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Varying Social Media and Involvement to Determine Recruitment Effectiveness in Adolescent Populations

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VARYING SOCIAL MEDIA AND INVOLVEMENT TO DETERMINE
RECRUITMENT EFFECTIVENESS IN ADOLESCENT POPULATIONS

BY

LUCY LING GU

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

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IN

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DOCTOR OF PHILOSOPHY DISSERTATION

OF

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UNIVERSITY OF RHODE ISLAND

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Abstract

This study examined how adjusting the degree of school involvement and types of recruitment channel relate to research recruitment effectiveness in both rural and urban high-school populations. Presently, there is a lack of consensus in the literature on the most useful media based channel or cost-effective strategy for sampling adolescents in school-based research. This study represents the second of a two-phased exploratory trial to determine effectiveness and cost-efficiency of examined methods to recruit adolescents to participate in online research. Varying combinations of social media channels (QR codes, Facebook ads) and degrees of school involvement (none, passive, active) were implemented at six different high schools, and a systematic tracking method was implemented to maintain involvement fidelity in each of the six schools. The results revealed that the combination of using QR Codes with active level of school involvement recruited the highest sample response percentage, but generated the highest cost per recruited participant; whereas QR Codes combined with no school involvement recruited the second lowest recruitment percentage but generated the second lowest recruitment cost per participant. Furthermore, in both rural and urban communities, there appeared to be a strong pattern of decreased cost-effectiveness of using social media for recruitment as the amount of school involvement increased. This is the first known study to examine QR Codes and Facebook combined with varying amounts of school involvement; as well as the first known study that seeks to understand how adjusting the amount of school involvement relates to recruitment effectiveness and cost-efficiency in this context. The findings are interpreted from a variety of theoretical and conceptual frameworks, including implementation feasibility, method sustainability, and cost-effectiveness.

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To my husband: you inspire me daily, to remain steadfast in my courage to face all things.

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Introduction

Effective and timely recruitment continues to be one of research's foremost challenges (Backinger et al., 2007; Bost, 2005; Greiner et al., 2014; Nguyen et al., 2012; Oude et al., 2008; Ramo et al., 2014; Spigarelli, 2008). For any study, the ability to recruit a sufficiently sized representative sample of the target population remains a core demand of research feasibility (Kealey et al., 2007). In order to inform prevention research in community and school settings about program effectiveness, prevention scientists often conduct research directly in the school environment. However, recruitment in this setting frequently poses unique challenges that are related to the administrative characteristics of the educational setting, such as heightened demands on the school districts, educators, parents, and students (Massey et al., 2003). Some common challenges include managing school calendars, classroom demands, exam schedules, extracurricular activities, and student absences (James et al., 2014; Lamb, Puskar, & Tusaie-Mumford, 2001).

The predominant school-based surveying method presented in the literature has been a traditional paper-pencil approach, which poses inherent complexities. The most commonly reported difficulties include negotiating access, disruption of classroom activities, increased burden for school personnel, planning and preparation, technical details, and difficulties of research accessibility (Atkins et al., 1997; Lytle et al., 1994; Ozga, 2000; Petosa & Goodman, 1991). In recent years, there has been an expanding body of research indicating that social media may be a viable option with documented success for sample recruitment (Gold et al., 2011; Jones et al., 2012; Lau et al., 2011; Lord, Brevard, & Simon, 2011;

Ramo, Hall, & Prochaska, 2010; Ramo & Prochaska, 2012). Cost per subject recruited continues to be a variable that is valuable when investigating recruitment methods, particularly for varying future strategies for feasibility and efficiency (Gu, Skierkowski, Florin, Friend, & Ye, 2016; Ramo, Hall, & Prochaska, 2010). An examination of Facebook as a mechanism to reach and survey young adults about health behavior found it to be a cost-effective and useful recruitment tool, generating 1548 survey participants, at a cost of \$4.28 per participant (Ramo & Prochaska, 2012). A review of the use of social media to recruit students for medical research found 30 studies that met review criteria, and concluded that there is growing evidence showing social media to be a valuable recruitment method for hard-to-reach populations and observational studies. They, however, highlighted the need for additional research in order to clarify patterns and mechanisms of efficiency (Haines-Saah, Hall, & Apolinario-Hagen, 2016). In our previous pilot study that used three different social media channels to recruit high school aged students in survey research, QR Codes yielded the largest proportion of recruited participants and lowest cost per participant (Gu et al., 2016).

