overcrowding.

Paternal Employment

In respect of 6 (7.1%) of the 84 sniffers and 5 (6%) of the 84 control cases the father was dead. Of the remainder, 71.8% of the sniffers' fathers were unemployed and 64.6% of the controls' fathers, the others being unemployed on account of chronic illness or other reasons not known to the children (Table 67).

Percentages have been corrected to 1 decimal place.

Paternal employment	Sniffers No.	%	Controls No.	%
employed	56	71.8%	51	64.6%
unemployed - illness	5	6.4%	5	6.3%
unemployed - other reason	17	21.8%	23	29.1%
Total	78	100%	79	100%

TABLE 67 : PATERNAL EMPLOYMENT OF TEST AND CONTROL CASES.

There were no statistically significant differences between the 2 groups with regard to paternal unemployment (Table 68).

Paternal employment	Sniffers	Controls	Total
father employed	56	51	107
father unemployed	22	28	50
Total	78	79	157

$x^2 = 0.9468$ with 1 degree of freedom $(p>0.05)$

TABLE 68: SOLVENT ABUSE AND PATERNAL UNEMPLOYMENT.

Social Class

When the father's occupation in each case was post-coded into Social Class using the 1970 'Classification of Occupations' it was found that 2.4% of sniffers belonged to Social Class II, 40.5% to Social Class III, 25% to Social Class IV and 32.1% to Social Class V. None of the control cases belonged to Social Class II but 33.3% belonged to Social Class III, 51.2% to Social Class IV and 15.5% to Social Class V (Table 69).

Social class	Sniffers No.	%	Controls No.	%
II	2	2.4%	-	-
III	34	40.5%	28	33.3%
IV	21	25.0%	43	51.2%
V	27	32.1%	13	15.5%
Total	84	100%	84	100%

TABLE 69 : SOCIAL CLASS DISTRIBUTION OF TEST AND CONTROL CASES.

Maternal Employment

In 4 of the test cases and 4 of the control cases studied, the mother was dead. 57.5% of the 80 remaining sniffers and 70% of the controls had mothers who were housewives and did not work outside their homes. The other mothers concerned did work outside their homes either on a full-time or part-time basis (Table 70).

Mother's employment	Sniffers No.	%	Controls No.	%
part-time employment	10	12.5%	11	13.8%
full-time employment	24	30.0%	13	16.2%
not employed	46	57.5%	56	70.0%
Total	80	100%	80	100%

TABLE 70: MATERNAL EMPLOYMENT OF TEST AND CONTROL CASES.

There was found to be no association between mothers working and solvent abuse (Table 71).

Maternal employment	Sniffers	Controls	Total
employed	34	24	58
not employed	46	56	102
Total	80	80	160

x^2 = 2.704 with 1 degree of freedom ($p>0.05$)

TABLE 71: SOLVENT ABUSE AND MATERNAL EMPLOYMENT.

Nor was any association found between the mothers who were working on a part-time basis and those in a full-time capacity (Table 72).

Maternal employment	Sniffers	Controls	Total
part-time work	10	11	21
full-time work	24	13	37
not employed	46	56	102
Total	80	80	160

x^2 = 4.2982 with 2 degrees of freedom ($p>0.05$)

TABLE 72: SOLVENT ABUSE AND THE TYPE OF MATERNAL EMPLOYMENT.

Maternal Employment by Social Class Distribution

When the mother's occupation was post-coded into Social Class for each case, using the 1970 'Classification of Occupations', it was found that 85.3% of sniffers and 75% of control cases had mothers whose employment was in semi-skilled or unskilled work (Table 73).

Social class	Sniffers No.	%	Controls No.	%
III	5	14.7%	6	25.0%
IV	13	38.2%	8	33.3%
V	16	47.1%	10	41.7%
Total	34	100%	24	100%

TABLE 73: MATERNAL SOCIAL CLASS OF TEST AND CONTROL CASES.

No association was found between the nature of the mother's employment and solvent abuse (Table 74). A chi-square test was carried out by combining Social Classes III and IV.

Social class	Sniffers	Controls	Total
III and IV	18	14	32
V	16	10	26
Total	34	24	58

$x^2 = 1.653$ with 1 degree of freedom ($p > 0.05$)

TABLE 74: SOLVENT ABUSE AND MATERNAL SOCIAL CLASS.

Paternal Smoking Patterns

In respect of both test and control cases, the number of cigarettes smoked by the fathers was recorded and post-coded into 4 categories, excluding non-smokers. 25% of the fathers of sniffers and 15.5% of the fathers of control cases were non-smokers. Of those who were left, most of the test cases' fathers, 36.9% in fact, smoked 11-20

cigarettes per day; a further 25% smoked in excess of 20 cigarettes per day; 11.9% smoked between 6 and 10 per day and 1.2% even less. In the case of the controls, the largest percentage of these fathers who did smoke, 58.3% in all, were again in the 11-20 cigarettes per day group, followed by a further 23.8% who took more than 20 per day and 2.4% who smoked less than 5 cigarettes per day (Table 75).

Paternal smoking	Sniffers No.	Sniffers %	Controls No.	Controls %
non-smoker	21	25.0%	13	15.5%
< 5/day	1	1.2%	-	-
6-10/day	10	11.9%	2	2.4%
11-20/day	31	36.9%	49	58.3%
> 20/day	21	25.0%	20	23.8%
Total	84	100%	84	100%

TABLE 75: PATERNAL SMOKING PATTERNS OF TEST AND CONTROL CASES.

The numbers of fathers who smoked no cigarettes or few cigarettes (< 5/day) were compared with those who smoked moderately or heavily (6-10/day -> 20/day) and a chi-square test was completed. No association, however, was found to exist between solvent abuse and paternal smoking patterns(Table 76).

Paternal smoking	Sniffers	Controls	Total
non-smoker) < 5/day)	22	13	35
> 6/day	62	71	133
Total	84	84	168

$x^2 = 2.9232$ with 1 degree of freedom ($p > 0.05$)

TABLE 76: SOLVENT ABUSE AND PATERNAL SMOKING PATTERNS.

Maternal Smoking Patterns

The number of cigarettes smoked by the mothers of test and control cases was recorded and post-coded into 4 categories, excluding non-smokers. 31% of the mothers of sniffers and 32.3% of the mothers of controls were found to be non-smokers. As in the case of the fathers studied the highest percentage in each group smoked 11-20 cigarettes per day and this represented 38.1% of the test case mothers and 46.4% of the control case mothers (Table 77).

Maternal smoking patterns	Sniffers No.	Sniffers %	Controls No.	Controls %
non-smoker	26	31.0%	27	32.2%
< 5/day	1	1.2%	1	1.2%
6-10/day	16	19.0%	8	9.5%
11-20/day	32	38.1%	39	46.4%
> 20/day	9	10.7%	9	10.7%
Total	84	100%	84	100%

TABLE 77: MATERNAL SMOKING PATTERNS OF TEST AND CONTROL CASES.

Those mothers who smoked no cigarettes or few cigarettes (< 5/day) were compared with those who smoked moderately or heavily (6-10/day - > 20/day). No association was found to exist between solvent abuse and maternal smoking patterns (Table 78).

Maternal smoking	Sniffers	Controls	Total
non-smoker) < 5/day)	27	28	55
> 6/day	57	56	113
Total	84	84	168

$x^2 = 0.0268$ with 1 degree of freedom ($p > 0.05$)

TABLE 78 : SOLVENT ABUSE AND MATERNAL SMOKING PATTERNS.

Paternal Drinking Patterns

As children rarely knew how much alcohol their parents drank or in what kind of beverage, the frequency of drunkenness as noted by their own children had to be taken as the measure of parental drinking habits. These drinking patterns, therefore, were noted and post-coded into 4 categories.

In 51.2% of the test cases and 67.8% of the control cases, the children had never seen their fathers drunk, whereas 25% of the test cases and 9.5% of the controls had fathers who were often drunk (Table 79).

Frequency of paternal drunkenness	Sniffers		Controls	
	No.	%	No.	%
never drunk	43	51.2%	57	67.8%
sometimes drunk	17	20.2%	15	17.9%
often drunk	21	25.0%	8	9.5%
drunk every day	3	3.6%	4	4.8%
Total	84	100%	84	100%

TABLE 79: PATERNAL DRINKING PATTERNS OF TEST AND CONTROL CASES.

When the fathers who never became drunk were compared with those who were 'ever drunk' in each group, there was found to be an association between solvent abuse and paternal drinking patterns which was significant at 5% (Table 80).

Paternal drinking patterns	Sniffers	Controls	Total
never drunk	43	57	100
ever drunk	41	27	68
Total	84	84	168

x^2 = 4.8424 with 1 degree of freedom ($p<0.05$)

TABLE 80 : SOLVENT ABUSE AND PATERNAL DRINKING PATTERNS.

When the categories of drunken behaviour were considered, there was found to be no association between solvent abuse and the frequency of drunken behaviour of the fathers (Table 81).

Paternal drunkenness	Sniffers	Controls	Total
sometimes	17	15	32
often) daily)	24	12	36
Total	41	27	68

x^2 = 1.2931 with 1 degree of freedom ($p>0.05$)

TABLE 81: SOLVENT ABUSE AND PATERNAL DRUNKENNESS.

This means that in so far as 57 of the fathers of control cases were never seen to be drunk and only 27 were found in the 'ever drunk' category, in comparison with 43 fathers of test cases who were never seen drunk and as many as 41 who were 'ever drunk', then it becomes obvious that the frequency of drunken behaviour is less important than the actual existence of drunken behaviour.

Maternal Drinking Patterns

Maternal drinking patterns, which were recorded in each case, were also post-coded into 4 categories. 73.8% of the test cases and 95.2% of the control cases had mothers whom they had never seen drunk whereas 10.7% of test cases and 1.2% of control cases had seen their mothers drunk sometimes and 14.3% of test cases compared with only 3.6% of controls often noted that their mothers were drunk (Table 82).

Frequency of maternal drunkenness	Sniffers No.	%	Controls No.	%
never drunk	62	73.8%	80	95.2%
sometimes drunk	9	10.7%	1	1.2%
often drunk	12	14.3%	3	3.6%
drunk every day	1	1.2%	-	-
Total	84	100%	84	100%

TABLE 82: MATERNAL DRINKING PATTERNS OF TEST AND CONTROL CASES.

When the 'never drunk' mothers were compared with the 'ever drunk' mothers in each group there was found to be an association between solvent abuse and maternal drinking which was significant at 1% (Table 83).

Maternal drinking patterns	Sniffers	Controls	Total
never drunk	62	80	142
ever drunk	22	4	26
Total	84	84	168

x^2 = 14.7432 with 1 degree of freedom ($p<0.01$)

TABLE 83 : SOLVENT ABUSE AND MATERNAL DRINKING PATTERNS.

In view of the small numbers in each of the categories, no chi-square test could be completed in respect of these. However it is clear that the fact of drunkenness in the mothers of solvent sniffers was a relevant factor.

Personal Smoking History

In every case studied the individual was questioned about smoking habits and the number of cigarettes smoked per day post-coded into 4 categories. The age at which the individuals started to smoke regularly was also noted in each case. Altogether 32 (38.1%) of the sniffers and 29 (34.5%) of the controls did not smoke regularly. The ages at which the remainder had started to smoke regularly ranged from 9-14 years for test cases (mean 11.9 years) and from 10-14 years for control cases (mean 11.9 years). The median was found to be 12 years for each group (fig. 17).

By far the largest percentage of these among the test and control cases who smoked had 6-10 cigarettes per day, the percentages being 35.7% and 32.2% respectively (Table 84). Percentages have been corrected to 1 decimal place.

Personal smoking habits	Sniffers No.	%	Controls No.	%
non-smoker	32	38.1%	29	34.5%
< 5/day	7	8.3%	9	10.7%
6-10/day	30	35.7%	27	32.2%
11-20/day	14	16.7%	18	21.4%
> 20/day	1	1.2%	1	1.2%
Total	84	100%	84	100%

TABLE 84 : PERSONAL SMOKING HABITS OF TEST AND CONTROL CASES.

When the cases who smoked no cigarettes or few cigarettes (5/day) were compared with those who smoked moderately or heavily (6-10/day - >20/day), a chi-square test was completed. No association was found to exist between solvent abuse and personal smoking patterns (Table 85).

Personal smoking	Sniffers	Controls	Total
non-smoker) <5/day)	39	45	84
>6/day	38	46	84
Total	77	91	168

x^2 = 0.024 with 1 degree of freedom ($p > 0.05$)

TABLE 85 : SOLVENT ABUSE AND PERSONAL SMOKING PATTERNS.

Personal Drinking History

Regular drinking was defined as being at least 1 drink per week over the previous 8 weeks. Each individual was asked about whether or not he/she drank regularly. It was found that 67 (79.8%) of the test cases and 71 (84.5%) of the control cases were not regular drinkers. The ages at which the remainder had started to drink regularly ranged from 12-16 years for the test cases (mean 12.8 years) and from 12-15 years for the control cases (mean 12.5 years). The median was found to be 13 years for each group (fig. 18).

There was found to be no significant difference between the 2 groups in respect of drinking patterns (Table 86).

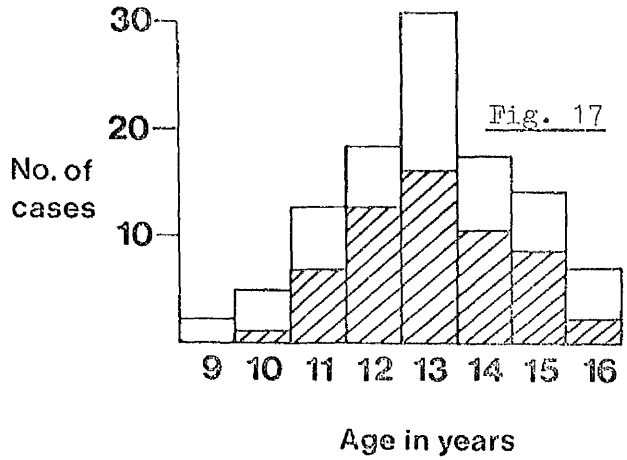


Fig. 17

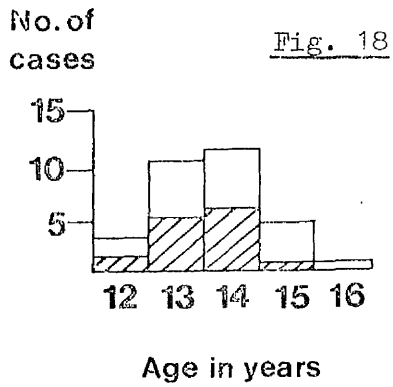


Fig. 18

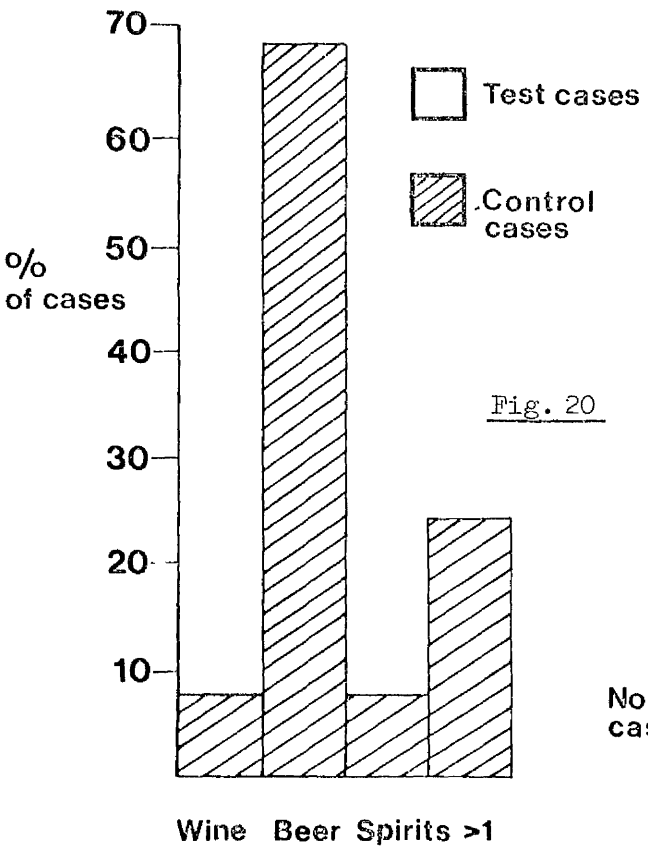


Fig. 20

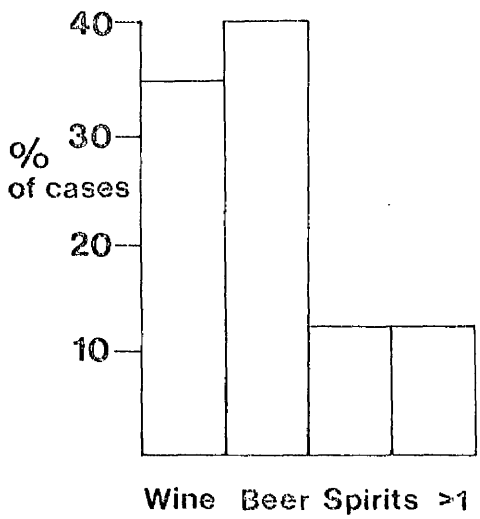


Fig. 19

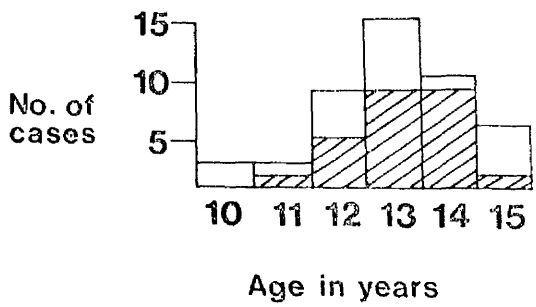


Fig. 21

Fig. 17 Test and control cases: age distribution of commencement of regular smoking habits.

Fig. 18 Test and control cases: age distribution of commencement of regular drinking habits.

Fig. 19 Test cases: beverages selected.

Fig. 20 Control cases: beverages selected.

Fig. 21 Test and control cases: age distribution of tattooing.

Personal drinking patterns	Sniffers	Controls	Total
not regular drinkers	67	71	138
regular drinkers	17	13	30
Total	84	84	168

$x^2 = 0.6494$ with 1 degree of freedom ($p > 0.05$)

TABLE 86: SOLVENT ABUSE AND PERSONAL DRINKING PATTERNS.

The kind of beverage chosen by the individuals in both groups differed but the largest single percentage in each group drank beer or lager. This represented 41.2% of the sniffers and 69.2% of the control cases. The remainder drank wine, spirits or beer + spirits (figs. 19 and 20).

Personal Drug Abuse

Only 1 of the sniffers admitted to abusing drugs. She was a 16 year-old girl and the drug involved was Cannabis. None of the remaining test cases and none of the control cases had abused drugs.

Knowledge and Experience of Solvent Abuse

Although, by definition, none of the control cases had been involved with solvent abuse, 25 (29.8%) had never even heard of it.

The source of information concerning the practice was found to be school friends in 29 (34.5%) of the sniffers and 33 (39.3%) of the controls, while 47 (56%) of the sniffers and 11 (13.1%) of the controls

had learned about it from friends living locally. Together 90.5% of sniffers and 52.4% of controls had received their information from friends. Other sources of information included older siblings and other children in List D schools. It was interesting to note that in individual cases, the subjects had discovered the practice accidentally when he/she happened to come across groups of children who were sniffing. Another child had read about it in the papers (Table 87). Percentages have been corrected to 1 decimal place.

Sources of information on solvent abuse	Sniffers		Controls	
	No.	%	No.	%
never heard of it	-	-	25	29.8%
school friends	29	34.5%	33	39.2%
friends living locally	47	56.0%	11	13.1%
older siblings	2	2.4%	2	2.4%
list D school peers	-	-	12	14.3%
saw others sniffing	5	5.9%	1	1.2%
read about it in paper	1	1.2%	-	-
Total	84	100%	84	100%

TABLE 87: SOURCES OF INITIAL INFORMATION ON SOLVENT ABUSE.

There was found to be a significant difference (at 1%) between the sources of information for the 2 groups (Table 88), when the 4 smallest categories were combined.

Category	Sniffers	Controls	Total
school friends	29	33	62
local friends	47	11	58
others	8	15	23
Total	84	59	143

$x^2 = 21.0038$ with 2 degrees of freedom ($p < 0.01$)

TABLE 88: SOLVENT ABUSE AND SOURCES OF INFORMATION.

The control cases were all asked why they did not indulge in solvent sniffing and the main reasons given were either that their friends did not do it, (17.85%) because they regarded it as 'stupid' (17.85%) or again because they did not wish to be involved in case sniffing might cause damage to their health (34.5%). These results are demonstrated in Table 89.

Main reason given for not sniffing	Controls No.	%
never heard of it	25	29.80%
friends do not sniff	15	17.85%
stupid people do it	15	17.85%
can cause health damage	9	10.70%
can cause brain damage	16	19.00%
can cause death	4	4.80%
Total	84	100%

TABLE 89: MAIN REASONS FOR NOT SNIFFING.

The main reasons offered by sniffers for their involvement in the practice were also of a wide variety although 70.2% admitted to having started because their friends were involved and a further 26.2% because they were curious. It was interesting to find that one had sniffed glue as a cheap substitute for drink. Another, who

had heard that it was possible to 'see things' when under the effects of glue, had started the practice in an attempt to see his mother, who had been dead for two years (Table 90).

Main reason given for sniffing	Test cases No.	%
curious to try	22	26.2%
friends do it	59	70.2%
siblings do it	1	1.2%
cheap substitute for drink	1	1.2%
to see dead mother	1	1.2%
Total	84	100%

TABLE 90 : MAIN REASONS FOR INITIAL INVOLVEMENT IN SOLVENT ABUSE.

The reasons given by sniffers for discontinuing the practice were also varied and interesting. Although 26 (31%) admitted that they had not stopped the practice, 19 (23%) had done so because they were following the lead of their friends. 27% had stopped because the police had come to their homes (9.5%), because they were concerned about the possible damage to health (9.5%) or because their curiosity had been duly satisfied (8%). The remaining 16 (19%) had desisted from the practice simply because sniffing made them feel sick or dizzy (Table 91).

