

Sampling hard to reach populations

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Studies on 'hidden populations', such as homeless people, prostitutes and drug addicts, raise a number of specific methodological questions usually absent from research involving known populations and less sensitive subjects. This paper examines the advantages and limitations of nonrandom methods of data collection such as snowball sampling. It reviews the currently available literature on sampling hard to reach populations and highlights the dearth of material currently available on this subject. The paper also assesses the potential for using these methods in nursing research. The sampling methodology used by Faugier (1996) in her study of prostitutes, HIV and drugs is used as a current example within this context.

Keywords: methods, sampling, non-random, snowball, hidden populations, hard to reach populations

INTRODUCTION

Following the advent of HIV, and its relationship with socially sanctioned and illegal behaviour, a growing interest in hard-to-reach populations has emerged. Often difficult to access owing to the threatening nature of the specific trait that characterizes its members, such populations include homeless people, prostitutes and drug addicts. However, social barriers created by ignorance combined with prejudice and discrimination have meant that many of these populations remain marginalized and have restricted access to appropriate health care. In addition, research literature in the area of health promotion is sparse and has resulted in a substantial gap in knowledge regarding their health care needs.

In terms of implications for nursing research, studies on hidden populations raise a number of specific methodological questions usually absent from research involving

known populations and less sensitive subjects. Scientific control trials are not a feasible alternative and no census-based sampling frame nor any other reliable source is available to define and randomly sample these populations. This in turn has given increased recognition to the use of nonrandom methods of data collection and the importance of innovative sampling techniques such as 'snowball sampling' (Morrison 1988). However, lack of confidence is an inherent part of nursing research and the methodologies used have been influenced by the often uninformed and biased opinions from within the nursing and medical professions opposing qualitative research methodologies. The inherent problems of conducting research with hard-to-reach and disadvantaged populations combined with the 'unscientific' sampling options has, in turn, led to a resistance to investigate these groups.

The aim of this paper is to review the currently available literature on sampling hard-to-reach populations and to assess the implications for future nursing research. The sampling methodology used by Faugier (1996) in her study of prostitutes, HIV and drugs will be used as a current example within this context. The paper will also highlight

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the advantages and limitations of nonrandom sampling methodologies and will emphasize the importance of retaining high quality research in this area.

AIDS AND DRUG MISUSE

The emergence of AIDS as a global threat has served to highlight the complexity of cultural subgroups and the diversity of lifestyles which must now be considered in the area of health policy and social planning. According to Carballo & Rezza (1990), AIDS has played a major role in drawing attention in a very stark way to lifestyles and modes of social organization often previously ignored. Vulnerable groups, entangled in social conditions of homelessness, poverty and crime, suddenly assumed a new importance in relation to the threat they now pose to public health.

Such was the situation when the transmission of AIDS by intravenous drug users through sharing infected injecting equipment became apparent. The response of British society to the problem of drug misuse has historically been one of rejection, fear, disapproval and legal prescription (Berridge 1992), an attitude which caused drug users and injectors in particular to become a covert group whose behaviour was poorly understood. The advent of AIDS, however, forced policy makers, researchers and health care planners to confront the fact that, prior to HIV, relatively little had been done to address the social and health care needs of drug injectors. A new mapping of parameters addressing the social realities of drug-taking and sexual behaviour was called for and a major programme of work in the area of drug misuse funded by the UK government.

Commissioned by the Department of Health, England, Faugier's (1996) study focused on the sexual and drug-related risk behaviour of prostitutes and their clients. The study used nonrandom and snowball sampling methodologies in order to gain a truer insight into the life, activities and health care problems of 100 drug-using prostitutes, and 50 nonusing prostitutes in Manchester, England. Data for the study were gathered during a 17-month period from November 1991 to March 1992, a pilot study having been conducted during 1990.

SAMPLING ISSUES

In an attempt to associate the problems of studying hidden groups with the use of qualitative research design, Van Meter (1990) reveals an opposition between extensive and intensive data collection methodologies. He distinguishes between descending methodologies (quantitative strategies executed at the level of general populations) and ascending methodologies (qualitative strategies executed at local level and adapted to selected groups). Descending methodologies necessitate highly standardized question-

naires, population samples and traditional statistical analysis, commonly used by national governments. Ascending methodologies typically use snowball sampling, life histories and ethnographic monographs with analysis adapted to the specific techniques employed.

