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Exploring 2-1-1 Service Requests As Potential Markers for Cancer Control Needs

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Abstract

Background—Delivering health information and referrals through 2-1-1 is promising, but these systems need efficient ways of identifying callers at increased risk.

Purpose—This study explores the utility of using 2-1-1 service request data to predict callers' cancer control needs.

Methods—Using data from a large sample of callers (N=4,101) to United Way 2-1-1 Missouri, logistic regression was used to examine the relationship between caller demographics and type of service request, and cancer control needs.

Results—Of six types of service requests examined, two were associated with one or more cancer control needs. Two of the service request types were also associated with health insurance status.

Conclusions—Findings suggest routinely collected 2-1-1 service request data may be useful in helping to efficiently identify callers with specific cancer prevention and control needs. However, to apply this approach in 2-1-1 systems across the country, further research and ongoing surveillance is necessary.

Introduction

Studies reported in this supplement to the *American Journal of Preventive Medicine*^{1,2} and elsewhere^{3,4} suggest that 2-1-1 systems are promising partners for delivering cancer prevention and control referrals. However, finding ways to do this without burdening the 2-1-1 system and callers is a challenge. One potentially promising strategy for efficiently identifying subgroups of 2-1-1 callers with cancer prevention and control needs (e.g., smoking cessation, mammography) is to employ “smart” systems.

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Decision support or “smart” systems can use available data and predictive analytics to anticipate and guide specific actions⁵ (e.g., identifying high-risk subgroups and assessing their cancer prevention needs). Such systems are increasingly being applied in public health, health care, and public safety.^{6–8} If associations were found between certain cancer control needs and data routinely collected by 2-1-1, it may be possible to create more-efficient, even automated, strategies to identify callers most likely to be in need of specific cancer control services.

As part of standard service, 2-1-1 systems collect data on each caller’s reason for calling, or “service request.” Service request data seem promising for identifying subgroups of 2-1-1 callers with specific cancer prevention needs. For example, many 2-1-1 service requests are indicative of callers having some unmet basic human need (e.g., housing, food). Evidence suggests that in poor populations, meeting basic human needs is ranked as more important than obtaining preventive services.^{9–11} Accordingly, 2-1-1 callers with certain service requests may be more likely than others to have cancer prevention needs. The current paper is the first to explore whether cancer control needs of 2-1-1 callers vary systematically by type of service request, and by extension whether service request data might be used to identify high-priority groups for cancer prevention and control.

Methods

Study Setting and Sample

This study analyzed data from a sample of 4,101 callers to United Way 2-1-1 Missouri (hereafter, 2-1-1 Missouri) who agreed to complete a brief cancer risk assessment after receiving standard service. In all, 2-1-1 Missouri serves 99 of the state’s 114 counties, as well as nine counties in southern Illinois, and received approximately 166,000 calls in 2011. Callers to 2-1-1 Missouri are predominantly low-income, female, and from racial/ethnic minority groups.⁴ English-speaking callers aged 18 years who resided in Missouri and called on behalf of themselves (rather than for another person) were eligible to participate. Those who provided informed consent answered a short series of questions about smoking, cancer screening (i.e., Paps, mammography, colonoscopy), HPV vaccination, and rules about smoking in their home.

The current analysis reports on data from callers to 2-1-1 Missouri who completed the risk assessment between June 15, 2010 and April 6, 2012. The primary relationships of interest were callers’ service requests and their cancer control needs. The IRB at Washington University in St. Louis approved this study.

Measures

Study measures include demographics, service requests, cancer control needs, and other health-related characteristics.

Demographics—Per 2-1-1 Missouri standard practice, data on age and gender were collected from all callers. Using two items from the 2008 Behavioral Risk Factor Surveillance System¹² (BRFSS), all callers were also asked to indicate whether children aged <18 years lived in the home (yes/no) and, if so, whether that child was a girl aged 9–17 years (yes/no).

