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Interpersonal Communication and Smoking Cessation in the Context of an Incentive-Based Program: Survey Evidence From a Telehealth Intervention in a Low-Income Population

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Abstract

The tobacco epidemic disproportionately affects low-income populations, and telehealth is an evidence-based strategy for extending tobacco cessation services to underserved populations. A public health priority is to establish incentive-based interventions at the population level in order to promote long-term smoking cessation in low-income populations. Yet randomized clinical trials show that financial incentives tend to encourage only short-term steps of cessation, not continuous smoking abstinence. One potential mechanism for increasing long-term cessation is interpersonal communication (IPC) in response to population-level interventions. However, more research is needed on IPC and its influence on health behavior change, particularly in the context of incentive-based, population-level programs. This study used survey data gathered after a population-level telehealth intervention that offered $20 incentives to low-income smokers for being connected to Minnesota's free quitline in order to examine how perceived incentive importance and IPC about the incentive-based program relate to both short-term and long-term health behavior change. Results showed that IPC was strongly associated with initial quitline utilization and continuous smoking abstinence as measured by 30-day point prevalence rates at 7-month follow-up. Perceived incentive importance had weak associations with both measures of cessation, and all associations were nonsignificant in models adjusting for IPC. These results were found in descriptive analyses, logistic regression models, and Heckman probit models that adjusted for participant recruitment. In sum, a behavioral telehealth intervention targeting low-income smokers that offered a financial incentive inspired IPC, and this social response was strongly related to utilization of intervention services as well as continuous smoking abstinence.

Tobacco use is the leading preventable cause of mortality and morbidity in the United States and abroad (World Health Organization, 2012). Smoking is estimated to be responsible for 5 million deaths annually worldwide, as it is causally linked to cardiovascular disease and multiple forms of cancer (McAfee, Davis, Alexander, Pechacek, & Bunnell, 2013). The tobacco epidemic disproportionally affects people of low socioeconomic status. Smoking

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prevalence among adults living below the federal poverty level is 28%, whereas the prevalence among people living at or above the poverty level is 17% (Centers for Disease Control and Prevention, 2014). Disproportionately high smoking rates persist among low-income women (Stewart et al., 2010), and it is estimated that smoking accounts for up to half of male mortality disparities associated with low socioeconomic status in countries such as the United States (Jha et al., 2006). Consequently, increasing smoking cessation within low–socioeconomic status groups can save millions of lives and decrease mortality disparities (Holford et al., 2014; Jha et al., 2006; Thomas et al., 2008).

There is a critical need to develop population-level smoking cessation programs for low-income populations that go beyond clinic-based settings, as clinics have limited access to low-income populations who underutilize preventive services, are geographically isolated, and are inadequately insured (see Bryant, Bonevski, Paul, McElduff, & Attia, 2011; Chokshi & Farley, 2014; Wilson, 1987). Telehealth, or the use of "telecommunications and information technology to provide access to health assessment, diagnosis, intervention, consultation, supervision, education, and information across distance" (Nickelson, 1998, p. 527), is effective for delivering health services to underserved and low-income populations (McBride & Rimer, 1999; Wootton, Jebamani, & Dow, 2005). Free state telephone tobacco quitlines are exemplars of telehealth's potential. Free telephone quitlines are evidence-based techniques for increasing smoking abstinence rates, particularly in low-income and non-White populations (Burns, Deaton, & Levinson, 2011; Fiore et al., 2008; Stead, Perera, & Lancaster, 2007), but utilization rates are low across the United States (Zhu, Lee, Zhuang, Gamst, & Wolfson, 2012).