Main reason for discontinuing the practice	Sniffers No.	%
not stopped	26	31.0%
police visit to home	8	9.5%
friends had stopped	19	23.0%
worried about health	8	9.5%
curiosity satisfied	7	8.0%
felt sick/dizzy	16	19.0%
Total	84	100%

TABLE 91: MAIN REASONS FOR DISCONTINUING THE PRACTICE.

56 (66.7%) of sniffers and 55 (65.5%) of controls were convinced that solvent abuse would not cause any damage to health. However, the remainder believed brain damage, addiction, lung damage, general physical damage or death might result (Table 92).

Health hazards of solvent abuse	Sniffers No.	%	Controls No.	%
none	56	66.7%	55	65.5%
brain damage	11	13.0%	16	19.0%
addiction	1	1.2%	-	-
lung damage	2	2.4%	-	-
general physical damage	10	11.9%	9	10.7%
death	-	-	4	4.8%
one of these	4	4.8%	-	-
Total	84	100%	84	100%

TABLE 92: HEALTH HAZARDS OF SOLVENT ABUSE QUOTED BY TEST AND CONTROL CASES.

It was particularly disturbing to discover that 46% of those who believed solvent abuse could damage health had not, in fact, stopped the practice.

Offences Associated with Solvent Abuse

76 (90.5%) of the sniffers stated that they had never committed any offence in association with the practice but talked openly about such offences committed by friends or acquaintances. 5 (5.9%) said they had committed theft in order to obtain the necessary substances, 2 (2.4%) had committed a Breach of the Peace while under the influence of solvents and 1 had been involved in both (Table 93).

Offences related to solvent abuse	Sniffers No.	%
none	76	90.5%
theft of substances	5	5.9%
Breach of the Peace	2	2.4%
(theft (Breach of the Peace	1	1.2%
Total	84	100%

TABLE 93: OFFENCES RELATED TO SOLVENT ABUSE.

Truancy from School

38 (45.2%) of the test cases and 30 (35.7%) of the control cases denied ever having truanted from school and confirmatory evidence in this respect was obtained from Calder House records and also from parents. No association was found between solvent abuse and truancy from school (Table 94).

Truancy from school	Sniffers	Controls	Total
truancy	46	54	100
no truancy	38	30	68
Total	84	84	168

$x^2 = 1.5812$ with 1 degree of freedom ($p > 0.05$)

TABLE 94: SOLVENT ABUSE AND TRUANCY FROM SCHOOL.

When the truancy patterns of the solvent sniffers were considered in greater detail, it was discovered that 34 of the 46 who had truanted did so prior to their sniffing activities and only 12 subsequently (Table 95). This would indicate that solvent abuse

was only a minor factor in the truancy patterns of sniffers.

Truancy from school	Sniffers No.	%
no truancy	38	45.2%
truancy prior to solvent abuse	34	40.5%
truancy subsequent to solvent abuse	12	14.3%
Total	84	100%

TABLE 95 : TRUANCY PATTERNS OF SOLVENT SNIFFERS.

Tattooing

Tattoos were found in 19 (22.6%) of the sniffers and 25 (29.8%) of the controls. They were, without exception, self-inflicted by means of a needle or pen used to prick particles of India ink into the dermis. In every case tattooing had been carried out as a condition of gang membership which was of vital importance to the people concerned.

The age range at which each individual had been tattooed was noted. The age range of sniffers in this respect was 10-15 years and that of controls 11-15 years (fig. 21).

There was found to be no association between solvent abuse and tattooing (Table 96) which was an interesting result in view of the influence of peer groups generally on behaviour.

Tattooing	Test cases	Control cases	Total
tattooed	19	25	44
not tattooed	65	59	124
Total	84	84	168

$x^2 = 1.1086$ with 1 degree of freedom ($p > 0.05$)

TABLE 96: SOLVENT ABUSE AND TATTOOING.

Prevalence

The total number of sniffers for each place of residence is presented in Table 97 . It is clear that the places involved were those previously associated with the practice of solvent abuse.

Place of residence	Male cases	Female cases
Airdrie	1	2
Bellshill	2	-
Blantyre	10	-
Calderbank	7	-
Cambuslang	1	1
Coatbridge	22	1
Glenboig	9	-
Motherwell	4	2
Rutherglen	1	2
Uddingston	-	1
Wishaw	18	-
Total	75	9

TABLE 97: SEX DISTRIBUTION OF SNIFFERS BY PLACE OF RESIDENCE.

It was also obvious that, once again, male sniffers greatly outnumbered females except in Airdrie, Rutherglen and Uddingston, where this trend was reversed.

In most places the age range of males involved was 13-16 years although even younger children were involved in Blantyre, Coatbridge and Wishaw (Table 98).

Place of residence	Male sniffers age range (years)
Airdrie	15
Bellshill	14-15
Blantyre	8-16
Calderbank	13-15
Cambuslang	13
Coatbridge	12-16
Glenboig	13-16
Motherwell	14-16
Rutherglen	15
Uddingston	-
Wishaw	10-16

TABLE 98: AGE DISTRIBUTION OF MALE SNIFFERS BY PLACE OF RESIDENCE.

Female sniffers tended to be older than male sniffers although one 9 year-old girl was found to be involved in Motherwell (Table 99).

Place of residence	Female sniffers age range (years)
Airdrie	15-16
Bellshill	-
Blantyre	-
Calderbank	-
Cambuslang	15
Coatbridge	16
Glenboig	-
Motherwell	9-13
Rutherglen	15
Uddingston	15
Wishaw	-

TABLE 99 : AGE DISTRIBUTION OF FEMALE SNIFFERS BY PLACE OF RESIDENCE.

Schools Attended

Details of the schools attended are presented for each of the 84 sniffers in Table 100 .

The primary school or schools appear first in alphabetical order followed by the comprehensive/secondary schools also in alphabetical order (Table 100).

Town	School attended	No. of cases
Airdrie	Airdrie Academy	2
	Caldervale High	4
Bellshill	St. Saviour's R.C. High	2
Blantyre	Auchinraith Primary	1
	St. Blane's R.C. Primary	2
	St. Joseph's R.C. Primary	1
	Blantyre High	5
	John Ogilvie High	1
Cambuslang	Trinity High	1
Coatbridge	St. Stephen's R.C. Primary	1
	Whifflet Primary	1
	Columba R.C. High	8
	Rosehall High	6
	St. Patrick's R.C. High	20
Hamilton	Holycross High	1
Motherwell	Logan's Primary	1
	Braidhurst High	3
	Dalziel High	1
	Our Lady's R.C. High	1
Rutherglen	Cathkin High	1
	Stonelaw High	3
Wishaw	Lammermoor Primary	2
	Thornly Primary	1
	St. Ignatius' Primary	1
	St. Thomas' Primary	1
	Coltness High	1
	Garrion Academy	6
	St. Aidan's R.C. High	5
	Wishaw Academy	1
Total		84

TABLE 100: SCHOOLS ATTENDED.

In some cases the children, though resident in one area, attended school in a different place as, for example these resident in Calderbank, Cambuslang, Glenboig, and Uddingston (Table 101).

Place of residence	Schools attended
Airdrie	Airdrie
Bellshill	Bellshill
Blantyre	Blantyre
Calderbank	Airdrie or Coatbridge
Cambuslang	Cambuslang or Rutherglen
Coatbridge	Coatbridge
Glenboig	Coatbridge
Motherwell	Motherwell
Rutherglen	Rutherglen
Uddingston	Hamilton
Wishaw	Wishaw

TABLE 101: SCHOOLS ATTENDED BY AREA OF RESIDENCE.

6.5 DISCUSSION

Between 1st January, 1975 and 31st July 1975, 125 children were consecutively admitted to Calder House in Blantyre, 121 of these being normally domiciled in Lanarkshire. It was interesting to find that only 25 (20.7%) had ever been involved in solvent abuse and they were, of course, included in the test group, while 84 of the remaining 96 were chosen to form the control group. During the same period a further 59 sniffers were referred by police and social agencies in Lanarkshire and, along with the 25 already mentioned, completed the test group.

In each group 89.3% were males. The mean age of all referrals was

13.8 years but the mean age for male sniffers (13.8 years) was significantly lower than that for females (14.4 years), a fact previously noted. The ratio of males to females was 8.3:1 in respect of both groups and, with the exception of 16 male sniffers and 14 male controls, all lived in urban areas.

As no provision is made for the routine assessment of Intelligence Quotient in respect of pupils in Lanarkshire schools, it was not possible to ascertain whether a child's I.Q. formed a significant factor when considering solvent abuse among young people.

It was quite possible, on the other hand, to state categorically that lack of recreational activities proved not to be relevant to solvent inhalation.

The majority of children in each of the 2 groups being studied lived at home with one or both parents. In 10 of the test cases and 9 of the control cases, one or other or both parents were dead. There was found to be no statistical difference between the 2 groups as regards home instability, a term defined as indicating a home where one or other parent was dead or divorced, or where the parents were separated. It must, therefore, be concluded that this was not a factor relevant to solvent abuse.

Furthermore, no association was found between solvent abuse and the ordinal position of children in the family or again between solvent abuse and overcrowding. Indeed a higher proportion of control cases

than test cases were found to be living in overcrowded housing conditions.

A higher proportion of sniffers than control cases were found to belong to Social Classes II, III and V and a statistical difference at 1% was found between the 2 groups. This leads to a firm conclusion that not all sniffers are from the lower socio-economic groups in the community.

Although in a proportion of cases belonging to each group the fathers were unemployed there was found to be no association between paternal unemployment and solvent abuse. Nor between maternal employment regardless of the hours worked, although proportionately more (85.3%) of the sniffers' mothers than control mothers (75%) were in employment classed as semi-skilled or unskilled.

No statistical difference was found between the 2 groups in respect of the smoking patterns of either parent.

There was found to be an association between solvent abuse and paternal drunkenness which was related purely to the fact of drunkenness and not to its frequency. An association was also found to exist between solvent abuse and maternal drunkenness and this was deemed to be an extremely important aspect of the problem in America, a view confirmed by the findings of this study.

The ages at which children in each group had started to smoke regularly were lower (mean 11.9 years) than the ages at which they

had begun to drink regularly and it was established that the controls had started to drink at a slightly earlier age (mean 12.5 years) than the sniffers (mean 12.8 years). Sniffers, therefore, were not found to be any more prone to early smoking or regular drinking than the controls.

Only one 16 year-old female sniffer had subsequently abused drugs so there would appear to be no association between solvent abuse and drug abuse, but the extreme youth of many of these individuals would render any predictions about the possibility of their future involvement with drug abuse hazardous, to say the least.

It was interesting to note that 25 of the control cases had never heard of solvent abuse. Friends at school or those living locally had provided the initial source of information on the subject for the majority of cases in both groups, thereby indicating the extent of the influence of peers.

This was further evidenced by the fact that almost 20% of the control cases had not indulged in the practice simply because their friends were not involved. A similar proportion however formed their own judgement and regarded the practice as 'stupid'. 70.2% of sniffers had started sniffing because their friends did so and 23% had discontinued the practice because they were following the lead of friends.

66.7% of the sniffers and 65.5% of the controls were unaware of any

health hazards associated with solvent abuse a fact which would indicate the need for health education on this subject. Although it was alarming to discover that 46% of those who were aware of health hazards had not discontinued the practice.

Although 90.5% of the sniffers stated that they had never committed an offence in relation to solvent inhalation, it was obvious that the offences had occurred, even in the face of a general reluctance to admit personal responsibility. However 5 (5.9%) admitted to committing theft in order to obtain the substances necessary to the practice, 2 had committed a Breach of the Peace while under the influence of solvents and one had been involved in both offences.

Truancy from school was noted in a somewhat higher percentage of control cases (64.3%) than sniffers (54.8%). Of the 46 sniffers who had truanted, 74% had done so anyway prior to their sniffing activities, thus indicating that solvent abuse played only a minor role in the truancy activities of the sniffers.

Despite the accepted fact that children abusing solvents were influenced considerably in this respect by their peer, tattoos were noted only in 19 (22.6%) of them compared with 25 (29.8%) of the control subjects. There was found to be no statistical difference, however, between the 2 groups in respect of tattooing.

Once again there would appear to have been a distinct clustering of cases within certain areas and in specific schools within these areas.

There emerge obvious differences between the characteristics of the practice in America and those in Lanarkshire. Not all of the Lanarkshire participants, for instance, belonged to the lower socio-economic groups, nor was the history of family instability significantly different between the control cases and the sniffers.

Peer group influences, however, were very important in Lanarkshire, just as they had proved in America and parental drunkenness would also appear to have been a significant factor, which may confirm a widely held view that the children being studied were merely imitating their parents by turning to an activity which achieved a form of drunkenness by means of substances readily and cheaply available to them.

CHAPTER 7

CLINICAL AND LABORATORY STUDIES OF SOLVENT ABUSE.

7.1 INTRODUCTION

To the potential sniffer, a wide variety of substances with volatile components was readily available in America and elsewhere and several authors have stated that sniffers sometimes showed a marked preference for one particular type of substance, although if for any reason it could not be procured, another could usually be found as an acceptable alternative (Durden et al., 1967; Korobkin et al., 1975; Press et al., 1967).

The methods employed in solvent abuse not only varied according to the type of product, but were also in many cases highly sophisticated. Glues, for instance, could sometimes be heated in a pan to increase vaporisation and subsequently heighten the effects (Kupperstein et al., 1968). Alternatively the vapours might be inhaled from a plastic or waxed paper bag (Chapel et al., 1970; Gellman, 1968). Liquid substances were often poured on to a rag which, when saturated, was held up to the nose (Harris, 1974). Aerosol products could sometimes be sprayed directly into the mouth or into a bag or balloon from which they were subsequently inhaled (Cohen, 1975; Wyse, 1973).

The early effects of solvent inhalation were, according to American studies, stated as being euphoria, excitement, dizziness and tinnitus (Glaser et al., 1962; Malcolm, 1968). Further inhalation might later result in diplopia, slurred speech, ataxic gait and finally drowsiness (Cohen, 1973). It can be clearly seen therefore that the range of

effects observed was very similar to that associated with the consumption of alcohol, although differentiation between the two was allegedly not difficult because of the chemical odour from the breath of sniffers (Ellison, 1965).

Both visual and auditory hallucinations have been reported in association with glue sniffing episodes (Wyse, 1973), but apparently only in relation to susceptible subjects (Press et al., 1967).

Although solvent sniffing has sometimes been found to be a solitary act (Ackerly et al., 1964; Sterling, 1964; Kupperstein et al., 1968), it appeared to occur mainly as a group activity, to the extent that in some cases sniffing parties were organised (Ellison, 1965; Powars, 1965; Wallace, 1967).

Records indicate that the degree of involvement of these individuals indulging in the practice also varied considerably. Some experimented merely because it formed the current "craze" (Gellman, 1968; Gregg, 1971), but others indulged in regular and more prolonged sniffing episodes extending over periods varying from 1 month to several years (Ackerly et al., 1964; Barman et al., 1964; Dodds et al., 1964: Massengale et al., 1963).

It has been generally agreed that a tolerance to solvents may be built up as a result of repeated exposure (Cohen, 1975; Crooke, 1972; Press et al., 1967) and that it could develop as early as 3 months after the commencement of weekly sessions (Press et al., 1967).

Again psychological dependence was reported as being common (Allen, 1966; Cohen, 1975) and certainly glue sniffers found it hard to give up the habit unless a suitable alternative presented itself (Fishbein, 1967; National Clearinghouse, 1962). There does however seem to be some doubt as to whether physical addiction did, in fact occur. Some authors have stated clearly that it does not (Allen, 1966; Ellison, 1965; Westermyer, 1973) but, on the other hand, chronic sniffers developed delirium tremens, irritability and headache on withdrawal (Crooke, 1972; Merry and Zachariadis, 1962; Wyse, 1973).

Mention has also been made in the literature of accidents caused by the euphoria and disorientation, which can be a feature of sniffing episodes.

These acts were reckless, dangerous and sometimes even fatal, but usually affected the individuals themselves and included such impulses as jumping from high places or walking in front of cars. Other incidents occurred, however, as a direct consequence of solvent inhalation and these proved to be just as potentially dangerous, besides involving other people as in cases of rape and homicide (Chapel et al., 1970; Press et al., 1967; Wallace, 1967).

Available information on the toxicity of solvents used deliberately for inhalation is conflicting and as yet poorly defined with little or no documentation of the pathological effects.

Sniffers who inhaled fuel containing aliphatic hydrocarbons were reported to have suffered from hallucinations but no other abnormalities (Ackerly et al., 1964).

In a series of studies carried out on glue sniffers who had not been hospitalised, as many as $\frac{1}{3}$ were found to have microscopic pyuria (Press et al., 1967; Sokol and Robinson, 1963) and microscopic haematuria was also noted in some cases. However in another study of 27 glue sniffers only 2 were noted to have persistent microscopic haematuria (Massengale et al., 1963) and no other abnormalities were detected.

It has also been suggested that chronic sniffers might suffer from glue sniffer's rash of nose and mouth (Cohen, 1973), loss of weight, low blood pressure, brain and kidney damage (Barman et al., 1964; Sokol et al., 1963), but the Public Health Service of the United States reported that it was not at all clear whether or not repeated inhalation could lead to chronic toxicity (Corliss, 1965).

In Lanarkshire, sniffers had come to the attention of police and social agencies as previously noted (chapters 2 - 6) and a certain amount of data about the practice had been collected. However there was an obvious need for more detailed information about both the practice and the participants.

7.2 THE OBJECTIVES

The objectives of this study were:-

(1) To compile a comprehensive list of the substances used for inhalation.

(2) To identify the volatile components of these.

(3) To establish the effects of the constituents with particular reference to toxicity.

(4) To ascertain the methods of inhalation.

(5) To discover the age at which individuals commenced the practice.

(6) To assess the individual degree of involvement in the practice.

(7) To determine whether solvent abuse appeared as a solitary or a group activity.

7.3 APPROACH AND METHODS

Permission to conduct this study was obtained from the officer in charge of Calder House and of course from the parents.

In order to build up a suitably detailed dossier concerning the actual practice of solvent inhalation and its participants as distinct from the more general study of solvent abuse, the children known to be involved were questioned on a slightly different basis, being required to give specific details of the practice and their reactions to it, none of which would have been relevant to non-participants.

These two studies, however, were conducted simultaneously between 1 January and 31 July 1975.

7.3.1 Questionnaire Design

A questionnaire was prepared with a view to collecting detailed information about the practice of solvent abuse with particular reference to methods and substances used, the degree of involvement and the extent to which the activities had been discovered by parents, police or social agencies. Questions were phrased in such a way as to leave ample scope for including the maximum amount of details and were not pre-coded because it was scarcely possible to predict such a large range of answers with sufficient accuracy. Replies to all questions were obtained by means of an informal though structural interview and the questionnaire was completed for each individual case by the investigator (Appendix 5).

7.3.2 The Patients

The patients consisted of the 84 sniffers who had been identified by social workers, police, parents or by the investigator (chapter 6). With the consent of parents or the officer in charge of Calder House, all cases were interviewed and clinically examined following referral. At the close of the interviews the patients and their parents were duly informed of the possible dangers surrounding solvent abuse and the subsequent need therefore for examination in order to detect any physical damage which might have occurred.

Most patients were extremely co-operative and readily offered details concerning the practice, thus enabling the investigator to complete the questionnaire relevant to each case. Additional information was sometimes acquired from parents, police or social workers.

It was sometimes possible, in cases referred immediately following a sniffing session, to photograph relevant details with parental consent, the organisation of this, where applicable, being in the hands of the police.

Samples of non-fasting venous blood and urine were obtained from all patients and taken within 2 hours to the Regional Laboratory at Strathclyde Hospital where they were analysed. It was usually only possible to obtain 1 sample of blood and urine per referral.

7.3.3 Control Group

Specimens of venous blood taken routinely on admission from 84 non-sniffing children admitted to Calder House between 1 January and 31 July 1975 served as controls.

7.3.4 Laboratory Investigations

Red and white cell counts and sedimentation rates were carried out on all blood samples (Appendix 6).

Liver function was assessed by serum aminotransferases, total proteins, bilirubin, cholesterol and thymol turbidity (Appendix 7). In view of the difficulty of assessing normal values of alkaline phosphatase in growing children, a level of 450 I.U./L. (ie $2\frac{1}{2}$ times the upper limit of normal for adults) was taken as the upper limit of normal in the age group 8-20 years (Holmes et al., 1973).

All samples of urine were tested qualitatively with Uristix (Ames Co.) for albumin and sugar, examined microscopically for cells and casts and cultured for organisms.

7.3.5 Psychiatric Assessment

Psychiatric referral was attempted in the cases of 15 patients who had either been involved regularly over a period of time or who had specific problems. In only 5 instances was this achieved and all these subjects were resident in Calder House at that time.

7.3.6 Volatile Components of Substances

Details concerning volatile constituents of the substances used for inhalation were obtained from the Scottish Poisons' Information Bureau and given by its Director on a confidential basis. In other cases where relevant information was not available the manufacturers sometimes proved willing to supply it (Appendix 8).

7.3.7 Data

The source of referral relevant to each case was noted along with the date of the most recent exposure to solvents and date of interview.

For every case details were recorded about the practice, including the brands of substances used, the methods employed, the duration and frequency of sniffing sessions, each individual's history of solvent inhalation, the number of occasions on which involvement had led to detection and whether the subject practised the abuse alone or as one of a group.

Information was also requested about any effects which had been noted either during the actual sessions or subsequent to commencement of the practice.

Details of previous medical history, clinical examination findings, psychiatric reports (where available) and laboratory test results were noted in each case and further facilitated completion of each questionnaire.

7.3.8 Data Handling

Data handling was conducted manually by the investigator.

7.3.9 Data Analyses

Data analyses consisted of case-reports, clinical and laboratory results, descriptive tables and histograms of the frequency and duration of solvent abuse, the length of actual sessions and the substances abused.

7.4 RESULTS

There were 84 children aged 8 - 16 years whose sniffing activities came to attention during the 7 month period of the study. 75 were males and 9 were females. The mean age for the total group was 13.8 years and the median age was 14 years.