Service requests—A person’s reason for calling 2-1-1 Missouri was recorded for every call received. The Alliance of Information and Referral Systems has established a taxonomy of 9,431 terms to describe specific service requests; 2-1-1 Missouri currently uses just under 2,000 of these terms. Callers in the current sample had specific service requests that were

recorded in 298 of these categories. After reviewing a list of specific service requests, the study team coded these into seven broad and mutually exclusive categories representing type of service request: bills, home and family, employment, health, housing, or other. Subcategories of each type of service request were also coded (Table 1).

During the coding, the coders were blind to responses to other items in the survey. Instances of coding disagreement were resolved via discussions among coders, and if needed, 2-1-1 Missouri staff, until consensus was reached. Up to three specific service requests were coded for each caller, as is standard practice by 2-1-1 Missouri. Data on “other” service requests ($n=455$) were excluded from analyses due to the heterogeneity in this category. Of 4101 callers, service request data were missing for one individual, leaving a final sample of 4100 for analysis.

Cancer control needs—Items from the 2008 BRFSS¹² were used to assess callers’ needs for six cancer prevention and control services: (1) mammography among women aged 40 years (ever had a mammogram, how long since last mammogram); (2) Paps among women/girls (ever had a Pap, how long since last Pap); (3) colonoscopy among participants aged 50 years (ever had a colon cancer screening test, how long since last colonoscopy); (4) human papilloma virus (HPV) vaccination, for self among women aged 18–26 years (ever had the HPV vaccination) and for individuals with a girl aged 9–17 years living in the home (ever had the HPV vaccination); (5) cigarette smoking (current smoking status); and (6) smokefree home policy (currently ban smoking in the home).

Callers were considered in need of specific cancer control services if they were women aged 40 years who had no mammogram in the past 2 years; women who had no Pap in the past 3 years; individuals aged 50 years who had no colonoscopy in the past 10 years; women aged 18–26 years who had not received the HPV vaccination; individuals with a girl aged 9–17 years living in the home who had not received the HPV vaccination; current smokers; or any individual without a smokefree home policy. For all callers, the total number of cancer control needs was coded into none, one, or two or more.

Other health-related characteristics—Data on health insurance coverage were collected from all participants. Callers could indicate having more than one type of insurance. Insurance coverage was coded into five categories: none; private; Medicare or Medicaid; other government program or military (i.e., State Children’s Health Insurance Program [SCHIP] or Children’s Health Insurance Program [CHIP]/military healthcare/other government program); or more than one type. In addition, insurance status was coded as uninsured (no coverage of any type) or insured (any coverage). Callers’ self-rated general health (*excellent/very good/good/fair/poor*) was assessed using an item from the 2008 BRFSS.¹³ For insurance and self-rated health items, responses of *don’t know/not sure* were excluded from analysis, as were responses indicating refusal.

Statistical Analyses

The primary analytic goals were to (1) describe demographics, cancer control needs, and other health-related characteristics of callers by service request; and (2) examine the association between cancer control needs and types of service requests. To describe characteristics of callers, demographics, cancer control needs, and other health-related data are reported as proportions. Because eligibility for some cancer control services is partially based on age (i.e., HPV vaccination for self, mammography, colonoscopy), age was categorized into four groups: 18–26 years, 27–39 years, 40–49 years, and 50 years. Due to a high prevalence of service requests related to “bills,” data on subcategories (utilities and rent/mortgage) are presented separately. Statistical tests comparing caller characteristics by

service request were not conducted because many callers had more than one service request during their call.

To examine the association between cancer control needs and types of service requests, binomial logistic regression was used. For each type of cancer control need and service request, logistic regression models were built with the cancer control need entered as the dependent variable and type of service request entered as the independent variable. Individuals not having the cancer control need served as the referent group. To further examine the association between cancer control needs and service requests, multinomial logistic regression models were built using the number of cancer control needs (0, 1, 2) entered as the dependent variable and type of service request entered as the independent variable. Individuals with no cancer control needs served as the referent group.

Because utilization of preventive care, such as cancer screening, is associated with health insurance status,¹¹ additional analyses examined the association between service requests and insurance status. Binomial logistic regression models were built with the type of service request entered as the independent variable and insurance status entered as the dependent variable. Insured individuals served as the referent group.