Another promising strategy for extending health services to underserved populations is financial incentives (Oliver, 2009). Designing incentive-based, population-level interventions in order to sustain long-term changes in health behaviors like smoking cessation has become a public health priority, particularly in low-income populations (Blumenthal et al., 2013). This is exemplified by the Affordable Care Act's Section 4108 and the Centers for Medicare and Medicaid Services' authority to provide grants to states to test the effectiveness of incentives in improving health behaviors such as tobacco cessation (Blumenthal et al., 2013, pp. 497–498). Financial incentives have been shown to increase health-enhancing behaviors (e.g., Gneezy, Meier, & Rey-Biel, 2011; Slater et al., 2005), and low-income smokers tend to be responsive to incentives (Bryant et al., 2011). However, incentives tend to be effective for encouraging preventive care that requires only a single activity or simple behavior but not complex actions that require additional engagement beyond initial intervention services (see Kane, Johnson, Town, & Butler, 2004). Smoking cessation requires prolonged engagement (Prochaska, DiClemente, & Norcross, 1992), and although incentives can influence short-term cessation in the context of a clinical trial (Sigmon & Patrick, 2012; Volpp et al., 2009), little is known about how incentives can encourage or be used to promote long-term cessation in population-level interventions within low-income populations (Blumenthal et al., 2013).

Research in behavioral economics demonstrates that financial incentives typically have an effect on short-term behavior change through the "direct price effect," which makes incentivized behaviors more attractive (Gneezy et al., 2011, p. 2). The direct price effect is

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often explained by its influence on extrinsic motivation to engage in a target behavior, and it tends to be less effective for promoting behavior maintenance once incentives are removed. Another type of effect, known as the "indirect psychological effect," can have both positive and negative influences on incentivized behaviors (Gneezy et al., 2011, p. 11). Multiple social and psychological factors can alter the effects of a financial incentive presentation in terms of promoting or unintentionally discouraging the incentivized behavior (see, e.g., Babcock, Bedard, Charness, Hartman, & Royer, 2011).

Two specific factors are particularly relevant for population-level interventions, and they have implications for both short-term and long-term behavior change. The first is that the incentive's effect depends on the context within which it is presented. If the incentive is presented in a private context within a controlled environment (e.g., randomized clinical trials), social influences, such as informal social control or social image processes, are limited. Alternatively, incentives offered in more public settings can activate social influences (Gneezy et al., 2011). Public settings are marked by the presence of others, and this can influence individuals' behavior by inspiring social responses to incentives instead of strictly monetary responses. For example, social reactions such as interpersonal discussions about the incentive can activate behavior based on social image maintenance or prevailing social norms (Gneezy et al., 2011, p. 11). The second related factor is that incentives can interact with social networks. As evidenced by past research on exercise maintenance, not only can incentives increase exercise, but social groups (e.g., friends) who jointly receive incentives are more likely to exhibit long-term behavior maintenance (Babcock et al., 2011; Charness & Gneezy, 2009). Addressing the relational context of health behaviors through network-oriented strategies has become a priority for prevention programs (Gest, Osgood, Feinberg, Bierman, & Moody, 2011), and this is especially true for smoking cessation interventions because social dynamics operating within networks strongly influence the cessation process (Burns, Rothman, Fu, Lindgren, & Joseph, 2014; Christakis & Fowler, 2008; Valente, 2010). Yet little is known about how these social mechanisms, and in particular incentive-based interventions, may influence long-term health behavior change in response to population-level interventions.

In sum, randomized clinical trials demonstrate that incentive-based interventions can encourage short-term behavioral engagement involving an incentivized behavior. Furthermore, past behavioral economic research implies that financial incentives offered in population-level interventions can potentially encourage social responses and indirect effects due to the context of the intervention. Population-level interventions occur in relatively public settings in conjunction with naturally occurring psychosocial dynamics, and these processes could have implications for both short-term and long-term behavior change. In terms of long-term behavior change such as sustained smoking cessation, a social response to an incentive-based program at the population level could be a marker of naturally occurring social mechanisms that have an inherent capacity to promote sustained behavioral engagement.

Past population-level smoking cessation interventions provide empirical support (see, e.g., Donovan, Boulter, Borland, Jalleh, & Carter, 2003; McAfee et al., 2013; van den Putte, Yzer, Southwell, de Bruijn, & Willemsen, 2011). Smoking cessation programs have

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demonstrated that long-term smoking cessation is indirectly influenced by social reactions measured through *interpersonal communication* (IPC) about the smoking cessation program (van den Putte et al., 2011). Supported by communication theories (see Katz & Lazarsfeld, 1955; Southwell & Yzer, 2007), IPC about a health promotion or prevention program can catalyze mechanisms embedded within social interactions, potentially cultivating intentions to change behavior, activating normative pressure, and making health behavior decisions more cognitively salient (see, e.g., Montano & Kasprzyk, 2008; Southwell, 2013). Yet further research on IPC and health behavior change in response to population-level interventions is needed, particularly in the context of incentive-based programs (Southwell, Slater, Nelson, & Rothman, 2012; van den Putte et al., 2011).