Age at Commencement of Solvent Abuse

The age at which the children had become involved in the practice was found to vary between 8 and 16 years, the mean being 12.9 years and the median 14 years (fig. 22). As these values were lower than the ages of the children at the time of referral it indicated a long history of solvent sniffing in some cases.

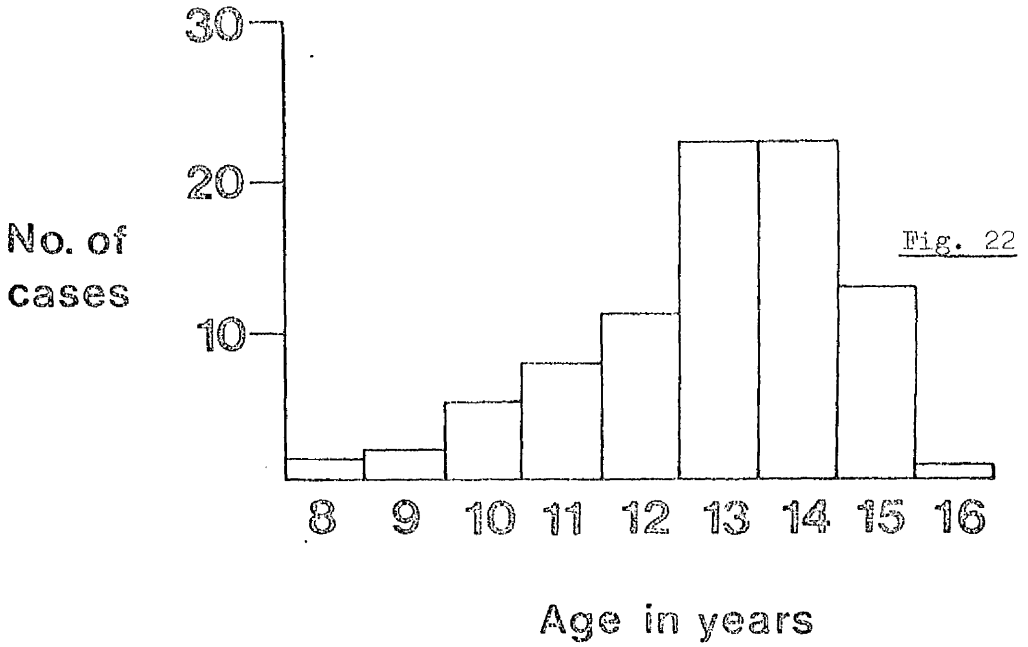


Fig. 22

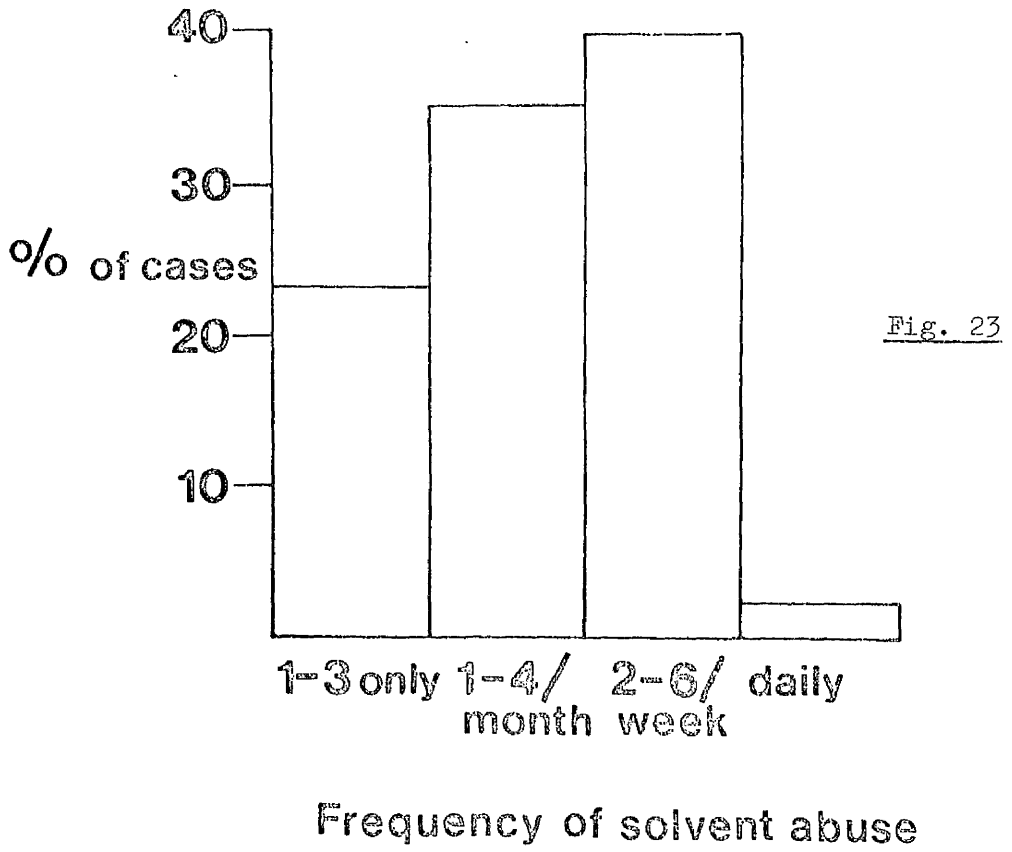


Fig. 23

Fig. 22 Age distribution of commencement of solvent abuse.

Fig. 23 Frequency of solvent abuse.

Interval between Last Exposure to Solvents and Referral

20 of the 84 (24%) had been referred within 1 week of their last sniffing episode and a further 47.6% within 16 weeks, but in the remainder of cases the time interval varied from 24 to more than 40 weeks (fig.24).

Those who were brought to attention soon after their most recent episode were, with only 2 exceptions, referred by the police authorities.

Frequency of Solvent Abuse

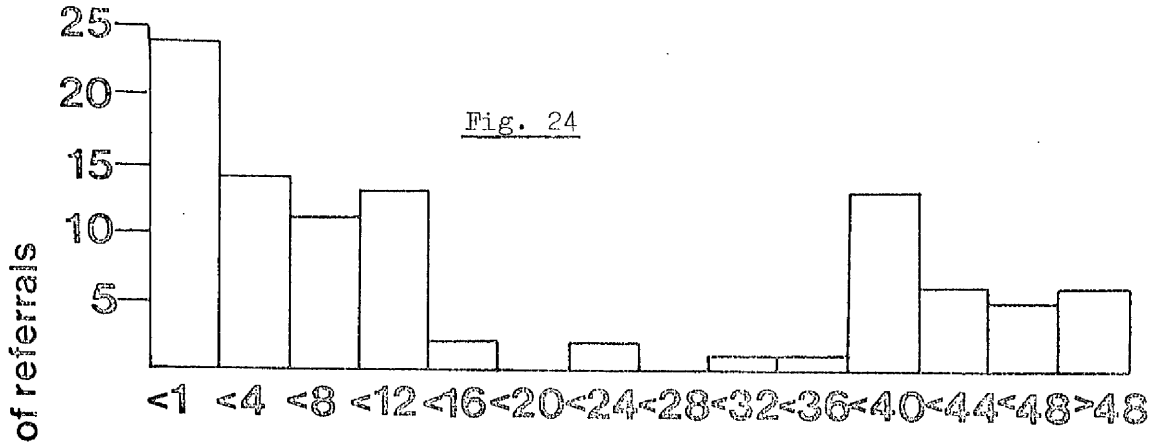
23% of the young people had only experimented with the practice on one, two or three occasions, 35% were involved more regularly, perhaps as often as once or four times per month, 40% indulged frequently, anything from 2 - 6 times per week and 2% were involved on a daily basis (fig. 23).

Duration of Solvent Abuse Practice

77% of the subjects had been inhaling solvents intermittently over a period of 1 - 48 months (median 4 months) and 10% of them for 18 months or more (fig.25).

Number of Sessions

When the total number of sessions came to be considered, it was found that 36% of the children had been involved 1 - 5 times only. The remaining 64% had indulged on 6 - 1000 occasions, 5% of whom were involved 100 or more times (fig. 26). Despite this degree of involvement only 59 (70.2%) had come to the attention of the community



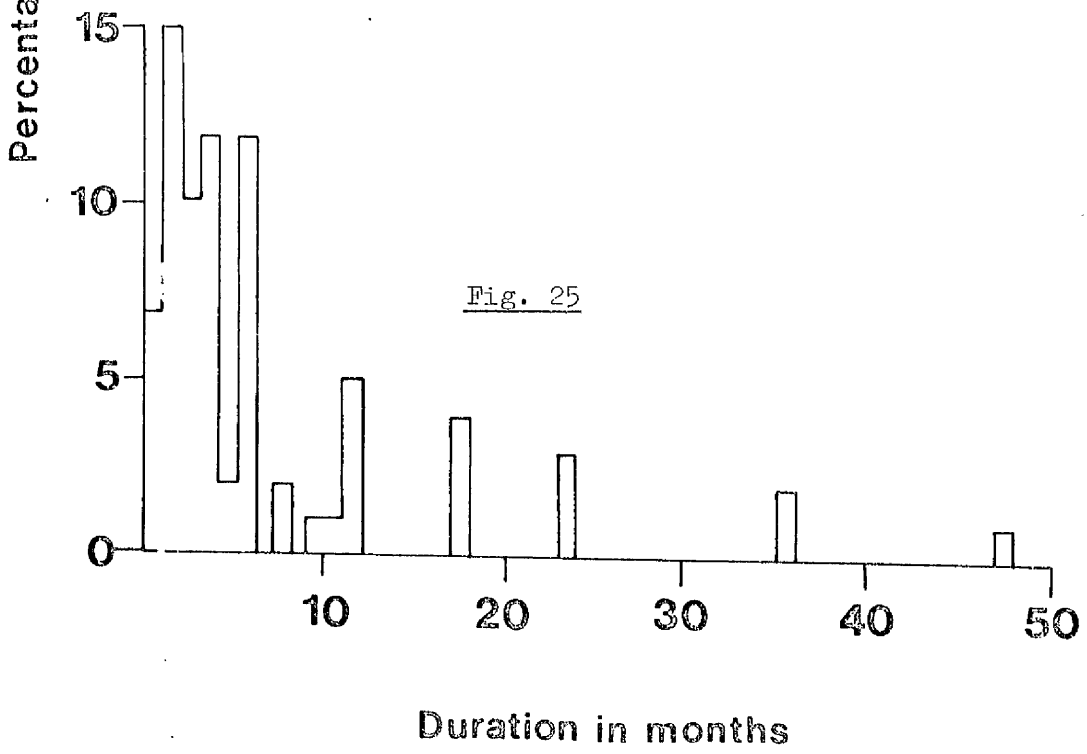


Fig. 24 Time interval between last exposure to solvents and referral.

Fig. 25 Duration of sniffing history in months.

agencies on 1 - 3 occasions, 20 (23.8%) had never been detected, while the activities of the remainder were known only to parents.

Length of Sessions

37 (44%) of subjects indulged in sniffing sessions of less than a ½ hour's duration, 19 (23%) for periods between ½ and 1½ hours and 6(7%) for longer than 3 hours per session (fig. 27).

Substances Abused

Although in 87% of cases various proprietary brands of adhesives were used, solvent sniffing was not confined to adhesives but included also vapours of dry-cleaning agents. In 2% of cases both types of products had been abused at different times (Table102). Percentages have been corrected to the nearest whole number.

Substances abused	No. of cases	%
adhesives	73	87%
dry-cleaning substances	9	11%
adhesives + dry-cleaning substances	2	2%
Total	84	100%

TABLE 102 : SUBSTANCES ABUSED BY SNIFFERS.

Volatile Constituents

Details of exact brands of substances used by the sniffers were noted for each case. Subsequently requests for information on the volatile

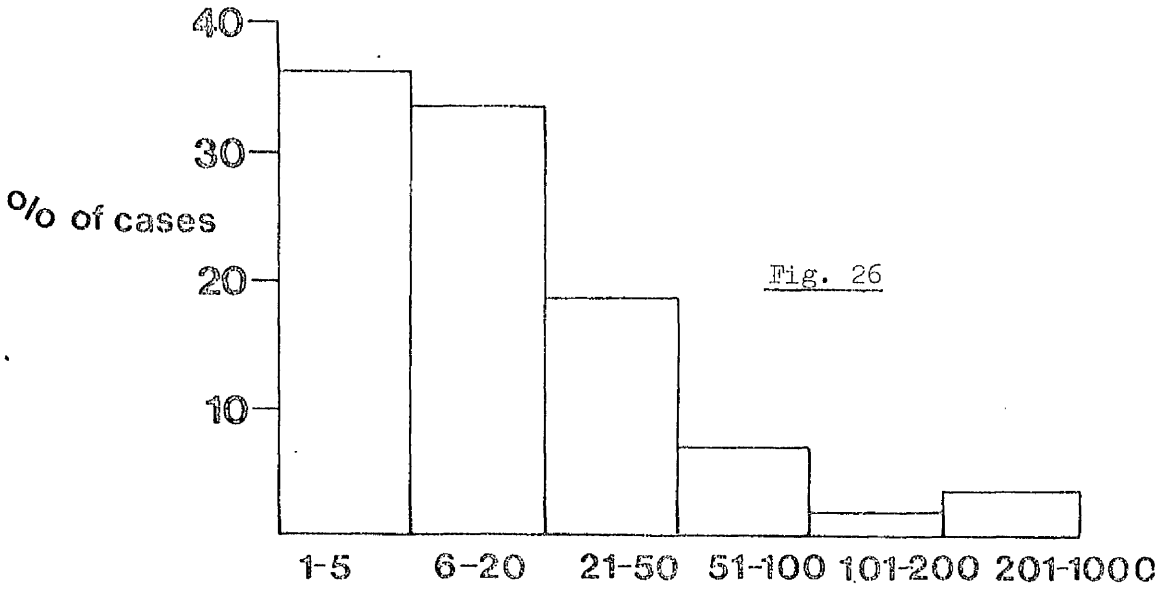


Fig. 26

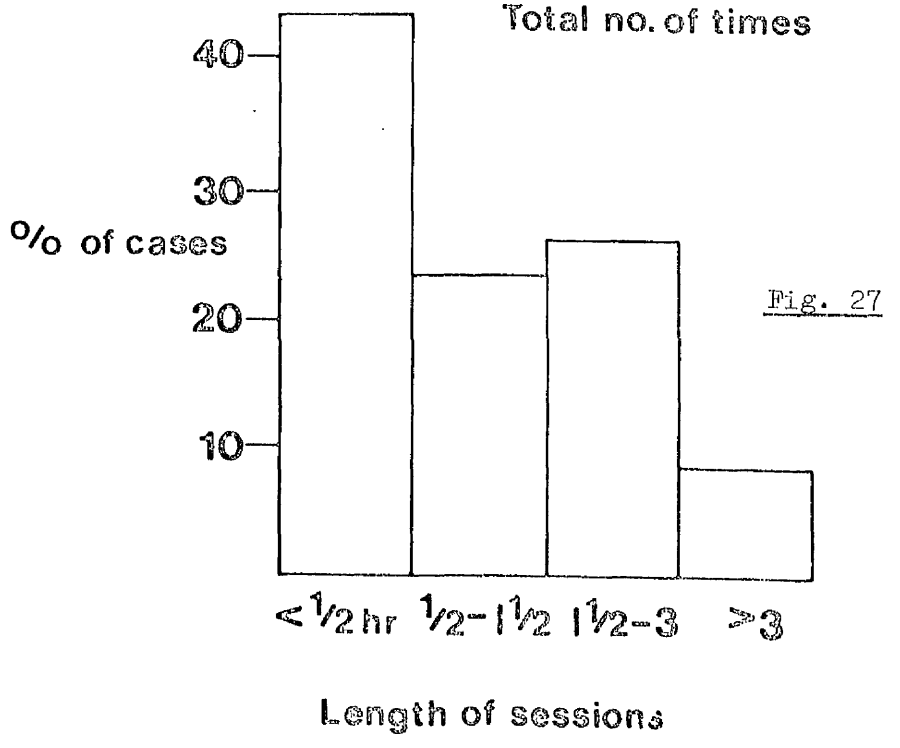


Fig. 27

Fig. 26 Total number of sniffing sessions.

Fig. 27 Length of sessions.

constituents were made to the manufacturers and also to the Scottish Poisons' Information Bureau, Edinburgh Royal Infirmary. The exact nature and composition of the products were released on a purely confidential basis (Appendix 8). The chief toxic components of adhesives were found to be mainly toluene and acetone. Dry-cleaning substances were found to contain one or more of the following constituents:-

trichloroethylene, trichloroethane, perchloroethylene (tetrachloroethylene), carbon tetrachloride.

Methods used for Inhalation

The method of inhalation was found to vary according to the type of product but in every case involved deep breathing through the nose and mouth as opposed to 'sniffing' as such. Dry-cleaning substances were inhaled directly from the tops of bottles (fig. 28) or alternatively from saturated rags or handkerchiefs (fig. 29).

Vapours emanating from adhesives were in every case inhaled from small containers such as polythene bags, some of these having a capacity of 500 mls., eg small potato crisp bags. In 7 cases cans of adhesives had been heated on an open fire before the contents were poured into the bags (fig. 30). The open end of the bag was then placed over the nose and mouth enabling the vapours to be inhaled (fig. 31). This technique involved re-breathing from the bag and involved the extra hazards of hypoxia and hypercarbia.

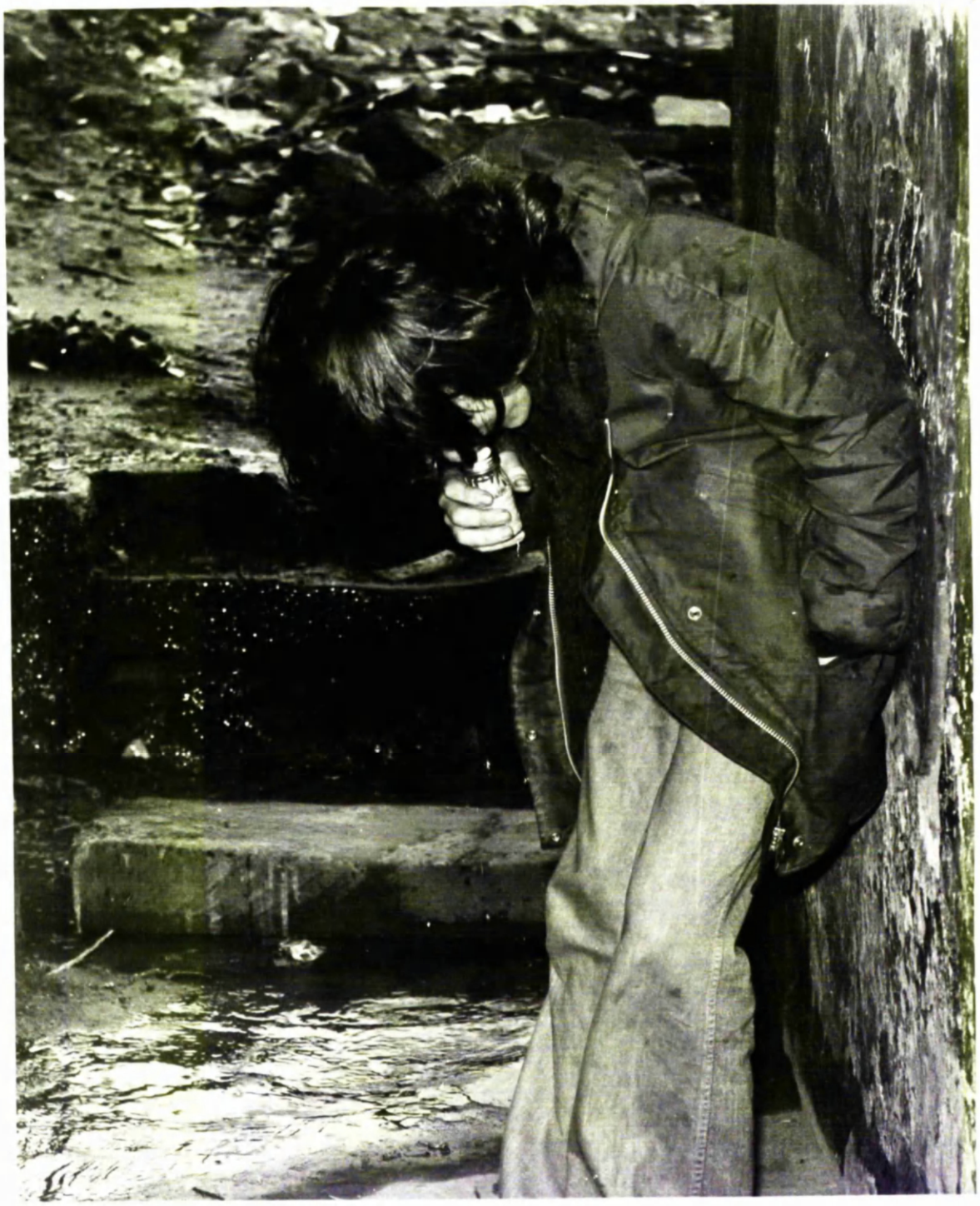


Fig. 28 Direct inhalation of the vapours of dry-cleaning agents.

Fig. 29 Inhalation of the vapours of dry-cleaning agents from saturated rags.

Fig. 30 Heating of adhesives prior to inhalation.

Fig. 31 Inhalation of adhesive vapours from a small plastic bag.

The Practice

In 70 (83.3%) of cases the practice involved groups of individuals. Only 4 (4.8%) had engaged in solitary sessions while 10 (11.9%) had sometimes been included in a group context, but had also indulged by themselves (Table 103).

The Practice	No. of cases	%
group only	70	83.3%
alone	4	4.8%
sometimes alone/ sometimes group	10	11.9%
Total	84	100%

TABLE 103 : THE PRACTICE OF SOLVENT ABUSE.

One aspect of solvent inhalation which had not been established was the timing of sessions and it remained an imponderable whether the children were simply unwilling to vouchsafe this information or whether they genuinely could not remember.

