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## Recruiting hard-to-reach United States population sub-groups via adaptations of snowball sampling strategy

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### Abstract

Nurse researchers and educators often engage in outreach to narrowly defined populations. This article offers examples of how variations on the snowball sampling recruitment strategy can be applied in the creation of culturally appropriate, community-based information dissemination efforts related to recruitment to health education programs and research studies. Examples from the primary author's program of research are provided to demonstrate how adaptations of snowball sampling can be effectively used in the recruitment of members of traditionally underserved or vulnerable populations. The adaptation of snowball sampling techniques, as described in this article, helped the authors to gain access to each of the more vulnerable population groups of interest. The use of culturally sensitive recruitment strategies is both appropriate and effective in enlisting the involvement of members of vulnerable populations. Adaptations of snowball sampling strategies should be considered when recruiting participants for education programs or subjects for research studies when recruitment of a population based sample is not essential.

### Keywords

Diversity; Hard-to-reach populations; Non-probability sampling; Recruitment; Snowball sampling

### INTRODUCTION

Nurses are engaged in a wide variety of research, clinical care and client education roles. Many of these roles involve the need to reach out to populations that are difficult to identify and contact, either because they are traditionally underserved, vulnerable or must fit within a set of narrowly defined characteristics.

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People who are traditionally underserved may be harder to reach because of a variety of personal or sociodemographic characteristics. For example, within most countries residents rely upon diverse *languages as their preferred mode of communication* and that can prevent potential subjects from accessing disseminated information about health programs and research studies from which they or others in their circle of family and friends might derive the benefits of scientific advances. *Lower literacy levels*, both in the language of their adopted country, and sometimes also in their native languages, may also make a portion of the population more difficult to reach. Some cultural groups are *reluctant to volunteer personal information* because of the risk of social, political, or other discriminatory repercussions (Tung et al., 2008). Belief systems linked to cultural norms about engagement in health care services or the history of prior abuses of minority groups during the research process may also interfere with participation (Russell et al., 2008). Isolation from the mainstream sources of information due to geographic, transportation and economic barriers can be equally troublesome in securing participation from members of diverse communities (e.g., residence in geographic communities that are a significant distance from a study center) (Fahrenwald and Stabnow, 2005). Furthermore, *some age groups* can be hard to reach, such as children, adolescents, and the elderly (Stoltz et al., 2007; Bjorkhaug and Hatloy, 2009).

Equally difficult to contact for inclusion in service programs or to recruit for participation in research studies are those in which the target group has become stigmatized either by personal circumstance or by association. Examples include: people living with HIV/AIDS and their families (Valle and Levy, 2008); abused women (Lutz, 2005); substance abusers (Vervaeke et al., 2007); commercial sex workers (Todd et al., 2007; Shahmanesh et al., 2009) and members of gay, lesbian or transgender communities (Browne, 2005; Gorbach et al., 2009).

The effect of these constraints is a limit on the size and diversity of the participants that can be gathered for health promotion intervention activities and/or research studies. A particular adverse impact in the research context is that the accrued sample may be neither large enough nor sufficiently representative of the at-large population to achieve results that can be generalized to the larger group. An equivalent concern arises when vital services do not reach all members of the group who could benefit from them. Recruiting these diverse individuals requires culturally sensitive, customized recruitment strategies.

Snowball sampling was conceptually designed as a sample recruitment method that offered a way to overcome many of the recruitment challenges associated with inviting difficult-to-reach communities to join health care intervention projects or research studies. Experience gained over many years of use generated a body of knowledge about both the benefits and limitations of the basic approach. Adaptations of the basic approach were then developed, to extend the effectiveness of the strategy in identifying hard-to-reach and hidden populations, and to expand the character of the achieved sample in order to make it more representative of the general population among whom these hidden populations reside (Magnani et al., 2005). This paper offers examples from the primary author's personal research in order to demonstrate how adaptations of the snowball sampling technique can be used to improve outreach efforts for health education programs and research studies assessing health education interventions.