The Current Study

This article reports results of a survey conducted after a population-level intervention that offered financial incentives to low-income smokers for being connected to Minnesota's free QUITPLAN® Helpline (QL). The survey captured self-report measures of IPC about the incentive-based program as well as the perceived importance of the incentive for the incentivized behavior (i.e., being connected to a quitline). The analysis focuses on the cessation process measured by short-term and long-term behavioral engagement. Using North American Quitline Consortium (NAQC) evidence-based measures (see NAQC, 2011), we measure the cessation process by (a) initial utilization of quitline services and (b) continuous smoking abstinence measured by 30 consecutive smoke-free days at 7-month follow-up. The main focus of the analysis is on how these two measures of the cessation process relate to both IPC and perceived incentive importance.

Based on past research on the effects of IPC in response to smoking cessation interventions, we hypothesize that IPC in the context of the current incentive-based telehealth intervention will be related to utilization of smoking cessation services as well as subsequent efforts to quit smoking (i.e., 7-month follow-up 30-day point prevalence rates). This hypothesis is also based on past research demonstrating that incentives presented in more public settings can inspire social and psychological mechanisms and that these mechanisms are potentially conducive to long-term behavioral engagement. In light of past research on financial incentives and smoking cessation in randomized clinical trials as well as the direct price effect of incentives on incentivized behaviors, we note that incentives are more likely to influence short-term behavior change than long-term smoking cessation. Therefore, we hypothesize that perceived incentive importance will relate to initial steps of cessation measured by utilization of quitline services and that perceived incentive importance will be less likely to impact continuous smoking abstinence.

Method

Participants and Procedures

Intervention Context—From September 2010 to September 2012, a behavioral tele-health intervention was implemented through Minnesota's National Breast and Cervical Cancer Early Detection Program (NBCCEDP), which is called "Sage." Sage serves low-income individuals experiencing health-related disparities. Specifically, Sage provides free

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cancer screening services to individuals who are ages 40 years or older, have household incomes at or below 250% of the federal poverty level, and are inadequately insured. Unique among NBCCEDPs, Sage has a call center staffed by patient navigators (see Freund et al., 2008) who are fluent in English and other languages relevant for Sage's target population. More details on NBCCEDPs (Lee et al., 2014) and Sage have been published elsewhere (Slater et al., 2005).

Intervention—The current intervention offered a $20 incentive for being connected to Minnesota's QL via a three-way phone call conducted by Sage patient navigators. Relying on participant-initiated phone contact (see Soet & Basch, 1997), we used two recruitment strategies: (a) a direct mail (DM) campaign and (b) an opportunistic referral with connection (ORC) call transfer system from within the Sage Call Center. Individuals identified as smokers in Sage's database were recruited using DM mailers designed to prompt cigarette smokers to call Sage's toll-free phone number. The DM mailers consisted of a folded card with emotionally evocative messages and graphics as well as a small insert card advertising the financial incentive. The mailers were strategically constructed based on past research (see Rothman & Salovey, 1997), and recruitment included two rounds of mailings (see Slater et al., 2005).

For ORC recruitment, Sage's patient navigators obtained the smoking status of individuals who called the Sage Call Center for cancer screening information or appointments. Callers identified as smokers were then opportunistically presented with the QL referral offer (i.e., a $20 incentive for being connected to the QL). Patient navigators handled phone calls for both intervention groups, and once participants agreed to be transferred, patient navigators put participants on hold and called QL operators. Patient navigators then confirmed with QL operators that an individual from Sage would be connected to the QL via a three-way call. Once QL operators agreed, patient navigators remained on the line until QL operators and intervention participants were connected and communication between participants and QL operators was confirmed.