Adolescents and the Internet

Web 2.0, or interactive media communications through the Web, represents one of the most prevalent methods of information distribution and consumption. Social media platforms are currently at the forefront of Web 2.0 use behavior, with American usage exponentially growing (Pew Research Center, 2016). Social media platforms are playing an increasingly central role in shaping how Americans access, share, and create information. According to the most recent yup!report on social media usage behavior,

Facebook remains the most popular and widely used social media platform by American teenagers (Pew Research Center, 2015; Pew Research Center, 2016). However, enthusiasm for Facebook has decreased amongst high-school aged users, largely due to reported dislike for the increased adult presence on Facebook and the perceived decreased privacy of their online content (Madden et al., 2015). Nonetheless, it appears that the young population still remains a presence on Facebook, but has decreased their Facebook usage time while supplementing their daily social media use with a wider variety of outlets, such as Instagram, Snapchat, and Twitter (Pew Research Center, 2016).

In recent years, scholarly interest in social media as an method to reach wide varieties of populations and settings for research has swelled (Bedrick & Sittig, 2008; Lewis, Kaufman, Gonzalez, Wimmer, & Christakis, 2008; Schleyer et al., 2008), including accessing geographically isolated rural populations; recruiting of adolescents to follow-up studies; targeting young adults regarding health risk behaviors such as substance use; and offering an alternative avenue to traditionally used recruitment methods (James, Taylor, & Francis, 2014; Jone, Saksvig, Grieser, & Young, 2012; Lohse, 2013; Lohse & Wamboldt, 2013; Ramo & Prochaska 2012; Ramo, Rodriguez, Chavez, Sommer, & Prochaska, 2014). With emergent trends of adolescent media use, a growing body of literature has called for a better understanding of up-to-date cost-effective sampling procedures in this population (Lohse & Wamboldt. 2013). However, current understanding of the effectiveness social media channels, such as QR Codes and Facebook, in their potential in recruiting young people to online research, is less clearly understood (Ramo et al., 2014; Wilson, Gosling, & Graham, 2012).

An annual report published in 2016 by the Pew Research Internet Project reported that over 95% of teenagers in the United States have access to the Internet, with the majority of this population using the Internet on a daily basis (Pew Research Center, 2016). With respect to smartphone usage, almost 90% of American adolescents ages 13 to 17 have access to mobile devices, with a majority (73%) accessing their smartphone multiple times a day (Lenhart, 2015). Moreover, the most recent report by the Pew Research Center examining American adolescent media use behavior found that over 70% of this population prefers to use more than one social media platform (Pew, 2016). In this age of increased accessibility, young people have emphasized privacy and flexibility as crucial determinants of participating in research (Berg et al., 2011; Kalkhoran et al., 2013). The omnipresence of mobile devices provides the potential for greater research engagement, while meeting young people where they are.

A review of the currently available literature on using social media for recruitment concluded that social media channels are a powerful method for recruiting participants for research and their use is expected to grow (Topolovec-Vranic et al., 2016). The same study found that, although there is clear evidence for social media's potential to reach difficult to access populations, including young adults; there remains varied and at times conflicting evidence, which necessitate further investigation to clarify specific methods that hold promise. A similar conclusion was reached during the initial phase of our two-stage pilot study (Gu et al., 2016).