All associations were examined using models stratified by gender as well. ORs and 95% CIs are reported. A Bonferroni correction was used for multiple comparisons, resulting in an alpha level of 0.0083 for assessing significance. Analyses were conducted in 2012 using SPSS 19.0.

Results

Sample Characteristics

The sample of 4100 callers was predominantly made up of women (81.3%) with an age range of 18–89 years (M 42.3, SD 13.6). Most callers were either uninsured (37.7%) or covered by Medicare or Medicaid (33.6%).

Service Requests

Although 58.1% of callers had only one service request during their call, 26.5% had two service requests and 15.4% had three service requests during the call. Table 1 presents the prevalence of each type of service request. The majority of requests (75.6%) were related to “bills”, predominantly utilities (55.9%), with those related to “home and family” (39.1%) as second most common. Less-frequent service requests were those related to “employment” (7.9%), “housing” (7.4%) and “health” (6.3%).

Caller Characteristics by Service Request

Not surprisingly, caller demographics and health-related characteristics varied somewhat by type of service request (Table 2). For example, a larger proportion of callers with service requests about employment were younger (52.8% aged <40 years) compared to those with service requests about health (35.2% aged <40 years). A relatively high proportion of individuals with service requests about utility-bill assistance had a child living in the home (58.6%) compared to those calling with service requests about health (43.0%). A higher proportion of individuals with service requests about employment were uninsured (60.1%) compared to those with service requests about home and family (24.4%). Only 6.4% of individuals with service requests about employment rated their health as poor, compared to 25.0% of those with service requests about health.

Cancer control needs also varied by type of service request (Table 3). For example, high proportions of individuals aged 50 years who called about employment or rent/mortgage were off-schedule for colonoscopy (64.9% and 57.8%, respectively) compared to those who called with other service requests. A relatively high proportion of women who called about health had not had a Pap in the past 3 years (28.4%) compared to those calling about rent/mortgage (17.2%) or utilities (18.3%), for example.

Association Between Service Requests, Cancer Control Needs, and Insurance

Service requests and specific cancer control needs—Regression analyses found that certain types of service requests were associated with increased odds of having specific cancer control needs. Among callers aged 50 years, service requests for rent assistance and employment were associated with not having had a colonoscopy in the past 10 years (for rent: OR=1.62, 95% CI= 1.23, 2.15; for employment: OR=2.08, 95% CI=1.28, 3.40). These associations were even stronger among men (for rent: OR=2.00, 95% CI=1.10, 3.62; for employment: OR=4.57, 95% CI=1.30, 16.00), although associations were not significant at the Bonferroni-adjusted alpha level. Among women, service requests about health were associated with not having had a Pap in the past 3 years (OR=1.75, 95% CI=1.26, 2.42). No associations were found between any type of service request and need for smoking cessation, smokefree home policy, mammography, or HPV vaccination.

Service requests and number of cancer control needs—Regression analyses found associations between certain types of service requests and increased odds of having cancer control needs. Service requests about health were associated with having two or more cancer control needs (OR=1.75, 95% CI=1.19, 2.58), a finding that was stronger among women (OR=1.82, 95% CI= 1.17, 2.84). Also among women, service requests about employment were associated with having two or more cancer control needs (OR=1.58, 95% CI=1.06, 2.36).

Service requests and insurance status—Service requests about rent and employment were associated with increased odds of being uninsured (for rent: OR=1.61, 95% CI=1.38, 1.88; for employment: OR=2.74, 95% CI=2.17, 3.46). No associations were found between other types of service requests and health insurance status.

Discussion

Using only a caller's age, gender, and/or reason for calling 2-1-1, it is possible to identify subgroups of callers with a greater likelihood of having certain cancer control needs. Associations were found between type of service request and need for colonoscopy and Paps. Findings suggest some potential for using 2-1-1 service requests as cues to assess callers' need for these cancer control services, and if needed, connect them with preventive services. More importantly, this suggests that designing and implementing mass cancer prevention strategies via 2-1-1 systems may be possible using information routinely collected by 2-1-1. The greatest potential of this approach is not at the individual level, but at the population level, where it seems possible to identify population subgroups that might have higher cancer prevention needs than others.