Details of exact locations of sniffing sessions were recorded in each case. The places chosen were found to vary considerably, although their selection generally had been determined with a view to avoiding detection and consequently were often very isolated (Table 104). Only 5 (6%) had practised at home, 2 in a shed and 3 in a garage. Percentages have been corrected to 1 decimal place.

Places chosen	No. of referrals	%
Woods	52	61.9%
railway yard	9	10.7%
shed	2	2.4%
garage	3	3.6%
air-raid shelter	2	2.4%
park	16	19%
Total	84	100%

TABLE 104 : PLACES CHOSEN FOR SNIFFING SESSIONS.

The Effects of the Practice

The participants variously described how they felt during the course of a sniffing session. 20 (23.8%) felt sick or dizzy and 11 (13.1%) admitted to 'blackouts'. One boy said sniffing made him feel like a superman and 2 said the practice gave them added strength in their arms.

For 12 (14.3%) it represented an entirely pleasant experience 'like being drunk'. In 43 (51.2%) of cases vivid hallucinations were a main feature throughout the sessions. These were mostly visual and often frightening. One 12 year-old boy described his experiences as 'something happening like God or the devil or monsters', while a 15 year-old boy declared that he felt he had become a headstone in the local cemetery when he was under the influence of glue.

The loss of both appetite and weight, directly attributable to the commencement of solvent abuse, was reported by parents in 11 (13.1%)

cases. 9 others reported severe frontal headaches and recurrent nightmares subsequent to their children becoming involved in the practice.

Medical Histories

The medical histories in respect of children yielded little significant information. Only one had ever been in hospital, a 13 year-old girl with a history throughout childhood of recurrent urinary tract infections, for which she had once been hospitalised. None of the other children had suffered from serious illnesses and all, in fact, were in excellent physical health. Two gave histories of bronchial asthma but had not required hospitalisation and were not currently receiving any medication for the condition. At the time of examination, both were asymptomatic.

Physical Examination

In 10 of the cases who were referred immediately following a very recent episode, there were obvious signs of adhesive on the face (fig. 32). A residual effect of the practice in the form of 'glue sniffer's rash' was found in 6 of the habitual sniffers and was thought to be caused by the repeated application of a plastic or polythene bag to the nose and mouth. The rash was symmetrical in distribution and consisted of comedones, papules and pustules extending from each nostril up the nasal fold and across the bridge of the nose (fig. 33).

The clinical states of three sniffers, who had been referred immediately after an episode, closely resembled that of acute alcoholic intoxication (fig. 34).

Fig. 32 Adhesive stains on the face.

Fig. 33 'Glue sniffer's rash'.

Fig. 34 Signs of acute intoxication following an episode of solvent abuse.

In the case of one chronic sniffer, vertical nystagmus and past-pointing, thought to have been caused by the effects of prolonged glue sniffing, were detected. This boy was also found to have developed physical addiction to glue and his case is described in full in Appendix 9 .

Apart from these signs, and those of extensive dental caries and self-inflicted tattoos (figs. 35-36), no abnormalities were detected when the test or control cases were subjected to physical examination.

Accidents

The intoxication resulting from abuse of solvents was sometimes associated with accidents. In 2 separate incidents firearms were discharged by a group of sniffers; in another case a boy found staggering in the path of moving vehicles on a busy street was rescued unhurt by the police; in two further cases knives were produced and used to threaten parents. In one case a girl, who had been initially referred in April 1975 and subsequently thought to have given up the practice, used glue in a suicide bid one year later (Appendix 9).

Laboratory Investigations

In view of the documented evidence (Cohen, 1973; Litt and Cohen, 1969) about the toxic effects of solvents when deliberately inhaled, laboratory tests were carried out in all cases to investigate the possibility of asymptomatic, heamatological, hepatic or renal damage. In 82 of the cases, only one sample of blood and urine was obtained.

Complete blood counts and recticlocyte counts were normal in all but one case. In this case the haemoglobin was found to be 8.8 gms. per 100 mls., the packed-cell volume 28%, red blood cells 3.7 x 10^6 per cubic millimetre, mean corpuscular volume 75mm^3, reticulocytes 1 per cent and the blood film showed the changes associated with iron deficiency anaemia. The individual was a 16 year-old boy who had intermittently inhaled adhesives for 12 months.

The results of all the tests of hepatic function, excluding alkaline phosphatase, were within normal limits for the age group 8 - 20 years. However, in 15 test cases and 10 control cases the alkaline phosphatase level was found to exceed 450 I.U./L. As it was not possible to carry out more detailed investigation in these cases it is not known whether this isolated finding was significant or whether indeed the levels could be considered normal for adolescents.

Urine analysis was negative in 69 of the test cases and 72 of the controls. In the remainder, a trace of albumin was detected but since there was no statistical difference ($X^2 = 0.3972$, d.f. = 1, $p > 0.05$) between the 2 groups and Uristix is a very sensitive test for presence of protein, this finding was not considered to be significant.

Psychiatric Assessment

Although some attempt was made to refer 15 cases for psychiatric assessment, it proved possible in only 5 cases, the subjects of which were all resident in Calder House. This was due to the reluctance of parents to travel long distances for this particular purpose.

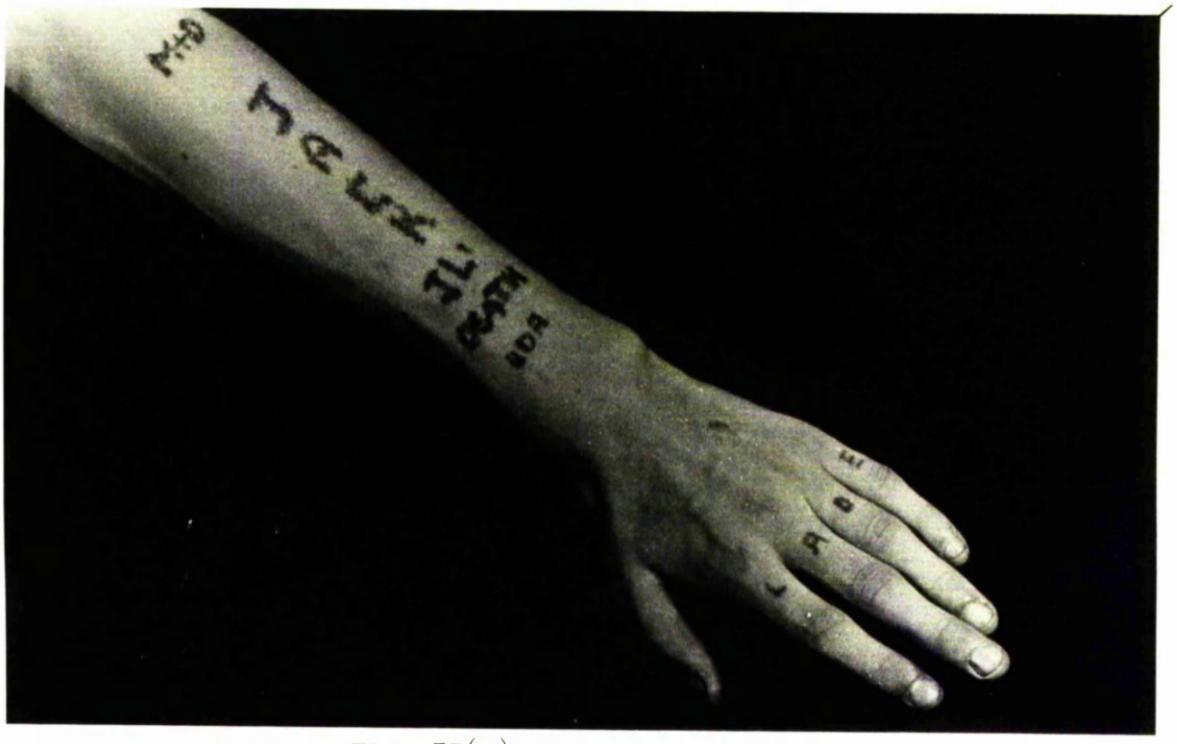


Fig. 35(a)

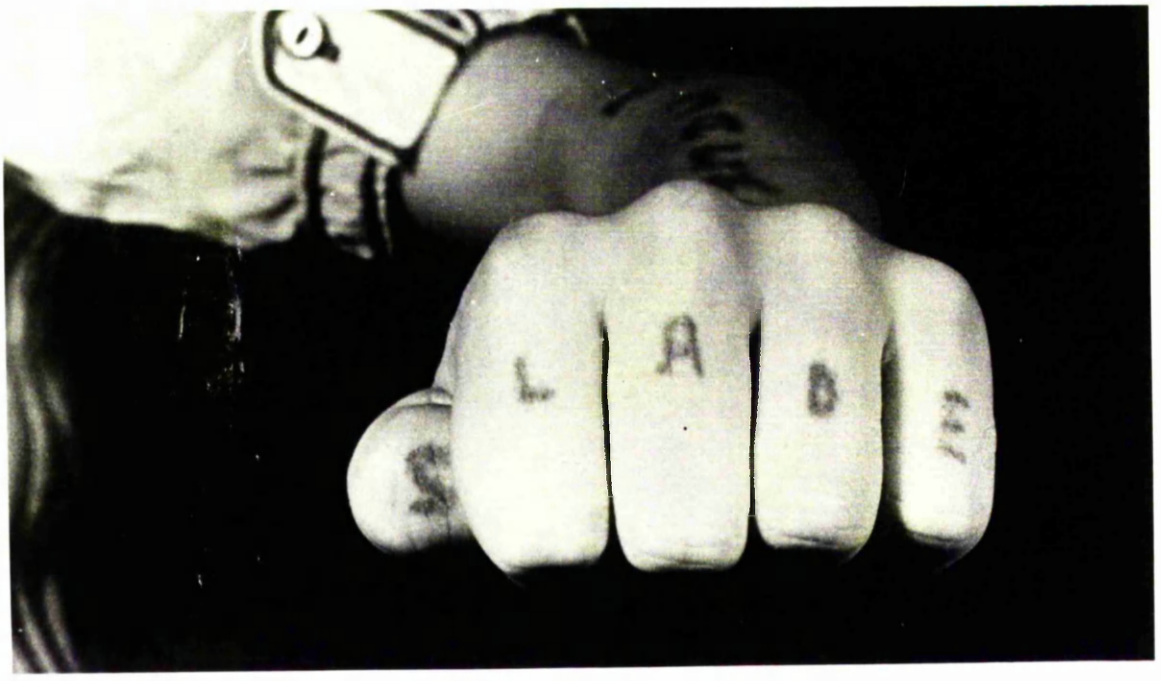


Fig. 35(b)

Figs. 35(a) and 35(b) Self-inflicted tattoos.

Fig. 36 Self-inflicted tattoos.

One was found to be suffering from depression, two from a combination of anxiety and depression while the other three were stated to be normal.

7.5 DISCUSSION

During the course of this study 84 young people, aged 8 - 16 years, all of whom had abused solvents were asked to provide information on the extent of their involvement in the practice.

Although 24% had been referred within 1 week of their last sniffing episode and a further 47.6% within 16 weeks, the time interval in respect of the remainder could sometimes be lengthy. Cases referred soon after a very recent episode were, with only two exceptions, referred by the police.

Despite vigilance on the part of referring agencies, it was quite clear from the results, that a considerable disparity existed between the number of cases on the one hand and these episodes which were self-reported on the other hand. In fact, voluntary statements, on the part of the young people involved, indicated that much of the practice must have remained undetected.

Although 44% of the young people indulged in sessions lasting less than 30 minutes, 6 (7%) indulged for more than 3 hours on each occasion, indicating that the activity occupied a significant proportion of their total time.

The term 'sniffing' was found to be inaccurate because the methods employed, although varying to some extent with the type of product used, almost always involved deep inhalation through the nose and mouth. The methods chosen in Lanarkshire were found to be similar to those used in America (Wyse, 1973).

The volatile components of dry-cleaning substances and/or adhesives had been used by the young people for the deliberate induction of intoxication. Various proprietary brands of adhesives proved most popular, presumably because of their ready availability and relatively low cost.

It was interesting to note the subjective effects of the practice but alarming to find that although 43 (51.2%) subjects had described their hallucinations as most frightening, this phenomenon had not in any way deterred them from the practice. 13.1% of the participants had suffered loss of appetite and weight following their involvement in the practice and a further 10.7% complained of nightmares and frontal headaches.

The chief toxic constituents of these substances were found to be toluene, trichloroethylene, tetrachloroethylene, trichloroethane and carbon tetrachloride. In view of the cases of acute and chronic toxicity reported in the literature, it was considered possible that toxic damage to liver, kidneys, bone marrow and brain might have occurred. Elevated serum levels of alkaline phosphatase and traces of albuminuria occurred in respect of both test and control cases but were not considered to be associated with solvent abuse. In only

one case was any abnormality noted which could have represented toxic damage to bone marrow. Further investigations, however, could not be carried out and it is, therefore, impossible to state whether there was any correlation between the solvent abuse and the anaemia detected.

Before concluding that solvent abuse is a harmless activity, account must be taken of certain relevant points. In 23% of the cases studied, exposure to solvents had been minimal; in a further 28.2% there had been a lengthy delay of more than 16 weeks between last exposure and time of referral, and in most cases it was only possible to obtain 1 random sample of blood and urine. These factors would considerably diminish the possibility of detecting any acute damage which had occurred. The absence of chronic systemic damage might be explained by the low concentrations of solvents achieved (despite repeated exposure), the lack of sensitivity of the tests employed or the capacity of different organ systems, especially the liver, to deal with acute insults. Long-term follow-up would seem to be desirable, as toxic effects may not be noticeable for many years (cf. alcohol), and more detailed research in this area would seem to be required.

7.6 SUPPLEMENTARY STUDY

Children frequently could not remember or were perhaps reluctant to say at what time of day or on which day of the week their sniffing activities had taken place. No relevant information on this score therefore was available either from studies carried out in America or elsewhere.

A further investigation in Lanarkshire was undertaken between March and August 1976 to obtain accurate and more detailed information on the patterns of solvent abuse, an attempt being made in this context to develop a rapid screening technique for measuring solvent levels in blood samples (Oliver and Watson, 1977).

7.6.1 Approach and Methods

Police personnel in the area known formerly as Lanarkshire were approached and offered a 24 hour emergency service in respect of sniffers by the investigator. Having accepted, it was agreed that the investigator could be contacted either within office hours or at home whenever necessary, if a sniffer was brought to police attention. A standard form was prepared by the police in order to facilitate this study and to ensure that all cases of solvent abuse were in fact notified (Appendix 10).

Relevant analyses of blood samples were carried out within the University Department of Forensic Medicine.

Patients

Between March 1976 and August 1976 police personnel referred 50 consecutive acute cases of solvent sniffing "for kicks". All patients were seen as soon as possible after referral usually within 1 - 1½ hours and the date and time of the referral were noted. A detailed medical history was obtained in each case and a physical examination carried out. Particular attention was paid to details about the recent sniffing episode including the substance or substances involved, the duration of the session, the method used, and the interval between

the end of the session and the time of examination. Samples of venous blood were taken from 32 of the cases referred during the time of the study. The samples were heparinised and stored at $4^{o}C$ until they were analysed for solvent gases by gas-liquid chromatography usually within 48 hours. The agents which had been used for inhalation by the young people involved were put into a polythene bag the neck of which was then sealed and transported with the blood-samples to the laboratory for analysis.

Parental consent had to be obtained in each case so that interview, examination, and blood-sampling might be carried out. In 6 cases, which were referred during the day, parental consent could not be obtained as the parents were both at work. In 4 cases the child's condition as indicated by the police seemed serious enough to warrant immediate hospital referral and indeed 2 of the 4 cases were admitted. 3 of the cases were reported 2 days after the episode and on five occasions, reported mid-week, the investigator was unable to attend. Only 32 blood-samples in all were obtained but full information on the other aspects of the 50 cases is presented.

Controls

For the purpose of providing control specimens, venous blood samples taken routinely on admission during July, 1976, from non-sniffing Lanarkshire Assessment Centre children aged 13 - 15 years were analysed for solvent levels.

Solvent-based Products

Most of the samples of these materials were obtained directly from sniffers or police, but a few were purchased from local hardware or department stores.

Analyses

The analyses were carried out using a Pye Model 104 gas chromatograph equipped with a heated-flame-ionisation detector and a heated injector port. The results were monitored using a Hewlett Packard 3370B integrator and displayed on a Tekman series 200 pen recorder. The column used was glass, 5 ft. x $\frac{1}{4}$ in. outside diameter, packed with 10% 'Carbowax' 400 on 80 - 100 mesh 'Chromosorb W'. The column was used at 70°C with a nitrogen carrier gas flow-rate of 60 ml./min.

Retention Times of Solvents

1 mg. per ml. solutions or suspensions of solvents in water were prepared. 1 µl. injections were used to determine retention times.

Identification of Solvents in Glues and other Products

1 ml. of each substance under investigation was placed in an open vial, sealed in a polythene bag, and allowed to degas at room-temperature. 1 ml. aliquots of the air space were used for the analysis.

Blood (5ml.) was degassed by warning in sealed vial at 100°C for 30 minutes. Aliquots (1 ml.) of the head-space gas were used for the analysis.

7.6.2 Results

During the 6-month period of the study there were 50 referrals involving 42 different persons. Altogether 38 of them were referred once, 2 were referred twice, 1 was referred three times, and 1 child on five occasions. Of the 42 children and young people who had come to the attention of the police, 40 were males and 2 were females (fig. 37). The age range was 12 - 19 years and the mean age was

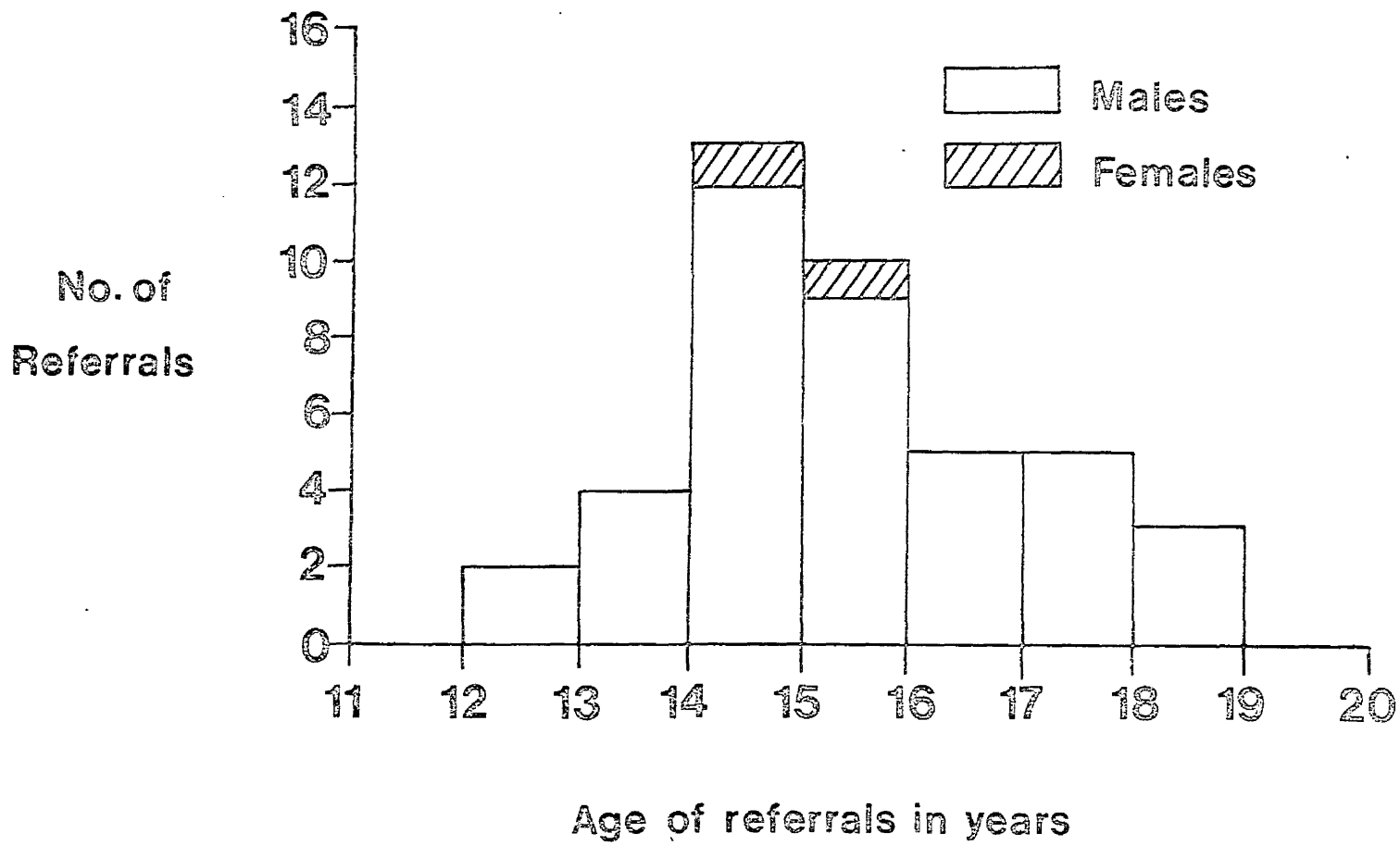


Fig. 37 Age and sex distribution of cases.

14.9 years. Mondays (26%), Wednesdays (24%), and Thursdays (26%) were the commonest days for referral, fewest cases referred on Saturdays (2%) and none on Sundays (fig. 38). Although the largest peak-period for referral was found to be between 8 p.m. and 11 p.m., other peaks were found to occur between 11 a.m. and 12 noon and between 2 p.m. and 4 p.m. (fig. 39). On most occasions (82%) several patients were referred at the same time because in the main solvent sniffing appears to be a group activity, but sometimes (18%) only 1 patient was referred.

Substances Involved

Although a wide variety of substances was involved, in most cases (84%) proprietary brands of adhesives were used. Most of the young persons expressed a preference for one particular brand but were prepared to try another if their first choice was not available.

Method

In all cases the substance was placed in a plastic bag, the open end of which was then placed over the nose and mouth. The term "sniffing" was found to be misleading as the method used in each case involved intermittent deep breathing (from the bag) for a minimum period of 30 minutes.