Passive vs. Active Recruitment

Passive and active recruitment strategies can be easily distinguished. The passive

recruitment method refers to activities in which the study does not initiate contact with individual participants, but instead disseminates information to the target population through a variety of diffusion methods. Passive recruitment is a non-directive sampling method that is intended for broad distribution of study information that is not issued to any specific individual, and responds to any inquiries that participants may approach researchers with independently (Backinger et al, 2007; Carlson & Fripp, 2014; Glasgow, Toobert, & Hampson, 1991; Lee et al., 1997; Linnan et al., 2002; Raynor et al., 2009; Williams et al., 2010; Yancey, Ortega, & Kumanyika, 2006). This mode of recruitment provides study materials through public service announcements, releases on intercom, flyers and/or posters on bulletins, posters, and word of mouth in order to prompt participants to participate in the intended research. On the other hand, active recruitment methods include person-to-person contacts that are initiated by researchers. These forms of person-to-person interaction used in active recruitment often involve in-person solicitation intended to maximize the study's contact with the target population (Backinger et al., 2007; Carlson et al., 2014; Glasgow et al., 1991; Lee et al., 1997; Linnan et al., 2002; Massey et al., 2003; Raynor et al., 2009; Williams et al., 2010; Yancey et al., 2006). Some active recruitment methods include classroom reminders, presentation in classrooms, targeting potential participants with questions, in-person referrals or invitations, telephone solicitations, targeted mailings, and mandatory involvement.

Prior studies have found passive recruitment to be more cost-effective at sampling target populations than active recruitment methods, with evidenced effectiveness in minority participants, low-income couples in relationship education, minority women,

diabetes outpatients (Carlson et al., 2014; Glasgow et al., 1991; Lee et al., 1997; Yancey et al., 2006). In contrast, there have been a handful of studies that found active recruitment to be more effective than passive recruitment methods in obese pediatrics populations, high-school aged adolescents, and a culturally diverse diabetes population (Massey et al., 2003; Peltier, 1982; Raynor et al., 2009; Vincent, McEwen, Hepworth, & Stump, 2013).

While there is valuable information available on how involvement levels can influence recruitment outcomes, there are inconsistencies across strategies that call for additional clarification on this important variable. One source of discrepancy is in the operationalization of passive and active involvement levels. For example, a study that examined research recruitment methods involving a smoking-cessation program in the student population defined active recruitment as one-on-one conversations with students (Massey et al., 2003), while another study defined active recruitment as weekly-reminder calls to the target population (Vincent, McEwen, Hepworth, & Stump, 2013).

In a review of recruitment and retention of youth in smoking cessation intervention research, Backinger and colleagues (2007) concluded that there is an overarching lack of information detailed in the recruitment procedures. In this review article, recruitment methods were predominantly conducted within the school setting and comprised of active, passive, combination, or not reported. It further reported that most studies relied on a combination of recruitment methods but did not explicitly outline the implemented procedures (Backinger et al., 2007). Although there is a good amount of available literature on recruitment methods, a frequently cited limitation is the lack of systematic reporting of recruitment procedures that were effective, and even less

available research in sampling the adolescent population (Backinger et al., 2007; Carlson & Fripp, 2014).

The first phase of our pilot study investigated whether three separate social media channels (Facebook, Twitter, and QR Codes) would show promise in recruiting high-school aged adolescents to online community research (Gu et al., 2016). The study found that QR Codes resulted in the highest response percentage and the lowest cost per recruited participant from three demographically similar rural high schools. This was the first time QR Codes were investigated for research recruitment potential, and appeared to show potential as a cost-effective recruitment source for high school aged adolescents in a rural setting. In this initial pilot, levels of school involvement varied across recruitment channels in an attempt to best understand each channel's reach potential. For instance, the QR Code strategy utilized a school liaison within the school in order to introduce and orient the QR Code postcards to the student population. Contrasted with this approach, Facebook was the least invasive recruitment strategy, as the strategy relied exclusively on Facebook advertisements for sample recruitment without the use of any school-based personnel. By investigating levels of school involvement, this follow-up pilot study aims to build on the initial pilot findings and refine recruitment strategies for future application.