One of the most frequently requested services—rent/mortgage assistance—was associated with needing a colonoscopy, and calling for employment needs was also associated with needing a colonoscopy. Although only about 6% of 2-1-1 Missouri service requests were related to health (and less than 1% were about prevention/screening), findings suggest subgroups of callers having health-related service requests may be particularly in need of

preventive services as these subgroups were more likely than others to have two or more cancer control needs.

The majority of callers to 2-1-1 (56%) called for utility assistance, which was not associated with any cancer control needs. This knowledge can help 2-1-1 systems filter callers whose service requests may not be predictive of cancer control needs, reducing the burden on not only callers but also 2-1-1 staff for requesting additional information that may potentially turn callers away. These findings seem to suggest that using service request category as an initial “screener” may have some benefit for efficiently identifying subgroups of callers more likely to have certain cancer prevention needs. For example, callers aged 50 years who call about rent/mortgage or employment could be asked a few additional questions to assess their use of colonoscopy, and those needing a colonoscopy could then immediately receive referrals for local colon cancer screening programs. In this way, 2-1-1 has the potential to not only assist with callers’ immediate basic human needs, but to proactively assess health needs of certain subgroups of callers, and, if needed, connect them to health services.

Although some service request types were associated with higher risk for having certain cancer control needs, it is important to note that the 2-1-1 caller population generally has disproportionately high health cancer control needs as a group. In this sample, 46% of callers were smokers and 48% of callers aged 50 years had not had a colonoscopy in the past 10 years. Among age-eligible female callers, 42% had not had a mammogram in the past 2 years and two thirds had not had the HPV vaccination. Given these data, it may be ideal to assess cancer and health needs among **all** 2-1-1 callers rather than specific subsets of callers. Still, if 2-1-1 systems are not able to assess the health needs of all callers, a smart system approach using data routinely collected by 2-1-1 may be beneficial.

The study has several potential limitations. First, nearly 300 specific service requests were categorized into six broad service request types, risking misclassification and bias toward null findings. However, this approach may enable 2-1-1 systems to be efficient in identifying high-priority groups for targeted intervention. Because there are thousands of specific service requests that any 2-1-1 system may use to describe needs of callers, the number of callers with any *specific* need may be small. Although certain specific service requests may be better predictors of health needs, using a broader classification system helps overcome the challenge of predicting cancer control needs using such fragmented sample sizes.

It is also possible that other variables (e.g., health insurance status, demographics) are more informative in predicting callers’ cancer prevention needs, and it is likely that associations found between service requests and cancer prevention needs are indicative of underlying, unmeasured factors such as SES. However, data on such variables are not routinely collected by 2-1-1 Missouri during the course of a typical 2-1-1 call. However, findings demonstrate how even limited data can be used as markers for subgroups with high cancer prevention needs. For practical purposes, it is less important *why* service requests are associated with cancer prevention needs and more important that high-risk subgroups can be identified with extant data.

Finally, findings may not be applicable to other states for two primary reasons. First, the service requests used by 2-1-1 Missouri may not reflect those used by other 2-1-1 centers, limiting the value of using these particular service request categories to prompt direct questioning about cancer prevention on a broader scale. However, this consideration is addressable through standardization of service request categories across 2-1-1 centers. Second, it is possible that associations between service requests and cancer control needs

differ across states and over time. Further research using data from 2-1-1s in other states and ongoing surveillance across states can help elucidate the extent to which smart systems would need to be translated for use in different geographic areas or time periods.

Thinking about cancer prevention may not be a priority for many 2-1-1 callers. Proactively inquiring about health needs—as well as providing information about accessible, affordable evidence-based interventions for cancer prevention and control—may help connect underserved populations with much-needed services. Using basic service request information routinely collected by 2-1-1 systems may begin to help identify high-priority subgroups and link individuals to services, helping to prioritize cancer prevention in their lives.

