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Using the Internet to Survey Small Towns and Communities: Limitations and Possibilities in the Early 21st Century

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Abstract

Researchers who are interested in small towns and rural communities in the United States often find that they need to conduct their own sample surveys because many large national surveys, such as the American Community Survey, do not collect enough representative responses to make precise estimates. In collecting their own survey data, researchers face a number of challenges, such as sampling and coverage limitations. This article summarizes those challenges and tests mail and Internet methodologies for collecting data in small towns and rural communities using the U.S. Postal Service's Delivery Sequence File as a sample frame. Findings indicate that the Delivery Sequence File can be used to sample households in rural locations by sending them invitations via postal mail to respond to either paper-and-pencil or Internet surveys. Although the mail methodology is quite successful, the results for the Internet suggest that Web surveys alone exclude potentially important segments of the population of small towns and rural communities. However, Web surveys supplemented with postal questionnaires produce results quite similar to those of mail-only surveys, representing a possible cost savings for researchers who have access to Web survey capabilities.

Keywords: Internet survey, mail survey, address-based sampling, small towns, rural communities

Sample surveys, mostly conducted by mail or telephone, have long been used to gain insight into the opinions and behaviors of rural people (Johnson, Meiller, Miller, & Summers, 1987). In recent years, the importance of such surveys has become greater because few, if any, national surveys have sufficient sample sizes to provide accurate information about small towns and rural communities; furthermore, the Decennial Census–Long Form, which provided important information on rural areas, has been discontinued as of 2000. As a result, those who are interested in obtaining detailed information from residents of particular communities or rural areas often find it necessary to collect that information themselves by conducting regional or local sample surveys.

There has been a great deal of interest in using the Internet to conduct such sample surveys because of the potential cost savings when compared with other modes, including mail. Historically, however, a number of barriers have prevented the effective use of the Internet to conduct general population surveys on both a national level and a local level. Foremost among these barriers are the following: Many potential sample members do not have Internet access (i.e., low coverage); no adequate Internet sampling methodology has yet been devised; and it is considered unethical to approach people by e-mail with a survey request unless the surveyor has a preexisting relationship with them (Council of American Survey Research Organizations, 2007).

A constellation of changes affecting the outcome of general population surveys has led to the need to reevaluate methods for conducting surveys in small towns and rural communities—especially, the feasibility of conducting such surveys via the Internet. One such change is that random-digit-dial (RDD) telephone surveys, which became the preferred mode of surveying in the late 20th century, are declining in effectiveness owing to decreasing coverage and increasing nonresponse. Mail surveys that rely on telephone directories as sample frames face even greater coverage problems. Another change is that it has become possible to randomly sample household addresses nationally or for specific geographic areas using a relatively new address-based sample frame: the Delivery Sequence File (DSF) provided by the U.S. Postal Service.

Our purpose in this article is to explore the potential for using this new address-based household sampling frame to survey people in a small rural community. We start by evaluating the effectiveness of a mail survey using the DSF as a sample frame. We then assess the feasibility of conducting such surveys via the Internet by using a mailed letter to convince sample members to complete a Web survey. Next, we examine whether the Internet can be used alone to survey small rural communities or whether it should be supplemented by another survey mode. Finally, we explore whether giving respondents a choice of response mode results in participation rates different from those based on a specific suggested mode. The underlying question is, has the Web reached its potential as an alternative to more expensive survey modes?

Background

Finding adequate and current data about people in small towns and rural communities has always been difficult because most national data sets do not have large enough sample sizes from such areas to allow precise estimation (i.e., the confidence intervals for estimates

are too wide). One exception was the Decennial Census–Long Form, which was administered to one in every six households throughout the United States once every 10 years. However, the long form was discontinued in 2000 and replaced with the American Community Survey. This survey provides more current data because it is conducted yearly, but like many national surveys, it does not have large enough sample sizes from small towns and rural areas to make acceptably precise and timely estimates for targeted areas on a yearly basis. Single-year data are released only for areas with populations of 65,000 households or more, meaning that such data are not available for small towns or rural areas. As of 2008, multiyear estimates are available that average data across 3 years for areas with populations between 20,000 and 65,000 households. The use of data from multiple years makes it possible to draw on enough cases (i.e., on a large enough sample) to gain the needed precision for estimates, but it also means that yearly up-to-date estimates are not available. For areas with populations smaller than 20,000 households, 5-year estimates are expected to be available in 2010; these will be based on averages across 5 years to get enough cases for statistical precision (Copeland, 2008; U.S. Census Bureau, 2009). In essence, what this means is that American Community Survey data are currently unavailable for small towns and rural areas, and when they do become available, they will not be as useful for research focused on analyzing change within shorter periods of time or for issues that are time-sensitive. As a result, smaller, more geographically focused sample surveys have become increasingly important as tools for understanding these communities. Many such surveys arise out of a long tradition of using sample surveys to conduct needs assessments in these areas (Johnson et al., 1987). However, conducting quality sample surveys of rural communities and counties is becoming increasingly difficult because of societal changes that are undermining the survey methodology traditionally used in these areas.

Telephone Surveys Are Now Less Effective

One significant problem is that telephone surveys are losing effectiveness for general population surveys because of poor coverage and lower response rates (Lavrakas, 2008; Tucker & Lepkowski, 2008). Although the percentage of U.S. households with no telephone service at all has remained steady at 2% over recent years, the percentage with only cellular telephone service (i.e., no landline) continues to grow, reaching 20% in the second half of 2008 (Blumberg & Luke, 2009). Thus, about 22% of U.S. households are not covered by traditional landline RDD telephone surveys. Moreover, those who are excluded are more likely to be young adults, living with unrelated roommates, renting, residing in poverty, and living in the South or Midwest (Blumberg & Luke, 2009).

As is the case with many national surveys, the National Health Interview Survey, which is the primary source for government survey data on the wireless-only telephone population, does not have a large enough sample size to estimate the size of the wireless-only population in small towns and rural areas, thereby making it difficult to say how much RDD telephone surveying in these areas is likely to be affected (Blumberg, Luke, Davern, Yu, & Soderberg, 2009). However, national estimates indicate that those living in metropolitan areas are more likely to be cell-only than those living in nonmetropolitan areas, suggesting that small towns and rural areas may have lower cell-only prevalence rates.

Nonetheless, the size of the national and state estimates now available means that researchers who are interested in conducting landline RDD telephone surveys in local areas need to evaluate the potential for bias from not covering the cell-only population.