When research concerns a known population, the choice of sample design is dependent on individual research goals. Whereas quantitative designs use 'representative' sampling strategies to make inferences about a whole population, qualitative sampling designs are nongeneralizable, but provide maximum theoretical understanding of a social process. Time and resources are obvious factors in sample choice, along with the trade off between using a larger sample or studying a smaller one more intensively. However, the more sensitive or threatening the phenomenon under study, the greater potential for respondents to hide their involvement and the more difficult the sampling is likely to be.

The problem of obtaining samples in situations where the population parameters are unknown and the extent of hidden behaviour is stated by Lee (1993):

In many situations, there are well-developed strategies for realising the twin aims of representativeness and cost-effectiveness. Neither, however, may be easy to obtain where the topic under investigation is a sensitive one. First, other things being equal, sampling becomes more difficult the more sensitive the topic under investigation, since potential informants will have more incentive to conceal their activities. Second and related to this, the less visible an activity the harder it is to sample.

For example, Hendricks & Blanken (1992) point out three reasons why random sampling methodology within the general population is often not a viable option around the drug-utilizing population: firstly, the potential legal and social sanctions deter respondents from cooperation; secondly, an extremely large sample is needed to achieve sufficient data for an accurate estimation of what is a statistically rare event; and, thirdly, given the 'hidden' or 'low visibility' of such populations, surveys tend to miss out important segments of the drug-using population because they are not living stable or easy-to-locate lives.

These hidden segments have been described as 'floating populations' which, according to Kaplan *et al.* (1987), have the distinctive quality of both horizontal and vertical sociogeographic mobility. This in turn prevents existing surveillance systems grounded in fixed community-based institutions such as health care or social assistance programmes from accounting for them.

Finally, Hendricks & Blanken (1992) argue that survey studies in the general population which rely on closed questions are inherently limited by the data obtained. They may yield little understanding of the phenomenon under study which is particularly problematic when exploring new fields or phenomena.

Snowball sampling

Thus, in attempting to study hidden populations for whom adequate lists and consequently sampling frames are not readily available, snowball sampling methodologies may be the only feasible methods available. Developed as an original solution to overcome problems of data sampling in the study of hidden populations, they can be used both as an informal way to reach a population and as a more formal method intended to make inferences with regard to a population of individuals (Snijders 1992). They are particularly effective in locating members of special populations where the focus of the study is on a sensitive issue, as Hendricks & Blanken (1992) point out:

If the aim of the study is primarily explorative, qualitative and descriptive, snowball sampling offers clear practical advantages in obtaining information on difficult-to-observe phenomena, in particular in areas that involve sensitive, illegal or deviant issues. It provides an efficient and economical way of finding cases, that may otherwise be difficult or impossible to locate or contact. In exploring a statistically rare event such as drug abuse, snowball sampling has the potential of producing a rapidly growing database, which would require enormous samples in household or other population surveys. For example, a 1% prevalence rate would require a sample of 10 000 subjects to yield 100 subjects who possess the trait under study.

Spreen (1992) embeds the use of snowball sampling, nonrandom sampling and other ascending methodologies into a general concept of link-tracing methodologies. He defines this as a sample design in which the respondent is asked to mention other persons, according to some inclusion criterion defined by the researchers. By interviewing the newly mentioned persons, the sample can be extended, the basic assumption being the existence of some kind of 'linkage' or 'bond' with other people in the sample population.

Berg (1988) portrays such sampling methodologies as being created by a series of referrals that are made within a circle of people who know one another, the cyclical nature permitting loops in which a person named in a later wave in turn names someone from an earlier wave, thus creating interesting comparisons.

Scarcity of literature

Many contemporary studies have, however, failed to acknowledge the history of using such methodologies in the research of deviant populations. In fact, in the 1960s, both Lindesmith (1968) in his study of opiate addicts and Becker (1966) in his investigation of marijuana users did use these sampling methods successfully, although both authors gave only a brief reference to the enormous amount of work involved. This in turn led to the impression that all that was required to sample difficult-to-reach popu-

lations was to start the ball rolling with one contact, then sit back and watch the sample pile up.