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Table 1

Service requests of 2-1-1 callers (N=4,100)

Category/subcategory	n (%) ^a
Bills	
Utilities	2292 (55.9)
Rent/mortgage	807 (19.7)
Home and family	
Family support	1047 (25.5)
Food assistance	275 (6.7)
Personal/household needs	249 (6.1)
Transportation	31 (0.8)
Employment	326 (7.9)
Housing	
Finding housing	201 (4.9)
Improving housing	104 (2.5)
Health	
Medical/dental services	117 (2.9)
Medical/dental expenses	54 (1.3)
Mental health/addiction	54 (1.3)
Prevention/screening	31 (0.8)

^aCallers may have more than one service request. Service requests categorized as “Other” are excluded.

Table 2
 Demographic and health-related characteristics of callers to 2-1-1 Missouri, by type of service request, %^a

	All (N=4,100)	Bills: Utilities (n=2,292)	Bills: Rent/ mortgage (n=807)	Home and family (n=1,601)	Employment (n=326)	Housing (n=306)	Health (n=256)
Female	81.3	83.6	79.6	81.5	77.3	77.5	77.7
Age, years							
18–26	14.0	13.8	15.4	13.2	17.2	19.6	8.2
27–39	31.2	32.3	32.2	31.1	35.6	24.5	27.0
40–49	21.8	21.6	21.6	21.4	24.5	18.6	27.7
50	33.0	32.3	30.9	34.4	22.7	37.3	37.1
Children living in the home							
Child aged <18 years	54.1	58.6	50.8	52.8	51.8	50.0	43.0
Girl aged 9–17 years	21.0	23.4	18.7	21.1	20.6	16.3	13.3
Health insurance^b							
None	37.7	36.1	47.0	35.9	60.1	36.9	44.5
Medicare or Medicaid	33.6	34.6	26.8	37.0	26.4	35.9	28.9
More than one type	12.5	13.1	8.6	12.8	2.5	12.4	11.3
Private	12.0	12.1	13.5	10.6	6.4	9.5	9.4
Other government or military	3.9	3.9	4.1	3.4	4.0	4.9	5.9
Self-rated general health^b							
Excellent	7.5	7.6	8.2	6.3	9.2	8.5	3.9
Very good	18.6	19.2	20.2	18.0	25.8	16.0	9.8
Good	30.8	30.2	31.5	30.2	34.4	31.7	25.8
Fair	28.6	29.1	27.4	28.3	23.9	30.2	34.8
Poor	14.3	13.8	12.5	17.0	6.4	13.4	25.0

^a Callers may have more than one type of service request. "Other" service requests are excluded.

^b Percentages do not total 100% due to *don't know* or refusal responses.

Table 3

Cancer control needs of 2-1-1 Missouri callers, by type of service request, %^a

	All (N=4100)	Bills: Utilities (n=2,292)	Bills: Rent/ mortgage (n=807)	Home and family (n=1,601)	Employment (n=326)	Housing (n=306)	Health (n=256)
Current smoker	46.3	45.5	46.6	48.6	49.7	49.0	53.5
No smokefree home policy	43.2	44.0	42.0	42.3	42.9	48.4	50.4
No colonoscopy in past 10 years ^b	48.0	47.0	57.8	47.3	64.9	45.6	54.7
No mammogram in past 2 years ^b	41.7	43.1	44.4	43.5	48.6	37.8	40.5
No Pap in past 3 years ^b	19.0	18.3	17.2	20.3	21.9	22.0	28.4
No HPV vaccination ^b							
For self	66.5	67.7	61.5	64.0	77.1	65.4	72.2
For girl aged 9–17 living in the home	60.0	60.6	61.6	63.2	67.2	56.0	47.1

^a Callers may have more than one type of service request.

^b Among eligible callers: Pap— women/girls; mammogram – women aged 40 years; colonoscopy – aged 50 years; HPV vaccination for self – women aged 18–26 years; HPV vaccination for daughter – callers with a girl aged 9–17 years living in the home