Compounding the cell phone–only problem is the fact that utilizing dual-frame sampling strategies that attempt to account for landline and cellular telephone sample frames can be prohibitively expensive; cell phone interviewing costs approximately two times as much as landline interviewing (Keeter, Dimock, & Christian, 2008). Some survey organizations conducting large, funded survey projects can absorb these costs, but at the state, county, and local levels, dual-frame sampling methods often cannot be afforded. The consequence is undercoverage of the cell-only population, which has the potential to produce biased survey estimates, especially for young adults, about 30% of whom live in cell-only households (Blumberg & Luke, 2007, 2009; Keeter, Kennedy, Clark, Tompson, & Mokrzycki, 2007). In addition to coverage challenges, cultural expectations about the telephone have changed over time such that it is increasingly acceptable to ignore unwanted telephone calls or refuse requests made over the telephone, thus lowering response rates for most telephone surveys and increasing the amount of effort required to get people to respond (Dillman, Smyth, & Christian, 2009; Tucker & Lepkowski, 2008).

Sampling cellular phones in rural counties or communities is further complicated by the mobile nature of these devices. Unlike landline telephones, which are wired to specific locations, a cell phone is not necessarily associated with a geographic area. Christian and Dimock (2009) estimated that at least one third of cell-only subscribers live in counties other than the ones derived from their cell numbers. This may result in some cell-only people being included in the sample frame who no longer live in the area and thus need to be screened out of the survey. Even more serious is the problem of undercoverage whereby cell-only subscribers who have moved into the area of interest are excluded from the sampling frame because their numbers are not in the target area (Lavrakas et al., 2008). Overall, the increasing use of cell phones has raised important methodological problems for surveys of a national scope, but many of these problems are magnified for surveys of smaller geographic areas, such as individual states, counties, or communities.

Is the Internet a Feasible Alternative?

An alternative survey mode that has garnered much attention and enthusiasm is the Internet. Since the first Internet-based surveys were conducted through electronic mail in the 1980s (Couper & Nicholls, 1998), the prospect of conducting surveys via the Internet has caused much excitement among social scientists, marketers, and practitioners, but Internet surveys of the general population have also been historically undermined by coverage problems. In 1995, only 3% of Americans had ever used the Web (Pew Center for the People & the Press, 1995); as recently as 2000, only about 50% of the U.S. adult population had Internet access (Madden, 2006), meaning that half the population was unavailable for Internet surveys. However, Internet coverage rates have improved considerably in recent years. According to the Pew Internet & American Life Project, in May 2008, about 73% of adults nationwide had access to the Internet from any location, and 65% had Internet access from home (percentages derived from Princeton Survey Research Associates International, 2008). Moreover, 55% of Americans with Internet access at home had high-speed

access, whereas only 10% had dial-up access (Horrigan, 2008). Similarly, the Current Population Survey estimates from October 2007 show that nearly 62% of U.S. households had an Internet connection, 71% had at least one household member who connected to the Internet from any location (Zhang, Callegaro, & Thomas, 2008), and nearly 51% had high-speed access from home (National Telecommunications and Information Administration, 2008).

Although such growth would seem to be a good sign for Web surveyors, these national estimates ignore important subgroup differences in access within the population. As of August 2008, only 64% of adults in rural areas used the Internet (Pew Internet & American Life Project, 2008); as of May 2008, only 38% of rural Americans had high-speed Internet access at home (Horrigan, 2008). Older Americans, those with lower incomes, and those with lower education also have relatively low Internet access rates. Thus, although Internet access has increased dramatically—causing some to question whether we have reached a threshold where Web surveys of the general public may be reasonable—the outlook in rural areas is a bit more bleak, given that nearly two thirds of the population either does not have Internet access or has only dial-up access, which allows for only the most simple Web surveys (i.e., text-based surveys with few visual enhancements or interactive features because these can increase download times).

In addition to having coverage limitations (which are more pronounced in rural than urban areas), Internet surveys have been historically hampered by difficulties in sampling people via the Internet mode itself. One difficulty is that there is no sample frame of e-mail addresses that would allow adequate probability sampling of Internet users. In addition, the unstandardized structure of e-mail addresses means that a sampling algorithm such as that used in RDD cannot be developed to sample Internet users (Dillman et al., 2009). That many people and households have multiple e-mail addresses and that others have e-mail addresses that they rarely check only further complicates matters. Moreover, because Internet access is not considered a public utility in the same way as landline telephones or postal addresses, it is considered inappropriate for organizations to approach people by e-mail with a survey request unless the surveyor has a preexisting relationship with the individuals and that relationship is such that the individuals might expect to be contacted over the Internet for research purposes (Council of American Survey Research Organizations, 2007). Unfortunately, for those studying small towns and rural areas, such a relationship rarely exists.

Overall then, the use of Internet surveys in the United States has been held back by coverage considerations, sampling difficulties, and ethical standards. As a result, Internet surveys have largely been reserved for specialized populations wherein Internet access rates are unusually high and e-mail addresses are already known (e.g., college students, members of a professional organization). However, the Internet may be the least expensive survey mode now available, and it has the potential to significantly reduce the costs and increase the speed of data collection when compared with other modes, provided an adequate sample frame can be located and people can be convinced to respond to an online survey. As a result, finding a way to successfully conduct Internet surveys of the general public would represent a considerable advancement. In addition, being able to use the Internet to collect sample survey data would be particularly beneficial for those working to understand small towns and rural communities precisely because of the unavailability of

adequate data about these areas in large national surveys and because of the funding constraints often faced by those surveying small towns and rural areas.

Is Mail a Viable Mode?

Another alternative is the mail survey. Until recently, mail surveys have been considered less adequate than telephone surveys for surveying community populations because of the lack of an adequate mail sample frame. Historically, with no better address-based sampling frame available, mail surveys typically relied on addresses associated with telephone listings. However, because some people choose not to have their numbers and/or addresses listed in directories (and cell phone numbers are not listed in directories), this sampling method had important gaps in coverage and, as a result, was considered less adequate than the RDD method used for telephone surveys.

In the last decade, an alternative address-based sample frame has become available that provides nearly complete coverage of all U.S. households. This frame, the U.S. Postal Service's DSF, consists of a list of all residential household addresses that receive mail delivery from the post office, as well as information that allows users to differentiate business and residential addresses (Iannacchione, Staab, & Redden, 2003). One of the distinct advantages of the DSF is that information on the frame makes it possible to geocode addresses and link them to common geographic indicators, such as counties, zip codes, and census blocks and tracts (Link, Battaglia, Frankel, Osborn, & Mokdad, 2008). As such, the information on the DSF enables much more accurate sampling of small geographic areas than that of telephone surveys (especially, cell phone surveys). In addition, the ability to geocode addresses opens up many possibilities for spatial analyses, such as examining whether geographic location is related to survey response/nonresponse behavior or how the respondents' proximity to a feature of the built environment influences the outcome of interest. Moreover, one can stratify DSF samples based on the demographic compositions of geographic areas (e.g., education, race/ethnicity) if that information can be obtained for the area of interest.