QL services included free smoking cessation telephone counseling with a maximum of five sessions within a 6-month period. The QL provided self-help materials and free nicotine replacement therapy for those who requested them. A total of 5,420 callers were offered the intervention from the Sage Call Center (DM = 870, ORC = 4,550), with 2,456 completing QL transfers. Of those transferred, 66% were ORC (n = 1,612) and the remainder DM (n = 844).

Survey Data—Participants who completed QL connections were interviewed via telephone by trained staff at least 7 months after their QL connection in compliance with recommended, evidence-based practices (see NAQC, 2011). All participants who completed QL connections were targeted for the survey; 10 call attempts were made before participants were deemed unresponsive. A total of 1,218 participants completed the survey. Because not all participants were offered QL services after being connected by Sage patient navigators, the current analyses focused on individuals who were offered QL services (n = 995) with complete data, resulting in an analytic sample of 970. Individuals not offered services were excluded because they were not subsequently asked about smoking cessation in the survey

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(e.g., utilization of QL services). No significant differences were found between individuals offered and not offered services in terms of demographic or smoking characteristics, except for age (*M*s = 53.7 vs. 52.2, respectively, $p < .01$). Of those not offered services, about 40% reported that it was because of their insurance coverage, and 60% reported miscellaneous reasons associated with program fidelity (e.g., accidental disconnection after patient navigator transfer, reported not receiving a call back from QL).

Measures

Following past research, two dichotomous outcomes for short- and long-term behavioral steps associated with smoking cessation were used: (a) QL utilization and (b) being smoke free for 30 consecutive days at 7-month follow-up (see DiClement et al., 1991; NAQC, 2011). For QL utilization, respondents were asked whether they had used the tools and services that were offered from the QL (1 = yes, 0 = no). For continuous smoking abstinence ("continuous cessation"), participants were asked whether they had not smoked for 30 consecutive days (in interviews conducted at least 7 months after being connected to the QL; 1 = yes, 0 = no).

Incentive influence was captured by measuring whether participants reported the incentive to be important for their QL connection (1 = important, 0 = not important).[1] IPC about the incentive-based program was measured as whether participants "told others about the Sage offer that rewards smokers $20 for being connected with a tobacco quitline through the Sage Call Center" (1 = yes, 0 = no).

Background characteristics included age, sex, education, race=ethnicity, and smoking history. Age was measured in continuous years; sex and race=ethnicity were dichotomous measures (1 = male, 0 = female; 1 = White, 0 = non-White). Education was an ordinal scale, ranging from 1 (completed eighth grade or less) to 6 (graduate school). Smoking characteristics included a continuous measure of years smoked, whether participants smoked on a daily basis (1 = yes, 0 = no), whether they lived with a smoker (1 = yes, 0 = no), whether they had made a quit attempt in the past with medication (1 = yes, 0 = no), and whether they were unlikely to contact the QL without the current intervention (1 = yes, 0 = no). Variables used to assess recruitment differences were (a) a dichotomous measure for DM versus ORC and (b) a measure of whether the participant had past involvement with Sage (1 = Sage, 0 = non-Sage). Approximately 65% of the analytic sample was recruited via ORC (ORC = 629, DM = 341), and 62% had previous contact with Sage.

Analytic Strategy

The first set of analytic sample analyses of surveyed respondents consisted of descriptive statistics and cross-tabulations. These descriptive analyses focused on bivariate relationships for (a) both cessation outcomes and IPC and (b) both cessation outcomes and incentive importance. We then explored these relationships more systematically via logistic regression

[1]We tested the credibility of this measure empirically by comparing answers to the question about how important the incentive was for the individual to answers to an additional question that asked how important the incentive was for the Minnesota Department of Health to get smokers to connect to the QL in general. We created a scale out of the two measures that had a reliability value of .901. Results using this alternative measure were not different from main analyses that utilized the dichotomous measure, and therefore we only report the results for the dichotomous measure described here.