More recently, Biernacki & Waldorf (1981) verified the continuing lack of attention given to the enormous difficulties of fieldwork with deviant populations involved in illegal behaviour. They found this puzzling in view of the fairly widespread use of nonrandom methods and chain referral or link methodologies in social enquiry research. In addition, there is a limited amount of literature available surrounding the utilization of snowball sampling or link-tracing methodologies. Accepted authoritative textbooks on research methods barely mention this problem, devoting little more than a paragraph to the sampling issues in unknown populations (Mitchell & Jolley 1988, Denzin 1970, Simon 1969). Even textbooks that concentrate solely on qualitative research devote little attention to the procedures or problems entailed.

The sample construction

Although much literature on snowball sampling may have failed to emphasize the labour involved, it is important to recognize that the researcher must actively develop and control the sample's initiation, progress and conclusion. Hendricks & Blanken (1992) claim that rigour in constructing the sample is essential in this form of research, especially considering the potential pitfalls still applicable on a theoretical and practical level. In their study of a group of ex-heroin addicts, Biernacki & Waldorf (1981) identified the following methodological problem areas to be addressed:

- finding respondents and starting referral chains;
- verifying the eligibility of potential respondents;
- engaging respondents as informal research assistants;
- controlling the types of chains and the number of cases in any chain;
- pacing and monitoring referral chains and data quality.

Researchers are still trying to contend with such issues, although several problems in regard to mapping and modelling potential sample populations still remain to be solved.

OVERCOMING PROBLEMS OF SOCIAL VISIBILITY

According to Heslin (1972), the social visibility of the target population is the first methodological problem that must be confronted in any research that uses snowballing methods to locate a study sample. This is also emphasized by Biernacki & Waldorf (1981) who state:

Many possible study populations, for example police, nurses or school teachers, have a relatively high social visibility. Whilst the researcher may have difficulty in gaining access to these

populations, the knowledge of where to locate them is not a problem. Other possible study populations, because of moral, legal or social sensitivities surrounding the behaviour in question, have a very low visibility and as a result, pose some serious problems for locating and contacting potential respondents.

(Biernacki & Waldorf 1981)

However, the basic conceptual origin of snowball sampling is that the behaviour or 'trait' under study can be conceived as a social activity, where the target sample members are involved in some kind of network with others who share the characteristic of interest. Taking the drug-using population as an example, several studies have suggested that mutual help and support in the areas of housing, clothes, money and drugs is a common occurrence. This is in contrast to the stereotyped view of addicts as interested only in the satisfaction of their own craving and suggests more social contact than might first be imagined. As Hendricks & Blanken (1992) explain:

Although drug use may in some cases lead to isolation in several important areas of life, the drugs must inevitably be obtained from another person, either directly from a dealer, or through an intermediate (partner, friend, colleague).

These helping practices are founded in a set of interpersonal relations and exchanges that ease coping with craving and facilitate survival on the margins of society (Grund *et al.* 1989). Common to most hidden populations, it is these relationships that are the basis for finding respondents and starting referral chains.

Tentative maps

In beginning to make contacts and collect data, Blanken *et al.* (1992) demonstrate that inferences from sample to population may be made only if the zero sample can be considered a probability sample. They point out, however, that in research with hidden populations, the application of the full random method or other type of probability sampling is not possible and that the researcher often has no better option than to rely on the 'face validity' of a 'tentative map' to judge its representativeness. This 'tentative map' concerns the distribution of the phenomenon under study, including types of individuals, times and places. It may, for example, be more likely to occur among certain age, gender or ethnic groups in specific areas of a city, at specific times.

In terms of construction, such a tentative map may be developed considerably on the basis of information given by professionals working with the population concerned such as the police, as Faugier (1996) discovered in her work with female prostitutes. Becker (1970) highlights the value of using a variety of indirect data sources whenever possible when faced with the problem of a hidden or relatively unknown population. He suggests that it is possible and

extremely useful to obtain a baseline of information or a 'tentative map' from those people whose work brings them into contact with the group in question. As Berg (1988) points out: 'In the absence of a sampling frame covering the population, insiders' knowledge is often required to locate people for study and to start referral chains'.

Sudnow (1965) also refers to the knowledge of operational structures and social characteristics available to groups of certain professionals as a result of their day-to-day contact with the groups concerned. Lee (1993) claims that such informants are 'wise' in Goffman's (1963) sense of the word, as they are uniquely placed for routine observation of, and interaction with, deviant groups, by virtue of the servicing or control functions they are presumed to perform.