Initial evaluations of the DSF show that it covers up to 95% of households in some areas (Iannacchione et al., 2003). It has the best coverage rates in densely populated areas but lower rates in rural areas,[1] areas in transition, Native American reservations, and military bases (Link et al., 2005; O'Muircheartaigh, English, & Eckman, 2007; Steve, Dally, Lavrakas, Yancey, & Kulp, 2007). Two additional appealing aspects of the DSF are that, unlike traditional RDD surveys, it enables researchers to collect data from cell-only households or individuals and it is considerably less expensive than RDD landline surveys—costing 12% less in one comparison (Link et al., 2008).

Although the DSF is ideally suited as a sample frame for mail surveys, it opens up new sampling possibilities for Internet surveys. In particular, the DSF makes it possible to draw a random sample of households (either at the national level or the local level) that can be mailed requests to complete an Internet survey. As such, it provides a sample frame (previously lacking for the Internet) in which each household has a known probability of selection, and it allows for contact of households without e-mail or with rarely checked e-mail (i.e., better coverage). Moreover, it helps researchers avoid the ethical issues surrounding e-mail survey invitations by sending the invitations via postal mail. One remaining problem with using the DSF in this way is that respondents who do not have Internet

access or are unwilling to use the Internet in this way will not respond to an Internet survey even if they are contacted. As a result, it is important to establish whether it is necessary to provide these sample members with an alternative survey mode in which to respond—that is are these respondents so different from Web users on the measures of interest that their exclusion would result in nonresponse error? This question is particularly important in small towns and rural areas where Internet access rates remain somewhat low compared to national rates.

In this article, we examine some of the current issues involved in surveying general population samples in small towns and rural areas. In particular, we report results from an experiment aimed at evaluating the potential for conducting surveys via both postal mail and the Internet using the DSF as a sample frame. The research questions we address are as follows:

> Can a mail survey using the DSF produce acceptable response rates in a small rural community?
>
> Can sample members be convinced by a postal mail letter to respond to an Internet survey, and do enough of them respond to make this a viable option?
>
> Can an Internet survey be used alone to survey small rural communities, or should it be supplemented by another survey mode?
>
> Does giving sample members a choice between mail and Internet result in participation rates different from that of initially offering only mail or only Internet?

Method

The data for this article come from a 2007 survey conducted in Lewiston, Idaho, and Clarkston, Washington, adjacent cities containing a combined population of about 45,000 people. These cities are somewhat isolated, being more than a hundred miles from any larger population center. The title of the survey was the Lewiston and Clarkston Quality of Life Survey, and it included 51 questions (requiring as many as 80 responses) about community satisfaction and issues facing the community, as well as questions about cell phone and Internet use and demographic characteristics.

A random sample of 1,800 addresses was obtained from the DSF and randomly divided into four treatment groups. In this article, we report on only the following three treatment groups because they are the most relevant to the question at hand; in each treatment, instructions asked the adult who had the most recent birthday to complete the survey for the household:

> *Mail preference*: Request to respond by mail with no mention of Web in initial mailing (n = 400).
>
> *Web preference*: Request to respond by Web, but if Web not available, a mail alternative will be sent in 2 weeks (n = 600).
>
> *Choice*: Choice of mail or Web is offered up front, with respondents encouraged to do whichever they prefer (n = 400).

The mail and Internet questionnaires developed for this experiment contained the same questions in the same order, and the visual presentation was similar across modes. Figure 1 shows sample pages and screens from the mail and Web versions of the questionnaire. Research has shown that different visual layouts produce different answers to survey questions but that the same layouts produce quite similar results on Web and mail (Dillman et al., 2009); as such, we gave careful attention to ensure that individual question layouts and the overall visual design were as similar as possible across the mail and Web surveys. As Figure 1 illustrates, the mail questionnaire was formatted as a 12-page 8.5 × 11-in. booklet with individual questions presented in their own enclosed regions in an attempt to match the page-by-page construction of the Web questionnaire (i.e., one question per screen). In the mail and the Web versions, pictures of the local area were included as part of the questionnaire to help personalize it to the respondents through their affiliation with the community. Pictures were used because the DSF includes only addresses, so the respondents could not be addressed by name in the survey contacts without matching them to another list, which is successful with only 65% to 80% of DSF addresses. In addition, Link et al. (2008) found that using matched names with a DSF sample does not improve response rates. The two designs also included the following parallels: The same picture was used on the front cover of the mail questionnaire and the opening screen of the Web questionnaire; pictures from the back cover of the mail questionnaire were used in the banner of the Web questionnaire (the picture changed every 10 screens); the title from the mail questionnaire was carried over to the banner of the Web pages; the contact information on the bottom of the front cover of the mail version was carried over to the bottom of every screen in the Web version; the same fonts and bolding scheme were used in both questionnaires; the same colors were used in both versions; and even the same types of answer spaces were used in both questionnaires (i.e., round versus square). Our overall design strategy was to unify the designs to the extent possible to minimize any visual layout differences between versions and to show that the mail and Web options were linked, for respondents who received both.