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models for each dichotomous outcome. It is important to note that the DM and ORC recruitment groups likely differed in their behavioral stage or readiness in terms of smoking cessation. This is because the DM group called Sage seeking smoking cessation services, whereas the ORC group called regarding unrelated health matters and were unexpectedly offered cessation services. As a result, we ran logistic regression models that included a dummy variable for DM versus ORC group membership, as well as supplementary analyses that consisted of a subsample analysis that adjusted for differences between the DM and ORC groups in terms of their likelihood of group membership (see Bushway, Johnson, & Slocum, 2007; Heckman, 1979).

The supplementary analysis consisted of maximum likelihood bivariate probit with selection models (Heckman probit models). In the Heckman probit models, recruitment group was used as a bivariate selection criterion (DM vs. ORC)—outcome models in the Heckman probit models censored unobserved objects from the selection model (i.e., ORC individuals). This generated an analysis of QL utilization and 30-day point prevalence quit status for a subgroup potentially more prepared for smoking cessation (i.e., DM) while adjusting for the likelihood of DM membership (see Bushway et al., 2007; Puhani, 2000). Outcome models are presented in table form and within the text, but selection models are not reported (selection models included all variables in the outcome models except for an exclusion restriction variable). Multivariate logistic regression and Heckman probit models were run in Stata Version 12. Cluster-adjusted robust standard errors were used in both logistic regression and Heckman probit models in order to account for clustering within patient navigators as well as for heteroscedasticity (Bushway et al., 2007).

Results

Participants

Participant characteristics are detailed in Table 1. The analytic sample was overwhelmingly composed of low-income female smokers because low-income, inadequately insured women are Sage's target population. It included a limited number of males, primarily as a result of information sharing about the intervention.

The sample was primarily White (75%); 15% of participants were African American, 5% were Native American, 2% were Hispanic, and the remaining were other races or ethnicities (3%), providing evidence that the intervention disproportionately reached racial and ethnic minorities in Minnesota (U.S. Census Bureau, 2012), which is also Sage's target population. The average education level was a high school diploma or equivalent. About 12% of the sample had not completed high school, and all individuals met income guidelines for receiving Sage services, reflecting the relatively low socioeconomic status of the sample.

The majority of participants were intense smokers. Years smoked was normally distributed, with an average of 30.94. More than 50% of participants had made a quit attempt with medication in the past, 94% smoked every day, and about 38% lived with a smoker. Most participants were unlikely to have contacted a QL without having been reached with the current intervention (72%).

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Survey Results

Of the surveyed participants who were offered QL services, 643 individuals (66%) were connected to the QL and utilized the services, such as receiving telephone counseling or self-help materials. In terms of 30-day point prevalence quit rates, about 19% reported continuous cessation 7 months after QL connection (184 individuals). About 50% engaged in IPC about the incentive-based program, and almost 69% noted that the incentive was important for their QL connection (see Table 1).

QL Utilization—The associations between QL utilization and IPC, and between utilization and incentive importance, are displayed in the left-hand portion of Table 2. IPC about the incentive-based program was associated with QL utilization ($\chi^2 = 32.32$, $p < .001$). Of those who utilized the QL, 57% engaged in IPC, whereas only 38% of the group who did not utilize the QL engaged in IPC. There was also a significant association between incentive importance and QL utilization ($\chi^2 = 5.16$, $p < .05$). The percentage of people who found the incentive important (71%) was significantly higher among individuals who utilized the QL than their counterparts who did not utilize the QL (64%).

Continuous Cessation—The relationships for continuous cessation are displayed in the right-hand portion of Table 2. IPC about the incentive-based program was moderately related to continuous cessation ($\chi^2 = 4.70$, $p < .05$). Of individuals who were smoke free for 30 days at the 7-month follow-up, 58% engaged in IPC; only 49% of those who were not smoke free engaged in IPC. The relationship between incentive importance and continuous cessation was weak and nonsignificant ($p > .10$).

These bivariate relationships provide initial support for the notion that the subjective importance of the incentive for making QL connections relates to the initial step of utilizing intervention services but not engagement beyond these services (i.e., continuous cessation). Moreover, IPC was associated with continuous cessation *and* QL utilization, supporting the claim that IPC is positively associated with initial steps of cessation and longer term cessation.