## DESCRIPTION OF THE TRADITIONAL SNOWBALL SAMPLING TECHNIQUE

The snowball sampling technique is modeled after “contact tracing” in public health, in which one individual names all other individuals who were associated with a specific event. The snowball sampling outreach strategy finds individuals (the “source,” also referred to as

the “seed”), who have the desired characteristics, and uses *that person’s* social networks to recruit similar subjects, in a multi-stage process. After the initial source helps to recruit respondents, the respondents then recruit others themselves, starting a process analogous to a snowball rolling down a hill (Wasserman et al., 2005). Thus, the semi-self-directed, chain-referral, recruiting mechanism is able to reach the hard-to-reach target group in a more pragmatic and culturally competent way.

### **Advantages of using snowball sampling strategies**

The benefits of the classic snowball sampling technique are considerable. The personal aspects inherent in these techniques often shorten the time and diminish the cost required to assemble a participant group of sufficient size and diversity to be representative of the specific target group. The technique is often more efficient and sometimes less expensive than using traditional recruitment strategies to gather participants in proportion to the focus community.

Consider the situation in which the community from which study participants are sought is small and so well integrated with the mainstream community that it is difficult to identify individual group members. For example, researchers who seek representative numbers of Pacific Islanders and Filipinos will discover that surnames in those communities are often of Hispanic or French descent due to the prior imposed occupation of those countries. Community informants can help identify which individuals with potentially eligible surnames, are actually from the community of focus, as well as those who through marriage, have lost surnames that link them to a specific community.

Another situation that can benefit from snowball sampling occurs when representation from diverse communities is needed, and it is impossible for the research team to include a representative of all the communities sought. The team may discover that it will have a difficult time distinguishing members of subgroups nested within the larger community, e.g., the diverse Asian community. In this example, a member of one community sub-group will usually know the sub-groups’ distinctions and be able to guide the research team to members of each sub-group, and they will, in turn, know others.

A third example of the benefit of snowball sampling is that it can help researchers identify study participants where there are multiple eligibility requirements, and this is particularly so when the study’s eligibility criteria involve characteristics that some people consider very private (for example, participants whose partners gave them a sexually transmitted infection or teenagers whose pregnancy is out-of-wedlock). However, if one eligible person is identified, that person can often identify and recruit others to the study.

A particular advantage of snowball sampling is its cultural competence and the inherent trust it engenders among potential participants. This can help to increase the likelihood that the identified person will agree to talk with the researcher/program coordinator.

### **The disadvantages of using snowball sampling strategies**

The use of probability sampling methods is considered the gold standard for recruiting participants who are most likely to be representative of the larger population from which they are drawn. Thus the downside to classic snowball sampling in the research context is that it is a non-probability method, i.e., it does not recruit a random sample. Participants do not enroll in the health intervention program or research study by chance alone. Any conclusion reached in a study that used a snowball recruitment strategy may be biased, e.g., the sample may include an over-representation of individuals with numerous social connections who share similar characteristics (Magnani et al., 2005). However, even probability sampling strategies have inherent bias. Probability sampling is intentionally

conducted by study recruiters who randomly contact potential participants who are drawn from a community-wide database. These recruiters, by definition, have no prior relationship with the potential participants they are contacting. In marketing jargon, this would be the difference between a “warm call” (a call to ask a favor of someone with whom the marketer already has a prior positive relationship) and a “cold call” (a call to ask a favor of random contacts with whom no prior relationship has been established). A high refusal rate is commonplace under the latter circumstances, thus contributing to a type of self-selection bias that can confound study outcomes.

Another bias inherent in probability sampling is that it tends to generate a sample that is unbalanced in selected demographic characteristics. For example, people from higher socioeconomic groups, and those with higher education levels, are more likely to understand the value and risks of research participation and able to discern which research studies are legitimate. They are, therefore, more likely to be responsive to invitations to participate when random sampling strategies are employed.