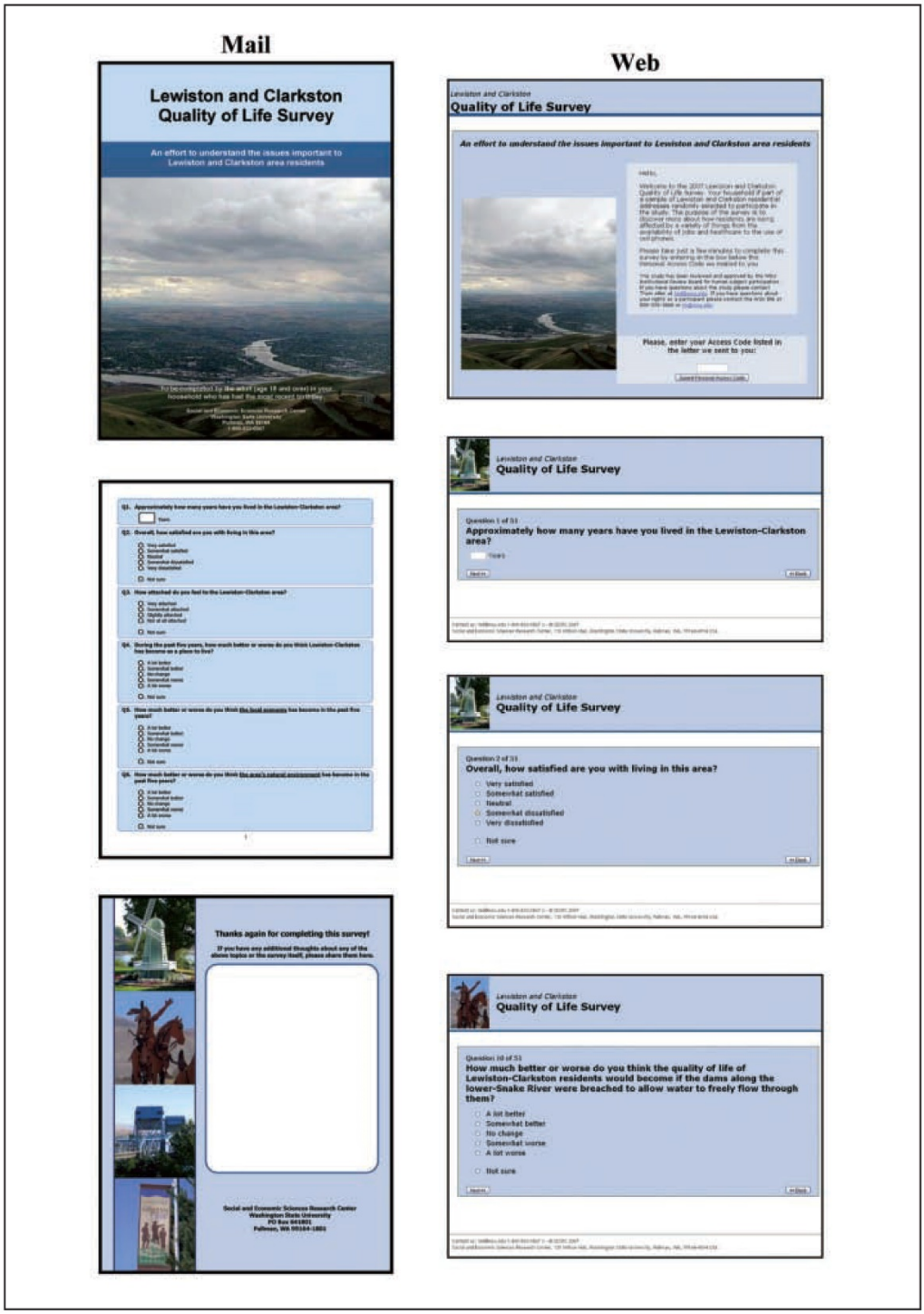

Figure 1. Lewiston and Clarkston Quality of Life Survey: Design of mail and Web questionnaires.

As was the case with the design of the questionnaires, we took enormous care in constructing the invitation and follow-up letters to sampled households. We made every effort to keep the content of the contacts exactly the same across the treatments, with the only exception being the deviations required because of the different modes through which respondents were being asked to respond. For example, the initial letter for the Web preference version contained a survey URL (Web address) and access code that were not included in the mail preference version.[2] Figure 2 shows the implementation protocol used for each treatment. As the figure shows, respondents to all treatments received the same prenotice letter, and all respondents received a $5 incentive with the initial invitation letter. Figure 2 also shows the situations in which respondents received the Web instructions. The Web instructions, like the Web pages themselves, were designed to convey the simplicity by which a Web response could be made, for those with low Internet skills and/or distrust or fear of providing information via the Internet.[3] In addition, we were careful to assign a Web address to the survey that respondents could easily transfer from the letter into their Web browser (http://www.opinion.wsu.edu/lewistonclarkston).

Date Mailed	Mail Preference	Web Preference	Choice
November 2, 2007	Standard prenotice letter	Standard prenotice letter	Standard prenotice letter
November 6, 2007	• Invitation letter • $5 incentive • Mail questionnaire • Return envelope	• Invitation letter including URL and password • $5 incentive • Web survey instructions	• Invitation letter including URL and password • $5 incentive • Web survey instructions • Mail questionnaire • Return envelope
November 13, 2007	Reminder postcard	Reminder postcard including URL and password	Reminder postcard including URL and password
November 29, 2007	• Reminder letter including URL and password • Web survey instructions • Replacement questionnaire • Return envelope	• Reminder letter including URL and password • Web survey instructions • Replacement questionnaire • Return envelope	• Reminder letter including URL and password • Web survey instructions • Replacement questionnaire • Return envelope

Figure 2. Implementation protocol by experimental treatment.

Findings

Can a mail survey using the DSF produce acceptable response rates in a small rural community? To answer this question, we focus on the mail preference treatment because it most closely resembles a standard mail survey. The possibility of completing the survey via the Web

was not revealed until the last reminder mailing. The final response rate, shown in Table 1, was 71.1%, with only 0.5% coming from respondents completing the Web version of the questionnaire. From these results, we conclude that mail remains a viable mode for conducting community surveys. In fact, the 71.1% response rate obtained here is consistent with response rates to mail surveys in the 1970s and 1980s.

Table 1. Response Rates by Experimental Treatment

	Sample Size[a]	Mail Completes	Web Completes and Partials	Total Completes	Responded by Mail		Responded by Web		Total Response Rate[b]	
Treatment	*n*	*n*	*n*	*n*	%		%		%	
Mail preference	367	259	2	261	70.6		0.5		71.1	
Web preference	566	80	232	312	14.1		41.0		55.1	
Choice	381	192	48	240	50.4		12.6		63.0	
					χ^2	*p*	χ^2	*p*	χ^2	*p*
Mail preference versus Web preference					306.56	.000	193.82	.000	24.03	.000
Mail preference versus choice					31.79	.000	43.54	.000	5.58	.018
Web preference versus choice					146.24	.000	88.14	.000	5.80	.016

a. Undeliverables are subtracted out of reported sample size.
b. Response rate calculated as such: (total completes/sample size) × 100. This response rate is equivalent to American Association for Public Opinion Research Response Rate 6.

An additional finding regarding the quality of the DSF as a sample frame for small towns and rural areas is that only 5.9% of the invitation letters sent to the entire sample for the three treatments reported here were returned undeliverable from the post office. Of these, 55% (3.2% of the entire sample) were returned because the address was vacant; 20% (1.2% of the entire sample) were returned as "unable to forward"; and the rest were returned for an assortment of other reasons, such as no mail receptacle, no such address/number, attempted/unknown, and unclaimed. These results are encouraging for those considering using the DSF as a mail survey sample frame because they are well within the estimated 90% occupancy rate cited by Iannacchione et al. (2003) as commonly found in metropolitan household surveys that use on-site enumeration methods.

Can sample members be convinced by a postal mail letter to respond to an Internet survey, and do enough of them respond to make this a viable option?