Logistic Regression and Heckman Probit Results—As shown in the left-hand portion of Table 3, patterns displayed in Table 2 were supported by logistic regression models. When we adjusted for background characteristics and smoking history (as well as DM vs. ORC membership), IPC was robustly related to both QL utilization and continuous cessation. The odds of QL utilization increased by 120% for individuals who engaged in IPC compared to those who did not. Moreover, the odds of reaching continuous cessation increased by 57% for individuals who engaged in IPC. Incentive importance for QL connections had nonsignificant and relatively weak associations with both QL utilization and continuous cessation in models adjusting for IPC, background characteristics, and smoking history. Background characteristics were not associated with QL utilization. Smoking intensity (i.e., years smoked and smokes every day) was negatively associated with continuous cessation, and age was positively associated with continuous cessation.

As previously noted, one likely difference between callers in the DM and ORC groups was readiness for smoking cessation. As shown in the left-hand, bottom portion of Table 3, DM

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participants were more likely to utilize QL services (odds ratio = 1.88, $p < .001$) and to reach continuous cessation (odds ratio = 1.33, $p < .05$). This supported the use of the Heckman probit models as a supplement to the logistic regression models.[2] In addition, the rho selection term in the Heckman probit models was statistically significant as indicated by Wald tests of independent equations: thus, accounting for recruitment group membership (DM vs. ORC) was warranted for both QL utilization and continuous cessation ($\chi^2 = 5.28$, $p < .05$; $\chi^2 = 8.94$, $p < .01$, respectively).

In general, the Heckman probit models showed that the findings from the logistic regression models were robust. The partial effect for IPC (i.e., IPC was included in both selection and outcome models) was positively and significantly associated with QL utilization and continuous cessation, censoring ORC individuals and controlling for other covariates. The coefficient for incentive importance was weak and nonsignificant for both QL utilization and continuous cessation in the Heckman probit models. Other differences between the Heckman probit and logistic regression models were minimal (see Table 3), except two additional smoking history measures were negatively related to continuous cessation in the Heckman probit models (i.e., quit attempt with medication in the past and lives with smoker).

Discussion

The current analysis examined survey data from participants in a population-level telehealth intervention. Using the infrastructure of Minnesota's NBCCEDP (Sage), the intervention offered a $20 incentive to low-income and inadequately insured individuals (primarily females) for being connected to Minnesota's free QL via three-way phone calls conducted by patient navigators. The program successfully encouraged short- and long-term behavioral steps associated with smoking cessation. Moreover, IPC about the incentive-based program was a robust correlate of QL utilization and continuous cessation. The relationship between perceived incentive importance and QL utilization was significant, but it became weak and nonsignificant in logistic regression models that adjusted for IPC, background characteristics, and smoking history. The relationship between perceived incentive importance and continuous cessation was nonsignificant in all analyses.

Population-level programs can have an indirect effect on smoking cessation through IPC about the campaign (van den Putte et al., 2011). The current study reaffirms that IPC is strongly related to smoking cessation and extends past research by considering the context of an incentive-based, population-level program. More specifically, this project shows that IPC in the context of an incentive-based program appears to trigger processes that encourage

[2]It is also important to note that the recruitment groups differed in their likelihood of having prior contact with Sage, as DM individuals were taken from a mailing list derived from prior enrollment in Sage. Past Sage participation proved to be strongly related to DM membership in Heckman probit selection models (adjusted probit coefficient = 1.31, $p < .001$) and to have weak and nonsignificant relationships with QL utilization and continuous cessation, thus making it an ideal exclusion restriction (Bushway et al., 2007). A dummy variable for past Sage participation was included in the selection model and excluded from the outcome model. Other potentially important differences between the groups were that DM participants were more likely to engage in IPC about the program and were slightly older. Individuals in the ORC group were also less likely to have contacted a QL in the absence of the intervention (analyses not displayed in Table 3).

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both initial steps of behavior change as well as more long-term behavioral engagement (Southwell, 2013).