The advantages and disadvantages of varying recruitment methods have been widely discussed in the literature (DeLeeus, Hox, & Dillman, 2008; Saris & Gallhofer, 2007). At the time of this writing, however, no published papers could be identified that examined varying types of recruitment methods and in-school involvement in the framework of using social media recruitment channels, specifically for QR Codes and

Facebook. Initial pilot findings revealed that of the three examined social media channels (QR Codes, Facebook, Twitter), Twitter was the least effective recruitment mechanism, and had the second highest cost per recruited sample. This follow-up pilot study aimed to build upon these initial results in order further refine recruitment implementation strategies. The current study's primary objective is to investigate two social media based recruitment channels, QR codes alone and QR Codes plus Facebook, with methods that vary the amount of interpersonal contact with the student population, in order to gain a deeper understanding of the functionalities and cost-effectiveness of using social media for reaching adolescent populations in school settings (see Table 1).

Research Objectives

At present, due to limited research, there remains no consensus on what the optimal social media based strategies to recruit young adults to online research. In light of this, the current study set out to shed light on the following questions:

- (1) Is the use of certain social media channels more effective at recruiting research participants than other channels?
- (2) Does the use of different levels of school involvement, produce varying effectiveness and cost efficiency in school-based research recruitment?
- (3) What is the most effective combination of social media channel and school involvement in recruiting students?

Methodology

Settings

The data was obtained by examining six New England public high schools, in both rural and urban communities. Urban communities are densely developed territories encompassing residential, commercial, and other non-residential urban land uses that encompass at least 2,500 people (United States Census Bureau, 2015), whereas rural communities are defined as encompassing populations and territories not considered urban (United States Department of Health and Human Services, 2015).

The purpose of this second phase pilot study was to test the recruitment strategy as a means to recruit students to an online survey, and was not intended as part of the school's previously implemented social norms campaigns. Social norms campaigns across each high school were similar in intent, to correct misperception of peer use of marijuana, but each represented by a distinctive school logo and "tag line".

Central Falls High School (CFHS) serves the town of Central Falls within Providence County. Total population served by the school is around 19,500 people. The median household income is approximately \$23,000. The city's per capita income is approximately \$11,000. Approximately 29% of the town's overall population is below the poverty line. The total CFHS student population is approximately 750 (49% females; 50% males; 45% Caucasian, 34% Black, 16% Pacific Islander, 12% Alaskan Native, 7% Asian). The social norms campaign implemented at CFHS was titled "Above the Influence", aimed at reducing personal and community risks by correcting existing misperceptions relating to drug use. The campaign uses multiple channels to deliver its message (e.g., posters, newsletters).

Beacon Charter School (BCS) serves the town of Woonsocket within Providence County. Total population served by the school is around 43,000 people. The median household income is approximately \$30,800. The city's per capita income is approximately \$31,500. Approximately 17% of the town's overall population is below the poverty line. The total BCS student population is approximately 230 (59% females; 38% males; 88% Caucasian, 10% Black, 9% Pacific Islander, 5% Asian, 4% Alaskan Native). The social norms campaign implemented at BCS was titled "Above the Influence", aimed at reducing personal and community risks by correcting existing misperceptions relating to drug use. The campaign uses multiple channels to deliver its message (e.g., posters, newsletters).

Blackstone Academy Charter School (BACS) serves the town of Pawtucket within Providence County. Total population served by the school is around 71,000 people. The median household income is approximately \$31,500. The city's per capita income is approximately \$39,000. Approximately 15% of the town's overall population is below the poverty line. The total BACS student population is approximately 170 (56% female, 43% male; 50% Caucasian, 48% Black, 11% Alaskan Native, 10% Pacific Islander, 2% Asian). The social norms campaign implemented at BACS was titled "Above the Influence", aimed at reducing personal and community risks by correcting existing misperceptions relating to drug use. The campaign uses multiple channels to deliver its message (e.g., posters, newsletters).