Constraints

However, a number of constraints operate to diminish the willingness or the ability of professionals to provide suitable information (Power 1989, Morrison 1988, Hartnoll *et al.* 1985). Firstly, professionals rarely see a full spectrum of types and drug users encountered by the police, for example, are likely to be quite different from those seen regularly by medical practitioners. This is possibly further hindered by a certain degree of distrust between professional groups such as police officers, social workers and other health professionals. Certain professionals may also be deliberately avoided by members of the deviant group, as in Faugier's (1996) study, where a few of the female prostitutes tended to avoid arrest and were consequently not known to the police.

Nevertheless, the presence of even minimal contacts may help in the process of selecting and contacting subjects for study in otherwise very hard-to-target populations. In addition, less obvious routes relying on the creativity of the researcher are often equally effective. For example, in Biernacki & Waldorf's (1981) study of a group of ex-heroin addicts, the research team needed to ensure that they managed to contact not only the ex-addicts who had undergone treatment for their addiction and therefore could be identified by clinic staff, records, etc., but also those individuals who had stopped using opiates without any treatment or help. By drawing on the networks previously found in Robins' (1973) classic study of Vietnam veterans, they were able to access those who had ceased to use drugs of their own volition, thus establishing chain-referral networks which often gave rise to others:

Occasionally, contacts and referral chains can be initiated fortuitously. This is not entirely a process of chance but results from an increasing sensitivity and attentiveness to information related to the study's focus that develops as the researcher becomes steeped in the research area. In a sense, it is the prepared mind that both knows and can take maximum advantage of opportunity. (Biernacki & Waldorf 1981)

FACILITATIVE ASPECTS

Anderson & Calhoun (1992) draw on the lessons gleaned from two field studies: one on homeless people in a sun-belt city conducted in the mid 1980s, where 168 homeless people were contacted in a variety of settings, and the other on male prostitutes conducted over a 3-month period in 1984 involving interviews with 18 prostitutes and systematic daily observations at the pick-up points for hustlers. They suggest that fieldworkers undertaking this type of research tend to concentrate on the difficulties of conducting research with deviant populations rather than addressing the ways in which ethnographic research can take advantage of the special opportunities presented.

Anderson & Calhoun (1992) offer four categories of facilitative aspects, given below.

Access to research settings

For example, homeless people and street hustlers can be observed and contacted in public places which are easily accessible. In Faugier's (1996) study, a direct outreach approach by the researcher on the streets was always well received by the women, particularly as she always carried condoms.

Social relationships

Deviant groups present special opportunities for developing rapport, particularly if the researcher is willing to accept stigma by association. This was a constant feature of Faugier's (1996) research where she was often mistaken by police and punters as one of the prostitutes.

Acquisition of information

Two roles, the anonymous stranger and the 'wise' person, are discussed as providing particular opportunities for gaining information by becoming the focus of attention.

The maintenance of researcher interest

Deviant groups tend to be very compelling populations, possibly encouraging researchers to spend more time in the field and extending interviews.

These suggestions need to be adapted to each individual study. Faugier (1996) found, for example, that the adoption of the 'wise person' role proved very useful in acquiring information, with the very fact of being a nurse and being known as such by the respondents assisting enormously in this process. Such a role often meant that female respondents would ask about health issues which had been worrying them or would, by virtue of a difference in age and what appeared to them to represent something of success in life, see the researcher as a source of knowledge.

THE PROBLEM OF BIAS

However, it is important to draw attention to the difficulties posed by the lack of generalizability in nonrandom research. Most snowball samples will be strongly biased towards inclusion of individuals who have many inter-relationships and the absence of individual inclusion probabilities means that unbiased estimation is not possible (Berg 1988). For example, in Faugier's (1996) study, problems occurred in identifying prostitutes who had only few and distant links with colleagues in the 'trade'; those who were being ostracized for various reasons and those who were new to the particular beat and had not yet established contacts.

Black & Champion (1976) emphasize that snowball sampling is more suitable for small sample size studies and has one major disadvantage:

Snowball sampling does not allow the researcher to use probability statistical methods. Elements included as a part of the sample are not randomly drawn. They are dependent on the subjective choices of the originally selected respondents.