These social dynamics have the potential for the successful promotion of smoking cessation because long-term smoking cessation is highly influenced by social networks and social support (Burns et al., 2014; Christakis & Fowler, 2008). In the current context, IPC about the incentive-based program is important because it may activate social dynamics through a social response to the incentive presentation likely resulting from the relatively public context of the intervention. This social response may supplement the effects of the intervention by directing communication to a participant's social network (see Compton & Pfau, 2009). Our measure of IPC was self-reported sharing with others, and therefore we did not directly capture network-oriented mechanisms such as the amount or type of actual network exchanges. Nonetheless, the import for the current discussion is that the social response of IPC has the potential to supplement the effects of a population-level intervention, potentially activating psychological and social effects associated with more public contexts markedly different from controlled clinical settings.

In terms of the direct influence of the incentive, past research would imply a direct price effect on short-term smoking cessation behavior (Gneezy et al., 2011; Volpp et al., 2009). The current study shows mixed support for this claim. Specifically, perceived incentive importance was related to initial steps of cessation in the bivariate analysis, but incentive importance was not independently associated with continuous cessation in any analyses, and it was not related to *any* step of cessation when we controlled for IPC. However, we were unable to rule out a direct effect of the incentive on any step of cessation because of the retrospective nature of the data and the absence of a control group that did not receive an incentive. We were also not able to directly measure whether the incentive itself caused IPC. The current study design was geared toward evaluating the role of IPC and perceived incentive importance on smoking cessation in the context of an incentive-based, population-level program. (For a detailed discussion of the tradeoffs between randomized control trials and program evaluations, see McCall & Green, 2004.) Even though many participants found the incentive to be important for motivating QL connections, and low-income smokers may be particularly receptive to financial incentives (Oliver, 2009), the critical finding here is that utilization of intervention services and prolonged engagement were less likely to occur in the absence of a social response to the incentive-based program measured by IPC.

These primary findings were observed in the entire sample regardless of the mode of recruitment. That said, the DM campaign attracted individuals more likely to utilize the QL and to report continuous smoking abstinence, highlighting not only the effectiveness of the campaign but also potential biases that could have confounded survey data findings. Additional analyses adjusted for intervention design and parsed out potentially confounding factors associated with smoking cessation. Primary results remained robust in these analyses.

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Conclusion

Although many nations have witnessed a decrease in smoking prevalence, the sheer number of smokers has increased in the United States (Ng et al., 2014). In addition, low–socioeconomic status groups are burdened disproportionately by this tobacco pandemic (Bryant et al., 2011; Jha et al., 2006). Multilevel smoking cessation interventions that target entire low-income populations but also address individual-level processes (e.g., behavioral, biological) outside of the clinical setting remain a high priority for prevention (Bryant et al., 2011). Behavioral telehealth remains an ideal multilevel approach for reaching low-income populations with cessation services (McBride & Rimer, 1999).

The current study found that IPC in the context of an incentive-based, population-level program is a critical factor for initial utilization of tobacco cessation services as well as prolonged smoking cessation. Other programs, such as other states' NBCCEDPs and Medicaid, can potentially target low-income individuals and utilize financial incentives, noting that indirect psychological effects and social motivations can arise in response to incentive-based programs (Babcock et al., 2011; Gneezy et al., 2011).

In short, an incentive-based, population-level telehealth intervention aimed at connecting low-income smokers to free smoking cessation services can not only encourage initial steps of behavior change but also catalyze IPC that is important for prolonged behavior change.

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Table 1

Participant characteristics (N¼970)

Characteristic	% (*n*) or *M* (*SD*)	Range
QL utilization	66.29% (643)	
Continuous cessation[a]	18.97% (184)	
Interpersonal communication about program	50.41% (489)	
Incentive important for QL connection	68.66% (666)	
Age (in years)	52.24 (7.71)	18–75
Sex	2.06% (20)	
Education[b]	3.50 (0.90)	1–6
Race=ethnicity		
White	74.74% (725)	
Non-White	25.26% (245)	
Years smoked	30.92 (10.93)	1–62
Smokes every day	94.02% (912)	
Quit attempt with meds in past	62.68% (608)	
Lives with smoker	37.63% (365)	
Unlikely to contact QL without intervention	71.96% (698)	

Note. Ranges are not presented for dichotomous measures (0, 1). QL = quitline.