Effects

In most cases, patients when examined were found to be co-operative despite intoxication of varying degree. However a few patients showed noisy aggressive and disruptive behaviour and were initially unco-operative. In only 2 cases had alcohol been consumed in association with the incident. It was not difficult to confirm the recent sniffing episode because in all cases the strong smell of chemical from the breath was easily detected.

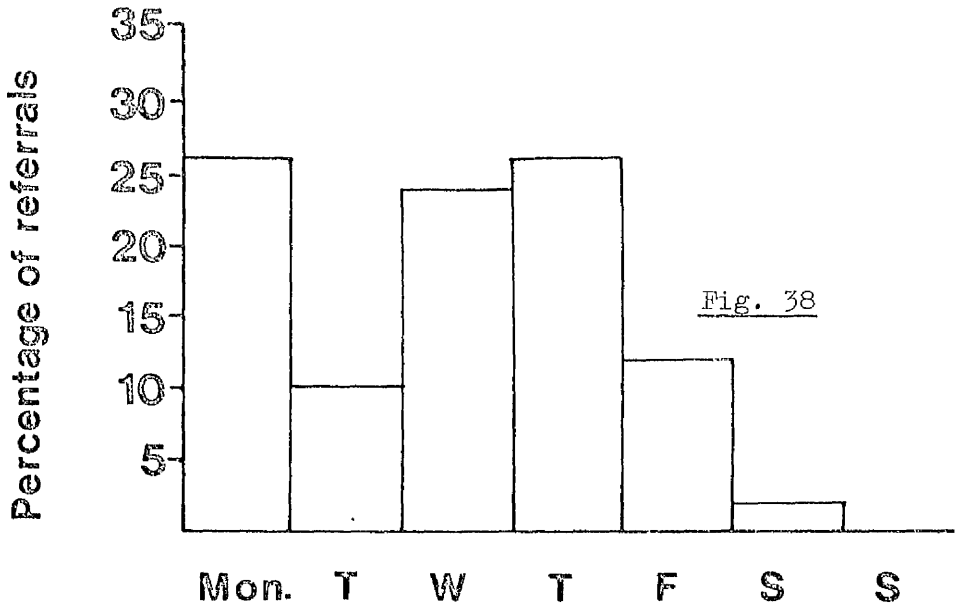


Fig. 38

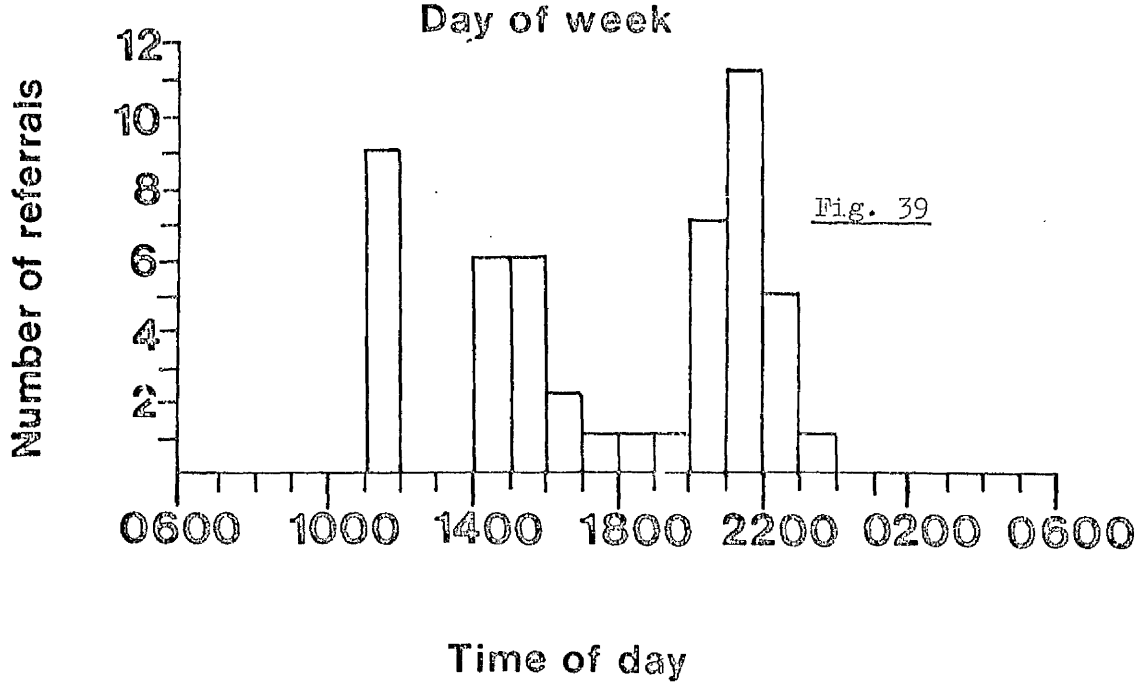


Fig. 39

Fig. 38 Days of the week on which cases were referred.

Fig. 39 Times of day when cases were referred.

Anaylses

The retention times of solvents chromatographed for reference purposes are set out (Table105). The glues and other proprietary substances investigated together with the solvents detected in them are also listed (Table106). The results of analysing the venous blood-samples from 8 control cases showed, at the most, a trace of acetone (fig.40a), whereas the analysis of blood-samples from sniffers invariably showed a significant increase in the amount of acetone, and in the case of adhesive inhalation a significant response also for toluene (fig.40b).

Solvent	Retention time relative to ethanol
ethanol	1.0
ethyl acetate	0.58
chloroform	1.04
isopropanol	0.94
acetone	0.479
amyl alcohol	3.68
butan-2-ol	1.58
1, 4-dioxan	1.67
1, 2-dichloroethane	1.35
perchloroethylene	1.04
formaldehyde	0.85
carbon tetrachloride	0.52
toluene	1.18
trichloroethylene	0.867
benzene	0.70
Retention time of ethanol = 2.5 minutes	

TABLE 105 : RETENTION TIMES OF SOLVENTS.

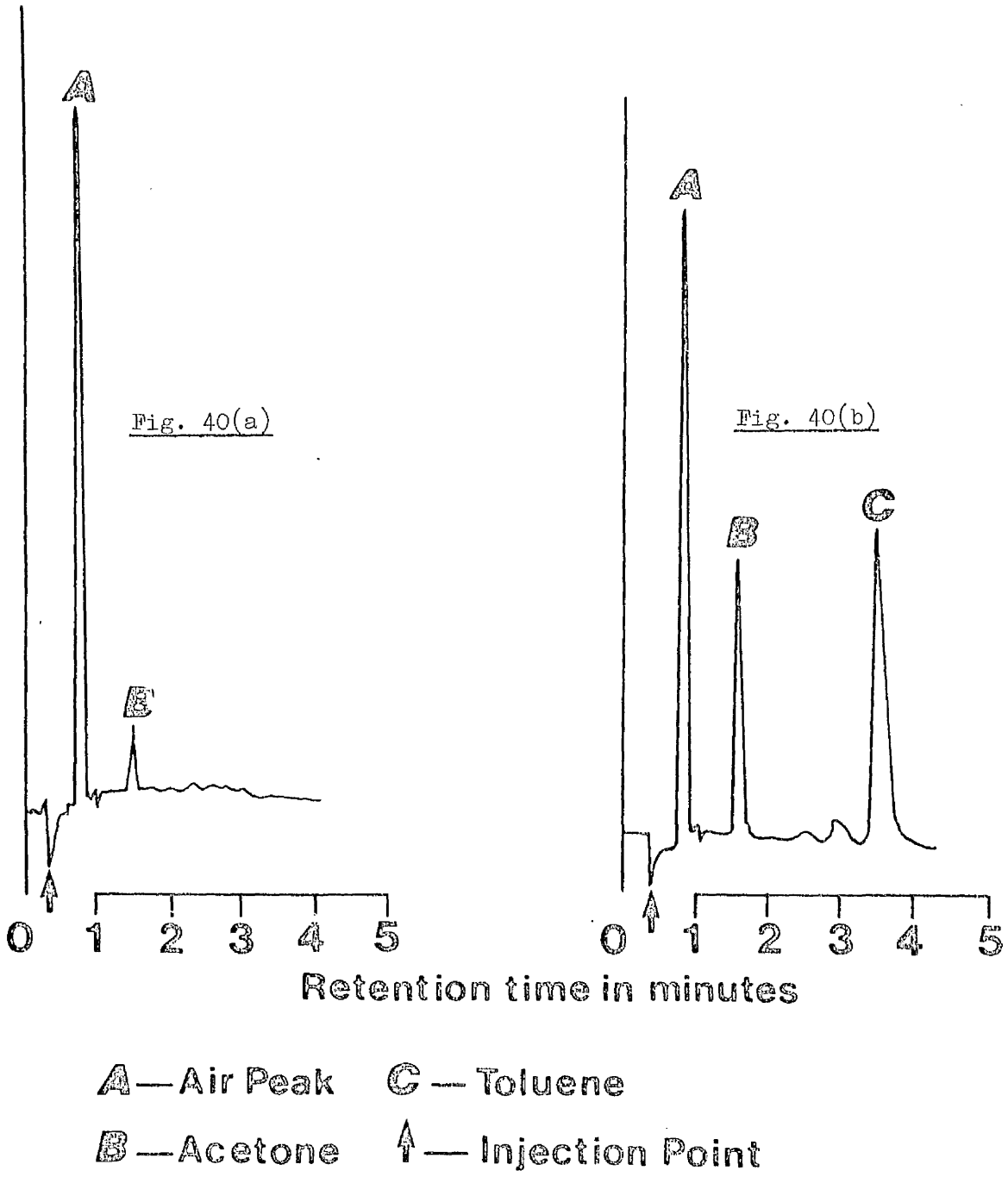


Fig. 40 Chromatogram of blood of: (a) non-sniffer;
(b) sniffer.

Product	Solvents detected
adhesives	mainly acetone and toluene
dry-cleaning substances	1 or more of trichloroethylene trichloroethane, tetrachloroethylene, carbon tetrachloride
dyes	acetone, methylene chloride
hair lacquer	methanol, ethanol
lighter refills	butane
nail-polish remover	acetone and amyl acetate

TABLE 106 : SOLVENTS DETECTED IN PRODUCTS ANALYSED.

7.6.3 Discussion

During the last few years, there has been growing concern in the west of Scotland over the increasing number of young people who inhale solvent-based materials "for kicks". The results presented show that males predominantly engage in the practice. The age group involved was 12 to 19 with a mean of 14.9 years. More than half (54%) were between 14 and 16 years of age.

Although most (98%) cases were referred during the week these figures could be incomplete or even biased for two reasons. Firstly because "sniffing for kicks" is predominantly a group activity so that a clustering of cases in certain areas at certain times would almost certainly occur. Secondly, the source of referral in each case was the police who might well be fully occupied at weekends with accidents, alcoholics etc., and therefore less likely to detect sniffers in a district. On the other hand the figures might represent

a natural decline in sniffing practice at weekends, possibly because of the availability of other interesting and less deviant activities - eg football and youth clubs.

The observed clustering of cases which occurred during the morning, afternoon, and evening further supports our belief that this is, in the main, a group activity. At first glance, it seemed as if the absence of referrals at periods during the day might coincide with police meal times. However, this was found not to be the case. We can only assume that the drop in reported episodes reflected the children's meal hours, and that it represented not only an evening social activity but for almost half the cases an alternative to school attendance. It was not possible to determine from the information available whether truancy in these cases pre or post dated the sniffing history.

Although a wide variety of solvent-based materials in common domestic use is readily available to would-be sniffers, in practice 84% had chosen proprietary brands of adhesives. The method of inhalation showed even more conformity and undoubtedly reflected previous experience with solvents. It was interesting to note that the acute effects of these solvents most closely resembled alcoholic intoxication.

The analytical technique developed was rapid, reliable and simple. Glues and other substances could be rapidly screened for suspected solvents thus confirming the formula stated by the manufacturer,

although with respect to the wishes of certain manufacturers we have not listed the solvent formulations of the products investigated. The most popular adhesives involved were found to contain both acetone and toluene. The analysis of the blood-samples from sniffers readily detected these solvents.

Although this investigation has added to our current knowledge about the sniffers, the substances, the solvents and the syndromes, it indicates a need for more factual information about the effects and toxicity of glues and other freely available solvent-containing materials whose vapours could be inhaled "for kicks".

CHAPTER 8

MORBIDITY AND MORTALITY STATISTICS ON SOLVENT ABUSE

8.1 INTRODUCTION

It has been stated that the media provide an important source of information in general and especially in large urban communities and perhaps in so doing may encourage deviant behaviour by reporting it (Young, 1974).

In America, furthermore, it was suggested that publicity on solvent abuse might have had an adverse effect on the problem by increasing children's curiosity about the subject (Freer, 1963), but on the other hand it was also stated that greater publicity increased general awareness of the problem. It also made the point that the practice was, in fact, prevalent prior to widespread publicity (Kupperstein et al., 1968). Again a case was quoted in the literature concerning a boy, who had been sniffing glue 2-3 times weekly for approximately 3 weeks consecutively, and who then read in the newspapers of the dangers to health and promptly discontinued the practice (Jacobziner and Raybin, 1962).

In Lanarkshire, an attempt by the investigator to conduct a prevalence survey on solvent abuse among children aged 12-15 years in 8 pre-selected schools had received a great deal of adverse publicity in the national newspapers and evoked indignant reactions from various people especially parents, as a result of which the survey had to be abandoned (Watson, 1975).

This particular study was initially undertaken in order to review the not inconsiderable number of newspaper articles which had appeared on solvent abuse between 1 November, 1970 and 31 December, 1975, with a view to analysing their contents and determining whether there existed an association between solvent abuse in Lanarkshire and newspaper reporting. There had been no media coverage of the subject apart from newspaper reporting during the period studied.

8.2 APPROACH AND METHODS

National Papers

A comprehensive search of the newspapers was carried out by the investigator between 1 February, 1976 and 31 May, 1976. National daily newspapers, bound into volumes, were available for the period studied within the Mitchell Library, Glasgow. The search took the form of a careful study of all the newspapers likely to carry such articles and involved a systematic search through each of the newspapers noting the name of the paper, the page number, the newspaper headline and the date in every case whenever relevant items were found. Since national papers are published daily (from Monday to Saturday) each day's paper for the years 1970-1975 were studied and a photocopy of each relevant article was then taken by the photocopying service available within the Mitchell Library. Back numbers of the following newspapers were studied:

The Citizen, The Daily Record, The Evening Times, The Glasgow Herald, The Scotsman, The Scottish Daily Express.

Local Newspapers

Local newspapers were not available at the Mitchell Library, so the

investigator wrote to the editors of each of the local newspapers in Lanarkshire (Appendix 11), detailing the purposes of the study and requesting copies of any articles related to solvent abuse, which might have appeared between 1 November, 1970 and 31 December, 1975.

There follows a list of such newspapers, which all appear weekly and which were considered to be likely sources of reports on solvent abuse:

The Airdrie and Coatbridge Advertiser, The Bellshill Speaker, The East Kilbride News, The Hamilton Advertiser, The Larkhall and Stonehouse Gazette, The Motherwell Times, The Wishaw Press.

In every case the editors proved both co-operative and helpful.

Articles on solvent abuse from local and national newspapers were subsequently mounted on cardboard and, after being photographed, were then reduced in size to suit A4 paper by staff of the Medical Photography Department at Law Hospital, Carluke.

8.3 RESULTS

In the period from November, 1970 to December, 1975, a total of 27 articles had appeared in newspapers on various aspects of solvent abuse (Appendix 12). Eleven of them had appeared in local newspapers and 16 in the national press. Of these, 2 had appeared in 1971, 1 in 1972, 9 in 1973, 8 in 1974 and 7 in1975 (Table 107).

Five deaths directly associated with the practice had been reported

MONTH	YEAR	NEWSPAPER
January	1971	Motherwell Times
March	1971	Motherwell Times
May	1972	Motherwell Times
January	1973	Larkhall and Stonehouse Gazette
January	1973	Glasgow Herald
February	1973	Scottish Daily Express
February	1973	Glasgow Herald
March	1973	Scottish Daily Express
October	1973	Motherwell Times
October	1973	Airdrie and Coatbridge Advertiser
December	1973	Daily Record
December	1973	Glasgow Herald
January	1974	Scottish Daily Express
January	1974	Scottish Daily Express
January	1974	Evening Times
May	1974	Airdrie and Coatbridge Advertiser
May	1974	Glasgow News
May	1974	Daily Record
June	1974	Glasgow Herald
September	1974	Glasgow Herald
March	1975	Motherwell Times
May	1975	Wishaw Press
September	1975	Scotsman
September	1975	Glasgow Herald
September	1975	Scottish Daily Express
September	1975	Daily Record
December	1975	Airdrie and Coatbridge Advertiser

TABLE107: NEWSPAPER ARTICLES ON SOLVENT ABUSE 1970-1975

throughout the period of the study and there were 3 reports of children who had required to be hospitalised following sniffing episodes. There was also a report of offences committed as a result of the practice, several warnings regarding the dangers of solvent inhalation and a further 3 articles on the proposed prevalence survey in Lanarkshire schools.

8.4 DISCUSSION

From the foregoing it was obvious that reporting on solvent abuse had been sporadic but specific in that it reported related incidents or deaths, all of which had already occurred. This aspect is discussed more fully in chapter 9. It was equally clear that there were some individuals, who had died as a result of their indulgence in the practice, or had at least been hospitalised.

This had, of course, also been a well-proven fact of the American studied. Five teenagers between 12 and 16 years of age, who, over a period had been inhaling spot-remover containing trichloroethylene and trichloroethane, displayed abnormalities of liver function, one having become jaundiced within a week of the episode (Litt and Cohen, 1969).

Another case involved 3 teenagers who developed acute centrilobular necrosis subsequent to the inhalation of cleaning fluid. Two of them also showed evidence of acute renal injury, presumed to be attributable to tubular necrosis (Baerg and Kimberg, 1970).

Many deaths associated with the practice have also been reported. Although these deaths have generally been attributed to plastic bag

suffocation (Cohen, 1973; Collom and Winek, 1970), the actual mechanism of death is believed to be a cardiac arrythmia (Bass, 1970), inhalation of vomit (Alha et al., 1973; Musclow et al., 1971), or laryngospasm preventing inspiration of oxygen (Cohen, 1973).

It was found in the previous study (chapter 7) that no physical damage had resulted from solvent abuse in the 84 individuals studied. However, it was possible that other participants unknown to the police or social agencies could have been hospitalised or could, in fact, have died following sniffing episodes.

8.5 MORBIDITY STATISTICS

Accordingly, it seemed reasonable to study hospital records with a view to completing statistics on the extent of the practice within Lanarkshire and also determining any morbidity which had resulted from solvent inhalation. The retrospective study was conducted between April, 1976 and October, 1976, the period covered by the study itself being 1 January, 1970 to 31 December, 1975.

Local Background

Three general hospitals serve the population of Lanarkshire (626,790) and these are Hairmyres Hospital, Law Hospital and Stonehouse Hospital. There is no hospital for children within Lanarkshire.

Although Hairmyres Hospital's catchment area includes Rutherglen and Cambuslang, there was a possibility that children from these areas

might have been removed instead to the Victoria Infirmary, Glasgow. There was a further possibility that the Royal Hospital for Sick Children, Glasgow, might have accepted some cases in view of the fact that it is the only Children's Hospital in the area.

All 5 hospitals were, therefore, included in the study. The District Medical Officer was approached in the case of each hospital and permission obtained to conduct a study of hospital records.

Accident/Emergency Records

The accident/emergency statistics for the period 1 January, 1970 to 31 December, 1975 in respect of each hospital were carefully perused by the investigator. This involved studying the case-books of all casualties seen at these hospitals. Where the nature of the complaint was stated to be solvent abuse or glue sniffing, or where it might have accounted for a patient's sudden collapse, access to the actual casualty record for that patient was requested and studied for further information. In the case of each sniffer, name, address, date of birth and details of the episode were all abstracted on a separate form (Appendix 2).

In-patient Statistics

The statistics on solvent abuse in relation to in-patients were also considered to be relevant to the study of morbidity.

The International Classification of Diseases coding is used throughout the world and reviewed every 10 years by the World Health Organisation. Examination of the index revealed that 304.8 was the accepted code for

glue sniffing. However, it was very possible that this was not generally known and equally obvious that it would not be applied to cases, where substances other than adhesives had been inhaled.

Accordingly, the following diagnostic classifications were selected as being appropriate though not entirely comprehensive:-

N977.8 Adverse effects of other specified drugs, not elsewhere classified.

N977.9 Adverse effects of drugs unspecified.

N982.1 Toxic effects of carbon tetrachloride.

N982.9 Toxic effects of other industrial solvents.

N987.9 Toxic effects of other gases, fumes or vapours.

N989.9 Toxic effects of other substances, chiefly non-medicinal as to source.

In view of the fact that the completed and coded S.M.R.I. forms of in-patient records are sent to the Information Services Division of the Common Services Agency in Edinburgh, an approach was made to this Agency by the investigator, who explained the nature of the study and who also requested that an abstract of medical data on Scottish Hospital In-patient statistics for these 7 chosen I.C.D. classifications in respect of the 5 hospitals for the period 1970-1975 be made available. However, information could only be obtained for the period 1970-1974 except in the case of the Royal Hospital for Sick Children, which possesses its own Master Index. In the latter case, details were also obtained from the period 1 January, 1975 to 31 December, 1975.

The print-outs obtained from the Information Division had to be acknowledged by return of post and destroyed after use in order to ensure security and preserve confidentiality.

Data

The data from the print-outs consisted of details relating to age, sex, occupation, social class, source of admission, dates of admission and discharge, number of days in hospital, diagnostic classification and case-record number.

Data Handling

Data handling was conducted manually by the investigator.

Data Analyses

The 'susceptible' age range for solvent abuse was set for the purposes of the study at 5-21 years. Record numbers of all the cases falling within this age range were noted from the print-outs for each hospital and classified according to the diagnostic category. The numbers for each hospital and for each category were duly noted.

The records for all cases noted as being within the age range 5-21 years were carefully studied for information on solvent abuse. Most of the case-records were found to contain no mention of involvement in the practice but in those cases, where the patients did seem to be implicated, the relevant details were abstracted on a separate form (Appendix 2).