The Web preference treatment allows us to address this question. For a reminder, respondents in this treatment were sent mail invitations asking them to complete the survey via the Internet, with nonrespondents provided a paper survey at the last contact in case they did not have Internet access. As shown in Table 1, the final response rate for this treatment was 55.1%, with 41.1% (i.e., 74% of the completes) coming via the Internet and 14.1% (i.e.,

26% of the completes) coming in via postal mail. An overall 55% response rate with 41% being completed on the Web demonstrates the potential for convincing the general public to respond via the Internet. In addition, for those organizations that have already established the infrastructure needed to conduct Web surveys, the ability to get 41% of sample members to respond via the Web represents potential cost and time savings over mail surveys. However, judging whether the 41% response rate produced by only the Web is adequate requires analyses of who responded via the Web and who did not.

Can an Internet survey be used alone to survey small rural communities, or should it be supplemented by another survey mode?

Although a 41% response rate via the Web in a general population survey of residents in a rural area is encouraging, determining whether the Internet mode alone is adequate requires analyses of what type of people responded via the Web and what type did not. In this study, we do not have the ability to do a formal nonresponse bias analysis, because the DSF sample frame does not contain the types of information about individual households that are needed in order to do so and no nonresponse follow-up survey was conducted. In addition, because our study was conducted 7 years after the previous Decennial Census, we do not have accurate benchmark estimates against which to compare demographic distributions. What we can do is examine those who completed the survey, comparing those who completed it via the Web with those who completed it via the mail. If there are no differences (or even very small differences) between these groups, we can have more confidence that the Web can be used as the sole survey mode for surveys of this type. If there are differences, we would be well advised to avoid using the Web without providing a supplementary mode to try to get responses from sample members who cannot or will not respond via the Web.

We start this analysis by focusing on respondents to the Web preference treatment who responded by mail and comparing them to those who responded by Web. The left half of Table 2 shows the results of these comparisons; significant differences are in bold font. Those who responded by Web were significantly younger, with a mean age of 51, compared to 62 for those who responded by mail (p = .000). As might be expected, the age category with the largest difference was the 65-and-older category; only 17% of Web respondents fit this age category compared to just over 48% of mail respondents. On the flip side, larger proportions of Web respondents were in the 34-and-younger category (5.9-percentage-point difference), the 35–50 category (9.2-point difference), and the 51–65 category (16-point difference). Table 2 shows that Web respondents were also more educated, with 30.8% of them having a 4-year college degree or more, compared to only 13.9% of mail respondent (p = .006). Nearly 51% of Web respondents were employed full-time, compared to only about 35% of mail respondents; a similar pattern emerged for income wherein 61% of Web respondents reported incomes higher than $50,000, compared to only 31% of mail respondents (p = .000). Web respondents were also more likely to be married (74% compared to 43%; p = .000) with a significantly higher mean number of children (0.81 compared to 0.29; p = .002). Finally, those who responded via the Web reported living in the area for significantly fewer years (26.2 years versus 34.9 years; p = .001). Together, these data indicate that those who responded to the Web preference treatment by the Web differ

considerably from those who responded to this treatment by the mail on most major demographic measures.

The Web and mail respondents differ in other important ways as well. Overall, those who responded by Web reported higher use of technology and less difficulty using it. For example, 84.9% of Web respondents reported having a cellular phone, compared to only 52.6% of mail respondents. The findings reported in Table 2 indicate that much of this difference occurs because Web respondents are considerably more likely to have both a cellular phone and a landline phone (65.1% versus 36.3%), whereas mail respondents are considerably more likely to have only a landline phone (40.0% versus 10.3%). Rates of cell-only status were somewhat similar between the two groups, with only a 3.5-percentage-point difference in favor of the Web respondents. Web respondents also reported heavier use of their cell phone, with 88.1% reporting using their cell phone several times a week or more,[4] compared to 76.7% of mail respondents (p = .052). Among those with a landline phone, there was no significant difference in the percentage with a listed number or call-blocking services. There was a substantial and significant difference in the percentage reporting that they have caller ID on their landline phone. Only 50.9% of mail respondents reported having caller ID, whereas 73.5% of Web respondents had this feature (p = .002).

Perhaps more important than telephone access and use is the substantial and significant difference between the two groups with respect to computer use. In sum, 91.8% of Web respondents reported heavy computer use (several times a week or more), compared to only 37.5% of mail respondents, a difference of about 54 percentage points (p = .000). Web respondents were also less likely to report needing assistance using computers all the time or frequently.[5] Only 4.0% reported such need for assistance, compared to 22.7% of mail respondents (p = .000). Similar patterns emerged regarding Internet use. Whereas only 37.5% of mail respondents reported heavy Internet use (defined as several times a week or more), a full 85.3% of Web respondents reported this level of use (p = .000). As with computer use, mail respondents were significantly more likely to report needing assistance with using the Internet (frequently or all the time; 9.5% versus 1.4%; p = .013).[6]

A 41% response rate by Web is a positive outcome but when taken together, the results reported thus far suggest great caution when considering the Web as a sole survey mode. Although a formal nonresponse bias analysis is not possible with the current data, the comparisons reported here provide evidence that eliminating the mail follow-up would have left out an important subgroup of sample members that is very different from those who responded via the Web. By definition, the exclusion of this subgroup would have resulted in nonresponse bias if any of the significantly different demographic or technology use variables reported in the current study were related to other substantive variables of interest (Groves, 1989).

Table 2. Characteristics of Respondents to the Web Preference (by Response Mode) and Mail Preference Treatments

	Web Preference[a]					Web Preference versus Mail Preference[b]				
	Mail	Web	±	t/χ^2	p	Mail Pref	Web Pref	±	t/χ^2	p
Age (*M*)	61.6	51.4	**–10.2**	5.01	.000					
Age (%)				29.92	.000				5.28	.152
< 34	8.9	14.8	**5.9**			9.5	13.3	3.8		
35–50	17.7	26.9	**9.2**			29.9	24.5	–5.4		
51–65	25.3	41.3	**16.0**			31.5	37.1	5.6		
> 65	48.1	17.0	**–31.1**			29.1	25.2	–3.9		
Sex (%)				2.07	.150				4.45	.035
Female	68.4	59.2	–9.2			52.7	61.6	**8.9**		
Male	31.7	40.8	9.1			47.3	38.4	**–8.9**		
White (non-Hispanic) (%)	93.8	89.2	–4.6	1.40	.278[c]	88.9	90.4	1.5	0.34	.557
Employment (%)				18.39	.001[c]				1.01	.798
Full-time	34.7	50.7	**16.0**			43.2	46.6	3.4		
Part-time	4.0	9.4	**5.4**			7.5	8.1	0.6		
Retired	52.0	25.6	**–26.4**			36.1	32.2	–3.9		
Other	9.3	14.4	**5.1**			13.3	13.1	0.9		
Education (%)				12.51	.002				5.13	.077
High school or less	38.0	21.4	**–16.6**			31.9	25.7	–6.2		
Some college	48.1	47.8	**–0.3**			38.5	47.9	9.4		
Four-year degree or more	13.9	30.8	**16.9**			29.6	26.4	–3.2		
Marital status (%)				46.76	.000[c]				6.09	.107
Married	42.9	74.0	**31.1**			56.0	66.0	10.0		
Divorced/separated	20.8	13.1	**–7.7**			19.1	15.0	–4.1		
Widowed	24.7	2.2	**–22.5**			11.7	8.0	–3.7		
Single	11.7	10.8	**–0.9**			13.2	11.0	–2.2		
No. of children (*M*)	0.29	0.81	**0.5**	–3.08	.002	0.7	0.7	0.0	–0.05	.962
Years living in area (*M*)	34.9	26.2	**–8.7**	3.41	.001	29.8	28.5	–1.3	0.77	.443
Income (%)				27.23	.000[c]				4.68	.197
> $25,000	31.2	10.8	**–20.4**			23.1	16.0	–7.1		
$25,000–$49,999	37.7	28.3	**–9.4**			29.1	30.7	1.6		
$50,000–$74,999	7.8	23.8	**–16.0**			18.7	19.7	1.0		