[a]This is a measure of 30-day point prevalence abstinence after 7 months from the beginning of the intervention, which is the measure of abstinence recommended by the North American Quitline Consortium.

[b]Education ranges from 1 (*completed eighth grade or less*) to 6 (*graduate school*).

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Table 2

Quitline utilization and continuous cessation according to interpersonal communication about incentive-based program and incentive importance for quitline connections (n = 970)

	Quitline utilization				Continuous cessation[a]			
	No utilization		Utilization		Not smoke free		Smoke free	
Variable	**Total (n = 327)**	**%**	**Total (n = 643)**	**%**	**Total (n = 786)**	**%**	**Total (n = 184)**	**%**
Interpersonal communication								
Did not tell others (n = 481)	204	62.4	277	43.1	403	51.3	78	42.4
Told others (n = 489)	123	37.6	366	56.9	383	48.7	106	57.6
Incentive importance								
Incentive not important (n = 304)	118	36.1	186	28.9	244	31.0	60	32.6
Incentive important (n = 666)	209	63.9	457	71.1	542	69.0	124	67.4

Note. Each of the four bivariate relationships totals to 970 participants. Four separate chi-square values were obtained for each of the four bivariate associations: (a) utilization by interpersonal communication = 32.32, $p < .001$; (b) utilization by incentive importance = 5.16, $p < .05$; (c) continuous cessation by interpersonal communication = 4.70, $p < .05$; (d) continuous cessation by incentive importance = 0.17, $p > .10$. All associations were statistically significant except for continuous cessation by incentive importance.

[a]30-day point prevalence abstinence after 7 months from the beginning of the intervention.

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Table 3

Multivariate logistic regression and Heckman probit models for quitline utilization and continuous cessation (N = 970)

	Logistic regression				Heckman probit	
	Quitline utilization		Continuous cessation[a]		Quitline utilization	Continuous cessation
Variable	Log-odds	Odds ratio	Log-odds	Odds ratio	Coefficient	Coefficient
Interpersonal communication about incentive-based program	0.79 (0.14)***	2.20	0.45 (0.13)***	1.57	0.47 (0.11)***	0.37 (0.17)*
Incentive important for quitline connection	0.23 (0.15)	1.26	−0.11 (0.11)	0.89	0.20 (0.17)	−0.22 (0.20)
Age (in years)	0.00 (0.01)	1.00	0.04 (0.01)***	1.04	0.01 (0.01)	0.04 (0.01)***
Sex	1.06 (0.63)	2.88	0.64 (0.63)	1.90	4.95 (0.52)***	−0.40 (0.84)
Education	0.11 (0.07)	1.11	−0.04 (0.10)	0.96	−0.01 (0.05)	−0.04 (0.03)
White (vs. non-White)	−0.14 (0.14)	0.87	0.36 (0.25)	1.43	−0.26 (0.16)	0.23 (0.18)
Years smoked	0.00 (0.01)	1.00	−0.02 (0.01)**	0.98	−0.01 (0.01)	−0.01 (0.00)**
Smokes every day	0.01 (0.25)	1.01	−0.43 (0.21)*	0.65	−0.42 (0.21)*	−0.75 (0.15)***
Quit attempt with meds in past	0.35 (0.19)	1.42	−0.12 (0.27)	0.89	−0.06 (0.22)	−0.36 (0.17)*
Lives with smoker	−0.18 (0.17)	0.84	−0.41 (0.22)	0.67	−0.23 (0.14)	−0.35 (0.13)**
Unlikely to contact quitline without Intervention	−0.05 (0.17)	0.96	0.14 (0.11)	1.15	−0.10 (0.20)	−0.09 (0.12)
Direct mail (vs. ORC)	0.63 (0.11)***	1.88	0.29 (0.14)*	1.33		
Censored objects[b]					629	629
Uncensored objects[c]					341	341

Note. ORC = opportunistic referral with connection.

[a] 30-day point prevalence abstinence after 7 months from the beginning of the intervention.

[b] Number of ORC individuals censored in probit models.

[c] Number of direct mail individuals not censored in probit models.

* $p < .05$.

** $p < .01$.

***$p < .001$.

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