8.6 RESULTS

General Data

Full details of in-patient and out-patient records in respect of each of the 5 hospitals are laid out in Appendix 13 . The number of solvent sniffers detected by means of in-patient and out-patient records is demonstrated in Table 108 . One case featured in the out-patient records but was also admitted as an in-patient.

Hospital	1970	1971	1972	1973	1974	1975
Hairmyres Hospital	-	-	-	1	-	-
Law Hospital	-	2	1	1	1	4
Royal Hospital for Sick Children	-	1	-	2	2	1
Stonehouse Hospital	1	1	1	3	-	-
Victoria Infirmary	-	1	1	-	1	-
Total	1	5	3	7	4	5

TABLE 108 : SOLVENT SNIFFERS BY HOSPITAL REFERRAL, 1970-1975.

This demonstrated clearly that a total of 25 young people had been examined at or admitted to one or other of the five hospitals during the period of the study.

The numbers for each I.C.D. classification are demonstrated in Table 109.

I.C.D. code	1970	1971	1972	1973	1974	1975	Total
304.8	-	-	1	1	2	-	4
N977.8	-	-	-	-	-	-	-
N977.9	-	-	-	1	1	-	2
N982.1	-	1	1	-	-	-	2
N982.9	-	1	-	-	-	-	1
N987.9	1	3	1	-	-	1	6
N989.9	-	-	-	-	1	1	2
Total	1	5	3	2	4	2	17

TABLE 109 : SOLVENT SNIFFERS BY I.C.D. CODES, 1970-1975.

From the available information it is obvious that, in all, 17 solvent sniffers were admitted to the 5 hospitals. Of these, however, the 3 patients admitted to the Victoria Infirmary were all resident in Glasgow and 5 of the 6 children admitted to the Royal Hospital for Sick Children were also domiciled in Glasgow. Only the details of the remaining 17 young people are considered within the context of this study.

Demographic Data

Among the 17 young people in Lanarkshire who had been referred and/or admitted to hospital, 12 (70.6%) were males and 5 were females. None were known to the police or social agencies.

The age range in respect of the males was 9-19 years while that of females varied between 11 and 15 years. The mean age for males

(14.8 years) was higher than that for females (13.4 years), while the median for males (15 years) was also greater than that for females (14 years). The proportion of males involved in comparison to females was 2.4:1 (Table 110).

Year of referral	No. of cases M	F	Sex Ratio
1970	1	-	1:0
1971	2	2	1:1
1972	1	1	1:1
1973	4	1	4:1
1974	-	1	0:1
1975	4	-	4:0
Total	12	5	2.4:1

TABLE 110 : NO. OF LANARKSHIRE CASES BY YEAR OF REFERRAL.

The variation in the age of males involved in the practice was much greater than that of females and this held true for each of the years surveyed (Table 111). Percentages have been corrected to one decimal place.

Year of referral	Age range (years)		Mean age (years)	
	M	F	M	F
1970	16	-	-	-
1971	13-18	14-15	15.5	14.5
1972	19	12	-	-
1973	9-14	11	12.8	-
1974	-	15	-	-
1975	15	-	15	-

TABLE 111: AGE RANGE AND MEAN AGE BY YEAR OF REFERRAL.

Substances Abused

Although a wide variety of proprietary brands of adhesives had been used in most cases (64.7%), petrol and cleaning fluids were also mentioned in the case-records (Table 112).

Year of referral	Substances abused	No. of referrals	%
1970	petrol	1	5.9%
1971	adhesives	1	5.9%
	dry-cleaning substances	2	11.8%
	petrol	1	5.9%
1972	dry-cleaning substances	2	11.8%
1973	adhesives	5	29.3%
1974	adhesives	1	5.9%
1975	adhesives	4	23.5%
Total		17	100%

TABLE 112 : SUBSTANCES ABUSED BY YEAR OF REFERRAL.

No details were available regarding the organisation of the episodes or where they were located.

Clinical Data

In all, 17 patients had arrived at hospital in a state of intoxication following episodes of solvent abuse, 8 of whom had been examined in Casualty Departments and subsequently sent home, the other 9 being admitted to the wards. Seven of the 9 patients had been in hospital for an overnight stay only but the other two patients had remained for 3-4 days.

Clinical examination revealed no signs of physical damage in any of the cases and haematological and biochemical tests, which were carried out in two cases only, proved negative. None of the cases was subsequently followed up and there is no evidence of subsequent referral or re-admission to hospital for any reason.

Prevalence

The actual place of residence in each case was studied and the results are presented in Table 113. All the places noted were situated in urban areas.

Place of residence	Total no. referred					
	1970	1971	1972	1973	1974	1975
Bellshill	-	-	-	3	-	-
Bothwell	-	1	-	-	-	-
Cambuslang	-	1	-	-	-	-
Coatbridge	-	1	-	-	-	-
East Kilbride	-	-	-	1	-	-
Hamilton	-	1	-	-	-	-
Larkhall	1	-	1	-	-	-
Motherwell	-	-	-	1	-	4
Newarthill	-	-	-	-	1	-
Wishaw	-	-	1	-	-	-
Total	1	4	2	5	1	4

TABLE 113 : NO. OF SOLVENT SNIFFERS 1970-1975 BY PLACE OF RESIDENCE.

The actual numerical total of cases admitted was small, but even so it was still obvious that there was a preponderance of cases in certain areas noted previously, ie Motherwell and Bellshill, as well as cases which had been referred from Bothwell, Larkhall and Newarthill, where previously the practice had not been known to exist.

There would appear to have been a greater number of males than females involved in solvent sniffing practices in respect of almost every area (Table 114).

Place of residence	1970 M	1970 F	1971 M	1971 F	1972 M	1972 F	1973 M	1973 F	1974 M	1974 F	1975 M	1975 F
Bellshill	-	-	-	-	-	-	3	-	-	-	-	-
Bothwell	-	-	1	-	-	-	-	-	-	-	-	-
Cambuslang	-	-	-	1	-	-	-	-	-	-	-	-
Coatbridge	-	-	1	-	-	-	-	-	-	-	-	-
East Kilbride	-	-	-	-	-	-	-	1	-	-	-	-
Hamilton	-	-	-	1	-	-	-	-	-	-	-	-
Larkhall	1	-	-	-	-	1	-	-	-	-	-	-
Motherwell	-	-	-	-	-	-	1	-	-	-	4	-
Newarthill	-	-	-	-	-	-	-	-	-	1	-	-
Wishaw	-	-	-	-	1	-	-	-	-	-	-	-
Total	1	-	2	2	1	1	4	1	-	1	4	-

TABLE 114 : SEX DISTRIBUTION OF SOLVENT SNIFFERS BY PLACE OF RESIDENCE.

The age range of males involved in the practice showed a wide variation from one area to another (Table 115).

Place of residence	1970 Age range (years)	1971 Age range (years)	1972 Age range (years)	1973 Age range (years)	1974 Age range (years)	1975 Age range (years)
Bellshill	-	-	-	14	-	-
Bothwell	-	13	-	-	-	-
Cambuslang	-	-	-	-	-	-
Coatbridge	-	13	-	-	-	-
East Kilbride	-	-	-	-	-	-
Hamilton	-	-	-	-	-	-
Larkhall	16	-	-	-	-	-
Motherwell	-	-	-	9	-	15
Newarthill	-	-	-	-	-	-
Wishaw	-	-	19	-	-	-

TABLE 115 : AGE DISTRIBUTION OF MALE SNIFFERS BY PLACE OF RESIDENCE.

Irrespective of the areas in which they lived, the ages of the girls involved varied only between 11 and 15 years (Table 116).

Place of residence	1970 age range (years)	1971 age range (years)	1972 age range (years)	1973 age range (years)	1974 age range (years)	1975 age range (years)
Bellshill	-	-	-	-	-	-
Bothwell	-	-	-	-	-	-
Cambuslang	-	15	-	-	-	-
Coatbridge	-	-	-	-	-	-
East Kilbride	-	-	-	11	-	-
Hamilton	-	14	-	-	-	-
Larkhall	-	-	12	-	-	-
Motherwell	-	-	-	-	-	-
Newarthill	-	-	-	-	15	-
Wishaw	-	-	-	-	-	-

TABLE 116 : AGE DISTRIBUTION OF FEMALE SNIFFERS BY PLACE OF RESIDENCE.

There was no information available as to schools attended in respect of any of the cases.

8.7 DISCUSSION

During the entire period studied, ie between 1 January, 1970 and 31 December, 1975, 17 young people resident in Lanarkshire had been referred to hospitals in the Lanarkshire area itself or in Glasgow. None were known to the police or social agencies.

Apart from one I.C.D. classification (N977.8), all the codes chosen were found to be relevant and, as a result, cases had been detected by examination of these case-records. This was particularly true of the indexed code for glue sniffing, 304.6, and also for N987.9 (Toxic effects of other gases, fumes or vapours).

The variation of 9-19 years in the ages of males involved in solvent abuse was much wider than that of females, which was between 11 and 15 years. Mean and median ages for males were both higher than those for females which is a complete reversal of the information discovered in the other studies.

Adhesives had proved to be the most popular agents used in the practice though dry-cleaning substances and petrol had also featured. Petrol was a substance which had not been implicated previously in Lanarkshire and was thereby making its first appearance.

In the case of the 9 children admitted to hospital, clinical examination had proved negative, but laboratory investigations were carried out in only two of these cases. It was also interesting to note that no deaths had occurred.

The urban areas, particularly those of Motherwell and Bellshill, appeared to lay claim to most of the cases, but there were also cases referred from Newarthill, Larkhall and Bothwell, where the practice had not previously been known to exist.

8.8 MORTALITY STATISTICS

Although not one of the 17 hospital cases of solvent abuse had died, it had been noted that at least 5 deaths had been reported in the national press and another had been recorded in the medical literature (Ward, 1971).

It seemed likely, therefore, that other deaths resulting from the

practice had occurred, not only in Scotland, but perhaps in other parts of Britain. A study of the mortality statistics was undertaken by the investigator between August 1976 and February 1977.

Approach and Methods

Details of solvent sniffing deaths between 1970 and 1976 were requested from the office of the Registrar General for Scotland. No information on this was found to be available in view of the fact, no doubt, that these individuals die from associated factors such as asphyxia or inhalation of vomit.

Details concerning the cause of specific deaths noted in newspaper reports were therefore requested, since names, addresses and dates of death had to be supplied in order to obtain a copy of the 'Particulars of Death' for each.

Strathclyde Police personnel were approached and asked for any information relevant to deaths from solvent abuse 1970-1976 and they supplied relevant details from the reports of three deaths, two of which are presented in Appendix 14 . In order to protect confidentiality, personal identifying details have been omitted. Details regarding these deaths were also requested from the Registrar General.

Pathologists at the University Departments of Forensic Medicine in Aberdeen, Dundee, Edinburgh and Glasgow were contacted by letter and asked for any information concerning deaths from solvent abuse for the period 1970-1976.

Finally an approach was made to the Department of Prices and Consumer Protection and a request made for information on the subject of solvent sniffing deaths for the period studied.

Data

The data obtained from these very different sources, of course, varied quite considerably.

The Registrar General's Office was able to supply a form which bore the name, address, age and sex of the person, along with the date and place of death and also the cause or causes of death.

More detailed information was available from pathologists in University Departments of Forensic Medicine except in the case of Edinburgh, where relevant data is still in the process of preparation. As a result of the information received, it was possible to exclude cases of sexual masochistic hangings in which solvents featured.

The information available from the Department of Prices and Consumer Protection proved very incomplete and there were no details available at all as regards names or addresses for any of the cases. On the other hand, the age and sex of the individual concerned was usually available, as well as the place of death and the substance which had been implicated. In 3 of the cases, the sex had not been recorded, in 4 the age was unrecorded and in a further 2 cases the exact date of death was not known. No information was available on the cause of death for any of these cases.

Data Handling

Data handling was conducted manually by the investigator.

Data Analyses

Data analyses consisted of a map demonstrating the deaths from solvent abuse in Britain since 1970, descriptive tables of age and sex distribution, the substances involved and, where known, the cause or causes of death.

Results

General Data

There were 45 deaths in Britain resulting from the deliberate abuse of solvents between January 1970 and January 1977 (Fig. 41). Twenty-five of these occurred in England, 17 in Scotland and 3 in Wales (Table 117).

41 Geographical distribution of solvent sniffing deaths in Britain 1970-1977.

	Place of death	No. of cases			Sex Ratio
		Total	M	F	
England	Birmingham	3	3	-	3:0
	Burnley	1	1	-	1:0
	Cambridge	1	1	-	1:0
	Chesham	2	2	-	2:0
	Cumberland	1	-	1	0:1
	Daventry	1	1	-	1:0
	Dudley	1	1	-	1:0
	Islington	1	1	-	1:0
	Leicester	1	1	-	1:0
	Lewisham	1	1	-	1:0
	Macclesfield	1	1	-	1:0
	Manchester	1	1	-	1:0
	Northants	1	1	-	1:0
	Rotherham	1	1	-	1:0
	Sheffield	1	1	-	1:0
	Southend	1	1	-	1:0
	Staffordshire	2	U/K	U/K	U/K
	Sunderland	1	1	-	1:0
	Watford	1	1	-	1:0
	West Merton	1	1	-	1:0
	Wigan	1	-	1	0:1
	Total	25	21	2	
Scotland	Blairgowrie	1	1	-	1:0
	Edinburgh	5	5	-	5:0
	Elderslie	1	1	-	1:0
	Glasgow	5	5	-	5:0
	Greenock	1	1	-	1:0
	Lanark	1	1	-	1:0
	Muir of Ord	1	1	-	1:0
	Perth	1	1	-	1:0
	Tayport	1	1	-	1:0
	Total	17	17	-	
Wales	Dyfed Powys	1	U/K	U/K	U/K
	Llanelli	1	1	-	1:0
	Tredegar	1	1	-	1:0
	Total	3	2	-	

TABLE 117 : GEOGRAPHICAL DISTRIBUTION OF SNIFFING DEATHS IN BRITAIN 1970-1977.

In 3 of the cases, the sex of the individual was unknown, but of the 42 remaining cases, 40 were males.

When the numbers of deaths due to solvent sniffing in the country as a whole were considered year by year, it was found that, apart from 1974 when there were 10 deaths from deliberate solvent inhalation, the number of deaths varied from 2 in 1971 to 6 in 1976. In 7 cases, 5 of them Scottish and 2 of them English, the exact year of death was unfortunately not known. The deaths in Scotland and Wales had occurred only sporadically, but in England it was obvious that, from 1971 onwards, some deaths from solvent abuse had occurred each year (Table 118).

Place of death	1970	1971	1972	1973	1974	1975	1976	1977	Year U/K
England	-	2	4	4	3	6	4	-	2
Scotland	3	-	-	2	1	3	2	1	5
Wales	-	-	2	-	-	1	-	-	-
Total	3	2	6	6	4	10	6	1	7

TABLE 118 : GEOGRAPHICAL DISTRIBUTION BY YEAR OF DEATHS.

When the total number of deaths from solvent abuse was studied there were 40 males, 2 females and 3 cases in which the sex was not stated. The number of male deaths greatly outnumbered that of females in England (10:1). Again there were no females included in the 17 Scottish deaths from solvent abuse nor any among the 3 Welsh deaths recorded.

The age range for all male deaths from deliberate solvent abuse for the period studied varied from 11-32 years (mean 17.3 years) while that for females was 16-17 years (mean 16.5 years).

When the geographical distribution was considered, it was discovered that the age range for males was 11-26 years in England (mean 16.5 years) while the age range for Scottish males was 14-32 years (mean 18.8 years) and that for Wales 16-17 years (mean 16.5 years). These results are demonstrated in Table 119. The only 2 female cases were English and their ages were 16 and 17 years respectively.

Place of death	Age range (years)	Mean age (years)	Median age (years)
England	11-26	16.5	16.5
Scotland	14-32	18.8	16
Wales	16-17	16.5	-

TABLE 119: AGE RANGE, MEAN AND MEDIAN AGES OF MALE CASES.

Substances Abused

In respect of 5 of the 17 Scottish deaths, no details were available regarding age, date of death, cause of death or substance involved, owing to the fact that this information is still being extracted from the records. However, in respect of the remaining 12 cases, the substances abused are presented in Table 120. Adhesives were much less prominent than in other studies and a wide variety of alternative substances such as petrol and butane gas featured instead.

Year of death	Substances abused	No. of cases	%
1970	ether	1	8.3%
	petrol	1	8.3%
	polystyrene cement	1	8.3%
1973	adhesives	1	8.3%
	trichloroethylene	1	8.3%
1974	adhesives	1	8.3%
1975	adhesives	1	8.3%
	glue	1	8.3%
	petrol	1	8.3%
1976	butane gas	1	8.3%
	fire extinguisher	1	8.3%
1977	butane gas	1	8.3%
Total		12	100%

TABLE 120 : SUBSTANCES ABUSED IN SCOTLAND BY YEAR OF DEATH.

In England, aerosols of one kind or another accounted for 40% of the cases, cleaning fluids for 32% and adhesives for only 12%. There was, interestingly enough, little variation in the substances chosen from year to year (Table 121).

Year of death	Substances abused	No. of cases	%
1971	dry-cleaning substances	2	8%
1972	adhesives	1	4%
	aerosols	1	4%
	dry-cleaning substances	2	8%
1973	aerosols	3	12%
	dry-cleaning substances	1	4%
1974	adhesives	1	4%
	dry-cleaning substances	1	4%
	lighter fuel	1	4%
1975	adhesives	1	4%
	aerosols	3	12%
	lighter fuel	1	4%
	shoe conditioner	1	4%
1976	aerosols	3	12%
	shoe conditioner	1	4%
U/K	dry-cleaning substances	2	8%
Total		25	100%

TABLE 121: SUBSTANCES ABUSED IN ENGLAND BY YEAR OF DEATH.

As regards the 3 Welsh cases, dry-cleaning substances or shoe conditioner were the substances which had been abused (Table 122).

Year of death	Substances abused	No. of cases	%
1972	dry-cleaning substances	1	33.3%
	shoe conditioner	1	33.3%
1975	shoe conditioner	1	33.3%
Total		3	99.9%

TABLE 122: SUBSTANCES ABUSED IN WALES BY YEAR OF DEATH.

Causes of Death

The actual causes of death were not available for any of the English or Welsh cases studied, nor for 7 of the 17 Scottish cases. Of those 7 cases are 5 for whom the relevant information has not yet become available and 2 whose cases are still sub judice.

The causes of death in the remaining 10 cases are presented in Table 123.

Year of death	Cause of death	No. of cases
1970	Ether poisoning	1
1970, 1974, 1975	Asphyxia	3
1970	Acute petrol poisoning	1
1973	Acute cardiac failure due to inhalation of glue vapours	1
1973	Trichloroethylene poisoning	1
1975	Cerebral haemorrhage due to fractured skull	1
1975	Acute renal tubular necrosis due to extensive body burns	1
1976	Inhalation of vomit	1
Total		10

TABLE 123 : CAUSES OF DEATHS FROM SOLVENT ABUSE IN SCOTLAND, 1970-1976.

It was interesting to note the different causes of death associated with the abuse of solvents. 30% had in fact died of asphyxia because they had inhaled solvents from a polythene bag. One died from inhaling vomit. One (the only Lanarkshire child detected) died of burns following an accident involving a can of petrol during a sniffing session and 4 died from the toxic effects of different substances. This amply confirmed the findings in America that the victims of solvent abuse most often die as a result of associated factors.

Discussion

From January, 1970, to January, 1977, 45 deaths associated with solvent abuse had occurred in Britain, 25 of them in England, 17 in Scotland and 3 in Wales. Of these, all but 2 were males.

The mean age for males (17.3 years) was higher than that for females (16.5 years), which proved to be a reversal of the pattern found by the police and social agencies. There were, however, too few female cases to support definite assertions on this score. In Scotland the age range (14-32 years) was wider than that for England (11-26 years).

Deaths resulting from the practice had occurred much more sporadically in Scotland than in England, where there were 2-6 recorded deaths per annum from 1971 onwards. Only one of the males, who died in Scotland, was from Lanarkshire.

It was interesting to note that, while solvent abuse had apparently been quite widespread in certain areas in Scotland, only a relatively

small proportion of the total deaths were associated with the abuse of adhesives, but a wide variety of other substances had been used.

In England and Wales there was little or no variation in the choice of substances used by those who had died from 1971 onwards and, in fact, aerosols of one kind or another were associated with 40% of deaths while adhesives accounted for only 12% of the cases.

One very disappointing aspect of the investigation was the lack of information regarding the causes of death in the majority of cases. This made interpretation difficult, but it was perfectly obvious that, while toxicity per se had caused death in 4 of the 10 cases, asphyxia had also been responsible in situations where a polythene bag had been used to administer the agent and again, in another case, the misuse of petrol adjacent to an open fire had led to a fatal conclusion.

Considering all these facts, it was perhaps surprising that more deaths had not occurred in association with the practice, although it also appeared likely that they had taken place but the vital link between the solvent sniffing episodes and the events leading to death had been missed. It was also clear and even alarming to find that this was no parochial prank but a practice that had spread, however thinly, throughout the length and breadth of Britain.

CHAPTER 9

TRENDS IN SOLVENT ABUSE

9.1 INTRODUCTION

Solvent abuse is by no means a new phenomenon. Indeed, deliberate inhalation of the volatile hydrocarbons contained in gasoline, paint-thinners, adhesives and dry-cleaning substances has already been described in the American literature, where it was stated the extent of the problem in America had reached epidemic proportions by the nineteen sixties but had appeared to decline ever since, explained perhaps in part by the ready availability of more conventional drugs.

In America too the practice was found to involve groups of deviant teenage males, the majority of whom lived in urban areas. Associated or predisposing factors were reported to be alcoholic parents, low socio-economic status within the community and educational retardation. It was further stated that the very nature of the agencies, which provided the information about the children, might well have created a degree of bias in an otherwise objective study of some of these factors.

The information available from America on the toxic effects of deliberate solvent inhalation is also conflicting perhaps because sniffers tended to have been referred to police and/or social agencies rather than to doctors and there was considerable variation too, not only in the substances chosen and thereby the type of solvents abused, but also in the methods employed, the actual doses taken and the frequency and duration of sniffing sessions. All these widely varying factors rendered interpretation difficult, but it remained an incontrovertible

fact that physical damage had occurred in some cases (Baerg et al., 1970; Barman et al., 1964; Litt et al., 1969; Sokol et al., 1963) while in others, sadly, deaths (Baselt et al., 1968; Bass, 1970; Cohen, 1973).