Table 2 continued

$75,000+	23.4	37.2	**13.8**			29.1	33.7	4.6		
Telephone status (%)				43.74	.000[c]				2.03	.730
Cell only	16.3	19.8	**3.5**			18.4	18.9	0.5		
Landline only	40.0	10.3	**–29.7**			21.1	18.0	–3.1		
Cell and landline	36.3	65.1	**28.8**			54.8	57.7	2.9		
No phone	5.0	0.9	**–4.1**			3.1	1.9	–1.2		
Unknown	2.5	3.9	**1.4**			2.7	3.5	0.8		
Years with cell phone (*M*)	5.8	7.2	1.4	–1.90	.059	5.9	6.9	**1.0**	–2.59	.010
Heavy cell phone use (%)	76.7	88.1	11.4	3.78	.052	64.4	67.3	2.9	0.55	.459
Landline phone services (%)										
Listed number	96.7	92.6	–4.1	1.31	.366[c]	86.9	93.6	**6.7**	5.69	.017
Caller ID	50.9	73.5	**22.6**	10.04	.002	64.1	67.8	3.7	0.66	.416
Call blocking	71.2	67.1	–4.1	0.30	.582	27.0	31.9	4.9	1.15	.283
Heavy computer use (%)	37.5	91.8	**54.3**	101.90	.000	69.7	77.9	**8.2**	4.93	.026
Need computer assistance (%)	22.7	4.0	**–18.7**	19.42	.000	8.6	7.1	–1.5	0.35	.555
Heavy Internet use (%)	37.5	85.3	**47.8**	69.21	.000	65.5	73.1	**7.6**	3.84	.050
Need Internet assistance (%)	9.5	1.4	**–8.1**	9.19	.013[c]	3.9	2.6	–1.3	0.59	.441
Have Internet at home (%)	44.3	96.4	**52.1**	111.62	.000	72.2	82.8	**10.6**	9.19	.002
Years, Internet at home (*M*)	6.1	8.2	**2.1**	–2.46	.014	7.9	7.9	0.0	–0.01	.990
Connection, high speed (%)	60.0	66.7	6.7	0.59	.441	63.0	65.7	2.7	0.33	.562

Significance tests for means are two-sided *t* tests. Significance tests for distributions and percentages are chi-square tests. Significant values are in bold. Questions about the number of years that one has had a cell phone or Internet were asked only of those who reported having a cell phone or Internet; likewise, questions about landline phone services were asked only of those reporting having a landline phone. Questions about needing assistance with computer/Internet use were asked only of those who reported at least some computer/Internet use. Heavy users of technology were defined as those who reported using the technology at least *several times a week* (on a scale of *several times a day*, *once a day*, *several times a week*, *once a week*, *once a month*, *less than once a month*, *never*). Those defined as needing assistance were those who answered *frequently* or *all the time* (on the scale of *all the time*, *frequently*, *occasionally*, *rarely*, *never*).

a. Mail, $n = 80$; Web, $n = 232$

b. Mail preference, $n = 261$; Web preference, $n = 312$

c. Fisher's exact for cells with fewer than five cases

Table 3. Opinions/Views of Respondents to the Web Preference by Response Mode and Mail Preference Treatments

	Web Preference					Web Preference versus Mail Preference				
	Mail	Web	±	χ^2	*p*	Mail Pref	Web Pref	±	χ^2	*p*
Satisfied with area (%)	89.9	85.3	–4.6	1.03	.309	88.9	86.5	–2.4	0.75	.387
Attached to area (%)	90.0	80.4	**–9.6**	3.89	.049	86.1	82.9	–3.2	1.13	.288
L/C improved as place to live (%)	56.3	50.9	–5.4	0.67	.413	48.2	52.3	4.1	0.94	.333
Local economy improved (%)	43.7	43.3	–0.4	0.00	.960	38.8	43.4	4.6	1.17	.280
Natural environment improved (%)	32.9	26.9	–6.0	0.95	.330	31.0	28.4	–2.6	0.43	.512
Job availability up (%)[a]	35.2	29.2	–6.0	0.92	.338	31.5	30.2	–1.3	0.09	.763
Health care availability up (%)[a]	30.0	21.6	–8.4	2.02	.155	26.3	23.3	–3.0	0.60	.439
Community involvement up (%)[a]	47.7	31.7	**–16.0**	5.50	.019	33.8	34.4	0.6	0.02	.882
Illegal drug activity up (%)[a]	82.5	80.5	–2.0	0.13	.719	76.0	79.8	3.8	1.02	.314
Firearm crimes up (%)[a]	47.7	56.9	9.2	1.66	.198	54.9	53.2	–1.7	0.12	.728
Salmon/steelhead population up (%)[a]	18.9	38.0	**19.1**	6.54	.011	26.4	32.0	5.6	1.52	.218
Affordable child care up (%)[a]	13.9	23.4	9.5	1.52	.218	23.7	20.4	–3.3	0.52	.469
Quality of life up (%)[b]										
People move in	34.3	39.1	4.8	0.54	.463	42.1	37.2	–4.9	1.35	.245
More retail chains	62.7	63.0	0.3	0.00	.965	58.9	61.6	2.7	0.44	.509
More gray wolves	9.4	11.4	2.0	0.20	.652	9.8	10.7	0.9	0.10	.753
More Internet use	43.4	62.1	**18.7**	6.09	.014	56.8	56.2	–0.6	0.02	.891
More cell phone use	26.9	44.1	**17.2**	6.33	.012	41.3	39.0	–2.3	0.27	.601
More cell while driving	6.4	2.7	–3.7	2.25	.161[c]	5.5	3.6	–1.9	1.20	.273
Breach dams	8.8	12.9	4.1	0.99	.319	12.3	13.8	1.5	0.25	.616
Environmental protection (%)				7.96	.047				0.56	.907
Too strong	16.3	16.2	**–0.1**			16.4	16.2	–0.2		
About right	47.5	41.2	**–6.3**			44.6	42.9	–1.7		
Too weak	16.3	30.7	**14.4**			24.2	27.0	2.8		
Not sure	20.0	11.8	**–8.2**			14.6	14.0	–0.6		
Gray wolves (endangered species list) (%)				4.00	.261				4.88	.181
Remain protected	7.5	10.1	2.6			12.7	9.5	–3.2		