Ponaganset High School (PHS) serves the towns of Foster-Glocester within Providence County. Total population served by the school is around 14,352 people. The median household income is approximately \$58,000. The cities' per capita income is

approximately \$22,000. Approximately 4% of the town's overall population is below the poverty line. The total PHS student population is approximately 700 (48% females, 48% males; 94% Caucasian, 4% Native American or Alaskan Native, 4% Black, 3% Asian, and 2% Pacific Islander). The social norms campaign implemented at PHS was titled "Join the Majority", aimed at reducing personal and community risks by correcting existing misperceptions relating to marijuana norms within the high school. The campaign has its own logo and slogan "7 out of 10 students at PHS don't use Marijuana. Join the majority". The campaign used multiple channels to deliver its message (e.g., posters, newsletter articles, ads in local newspapers, tee-shirts and other promotional items).

Chariho High School (CHS) serves the towns of Charlestown, Richmond and Hopkinton within Washington County. The total population the school serves is around 23,700 people. The median household income is approximately \$51,000. The cities' per capita income is approximately \$23,000. Approximately 4.0% of the overall county population is below the poverty line. The total CHS student population is approximately 1,200 (49% females, 47% males; 94% Caucasian, 7% Native American or Alaskan Native, 6% Black, 5% Asian, and 3% Pacific Islander). The social norms campaign implemented at CHS was titled "Fit IN", which seeks to highlight the student body's overestimations of marijuana use in the hopes of strategically reducing marijuana-related behaviors and enhancing latent healthy norms. "Fit IN" is both the school campaign's logo and slogan, delivered through multiple channels.

Tiverton High School (THS) serves the town of Tiverton in Newport County. Total population served by the school is around 15,800 people. The median household

income is approximately \$50,000. Tiverton's per capita income is approximately \$23,000. Approximately 4.5% of the town's overall population is below the poverty line. The total THS student population is approximately 700 (49% females, 47% males; 93% Caucasian, 5% Native American or Alaskan Native, 4% Black, 5% Asian, and 2% Pacific Islander. The social norms campaign implemented at THS was titled "UnMarketing Weed" with the logo "5↯6", which symbolizes correction of the false perception that marijuana is safe, currently believed by 56% of the student body. Delivery channels include face-to-face presentations by youth, e-newsletters and posters.

Measures

This study recruited student participants from target high schools to online surveys by implementing two types of social media channels, in combination with three different levels of school involvement (none, active, or passive recruitment). Passive recruitment is defined as activities in which the study did not initiate contact or solicitation with individual participants, but instead a non-directive broad dissemination method to recruit from the school population. Active recruitment is defined as activities that were geared towards person-to-person contact that was initiated by the researchers, which included in-person solicitation, intended to maximize study contact with the target population.

QR codes were used across three schools, and a combination of QR codes and Facebook were used across the three other schools. The most recent report by the Pew Research Center (2016) highlights that most teenagers prefer to use multiple social platforms throughout the day. QR Code and Facebook were combined in this study in an

attempt to extend previous findings while attempting to reflect the sample population's user preferences.

Online surveys were personalized to the respective high school's social norms campaign. Measures embedded in the surveys included: unaided and aided awareness of campaign recognition, modes of exposure, frequency of exposure, key message recognition, and outcome measures. Demographic information gathered included: grade level, gender, race/ethnicity, and socioeconomic status denoted by combined parental education levels. The online survey was administered via *Survey Monkey*, and was pretested for usability and technical functionality.

The primary measure of interest for this study is for students to obtain access to the study's online surveys. All students participating in the online survey will be considered *respondents*, as the degree to which the surveys are completed was not the primary interest of this study. The recruitment method that yields the highest percentage of the total school population and the least cost-per-recruited participant is the most effective recruitment strategy. The actual responses to the survey will be used for a separate study, as this study focuses on subject recruitment.

Procedures

Six different combinations of recruitment channel(s) and school involvement levels (See Table 1) were employed in recruiting high school students to the study's online surveys. Students across all six high schools received postcards with embedded QR codes linked to the respective online survey and personalized information relating to the study contest rules (see Figure 1). Postcards were created and purchased through *Vistaprint*, an

online supplier of printed promotional materials. The same design and message template was used throughout the six different schools. Attempts were made to personalize the postcard colors and logos to each respective school community. The postcards were then distributed throughout each high school’s homerooms. Students were able to scan the QR barcode with smartdevices, which automatically relayed them to the study’s connected survey.