Throughout the last decade reports have appeared from time to time in British journals regarding physical damage resulting from the practice (Merry et al., 1962; O'Brien et al., 1971; Shirabe et al., 1974) and this despite the fact that many doctors continue to regard the practice as a harmless adolescent escapade (Watson, 1977b).

9.2 LOCAL BACKGROUND

Ever since 1970, police authorities in Lanarkshire have been well aware of the existence of a problem of solvent abuse among young people. Initially the individuals whose cases provided the statistics for this study had been brought to the attention of the police in one of three main ways either by

1. having committed a breach of the peace;
2. behaving in an apparently drunk or disorderly fashion;
3. having been reported as missing from home.

Early on in the course of interrogations, the true nature of the problem began to be recognised and factual information regarding the actual practice of solvent abuse in Lanarkshire began to accumulate.

During the last few years, therefore, police personnel have become increasingly anxious to at least control if not entirely eradicate the

practice, convinced as they are that solvent sniffing is directly linked to truancy, habituation (if not addiction) and a generally poor standard of health. Repeated efforts have also been made to draw the attention of other professional groups to a problem regarded by police authorities as presenting distinct hazards to health and social workers have been made increasingly aware of its existence in the course of compiling case-records often in a different context.

Since all the information available on the subject came from police sources or social agencies, an attempt was made in 1974 to conduct a point-prevalence survey on solvent abuse among Lanarkshire school pupils aged 12-15 years. This unfortunately had to be abandoned for the reasons previously stated.

Several factors were immediately obvious. If solvent abuse was linked in any way with truancy, then any prevalence survey carried out in schools would fail to reach those to whom it was directed, thereby clouding the issue. Again, a proportion of those pupils present, some of whom could be sniffers, might also be poor school performers and therefore unable to understand the questionnaire properly or answer it adequately. Either of these contingencies would have made interpretation difficult. Lastly, one salient fact emerges and that is the extreme difficulty of researching an area which is politically and emotionally sensitive (Watson, 1976a).

In view of this no attempt was made within the context of this work to conduct period-prevalence or point-prevalence studies into solvent abuse. Instead the available information on the subject was sought

retrospectively from police and social workers, Assessment Centre and hospital records. In addition to this, an on-going case control study of 84 sniffers and 84 non-sniffing deviant control subjects of the same age and sex was conducted between 1 January, 1975 and 31 July, 1975, with a view to determining the factors associated with solvent abuse and the fullest possible details of the practice.

These facts and figures were collated to determine the degree to which young people in Lanarkshire had become involved in the practice; to ascertain the extent of the clustering in certain areas and in certain schools; to search for any seasonal variation in the practice.

9.3 APPROACH AND METHODS

9.3.1 Population Studied

Every case of solvent abuse in Lanarkshire which had come to the attention of police personnel and social workers, or had been admitted to hospital or had been referred to Lanarkshire's Assessment Centre or had died were studied. Since in most of these cases identifying details of names, addresses and ages were known to the investigator, it was possible to ensure that no individual was included more than once.

9.3.2 School Populations

An approach was made to the Director of Education for Lanarkshire and, as a result of the co-operation and good-will encountered, it was possible to have access to information regarding the size of school rolls in the area for the years 1970-1975.

9.3.3 Youth Club Facilities

Details of the youth club facilities available to young people throughout Lanarkshire were obtained from Lanarkshire's Further Education Department.

9.3.4 Data

Dates of referral to the police, social agencies, hospital or Calder House were recorded in each of the cases studied retrospectively. Within the scope of the clinical study, the year or years of involvement, with relevant correction of the individual's age during each year, were noted in respect of each case. One death from solvent abuse along with the relevant date had been recorded in the case of one Lanarkshire victim. These details made it possible to estimate the number of cases involved each year.

Demographic data consisted of details regarding age, sex, places of residence and, in some cases, schools attended. Information regarding the substances used was also collated.

In order to establish the extent to which the practice had involved a youthful population in certain areas, population data of age and sex distribution in Lanarkshire were obtained by means of the 1971 Census Data. This rendered it possible to calculate the proportion of children involved in solvent abuse within each age group for each year from 1970-1975.

Information regarding specific school rolls for the year relevant to the study was abstracted from statistics contained in the Annual

Attendance Summaries for Lanarkshire schools for the years 1970-1975.

Details of the newspaper coverage of solvent abuse for the relevant period was also included.

9.3.5 Data Handling

Data handling was conducted manually by the investigator.

9.3.6 Data Analyses

These consisted of descriptive tables and graphs of the total number of solvent sniffers in Lanarkshire, the age and sex distribution according to areas and schools and the extent to which the practice had occurred. Completion of the statistical analyses was facilitated by means of a desk calculator.

9.4 RESULTS

It was quite obvious that between 1 January, 1970 and 31 December, 1975, solvent abuse had become increasingly common among children and adolescents in Lanarkshire (fig. 42). Altogether, 12 young persons were involved in 1970, 53 in 1971, 27 in 1972, 113 in 1973, 90 in 1974 and 231 in 1975. The ratio of males to females rose from 2:1 in 1970 to 22:1 in 1975 (Table 124). Percentages have been corrected to 1 decimal place.

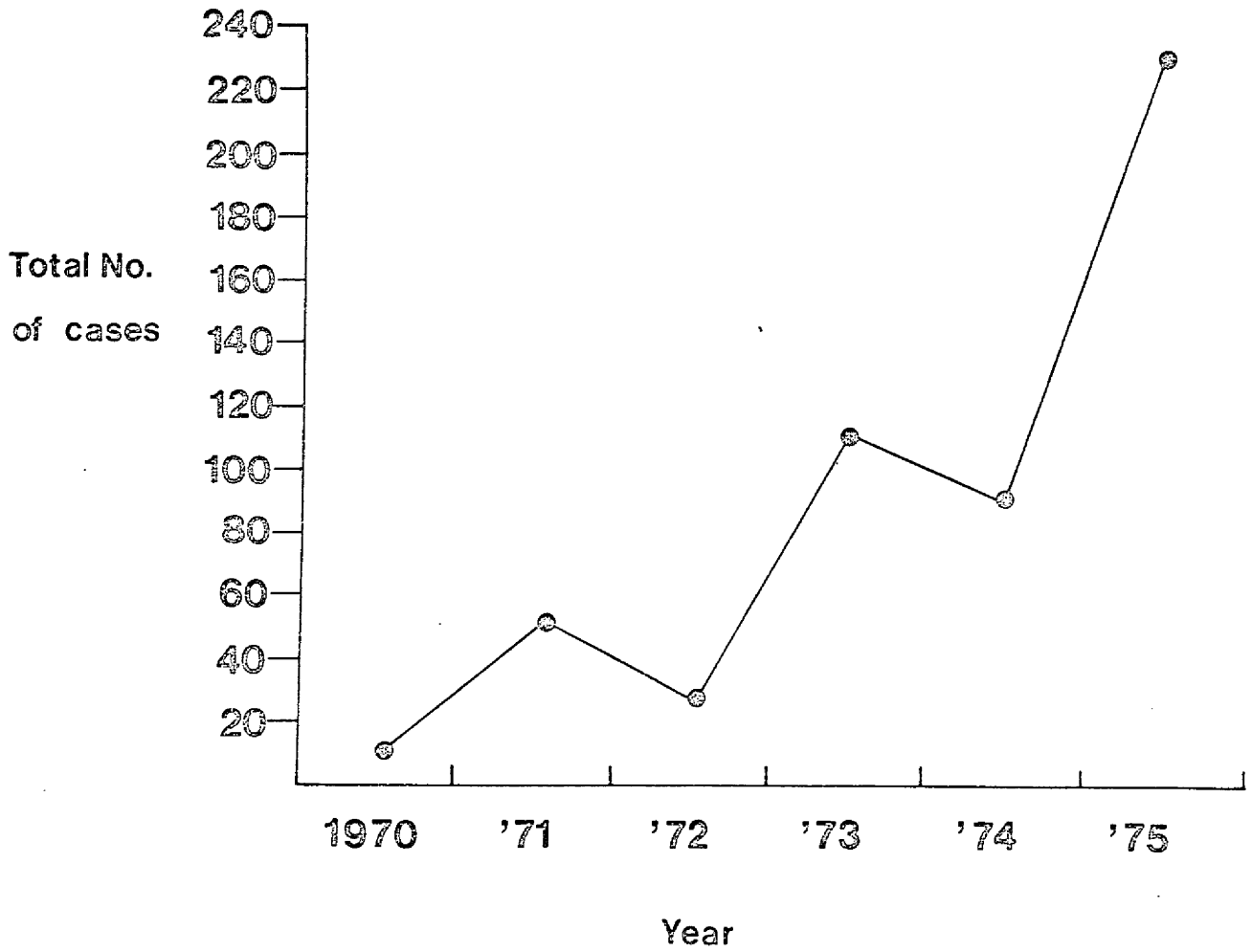


Fig. 42 Total no. of solvent sniffers in Lanarkshire 1970-1975.

Year	No. of cases		Total no. of cases	Sex ratio M:F
	M	F		
1970	8	4	12	2:1
1971	40	13	53	3.1:1
1972	22	5	27	4.4:1
1973	86	27	113	3.2:1
1974	80	10	90	8:1
1975	221	10	231	22:1
Total	457	69	526	

TABLE 124 : NO. OF SOLVENT SNIFFERS IN LANARKSHIRE, 1970-1975, BY YEAR OF INVOLVEMENT.

Demographic Data

Of these 526 young people, 457 (86.9%) were males and 69 (13.1%) were females. The variation in age ranged between 6 and 19 years for males and between 9 and 18 years for females.

When details of the individuals concerned were examined by year of their involvement, there were found to be variations, and the mean age for males fluctuated significantly more than that for females. The median age for males fell from 15 years in 1970 to 14 years in 1975 but conversely that for females rose from 14 years in 1970 to 14.5 years in 1975. These results are presented in Table 125, numbers being corrected to 1 decimal place.

Year	Age range (years)		Mean age (years)		Medain age (years)	
	M	F	M	F	M	F
1970	14-17	14-15	15.3	14.3	15.5	14
1971	6-18	14-16	13.8	14.8	14.5	15
1972	12-19	12-15	14.4	14.2	14	15
1973	9-17	9-15	13.5	13.5	14	14
1974	9-18	13-15	13.5	14	14	14
1975	8-17	9-18	13.9	14.3	14	14.5

TABLE 125: AGE DISTRIBUTION OF SOLVENT SNIFFERS, 1970-1975.

Extent of the Practice

The actual places of residence for each case in respect of the year or years of involvement in the practice were studied and an attempt made to determine the extent of the practice in each area between 1970 and 1975. The male and female populations in each appropriate age range were calculated from the 1971 Census Data. In the case of those individuals outwith the Burghs of Airdrie, Coatbridge, East Kilbride, Hamilton, Motherwell/Wishaw and Rutherglen, the population for Lanark County (excluding the large Burghs) was the appropriate denominator value and the age and sex distribution calculated from the 1971 Census Data. As none of the sniffers was married, the values were calculated on the basis of single males and single females in each case.

These results, corrected to 1 decimal place, are presented in Tables 126 - 131 .

Population Data	Place of residence	No. of cases		Age range (years)		Population in relevant age and sex range		Rate/ 1000	
		M	F	M	F	M	F	M	F
Lanark County	Larkhall	1	-	16	-	2,496	-	0.4	-
Motherwell and Wishaw Burgh	Motherwell	7	4	14-17	14-15	2,426	1,165	2.9	3.4
Lanarkshire	Total	8	4						

TABLE 126: EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1970, BY PLACE OF RESIDENCE.

Population Data	Place of residence	No. of cases		Age range (years)		Population in relevant age and sex range		Rate/ 1000	
		M	F	M	F	M	F	M	F
Hamilton Burgh	Hamilton	-	1	-	14	-	401	-	2.5
Lanark County	(Bothwell	1	-	13	-	2,981	-	0.3	-
	(Cambuslang	-	1	-	15	-	2,254	-	0.4
Motherwell and Wishaw Burgh	Motherwell	38	10	16-18	14-16	7,902	1,675	4.9	6.0
	Wishaw	1	1						
Lanarkshire	Total	40	13						

TABLE 127: EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1971, BY PLACE OF RESIDENCE.

Population Data	Place of residence	No. of cases		Age range (years)		Population in relevant age and sex range		Rate/ 1000	
		M	F	M	F	M	F	M	F
Coatbridge Burgh	Coatbridge	1	-	13	-	556	-	1.8	-
East Kilbride Burgh	East Kilbride	3	3	13-15	13-15	1,916	1,809	1.6	1.7
Lanark County	(Bellshill	4	-	13	-	2,981	-	1.3	-
	(Larkhall	-	1	-	12	-	2,818	-	0.4
Motherwell and Wishaw Burgh	(Motherwell	8	-	(13-19	15	4,266	510	3.3	2.0
	(Wishaw	6	1						
Lanarkshire	Total	22	5						

TABLE 128 : EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1972, BY PLACE OF RESIDENCE.

Population Data	Place of residence	No. of cases		Age range (years)		Population in relevant age and sex range		Rate/ 1000	
		M	F	M	F	M	F	M	F
Airdrie Burgh	Airdrie	3	1	14-16	14	935	351	3.2	2.8
Coatbridge Burgh	Coatbridge	27	5	10-15	13-14	3,244	1,074	8.3	4.7
East Kilbride Burgh	East Kilbride	4	4	14-16	11-14	1,699	2,668	2.4	1.5
Hamilton Burgh	Hamilton	2	-	15	-	353	-	5.7	-
Lanark County	(Bellshill	10	1	(	(				
	(Caldercruix	2	1	(	(				
	(Cambuslang	-	3	(9-17	(13-15	25,500	7,890	0.9	0.6
	(Glenboig	12	-	(	(				
Motherwell and Wishaw Burgh	(Motherwell	10	7	(	(				
	(Wishaw	16	1	(9-17	(9-14	5,799	3,963	4.5	2.0
Rutherglen Burgh	Rutherglen	1	3	14	14-15	216	371	4.6	8.1
Lanarkshire	Total	87	26						

TABLE 129 : EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1973, BY PLACE OF RESIDENCE.

Population data	Place of residence	No. of cases		Age range (years)		Population in relevant age and sex range		Rate/ 1000	
		M.	F.	M.	F.	M.	F.	M.	F.
Airdrie Burgh	Airdrie	2	2	13-15	15	977	256	2.0	7.8
Coatbridge Burgh	Coatbridge	31	1	9-16	15	4,273	459	7.3	2.2
East Kilbride Burgh	East Kilbride	-	1	-	14	-	667	-	1.5
Hamilton Burgh	Hamilton	2	1	14-15	-	778	-	2.6	-
Lanark County	Bellshill	1	-	10-15	14	17,349	2,818	1.0	0.7
	Blantyre	8	-						
	Cambuslang	1	1						
	Glenboig	5	-						
	Uddingston	-	1						
Motherwell and Wishaw Burgh	Motherwell	5	-	10-18	-	5,684	-	4.4	-
	Wishaw	20	-						
Rutherglen Burgh	Rutherglen	5	4	13-14	13	432	206	11.6	19.4
Lanarkshire	Total	80	10						

TABLE130: EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1974, BY PLACE OF RESIDENCE.

Population data	Place of residence	No. of cases		Age range (years)		Population in relevant age and sex range		Rate/ 1000	
		M.	F.	M.	F.	M.	F.	M.	F.
Airdrie Burgh	Airdrie	22	3	13-15	15-18	977	1,024	22.5	2.9
Coatbridge Burgh	Coatbridge	51	2	9-16	13-16	4,273	1,992	11.9	1.0
Hamilton Burgh	Hamilton	2	-	14	-	425	-	4.7	-
Lanark County	Bargeddie	-	1						
	Bellshill	21	-						
	Bishopbriggs	1	-						
	Blantyre	4	-						
	Calderbank	10	-	8-16	14	26,319	2,818	2.3	0.4
	Chryston	2	-						
	Glenboig	21	-						
	Uddingston	1	-						
Motherwell and Wishaw Burgh	Motherwell	41	4	10-17	9-16	5,098	4,963	15.9	0.8
	Wishaw	45	-						
Lanarkshire	Total	221	10						

TABLE131: EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1975, BY PLACE OF RESIDENCE.

The above Tables demonstrate clearly a variation in the extent to which solvent abuse occurred year by year in each of the different areas. It was most unfortunate that all the landward areas outwith those of the large Burghs had to be considered as a whole. As a result it proved impossible to demonstrate the actual extent to which the practice had occurred in those rural areas with a relatively small population.

The involvement in the practice varied from 0.3 to 22.5 per 1000 males while for females there was a narrower variation of 0.4 to 8.1 per 1000, indicating that although more widespread in some areas than in others, solvent abuse affected only small sectors of the population in any area.

By collating the rates per 1000 population within the appropriate age range for each individual area, it became obvious that by 1973 the practice of solvent inhalation had become more widespread among both males and females in several different localities and it had also become clear that in spite of occasional divergences, for example in Hamilton, where between 1973 and 1975 the rate of involvement declined, and in East Kilbride and Rutherglen where the practice had apparently flourished for only two of the five years studied, the trend was towards an increasing degree of involvement in solvent abuse among males in every area with the passing of time (Table 132).

Conversely, however, in the case of females this trend was not paralleled and in every area, with the exception of Rutherglen, the rate continued to decline steadily (Table133).

Place of residence	Rate/1000 population in relevant age range					
	1970	1971	1972	1973	1974	1975
Airdrie Burgh	-	-	-	3.2	2.0	22.5
Coatbridge Burgh	-	-	1.8	8.3	7.3	11.9
East Kilbride Burgh	-	-	1.6	2.4	-	-
Hamilton Burgh	-	-	-	5.7	2.6	4.7
Motherwell and Wishaw Burgh	2.9	4.9	3.3	4.5	4.4	16.9
Rutherglen Burgh	-	-	-	4.6	11.6	-
Lanark County	0.4	0.3	1.3	0.9	1.0	2.3

TABLE 132: TRENDS IN SOLVENT ABUSE BY MALES IN LANARKSHIRE, 1970-1975.

Place of residence	Rate/1000 population in relevant age range					
	1970	1971	1972	1973	1974	1975
Airdrie Burgh	-	-	-	2.8	7.8	2.9
Coatbridge Burgh	-	-	-	4.7	2.2	1.0
East Kilbride Burgh	-	-	1.7	1.5	1.5	-
Hamilton Burgh	-	2.5	-	-	-	-
Motherwell and Wishaw Burgh	3.4	6.0	2.0	2.0	-	0.8
Rutherglen Burgh	-	-	-	8.1	19.4	-
Lanark County	-	0.4	0.4	0.6	0.7	0.4

TABLE 133 : TRENDS IN SOLVENT ABUSE BY FEMALES IN LANARKSHIRE, 1970-1975

Schools Attended

Unfortunately, information on schools attended was not always available, mainly because it had not been included in hospital case-histories or social work case-records, and sometimes omitted from police files. This was particularly true of the statistics for the period 1970-1972. Any information, which was available, along with the average school rool relevant to the particular year were studied. The results are demonstrated in Tables 134- 138. The primary schools are listed first in alphabetical order followed by the comprehensive/ secondary schools, also in alphabetical order. The average numbers of each school roll have been corrected to the nearest whole number. Percentages have been corrected to 1 decimal place.

Town	School	Total no. of sniffers	Average no. on school roll	Rate/ 1000
Motherwell	Ladywell Primary	9	619	15
Wishaw	St. Aidan's R.C. High	1	1,079	0.9
	Unknown or not recorded	43	-	-
Lanarkshire schools	Total	53		

TABLE 134 : EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1971, BY SCHOOLS ATTENDED.

Town	School	Total no. of sniffers	Average no. of school roll	Rate/ 1000
Bellshill	Bellshill Academy	1	1,230	0.8
Wishaw	St. Aidan's R.C. High	3	1,154	2.6
	Wishaw High	1	916	1.1
	Unknown or not recorded	22	-	-
Lanarkshire schools	Total	27		

TABLE 135 : EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1972, BY SCHOOLS ATTENDED.

Town	School	Total no. of sniffers	Average no. of school roll	Rate/ 1000
Airdrie	Caldervale High	7	1,608	4.4
Bellshill	Bellshill Academy	10	1,365	7.3
	St. Saviour's R.C. High	1	301	3.3
Coatbridge	St. Bernard's R.C. Primary	2	453	4.4
	Whifflet Primary	1	438	2.3
	Clifton High	9	585	15.4
	Coatbridge High	1	1,546	0.6
	Columba R.C. High	18	1,820	4.4
	Rosehall High	3	870	3.4
	St. Patrick's R.C. High	8	1,743	4.6
East Kilbride	Duncanrigg	1	1,888	0.5
Glenboig	Our Lady and St. Joseph's R.C. Primary	2	248	8.1
Motherwell	St. Brendan's R.C. Primary	1	489	2
	Dalziel High	1	1,035	1
	Our Lady's R.C. High	4	1,821	2.2
Rutherglen	Cathkin High	7	1,834	3.8
Wishaw	St. Aidan's R.C. Primary	4	502	7.9
	Garrion Academy	2	1,067	1.9
	St. Aidan's R.C. High	2	1,319	1.5
	Wishaw High	1	1,062	0.9
	Unknown or not recorded	28	-	-
Lanarkshire schools	Total	113		

TABLE 136 : EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1973

BY SCHOOLS ATTENDED.