Table 3 continued

Not protected, restrict hunting	38.8	48.5	9.7			37.7	45.9	8.2		
Not protected, no restrictions	43.8	35.2	–8.6			40.0	37.5	–2.5		
Not sure	10.0	6.2	–3.8			9.6	7.2	–2.4		
Gray wolves (no threat to . . .) (%)										
Residents of L/C	42.5	53.0	10.5	2.63	.105	54.4	55.3	0.9	0.04	.839
Other Northern Idaho residents	16.3	20.3	4.0	0.62	.433	25.8	22.5	–3.3	0.73	.392
Pets/domestic animals	2.5	9.9	**7.4**	4.44	.033	6.2	8.6	2.4	1.09	.297
Farm animals	1.3	2.2	0.9	0.26	1.000	2.5	2.0	–0.5	0.12	.730
Wildlife or game	2.5	6.5	4.0	1.82	.256	6.6	5.8	–0.8	0.17	.684
Ever encountered wolf in wild (%)	46.3	56.0	9.7	2.25	.133	44.2	53.4	**9.2**	4.79	.029
Known of attacked animals (%)	24.1	20.8	–3.3	0.37	.545	19.1	21.6	2.5	0.57	.451

The percentages in the table indicate respondents who selected a Likert-type item based on the positions listed; for example, the first item, "satisfied with area," refers to respondents who indicated that they are *very satisfied* or *somewhat satisfied* (on the scale *very satisfied*, *somewhat satisfied*, *neutral*, *somewhat dissatisfied*, *very dissatisfied*, *or not sure*). L/C = Lewiston/Clarkston. Significant values are in bold.

a. Respondents were asked to what extent each of these characteristics has increased or decreased in the last 5 years (*increased a lot*, *increased a little*, *no change*, *decreased a little*, *decreased a lot*, *not sure*). The numbers reported here are the percentage who answered *increased a lot* or *increased a little*.

b. These items asked to what extent the quality of life in the area would become better or worse if the stated event continued to happen over the next 5 years. The numbers reported here are the percentage of respondents who answered that the quality of life would be *a lot better* or *somewhat better* (*no change*, *somewhat worse*, *a lot worse*, *not sure*).

c. Fisher's exact for cell with fewer than five cases.

In fact, in the current study, significant differences between Web and mail respondents were found in 7 of 24 substantive questions analyzed (see left side of Table 3).[7] For example, among Web respondents, 80.4% reported being somewhat or very attached to the local area, but among mail respondents 90.0% reported this level of attachment ($p = .049$). Other significant differences were that Web respondents were less likely to report that the willingness of residents to be involved in the community had increased in the last 5 years ($p = .019$); more likely to believe that the number of salmon and steelhead in local rivers had increased in the last 5 years ($p = .011$); more likely to believe that wolves do not pose a threat to pets and other domestic animals ($p = .033$); more likely to report that current environmental regulation and protection in the area are too weak ($p = .047$); more likely to report that increased use of the Internet in the next 5 years would improve the quality of life of local residents ($p = .014$); and more likely to report that increased use of cell phones in the next 5 years would improve the quality of life of local residents ($p = .012$).

If, as the evidence here suggests, the Web is not yet an adequate survey mode for general population surveys, a logical follow-up question is thus: Can the Web be combined with another mode to collect quality data at a cost savings, or is the Web not yet an acceptable survey mode for these types of surveys? To answer this question, we turn to a comparison of all respondents to the Web preference treatment (i.e., Web and mail respondents combined) with all respondents to the mail preference treatment. The underlying methodological question that motivates this comparison is as follows: Can we produce results similar to those of a mail survey by first encouraging sample members to respond to the Web and then only at the last minute allowing the strongest holdouts to respond via mail?

The right half of Table 2 shows this comparison for the demographic and technology use variables. Once again, the significant differences are in bold font. What is striking about this comparison is that when the Web and mail respondents to the Web preference treatment are combined in the analyses, there are few differences between that treatment and the mail preference treatment. Only one demographic difference reaches significance: The Web preference treatment had significantly more female respondents (61.6%) than the mail preference treatment (52.7%, $p = .035$). Likewise, there are fewer technological differences between these two treatments than there were between mail and Web respondents within the Web preference treatment. Despite no significant difference in telephone status, respondents to the Web preference treatment reported having a cell phone for a longer time (6.9 years versus 5.9 years, $p = .010$). In addition, significantly more respondents to the Web preference treatment had a landline phone with a listed telephone number when compared to respondents to the mail preference treatment (93.6% versus 86.9%, $p = .017$). Not surprisingly, the respondents to the Web preference treatment were more likely to report being heavy users of computers (77.9% versus 69.7%, $p = .026$) and the Internet (73.1% versus 65.5%, $p = .050$) and were more likely to have Internet access at home (82.8% versus 72.7%, $p = .002$); notably, these differences between treatments are considerably smaller than those that occurred within the Web preference treatment.

As was the case with the demographic and technology use variables, the significant differences in reported opinions and views within the Web preference treatment are eliminated when we combine the mail and Web respondents to this treatment and compare their responses to respondents to the mail preference treatment. In this comparison, shown

in the right side of Table 3, there is a significant difference on only 1 item; on the remaining 23 items, respondents to the Web preference treatment did not significantly differ from respondents to the mail preference treatment.

Thus, although some differences still exist, it is readily apparent that there are more differences within the Web preference treatment (by response mode) than across the two treatments. These findings largely support the notion that a Web survey supplemented by another mode is becoming an increasingly viable option for general public surveys such as this one, in a small rural community. The key point here is that there still needs to be a supplemental mode to allow those people who cannot or will not respond via the Internet to complete the survey. A mail questionnaire (paper-and-pencil) seems to be the most appropriate supplementary mode where possible because it utilizes many of the same communication channels as the Web (i.e., visual; Dillman et al., 2009) and, when designed with care, can be made to closely resemble the Web questionnaire, as described above.