An additional limitation of snowball sampling in the research context is the fact that there is no statistically reliable way to estimate whether “saturation” of the sample has been reached. This is particularly important in qualitative research because in that body of work, “saturation” is defined as when no new information is forthcoming from the participants *in the sample that has already been recruited*. Therefore, it is not possible to know whether new or other information could be gleaned had a random sample been recruited.

Finally, while snowball sampling has the advantage of helping researchers to identify potential study participants and helping educators to identify individuals who might benefit from participation in a health intervention, the technique does carry the inherent risk of disclosure of personal information to others. The sources may be reluctant to contact other individuals whom they believe to have a certain characteristic, as that may represent a disclosure of information about themselves or information that has been obtained in a personal and private context. The named individual, when contacted by the source, is faced with the challenge of deciding whether to disclose information about personal status to the outsider, in order to declare eligibility for participation in the health intervention program or research project.

### **Achieving Sampling Balance**

Thus in both probability and non-probability sampling methods, there can be concern regarding the generalizability of study findings. However, in these circumstances, sampling adjustments can be made. For example, randomly selecting participants from the larger pool of potential participants that were recruited through the chain-referral methods can compensate to some degree. Recent advances in the methodology of snowball sampling have attempted to incorporate anticipatory compensation for these potential imbalances in the recruited sample. The methodology of respondent driven sampling is one such adaptation (Salganik, 2006). In addition, some compensation can be accomplished for sampling imbalances through the application of statistical manipulations during the data analysis phase (Knoke and Yang, 2007).

## **ADAPTATIONS AND VARIATIONS – DESCRIPTIVE APPLICATIONS**

Table 1 provides examples of variations and adaptations of the snowball sampling strategy, as it has been used in research and education programs with which the primary author has been associated. In addition to recruiting to her own research grants, she has been funded by the United States’ National Institutes of Health to help other researchers develop effective recruitment strategies for people who are commonly underrepresented in such programs.

These examples are offered to demonstrate ways in which this recruitment technique has been effectively applied to reach members of underrepresented groups. The examples provided demonstrate the use of a broad variety of “sources,” including individuals (e.g., business people) (Sadler et al., 2007), formal and informal group leaders (e.g., business leaders) (Sadler et al., 1998), elected officers of business guilds and social leagues (Matteson et al., 2008), affinity and social groups (Choe et al., 2009), and third party entities (e.g., membership lists or telephone directories) (Wu et al., 2005). These examples demonstrate the adaptability and flexibility that is inherent in non-probability sampling strategies that are based on the concepts inherent in the snowball sampling strategy.

Personal communication is fundamental to the snowball sampling process. For example, participants at health fairs can be viewed as potential sources who can be invited to participate themselves and to facilitate the recruitment of others. The individual contacts are first given information about a study or program for which they might be personally eligible. They are then asked to pass the information along to other individuals whom they know and for whom the information might be relevant. For example, women who learned about a study were asked to host health parties in their homes where multiple other attendees could be recruited simultaneously (Sadler et al., 2006).

Another example of this strategy is accomplished when outreach workers identify community “sources” that have an appreciation of the value of spreading program and research information to their community members. The outreach workers share information about one or more studies with the community sources and ask them to address flyers to potential participants with a note saying, “Sending this to you in the hope that you will know someone who might be eligible. Please call me if you would like more information.” (This non-personalized message avoids disclosing personal information about the recipients’ presumed eligibility should another person read the recipients’ mail.) Alternatively, a community source may prefer to phone potential participants directly. For research study recruitment, this must be accomplished in a way that precludes disclosure of personal information to the outreach worker until the potential participant gives the source permission to do so. In this example, community sources are like the “connectors” and “Mavens” whom Malcolm Gladwell (2002) has described in his book *The Tipping Point: How Small Things Can Make a Big Difference*.