These methodological dilemmas are also stressed by Van Meter (1990) who, whilst arguing that ascending methodologies are well adapted to the study of hidden populations, highlights problems in handling issues of sample bias, estimates concerning the level of the general population, and variance explanation. Hendricks & Blanken (1992) address these difficulties in their study of cocaine users:

The issue of bias has been the general problem in all epidemiological sampling designs. Random sampling designs have the advantage of being grounded in a probabilistic theory, which provides us with a formal model of selection and selection bias, and with the practical tools to infer from sample to population. Although we can never be sure that the random sample is 'perfect', i.e. truly representative of the population from which it is drawn, we can at least apply the laws of 'chance' to estimate bias parameters.

(Hendricks & Blanken 1992)

Without the advantage of such a theory or tools, the unknown or unknowable bias parameters that are subject to the laws of chance in random models cannot be assumed to be corrected by such laws in nonrandom sampling designs (Rapoport 1979).

There have been attempts to apply mathematical terms to snowball sampling and Goodman (1961) claimed that the sampling procedure can be utilized to make statistical inferences about aspects of the relationships occurring in the population. However, this attempt to attach statistics to an inherently nonstatistical method could be seen as a means of deflecting accusations of bias.

Snijders (1992) also demonstrates mathematical models related to the formal use of sample snowball designs which allow inferences with regard to the population of

individuals, but concedes that most ethnographic methods used to recruit initial respondents will lead to bias in the sense that the more widely known individuals are over-represented, even in the initial sample.

Sources of bias

In an attempt to formalize the factors that influence events such as the nomination of subjects for a snowball sample, Rapoport (1957) distinguishes five sources of bias that might be expected to operate in social networks:

- 1 the *social distance* between pairs of individuals: clearly, the probability of one individual being connected to the other is some function of the social distance between them;
- 2 the *island model*: several subsets of individuals may exist, within which the connection probabilities are random, but between which the connections have finite probabilities;
- 3 *overlapping acquaintance circles*: although several subsets of individuals exist without any connections between the subsets, the entire population can be connected owing to individuals being members of more than one subset;
- 4 *reflexive bias*: a connection from an original individual to a target individual enhances the likelihood of a connection from the target person back to the original person;
- 5 *force field bias*: some individuals, because of certain characteristics (for example, popularity), have a greater likelihood of being targeted than others.

ETHICAL ISSUES

Those involved in research with hidden populations may often have access to sensitive and potentially damaging data and should be particularly careful in the way in which their value judgements are made and about the character and consequences of their research (Mirvis 1982). The primary social and moral obligation of researchers must be to those who participate in the research process and it is their interests that must be the researcher's main concern.

It is important to note the predominant power differential between the researcher and the participant, accentuated by the researcher's theory and knowledge regarding the project and the participants' lack of insight into how the research may affect them and their inability to protect themselves. This gap is particularly heightened in the case of powerless groups where those with limited skills in articulation, such as children and minority groups or people in crises and terminally ill or homeless people, may be less able to judge the purpose of an investigation fully to anticipate the risks they might be taking.

Berg (1988) argues that ethical problems will arise if respondents cannot be assured of adequate protection regarding the information they give about themselves in the chain-referral process. This becomes particularly crucial in studies of a very sensitive nature. Faugier (1996) found this to be of immense importance in her study of women who prostitute and use illegal drugs; absolute assurance that other members of the chain would not know the reality of their behaviour with clients and their real-life stories was requested. Not only did confidentiality have to be assured, it also had to be tested everyday as many of the women in the chains would meet each other on the streets, in court or in prison, and any disclosure which could only have come from the researcher would have seriously damaged relationships with the individual in the study sample as a whole and militated against future potential recruitment.

DISCUSSION

Many researchers argue that sampling in field research should always be seen as an ongoing and emerging feature of the research process, in which further selection of sample elements is guided by theoretical understandings, reflections and judgements which emerge over the course of the research (Lee 1993, Denzin 1970, Glaser & Strauss 1967). In discussing the fields of application of such sampling methods, the usefulness of snowball sampling on the location of special or hidden populations has already been emphasized (Spren 1992). As Biernacki & Waldorf (1981) state:

The method is well suited for a number of research purposes and is particularly applicable when the focus of the study is on a sensitive issue, possibly concerning a relatively private matter, and thus requires the knowledge of insiders to locate people for study.