Town	School	Total no. of sniffers	Average no. on school roll	Rate/ 1000
Airdrie	Airdrie Academy	2	1,630	1.2
Bellshill	St. Saviour's R.C. High	1	336	2.9
Blantyre	Auchinraith Primary	1	501	2
	Blantyre High	5	809	6.2
	John Ogilvie R.C. High	1	1,273	0.8
Cambuslang	Trinity R.C. High	1	1,208	0.8
Coatbridge	Coatbridge High	3	1,410	2.1
	Columba R.C. High	10	1,812	5.5
	Rosehall High	6	946	6.3
	St. Patrick's R.C. High	14	1,647	8.5
Hamilton	Holycross High	1	1,837	0.5
Motherwell	Braidhurst High	1	899	1.1
	Our Lady's R.C. High	4	2,055	1.9
Rutherglen	Cathkin High	1	1,757	0.6
	Stonelaw High	4	1,222	3.3
Wishaw	St. Thomas' R.C. Primary	4	420	9.5
	Coltness High	2	813	2.5
	Garrion Academy	4	1,262	3.2
	St. Aidan's R.C. High	7	1,326	5.3
	Unknown or not recorded	18	-	-
Lanarkshire schools	Total	90		

TABLE 137 : EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1974, BY SCHOOLS ATTENDED.

Town	School	Total no. of sniffers	Average no. on school roll	Rate/ 1000
Airdrie	Airdrie Academy	2	1,614	1.2
	Caldervale High	28	1,564	18
Bellshill	Bellshill Academy	13	1,309	9.9
	St. Saviour's R.C. High	11	326	33.7
Blantyre	Auchinraith Primary	1	502	2
	St. Blane's R.C. Primary	2	513	3.9
	St. Joseph's R.C.Prim.	1	682	1.5
	John Ogilvie R.C.High	2	1,235	1.6
Coatbridge	St. Stephen's R.C. Primary	1	520	1.9
	Coatbridge High	7	1,389	5
	Columba R.C. High	12	1,767	6.8
	Rosehall High	7	924	7.6
	St. Patrick's R.C. High	44	1,620	27
Motherwell	Logan's Primary	1	185	5.4
	Muir Street Primary	1	405	2.5
	Braidhurst High	8	882	9
	Dalziel High	1	994	1
	Our Lady's R.C. High	13	2,032	6.4
Wishaw	Lammermoor Primary	1	385	2.6
	St. Aidan's R.C. Primary	3	497	6
	St. Ignatius' R.C. Primary	1	307	3.3
	St. Thomas' R.C. Primary	1	408	2.5
	Thornly Primary	1	351	2.8
	Coltness High	2	497	4
	Garrion Academy	9	1,243	7.2
	St. Aidan's R.C. High	8	1,301	6.1
	Wishaw High	1	1,070	0.9
	Unknown or not recorded	49	-	-
Lanarkshire schools	Total	231		

TABLE 138 : EXTENT OF SOLVENT ABUSE IN LANARKSHIRE, 1975, BY SCHOOLS ATTENDED.

It was immediately obvious that there existed considerable variation in the rate of solvent abuse per 1000 school population even within the same town as, for example, in Bellshill where, in 1975, the rate of involvement from school to school varied as much as from 9.9 per 1000 to 33.7 per 1000. In Airdrie, for the same year, the degree of variation was 1.2 to 18 per 1000, while that in Coatbridge was 1.9 to 27 per 1000. The extent of the variation in Motherwell, Airdrie and Wishaw was much less dramatic but in Blantyre, in 1974, the rate of implication showed a striking variation, increasing as it did from 0.8 to 6.2 per thousand.

Information on schools attended was collated and variation in the rates of involvement in the practice was found to have occurred but the trend was upwards towards a steady increase in the number of cases each year (Table 139).

Town	School	Total no. of cases per year				
		1971	1972	1973	1974	1975
Airdrie	Airdrie Academy	-	-	-	1.2	1.2
	Caldervale High	-	-	4.4	-	18
Bellshill	Bellshill Academy	-	0.8	7.3	-	9.9
	St. Saviour's R.C. High	-	-	3.3	2.9	33.7
Blantyre	Auchinraith Primary	-	-	-	2	2
	St. Blane's R.C. Primary	-	-	-	-	3.9
	St. Joseph's R.C. Primary	-	-	-	-	1.5
	Blantyre High	-	-	-	6.2	-
	John Ogilvie R.C. High	-	-	-	0.8	1.6
Cambuslang	Trinity High	-	-	-	0.8	-
Coatbridge	St. Bernard's R.C. Primary	-	-	4.4	-	-
	St. Stephen's R.C. Primary	-	-	-	-	1.9
	Whifflet Primary	-	-	2.3	-	-
	Clifton High	-	-	15.4	-	-
	Coatbridge High	-	-	0.6	2.1	5
	Columba R.C. High	-	-	4.4	5.5	6.8
	Rosehall High	-	-	3.4	6.3	7.6
	St. Patrick's R.C. High	-	-	4.6	8.5	27
East Kilbride	Duncanrigg	-	-	0.5	-	-
Glenboig	Our Lady and St. Joseph's R.C. Primary	-	-	8.1	-	-
Hamilton	Holycross High	-	-	-	0.5	-
Motherwell	Ladywell Primary	15	-	-	-	-
	Logan's Primary	-	-	-	-	5.4
	Muir St. Primary	-	-	-	-	2.5
	St. Brendan's R.C. Primary	-	-	2	-	-
	Braidhurst High	-	-	-	1.1	9
	Dalziel High	-	-	1	-	1
	Our Lady's R.C. High	-	-	2.2	1.9	6.4
Rutherglen	Cathkin High	-	-	3.8	0.6	-
	Stonelaw High	-	-	-	3.3	-
Wishaw	Lammermoor Primary	-	-	-	-	2.6
	St. Aidan's R.C.Primary	-	-	7.9	-	6
	St. Thomas' R.C.Primary	-	-	-	9.5	2.5
	Thornly Primary	-	-	-	-	2.8
	Coltness High	-	-	-	2.5	4
	Garrion Academy	-	-	1.9	3.2	7.2
	St. Aidan's R.C. High	0.9	2.6	1.5	5.3	6.1
	Wishaw High	-	1.1	0.9	-	0.9

TABLE 139 : TRENDS IN SOLVENT ABUSE 1971-1975 BY SCHOOLS ATTENDED.

Clearly this confirmed the fact, discovered in the case control study that friends at school or those living locally, who are therefore likely to attend a nearby school, are the single most important influence in controlling the commencement and/or discontinuance of the practice.

Substances Abused

Irrespective of the agency by which the sniffer had been referred and despite variations in the specific method employed, the frequency of involvement, apart even from the facts of hospitalisation or death, there remained one consistent feature of solvent abuse and that was a quite definite trend in the popularity of agents used in Lanarkshire. This began with trichloroethylene, which had been stolen with remarkable ease from local works. This was supplanted in popularity by dry-cleaning substances and finally by adhesives. It is interesting to record that this particular trend, for which no explanation has yet been offered, was also noted in America.

Seasonal Variation

From a study of police statistics (chapters 2 and 3), it would appear that solvent abuse reached peak proportions during specific months of the year, in particular September to December and February. This was not borne out, however, by detailed clinical study of the sniffing practice and would point rather to the possibility of the detection rate reaching peak proportions at specific times of the year than the solvent abuse itself.

Youth Clubs

There was found to be no association between lack of recreational activities and solvent abuse (chapter 6) and confirmatory evidence of the availability of youth club facilities in all areas of Lanarkshire was obtained from the Further Education Department (Appendix 15).

Effect of Publicity

No increase in the numbers of solvent sniffers was reported following the publicity given to the proposed survey in January, 1974. Indeed the number of cases fell during 1974 only to rise sharply again in 1975, at a time when newspaper coverage was considerably reduced (fig. 43). This raises two possibilities - either that there was a genuine decrease in solvent abuse following the publicity or else that the children themselves had become more adept at evading detection. The former premise would seem more acceptable in view of the fact that increased publicity was likely to have greatly increased the general vigilance on the part of professional people dealing with the problem.

A spectacular rise in the number of cases in 1975 proved alarming, but there is later evidence, not included in the relevant graph that there has been a considerable decline in the number of cases occurring during the last few months. This could be explained by the very greatly increased amount of coverage by the mass media during the summer months or, alternatively, might be accounted for by the reports of increased numbers of deaths from solvent abuse which could well be expected to exercise a definite restraint.

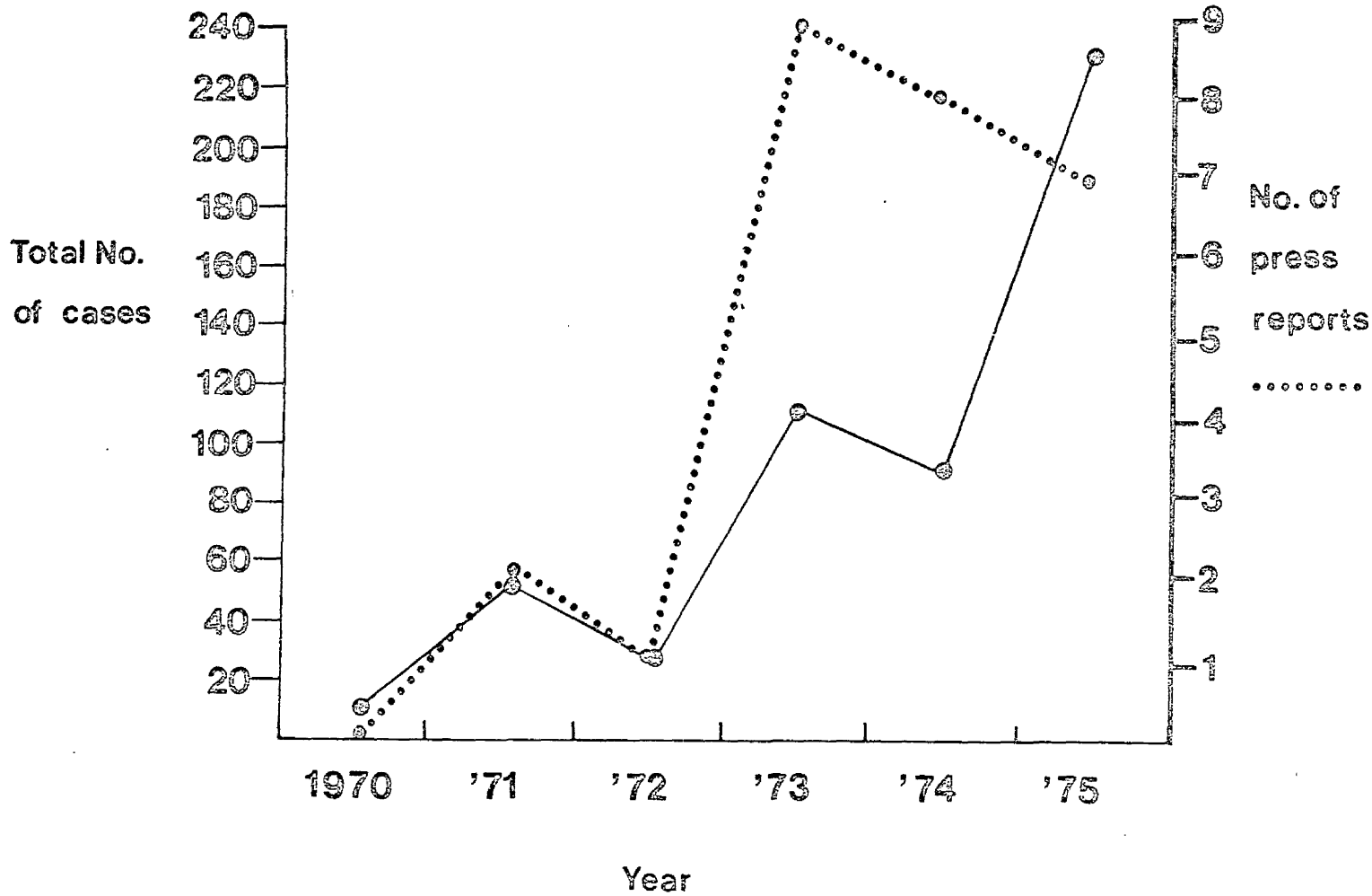


Fig. 43 Effect of press reporting on the no. of cases of solvent abuse in Lanarkshire 1970-1975.

9.5 DISCUSSION

In the course of conducting this study, the author has sincerely attempted to investigate a local health problem in Lanarkshire and to view it in a wider context. It has been necessary, as well as interesting, to examine briefly the lengthy and somewhat inglorious history of the practice from its earliest appearance.

The substances used for solvent abuse in Lanarkshire since 1970 have been directly linked to their general availability and accessibility within the community and bear a striking similarity to those used in America.

Solvent abuse in Lanarkshire has involved children and young people aged 6-19 years, predominantly those living in urban areas. It would appear that, although some females have been involved in the practice from time to time, males have always vastly outnumbered females and the preponderance was even greater in 1975 than in 1970. No valid explanation can be offered for this observation except the obvious one that young males, to whom peer group influences are of vital importance, are the more likely to be apprehended because of the predominantly group nature of the practice. It is at least possible that female sniffers, like female alcoholics, could be more adept at avoiding detection than their male counterparts.

It was most interesting to discover that in 1973 the practice, which had previously been confined to a few heavily industrialised areas, made its appearance in several different parts of Lanarkshire and particularly within specific schools in these areas. This confirms

the general impression of clustering of cases, caused no doubt by peer group influence. In only a small proportion of cases, however, did solvent sniffing constitute a regular habit, extending over a period of months or even years.

It is obvious that, despite the increase in the number of children and young people involved, the problem of solvent abuse remains an insignificant one which has never fortunately reached the proportions of American sniffing practices. It is also interesting to speculate on the question as to whether these individuals differ in some specific way from their non-sniffing neighbours, although there seems to be little doubt that they are more likely to abuse drugs or alcohol at a later date.

CHAPTER 10

CONCLUSIONS

It was discovered that solvent sniffers in Lanarkshire had come to the attention of the police mainly between 1970 and 1975 and that for the period 1st May 1971 to 31st December 1975 they had accounted for 14.6% of all juvenile cases referred to Community Involvement personnel - a not unsubstantial proportion.

It was concluded from a comparative survey of 102 sniffers and 102 non-sniffing deviant controls matched for age and sex that solvent abuse occurred only sporadically and could be considered as a facet of deviant behaviour.

Solvent sniffers were found to be more prone than control cases to abuse alcohol or drugs within 2 - 3 years of their involvement in solvent inhalation but a fact which could not be ascertained with any degree of certainty was whether or not this would have occurred anyway or whether early experimentation with solvents had led them to explore the effects of other substances at a later date.

From a review of the police statistics it was obvious that solvent abuse was in the main a group activity involving as it did, either groups of males or groups of males and females. It was perfectly possible, however, that the very nature of the group activity rendered it vulnerable to police attention.

There would appear to have been some kind of seasonal variation operating in respect of solvent sniffing, judging by available police

statistics, since the majority of cases had been detected in February and between September - December.

Although cases involving solvent abuse constituted a fair proportion of the total police case-load this was not borne out by the review of Lanarkshire Social Work statistics, Assessment Centre statistics or hospital referrals. Despite the fact that the exact size of the Social Work case-load in Lanarkshire was unknown, solvent abuse was thought to constitute only a small proportion of it. The supportive information for this was however quite under-representative because not only is solvent abuse not specifically noted in Social Work returns but also because in spite of the fact that police had referred some cases between 1970 and 1972 and knew of others who were in the care of Social Work Departments, no cases of solvent abuse ever featured in the Social Work statistics before 1973. It was also interesting that solvent abuse flourished in a small way among children with multiple problems. Although 3.6% of the 1081 Assessment Centre records for the periods studied were found to be missing, this was not thought likely to alter the findings materially and indeed only 1.7% of these cases had been involved in solvent abuse at any time. That similar activities in respect of other cases could have remained unknown and, therefore, unrecorded is a distinct possibility and should be borne in mind.

A very small proportion of both hospital casualties and in-patients were found to have been involved in solvent abuse but it is again possible that other cases might have been detected if more I.C.D. coding classifications had been included initially.

Results obtained from the case control study indicated that lack of recreational facilities, an explanation offered by some sniffers and their parents, was not by any standards a relevant factor. Again family instability was not an associated factor nor was overcrowding or ordinal position of the child in the family and since the Intelligence Quotient was only available in 13 of the 168 cases, it was not found possible to ascertain whether a child's I.Q. or its degree of educational retardation were relevant factors in solvent abuse.

Sniffers were found not to belong to lower socio-economic groups within the community, surprisingly enough, and there was no association between paternal unemployment and solvent abuse nor again between working mothers, regardless of the hours worked, and solvent abuse.

Although no association was found between solvent abuse and parental smoking, paternal and maternal drunkenness were both found to be associated with it, and this was also proved to be related to the fact of drunkenness as distinct from its frequency.

There was no direct association between drug abuse and solvent abuse nor were sniffers found to be more likely to start drinking at an earlier age than controls. Despite the fact that solvent abuse appeared to have occurred as a symptom of deviant behaviour, it was found that only 20.7% of 121 deviant Lanarkshire children admitted consecutively to the Assessment Centre between 1st January 1975 and 31st July 1975 had ever experimented with solvent abuse and 29.8% of the 84 control cases had never even heard of it.

It was possible, at least to a limited extent, to check the veracity of answers to questions regarding solvent abuse among Calder House admissions, since all the children involved in the practice knew of others who were also implicated and further confirmatory evidence was sometimes provided by Calder House staff or parents. However, there might well have been others who had indulged in the practice without having admitted to it. On the whole, it did appear that only a small proportion of deviant children indulged in the practice.

Peer group influences featured strongly in respect of both control and test cases, influencing sniffers on the one hand to start and/or to stop the practice, and controls on the other hand to refrain from it.

Information regarding tattooing revealed a further example of the pressure exerted by the peer groups, but no association was found to exist between solvent abuse and tattooing.

Truancy from school proved to be only of minor significance in the pattern of solvent abuse, since only 54.8% had ever truanted and only 26% had done so subsequent to their involvement in the practice.

It was disturbing to find that a majority of cases in both groups were totally unaware of any health hazards associated with solvent abuse, a fact which would strongly indicate a need for health education on the subject. On the other hand, 46% of those who were, in fact, aware of the dangers had not discontinued the practice in consequence.

Almost one quarter of all sniffers had merely dabbled in the practice, one third were more regular participants, while 40% indulged frequently. It was clear that most of the sniffing sessions had passed unnoticed in the community as a whole and also that the apparent seasonal variation was a variation in the detection rate and not in the incidence of solvent inhalation.

The practice was found to be mainly a group activity, despite the fact that many sessions had gone undetected. This confirms the original impression and strongly supports the theory that this is how the practice would have evolved anyway, independent of the fact that it was largely groups that had been detected. The low rate of detection could well be explained by the fact that the sites chosen specifically for sniffing sessions were usually very isolated.

The variation in choice of substances abused showed a quite definite and largely inexplicable trend from trichloroethylene to paint-thinners, dry-cleaning substances and finally adhesives. It was also clearly demonstrated that alternative substances were sometimes used if they should become available e.g. acetone, chloroform, ether, indicating that easy accessibility was an important factor.

The techniques employed in administering the agents were extremely sophisticated in many cases and designed to achieve a high concentration of solvent and consequently a more sustained effect.

Irrespective of the agent or its chemical constituents, the aim of

every sniffer is to achieve rapid intoxication and, having done so, to maintain the euphoria for as long as possible. The state of intoxication induced closely resembled that of acute alcoholic intoxication, but differentiation was not difficult on account of the strong chemical odour emanating from the breath and, in some cases, traces of adhesive adhering to face, hands and/or clothes.

Although 51.2% of the participants complained of frightening hallucinations, it in no way deterred them from the practice.

No physical or laboratory abnormalities directly attributable to the abuse of solvents were detected, indicating that no obvious morbidity had resulted. Although little is known about the long-term toxicity of the substances involved, their inherent capacity for detriment to the physical and mental health of the young people who participate must remain a matter for concern.

Solvent sniffing episodes occurred more frequently during the week than at weekends, possibly because of the availability of less deviant pursuits. More than half the reported episodes took place in the evenings between 8 p.m. and 11 p.m. indicating that, for some people at least, it represented a social activity. Other peak times noted were mid-morning and mid-afternoon - both times when the individuals involved should have been at school.

A rapid and reliable analytical technique was developed for measuring solvent levels in samples of blood, but quantitation was not feasible.

In all, 45 deaths from solvent abuse occurred in Britain between 1970 and 1977. It is possible that there have been other deaths resulting from accidents associated with the practice and also that in some cases, where death has resulted sometime later, the vital connection with solvent abuse may have been overlooked or not recognised. In this way, the number of actual cases could well be much higher than that represented in the statistics. It was obvious from a study of the distribution of fatalities that the practice of solvent abuse had occurred in many areas of Britain since 1970.

Irrespective of the nature of the agency to which children had been referred, the mean age of those involved remained remarkably constant at something between 13.5 and 15.5 years for males and between 14 and 15.5 years for females for each consecutive year of the study. Males predominated throughout, although the degree of male predominance over females increased proportionately from 2:1 in 1970 to 22:1 in 1975. Most of the participants lived in urban areas and all the actual episodes occurred in towns. The number of young people involved rose from 12 in 1970 to 231 in 1975.

A clustering of cases was found in certain urban areas and in specific schools within these areas, considered to be the result of peer group influence. Despite this, it was clear that solvent abuse was a relatively small problem which has so far not reached any really alarming proportions. The actual extent to which other children may well have been involved remains obscure.

The relationship between newspaper reporting and the number of reported cases of solvent abuse was interesting and tended to suggest that greater publicity caused a decline in the number of cases, perhaps because of a sharpened awareness and increased vigilance on the part of the professional people dealing with such problems. It is, however, equally possible that more publicity caused the children to gravitate to even more isolated sites than before in order to continue the practice.

In view of the objective of nature of the study and the fact that it was largely retrospective, it was well-nigh impossible to check on the validity and reliability of the answers given, except in the cases of those children in the case control study. It was thought likely that any bias or selectivity which operated was likely to affect all cases equally.

It was obvious that deviant behaviour or low socio-economic status were not in themselves adequate reasons to offer as explanations for the abuse of solvents among young people, since only a small proportion of either deviant or disadvantaged children did, in fact, become involved in solvent inhalation.

It is interesting to speculate on the question of whether solvent sniffers differed in some specific way from their non-sniffing contemporaries or whether it becomes only a question of the degree to which they were influenced either by chance encounters or the pressure of friends.

Finally this study would seem to establish a need for wider investigation of a specific problem, for more detailed information concerning its underlying causes and for much greater insight in dealing with its long-term effects.

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