There are additional variations and adaptations of the classic snowball sampling strategy that are less precise in definition, but that can be considered when designing a particular population-based outreach strategy. For example, there are times when the initial “source” may not need to make direct contact, but instead will use his or her mantle of authority to convey approval that the information be shared. For example, recruitment brochures placed in church bulletins carry the implied and actual support of the church leadership. Similarly, study notices placed in communiqués sent by elected officials to their constituents carry a similar tone of endorsement. Other examples of such recruitment strategies include program recruitment literature appended to the newsletters disseminated by home owners’ associations, inserted into water and electricity bills, or printed on grocery store and other retail receipts

The ever expanding social networking capacity of the Internet community has generated additional options for the dissemination of recruitment materials. Examples of these social networking options included targeted e-mail communications, individual or institutional Internet home pages, or social networking sites, such as blogs and such Wiki sites as Facebook, MySpace, LinkedIn, and Plaxo (Bowen et al., 2004). Recruiters can place descriptions of research and educational opportunities on these sites for widespread dissemination. Respondents can then either contact the recruiter directly, contact the person

(“the seed”) who sent the recruiter’s message to them, or forward the message to others in their social circle, which is the essence of the snowball sampling strategy.

## **SPECIAL CONSIDERATIONS WHEN RECRUITING PARTICIPANTS FOR RESEARCH STUDIES**

The international community recognizes that the protection of human subjects’ privacy is a primary consideration when engaging participants using any recruitment strategy. International agreements have generated universal principles for research ethics. When the purpose of the recruitment is to attract participants for research studies, special attention must be given to assuring adherence to these national and international ethical guidelines (Brody, 1998; Claudot et al., 2009). In the context of the snowball sampling variations described above, researchers must take care to protect the privacy of both the sources (the “seeds”) and those who are being invited to participate. It is critical that communications do not disclose or imply the disclosure of personal information about either party. While this privacy protection is mandated by ethical review boards for research study recruitment, it should be of equal concern for recruitment to educational and support programs.

These same considerations hold true when communications are conducted through the Internet. The Internet’s rapidly evolving capacities are creating extraordinary social networking opportunities for educators and scientists. It is imperative that both groups stay alert to these new opportunities as they emerge, while also staying abreast of evolving international human subjects regulations that address the rights of personal privacy when using these public discussion forums.

## **DISCUSSION**

Snowball sampling strategies have evolved from many of the concepts developed for the field of social marketing (Kotler et al., 2002). Social marketing describes the phenomenon of reaching people with an action-prompting message. “Narrowcasting” is a term that has emerged to describe the impactful dissemination of a message to a narrowly defined and often hard-to-reach audience. To achieve their goals, social marketers also borrow from the sales forces such promotion techniques as “guerrilla marketing,” “buzzmarketing” (Hughes, 2005), and “permission marketing” (Godin, 1999) in order to create effective contact and promotion strategies.

However, unlike the sales marketing forces, those concerned with recruitment to research studies and health education opportunities must be ever vigilant about protecting the privacy of patients and the public. International human subjects guidelines place researchers and providers of health related services/information in a position of higher accountability for maintaining privacy than any other “sales force.” The consequences of non-compliance with these guidelines range from a reprimand to the closure of a research study, to the disqualification of a researcher from engaging in future research.

## **CONCLUSIONS AND IMPLICATIONS FOR CLINICAL PRACTICE**

The need to find more effective and efficient recruitment strategies is paramount. Snowball sampling is a recruitment strategy that is particularly effective in reaching hard-to-reach groups. Variations on this technique have proven to be adaptable and appropriate in a wide variety of education and research applications. The benefits and limitations of these adaptations of snowball sampling when used in the research context must be carefully evaluated against the benefits and limitations of probability sampling in order to select the optimal strategy. The benefits of using these approaches to recruit participants for health

intervention programs must be weighed against the privacy concerns that are inherent in any individual social situation or health condition.