In his study of cocaine users, Adriaans (1992) also found it essential to have insider knowledge in locating and contacting individuals for inclusion in the study and emphasized the importance of utilizing nonrandom methods such as link-tracing and snowball methodologies when investigating drug-misuse issues. Whilst pointing to the usefulness of snowball sampling as a very effective tool, particularly in tracing the diffusion of information in social networks, Black & Champion (1976) emphasize other advantages:

Snowball sampling is extremely helpful in studying small social organisations such as small businesses or industries. Worker association patterns can be delineated by this method, and much information can become available. Communication methods can be uncovered and community power and decision making can be studied.

(Black & Champion 1976)

Snowball sampling

Snowball sampling also has the ability to resolve some of the serious problems encountered by descending methodologies, such as in-built validity checks (Van Meter 1990). Thus, whilst recognizing the personal bias and distortion inherent in snowball sampling as a price which must be paid in order to gain an understanding of these hidden populations and their particular circumstances, the confidence that develops in a relationship over a period of time is perhaps the best guarantee of sincerity (Foote Whyte 1982) and should increase the validity of the data:

Without allowing people to speak freely we will never know what their real intentions are, and what the true meaning of their words might be.

(Cottle 1977, cited in Burgess 1982)

In addition, although many researchers perceive a massive division between data gained through quantitative in comparison to qualitative methods, as Campbell (1955) suggests, the opposing nature of the two methodologies should not prevent them from being useful to each other. There is a need for qualitative and quantitative research to be mutually informative and provide the possibility for analyses in which both types of data contribute to and illuminate the analysis as a whole (Laurie & Sullivan 1991). By combining theories, methods and sources of data, researchers are more likely to overcome the bias, generalizability or restrictions intrinsic to any single methodology and make the widest use of any data or observations. Contrasting approaches should be encouraged for their ability to allow us to understand different aspects of the world.

Until recently constraints in relation to research understanding have prevented nurses from realizing the benefits of using nonrandom sampling methodologies, but if they are truly to understand the needs of client groups such as drug users, homeless people and prostitutes who are involved in socially or legally sanctioned activities, these methods are essential. There is now an urgent need to develop these nonscientific, nonrandom sampling methods to study hidden populations. By building relationships with members of such groups, nurses can inform health education and facilitate the development of new models of healthcare service delivery.

Clinical knowledge helps

Faugier's study (1996) highlighted the benefits of using such a methodology to reveal risky sexual practices and the urgent need to promote health interventions among female prostitutes and their clients. Her experience of collecting data both as a researcher and as a nurse qualified in psychotherapy meant that she had a great awareness and understanding of the health risk behaviour and the

physical and psychological status of the women involved. Thus, it would seem that nurses are in a prime position to utilize their own clinical knowledge and experience to further enhance research with such populations.

Finally, it should be emphasized that this paper is not intended as an apology or as an excuse for inferior or shoddy research methodology. It is of fundamental importance that nurses recognize the constraints on interpretation which arise from this method of sampling and report any likely sources of bias.

Also, from the apparent dearth of current literature available, the importance of publishing relevant work and sharing the procedures and problems entailed with other professionals should be stressed.

Nurses need to build on and learn from each others' experiences to gain the confidence to use nonrandom sampling methodologies in the discovery of hidden populations; an area which remains largely ignored and a methodology which is still denied the status it deserves.

References

- Adriaans N.F.P. (1992) The practice of snowballing. In *Snowball Sampling: A Pilot Study on Cocaine Use* (Hendricks V.M., Blanken P. & Adriaans N.F.P. eds), IVO, Rotterdam.
- Anderson L. & Calhoun P. (1992) Facilitative aspects of field research with deviant street populations. *Sociological Inquiry* **62**(4), 490–498.
- Becker H.S. (1966) *Outsiders: Studies in the Sociology of Deviance*. Macmillan, New York.
- Becker H.S. (1970) Practitioners of vice and crime. In *Pathways to Data* (Haberstein R. ed.), Aldine, Chicago, pp. 56–83.
- Berg S. (1988) Snowball sampling. In *Encyclopedia of Statistical Sciences* vol. 8 (Kotz S. & Johnson N.L. eds), pp. 529–532.
- Biernacki P. & Waldorf D. (1981) Snowball sampling: problem and techniques of chain referral sampling. *Sociological Methods and Research* **10**(2), 141–163.
- Black J.A. & Champion D.J. (1976) *Methods and Issues in Social Research*. John Wiley and Sons, Chichester.
- Blanken P., Hendricks V.M. & Adriaans N.F.P. (1992) Snowball sampling: methodological analysis? In *Snowball Sampling: A Pilot Study on Cocaine Use* (Hendricks V.M., Blanken P. & Adriaans N.F.P. eds), IVO, Rotterdam, pp. 83–100.
- Burgess R.G. (ed.) (1982) *Field Research; A Sourcebook and Field Manual*. Allen and Unwin, London.
- Campbell D.T. (1955) The informant in quantitative research. *American Journal of Sociology* **60**, 42–57.
- Carballo M. & Rezza G. (1990) AIDS, drug misuse and the global crisis. In *AIDS and Drug Misuse* (Strang J. & Stimson G. eds), Routledge, London, pp. 16–29.
- Denzin N.K. (ed.) (1970) *Sociological Methods: A Source Book*. Butterworth, London.
- Faugier J. (1996) Looking for business: a descriptive study of drug using female prostitutes, their clients and their health care needs. Unpublished PhD thesis, Manchester University, Manchester.
- Foote Whyte W. (1982) Interviewing in field research. In *Research;*