Does giving sample members a choice between mail and Internet result in different participation rates than that of initially offering only mail or only Internet?

In the Web preference and mail preference treatments, we encouraged respondents to respond by one mode, and we offered the second mode for only the strongest holdouts. Another possible implementation strategy is to offer both modes up front and allow the respondents to choose. The rationale for the choice treatment is that allowing respondents to answer in the mode that best suits them from the outset might encourage more of them to respond and it may be taken as a goodwill gesture (de Leeuw, Dillman, & Hox, 2008; Dillman et al, 2009).

Our findings, however, are mixed. As shown in Table 1, compared to the mail preference treatment, the choice treatment resulted in an 8.1-percentage-point reduction in response rate, but compared to the Web preference treatment, it resulted in a 7.9-point increase in response rate. Table 4 shows the percentage of completed responses that were returned by mail and Web for each treatment. When given a choice, 80% of those who completed the survey did so by mail, but when we pushed respondents toward mail, we were able to get 99% of those completing the survey to respond in that mode (and we got higher response rates overall). On the flip side, 20% of those who completed the survey did so by Web when given a choice, but when we pushed them toward Web, we were able to get 74% of those completing the survey to do so by Web (although we got a lower response rate overall). These results indicate that it is very possible to strongly influence the mode in which respondents reply when there are multiple options, but the results also suggest that a significant portion of respondents to the Web preference treatment, despite answering on the Web, may have preferred to answer by mail.

Table 4. Percentage of Completed Surveys Returned by Mode for Each Treatment

	Returned by Mail	Returned by Web
Mail preference	99.2	0.8
Web preference	25.6	74.4
Choice	80.0	20.0

Discussion and Conclusion

Our study provides several insights into procedures for conducting sample surveys in small towns and communities. First, the DSF can be used to geographically sample households in particular areas so that a survey invitation can be mailed to respondents requesting that they complete a survey on the Web. This is important because there is no systematic way to sample e-mail addresses and because professional norms prevent surveyors from contacting people by e-mail when no prior relationship exists. In addition, the ability to achieve a 41% response rate using this method is promising, especially when considering that response rates for many telephone surveys are even lower.

Second, despite achieving a 41% response rate by Web, our results suggest that the Internet mode should not be used alone to survey the general public—especially, the general public in small towns and rural communities. A significant number of households still lack Internet access, and it appears that some types of respondents prefer to respond by mail. When respondents were first asked to respond by the Internet but told that a mail questionnaire would be sent in about 2 weeks, 14% of the households responded by mail, and the Web and mail respondents were significantly different not only demographically but in their attachment to the local community, on environmental attitudes, and on opinions about and their use of technology. However, when these respondents were combined and compared to those who responded in the mail preference treatment (virtually all of whom responded by mail), very few differences existed.

Thus, the Internet shows significant promise for use in mixed-mode surveys where most respondents can be encouraged to respond via the Web but where a mail alternative is provided for those who cannot or do not want to respond via the Web. This finding is consistent with results from a recent analysis of a Gallup Panel survey in which respondents were encouraged to respond by Web but those who preferred to respond by mail were given that opportunity. Rookey, Hanway, and Dillman (2008) showed that the addition of the mail mode in this survey produced results that were more accurate than those that could be obtained by analyzing only Web respondents and, as is common practice, weighting the results. The need for a supplementary mode such as mail, along with the Web mode, is likely to be more pronounced in small towns and rural communities because Internet penetration rates overall are lower there, as are rates of high-speed Internet access. Thus, more people in these areas might need or prefer to respond via an alternative mode.

Third, our research demonstrates that providing everyone with a paper questionnaire in the initial mailing and announcing a Web alternative 2 weeks later results in a higher overall response rate than that of offering the Web first followed by a paper questionnaire 2 weeks later (71% versus 55%). However, virtually all respondents who received the paper questionnaire in the initial mailing responded via mail; less than 1% responded via the Web. It seems that in this case, offering only a paper questionnaire would be less expensive. In addition, the 71% response rate is comparable to rates obtained in the 1970s (Dillman, 1978, 1991) and suggests that mail surveys continue to be effective for surveying small towns and rural communities.

It is important that we recognize the limitations of the current study. First, this survey was conducted in one small rural area in the inland Northwest. These procedures need to

be tested on statewide rural populations, in multiple counties, and in different regions of the country, all of which would make the tailoring and personalization used here more difficult to achieve. Second, the current survey used a token $5 cash incentive. Response rates likely improved by the use of this incentive, given that token incentives have been repeatedly shown to be effective in improving response rates (Dillman et al., 2009); however, this procedure cannot be used in all sample surveys. Third, although great care was taken to ensure that the visual presentation of the survey was similar across modes (thereby reducing the potential for mode differences), we cannot rule out the possibility that other types of mode effects may have affected the responses. Finally, it is important to reiterate that we are unable to do a formal nonresponse bias analysis with this data, in part because of the unavailability of benchmark data from the American Community Survey or from other national surveys that could be used to determine how well our respondents mirror the target population.

Nonetheless, whether by mail alone or by a combination of Web and mail, it appears that sample survey procedures exist that can be effectively used to collect data from people in small towns and rural communities. This is important in this era in which fewer and fewer data are available from the U.S. Census Bureau and from other large survey efforts that allow statements to be made about specific towns or rural communities.

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Notes

1. Coverage of rural areas is expected to improve with the adoption of emergency 911 protocols that require street addresses (Link et al., 2005).
2. Sample invitation letters can be found in the work of Dillman, Smyth, and Christian (2009). Additional methodological details about the study can be found in the work of Millar, O'Neill, and Dillman (2009).
3. An image and discussion of the Web instructions can be found in the work of Dillman et al. (2009).
4. The response scale was as follows: *several times a day*, *once a day*, *several times a week*, *once a week*, *once a month*, *less than once a month*, *never*.
5. The response scale was as follows: *all the time*, *frequently*, *occasionally*, *rarely*, *never*.

6. In additional analyses that are not shown (but are available upon request), we used logistic regression to examine the effects of each variable on respondents' chosen response mode in the Web preference treatment while controlling for all other variables. The results indicate that the major predictors of response mode were the technology use variables—especially, those reflecting heavy computer use (29 times more likely to respond via the Web) and frequently needing assistance using a computer (76% less likely to respond via the web). Demographic variables did not have a significant effect when the technology use variables were controlled. Thus, although Web and mail respondents to the Web preference treatment are significantly different in many ways, it is their differences with respect to computer use that largely predict their choice of response mode.
7. The 24 items selected for analysis were all the questions in the survey that were not intended to measure technology use or demographic characteristics.

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