Table 1: *Combinations of social media channel(s) and school involvement*

		Recruitment Channels	
Involvement Levels		QR CODES (urban)	QR CODES & FACEBOOK (rural)
	ACTIVE	Recruitment Combination #3 <i>QR Code-active</i> Blackstone Academy Charter School	Recruitment Combination #6 <i>QR Code plus FB-active</i> Tiverton High School
	PASSIVE	Recruitment Combination #2 <i>QR Code-passive</i> Beacon Charter School	Recruitment Combination #5 <i>QR Code plus FB-passive</i> Chariho High School
	NONE	Recruitment Combination #1 <i>QR Code-none</i> Central Falls High School	Recruitment Combination #4 <i>QR Code plus FB-none</i> Ponagansett High School

Figure 1. *Example of QR Code postcard, front and back*



A combination of Facebook advertisements and QR Code postcards were used to recruit students across three urban high schools. Facebook aimed advertisements to specific geographical areas and demographic details, and targeted user profiles that matched the study's inclusion criteria, which included users aged 14-19, indicated "high school" as the present level of education, and resided within a 10-mile-radius of the respective school community. The QR code postcards used images of the school's respective logo and main text of up to 130 characters.

The study's online surveys were open for participation across a three-week period beginning in May and ending in June of 2015. The study included raffle drawings for one participant from each school to win an iPad Air, valued at \$500. Raffle drawings for the prizes were used in place of individual incentives, as previous research has indicated that younger adults prefer drawings to individual types of incentives (Ramo, Hall, & Prochaska, 2010). All students participating in the online surveys, regardless of completion, are considered respondents. In an effort to preserve data fidelity by preventing duplicate survey attempts, student names retrieved from the de-identifying pages were cross-referenced with enrollment records from each respective school to avoid bogus entries. Only initial duplicate survey entries were included in this study.

Experimental Manipulation. The *no-school-involvement level* refers to procedures using social media channel(s) across two schools that do not include any additional recruiting strategy outside of the researcher distributing the study materials (postcards). Two schools were included in the no recruitment method condition, and did not implement the use of school liaisons to help with distribution. QR code postcards were disseminated across the schools' homerooms, and Facebook advertisements were

distributed online. No auxiliary public announcements, bulletin announcements, or solicitation were used in this recruitment condition.

The *passive school involvement level* refers to procedures that target broad distribution of recruitment channels and study information to the target participants, but not targeting individual participants. Two schools were included in the passive recruitment condition, and implemented the use of one school liaison to assist in distributing the postcards to homerooms. The school liaisons' responsibility is of a study facilitator, mainly focused on integrating postcards into homerooms, posting QR Code postcards and Facebook advertisements on school bulletin boards, announcing weekly reminders of the study on school intercom, and answering any student inquiries with regard to survey access or recruitment channels. No additional individual solicitation, invitation, or referrals were made by researcher or school liaison in this passive recruitment condition. However, clarification of study logistics and provision of technical assistance were permitted.

The *active school involvement level* refers to procedures that target individual participants within the school, in addition to target the overall school audience as a whole. Strategies of in-person solicitation or invitations to participate in the study are also incorporated in the active school involvement condition. Two schools were included in the active recruitment condition, and implemented the use of one school liaison to assist in distributing the postcards to homerooms, in addition to making weekly appearances at homerooms to remind students about the present study. The school liaisons' responsibility is of a study facilitator, mainly responsible for integrating postcards into homerooms, in addition to approaching students in the hallways weekly to actively

inquire about any questions that they may have regarding the study. In line with prior research, the active school involvement in this study attempted to maximize its efforts by combining the aspects of the aforementioned passive involvement level into the active involvement, such as posting on bulletin boards and making weekly intercom announcements.