- A Sourcebook and Field Manual* (Robert G. ed.), Allen and Unwin, London, pp. 111–122.
- Glaser B. & Strauss A. (1967) *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Aldine, Chicago.
- Goffman E. (1963) *Stigma*. Prentice-Hall, Englewood Cliffs, New Jersey.
- Goodman L. (1961) Snowball sampling. *Annals of Mathematical Statistics* **32**, 245–268.
- Grund J.P.C., Kaplan C.D. & Adriaans N.F.P. (1989) Needle exchanging and drug sharing: a view from Rotterdam. *Newsletter, International Working Group on AIDS and IV Drug Use* **4**(1), 4–5.
- Hartnoll R., Daviaud E., Lewis R. & Mitcheson M. (1985) *Drug Problems: Assessing Local Needs*. Drug Indicators Project, London.
- Hendricks V.M. & Blanken P. (1992) Snowball sampling: theoretical and practical considerations. In *Snowball Sampling: A Pilot Study on Cocaine Use* (Hendricks V.M., Blanken P. & Adriaans N. eds), IVO, Rotterdam, pp. 17–35.
- Heslin J.M. (1972) Studying deviance in four settings: research experiences with cabbies, suicides, drug users and abortionees. In *Research on Deviance* (Douglas J. ed.), Random House, New York, pp. 23–37.
- Kaplan C.D., Korf D. & Sterk C. (1987) Temporal and social context of heroin-using populations: an illustration of the snowball sampling technique. *Journal of Nervous Mental Disorders* **175**(9) 566–574.
- Laurie H. & Sullivan O. (1991) Combining qualitative and quantitative data in the longitudinal study of household allocations. *Sociological Review* **39**(1), 112–131.
- Lee R.M. (1993) *Doing Research on Sensitive Topics*. Sage, London.
- Lindesmith A.R. (1968) *Addiction and Opiates*. Aldine, Chicago.
- Mirvis P. (1982) Know thyself and what thou art doing: bringing values and sense into organisational research. *American Behavioural Scientist* **26**(2), 177–197.
- Mitchell M. & Jolley J. (1988) *Research Design Explained*. Holt Rinehart Winston.
- Morrison V.L. (1988) Observation and snowballing: useful tools for research into illicit drug use? *Social Pharmacology* **2**(3), 247–271.
- Power R. (1989) Participant observation and its place in the study of illicit drug abuse. *British Journal of Addiction* **84**, 43–52.
- Rapoport A. (1957) Contribution to the theory of random and biased nets. *Bulletin of Mathematical Biophysics* **19**, 257–277.
- Rapoport A. (1979) A probabilistic approach to networks. *Social Network* **2**(1), 1–18.
- Robins L.N. (1973) *The Vietnam Drug User Returns*. Government Printing Office, Washington, DC.
- Simon J.L. (1969) *Basic Research Methods in Social Science: The Part of Empirical Investigation*. Random House, New York.
- Spren M. (1992) Rare populations, hidden populations and link-tracing designs: what and why? *Bulletin Methodologie Sociologique* **36**, 34–58.
- Sudnow D. (1965) Normal crimes: sociological features of the penal code. *Sociological Problems* **12**, 255–276.
- Van Meter K.M. (1990) Methodological and design issues: techniques for assessing the representatives of snowball samples. *National Institute on Drug Abuse: Research Monograph Series Mono 98*, 31–43.