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**Table 1**

Examples of adaptations and variations of the snowball recruitment strategy

Snowball sampling framework	Who/What is the source?	Who is the direct focus of the source?	Who is the indirect focus of the source?	Study focus	Outcome measures	Manner of application of the adapted strategy
<b>Affinity resources</b>	<b>Chamorro Directory International</b>	100 adult males and 100 adult females of the Chamorro community (indigenous to Mariana Islands) of all ages	Other qualifying Chamorro adults not listed in the Directory	Health practices and prevention assessment of the Chamorro community	<ul style="list-style-type: none"> <li>Behaviors related to participation in health screening and risk factor management</li> <li>Comprehensiveness of the Directory</li> </ul>	<ul style="list-style-type: none"> <li>Social directory provided to research team by collaborating community's leaders</li> <li>Directory entries were numbered; calls placed in computer generated random order</li> <li>Participants were asked to name three other Chamorro community members to test inclusiveness of the Directory</li> </ul>
<b>Affinity organizations</b>	<b>Deaf Community Services of San Diego, Inc.</b>	Deaf or Hard of Hearing adults (multiple studies)	Other Deaf or Hard of Hearing adults	Cancer education interventions	Change in cancer-related knowledge, attitudes, and screening behaviors	<ul style="list-style-type: none"> <li>Organization sent postal and electronic mailing to its membership and they were asked to pass along the information to associates</li> <li>Organization-sponsored community events were opened to the researcher</li> </ul>
<b>Affinity social groups</b>	<b>Deaf bowling league leader</b>	Deaf adults	Family and friends with same characteristics	Computer-based dietary and exercise intervention	Effectiveness of an interactive computer education program when used by members of the Deaf community	<ul style="list-style-type: none"> <li>Research team introduced to league members and members self-declared their interest by initiating dialogue with the research team. League members then passed the information to others or introduced the team to other community members</li> </ul>
<b>Affinity social groups</b>	<b>Elected official notified leadership of inner-city AARP group about study</b>	Age 50 and older African American males and females	Family and friends with same characteristics	Glaucoma research study	Defining reference levels for normal intraocular pressure and characteristics among age-appropriate African Americans	<ul style="list-style-type: none"> <li>Elected official encouraged leadership to invite study coordinators to make a presentation about the study</li> <li>Members were asked to consider personal participation and to invite friends and families to do so</li> </ul>
<b>Affinity businesses</b>	<b>African American cosmetologists</b>	Adult African American women	Other similar clients	Cancer and diabetes literacy and screening promotion	Change in cancer and diabetes-related knowledge, attitudes, and screening behaviors	<ul style="list-style-type: none"> <li>Stylists initiated recruitment among their clients; asked clients to disseminate what they learned to others</li> </ul>
<b>Affinity businesses</b>	<b>Asian grocery store owners</b>	Adult females of Pan-Asian descent	Their loved ones	Efficacy of a cancer education intervention offered at a	Change in cancer-related knowledge, attitudes, and screening behaviors	<ul style="list-style-type: none"> <li>Opportunity to participate was conveyed via volunteer community health educators through personal contacts made at the grocery store.</li> </ul>

Snowball sampling framework	Who/What is the source?	Who is the direct focus of the source?	Who is the indirect focus of the source?	Study focus	Outcome measures	Manner of application of the adapted strategy
Affinity businesses	Community newspapers	Asian, Hispanic, and African American editors	Readership	convenient community site Multiple studies open to recruitment	Changes in knowledge and behavior related to glaucoma, breast cancer, exercise	<p>Contacts were asked to pass along the information to others</p> <ul style="list-style-type: none"> <li>News article presented information about a health problem and the opportunity to participate in a study addressing the problem and asked readers to pass along the information to others</li> </ul>
Community leaders - formal and informal community leaders	African American church leaders, barbers, Brotherhood of Black Firefighters, Black Men United	Adult African American couples coping with prostate cancer	Family and friends with same characteristics	Efficacy of a spousal problem solving therapy intervention	Change in mood states and problem solving skills	<ul style="list-style-type: none"> <li>Sources initiated recruitment among their clients and social networks, and asked clients and friends to recruit other participants</li> </ul>