Manipulation Checks. Documentation of personnel efforts involved in the recruitment process is important for considering the viability of each recruitment method, particularly in school settings, and informing future investigations. Time spent on recruitment-related activities was tracked in order to estimate the cost analyses of expended resources per recruited participant in each study condition. Fidelity checks were implemented weekly in order to best ensure that the school involvement levels were consistently distributed across conditions. Response rates are calculated by taking account the student population at each high school.

Results

Participant Characteristics

Demographic data, including gender, race/ethnicity, and grade level, from all 697 respondents is presented in Table 2. Although gender distribution varied slightly across recruitment conditions, respondent data revealed that all six recruitment conditions recruited representatively balanced samples, with the average gender distribution of 49.6% female and 50.4% male. With respect to race/ethnicity affiliation, sample distributions varied across test conditions, but were roughly representative of the overall

school populations across all six conditions. Distributions of the race/ethnicity affiliations across the three QR Code recruitment conditions had samples distributions that reflected the schools' urban setting, with on average more Black and/or Hispanic than White respondents. Distribution of race/ethnicity affiliation across the three QR Code plus Facebook conditions were also representative of the three rural school populations, irrespective of the amount of school involvement. Respondents' grade level profiles revealed representation of students across all four grades (9-12). There were comparatively more sophomores and fewer seniors across all six school conditions. The average percentages of all respondents recruited in this study were: 25% freshmen, 34% sophomores, 24% juniors, and 17% seniors. All six recruitment conditions recruited a comparatively higher percentage of 10th and 11th grade respondents, irrespective of social media channel or school involvement.

Table 2: Frequencies and percentages of respondent demographics

Recruitment Condition	QR Code none urban N (%)	QR Code passive urban N (%)	QR Code active urban N (%)	Both none rural N (%)	Both passive rural N (%)	Both active rural N (%)
Gender						
Female	63 (45.0%)	23 (53.5%)	22 (41.5%)	65 (47.8%)	118 (54.4%)	55 (50.9%)
Male	77 (55.0%)	20 (46.5%)	31 (58.5%)	71 (52.2%)	99 (45.6%)	53 (49.1%)
Total n	140	43	53	136	155	108
Race/Ethnicity						
American Indian	3 (2.1%)	4 (9.3%)	3 (5.7%)	4 (2.9%)	13 (5.9%)	3 (2.8%)
Asian / Pacific Islander	0	1 (2.3%)	1 (1.9%)	2 (1.5%)	4 (1.8%)	2 (1.9%)
Black	20 (14.3%)	6 (13.9%)	11 (20.8%)	1 (0.7%)	6 (2.8%)	7 (6.5%)
Hispanic	108 (77.1%)	8 (3.23%)	34 (64.2%)	5 (3.7%)	8 (3.7%)	3 (2.8%)
White	16 (11.4%)	30 (69.8%)	12 (22.6%)	128 (94.1%)	200 (92.1%)	101 (93.5%)
Total n	140	43	53	136	217	108
Grade Level						
9	26 (18.6%)	8 (18.6%)	10 (18.9%)	31 (22.8%)	60 (27.7%)	39 (36.1%)
10	49 (35.0%)	19 (44.2%)	16 (30.2%)	41 (30.2%)	74 (34.1%)	39 (36.1%)
11	36 (25.7%)	14 (32.6%)	16 (30.2%)	36 (26.5%)	51 (23.5%)	15 (13.9%)
12	29 (20.7%)	2 (4.7%)	11 (20.8%)	28 (20.6%)	32 (14.8%)	15 (13.9%)
Total n	140	43	53	136	217	108

Recruitment Response Rates

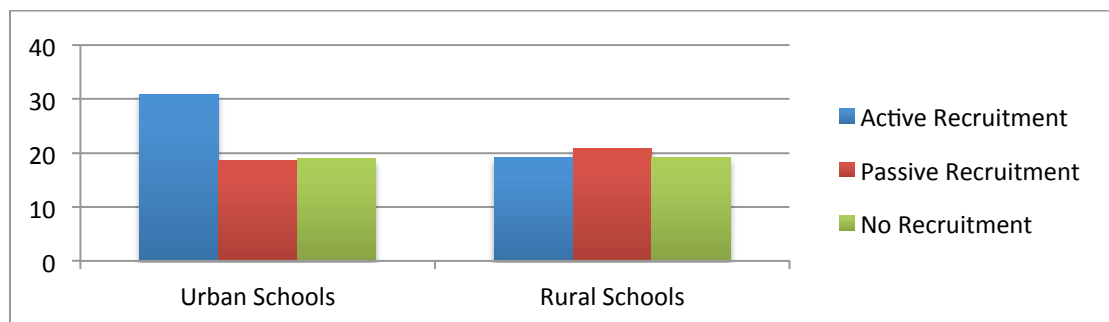
The study spanned a period of three weeks for sample recruitment. A total of 697 students responded to the study's online survey. The percentages of responses from each school varied across combinations of recruitment channel and school involvement level (see Table 3), from **18.7%** (*Recruitment combination 1: QR Code-none*) to **30.9%** (*Recruitment combination 3: QR Code-active*). The recruitment combination using only QR Codes and active school-involvement emerged as the most effective method, while

using only QR Codes while implementing no school-involvement emerged as the least effective method, by measure of the lowest percentage of yielded participants, of the methods studied (see Figure 2). It is vital to highlight that there is an average median household income between the urban and rural communities is examined in this present study. The average median household income of the urban school communities was on average \$25,000 less than that of the rural school communities. This wealth discrepancy should be carefully considered when conceptualizing sustainable methods of future implementation.

Table 3. *Frequencies and percentages of responses*

		Recruitment Channels	
		QR Codes (Urban)	QR Codes + Facebook (Rural)
School Involvement Levels	Active	53/171 30.9%	108/563 19.2%
	Passive	43/230 18.7%	136/651 20.9%
	None	140/742 18.9%	217/1137 19.1%

Figure 2. *Percentage chart of respondents at each school*



A chi-square test was conducted in order to determine whether there were significant differences in response rates across recruitment combinations (social media channel and amount of school involvement). Examination of these initial results, $\chi^2(2) = 2.19$, $p = .33$, failed to recognize the presence of a relationship for any pairing of recruitment combinations (QR Code-active, QR Code-passive, QR Code-none, QR Code plus FB-active, QR Code plus FB-passive, QR Code plus FB-none). Upon splitting the school involvement levels into dyads, there is still no significance for any pairing: Active-Passive: $\chi^2(1) = 1.87$, $p = .17$; Active-None: $\chi^2(1) = 1.25$, $p = .26$; Passive-None: $\chi^2(1) = 0.05$, $p = .82$.

Upon further examination of responses within only the urban schools, overall chi-square was significant: $\chi^2(2) = 12.45$, $p < .01$. Active school involvement (QR Code-active) had a significantly higher response rate than passive involvement (QR Code-passive): $\chi^2(1) = 8.69$, $p < .01$; and active school involvement (QR Code-active) had a significantly higher response rate than no school involvement (QR Code-none): $\chi^2(1) = 8.65$, $p < .01$. Examination of rural school failed to reveal significance for the overall response rates. Likewise, none of the pairings revealed any significant differences. These findings provide support that QR Codes continues to be a potentially valuable method of recruiting young people to research. Moreover, these findings provide moderate evidence that response rates appear to differ across levels of school involvement.

QR Code Postcards plus Facebook Advertisements

Another dimension of interest in this study was the breakup of responses generated by each distinct social media channel implemented in the rural schools. In

these three conditions, the study examined recruitment potential using a combination of QR Codes and Facebook to see whether multiple channels would enhance responding. In each of these three conditions, QR Codes generated considerably larger percentages of successfully recruited samples than did Facebook advertisements (See Table 4).

Table 4. Breakdown of responses by social media recruitment (QR codes, Facebook)

	QR Code Responses	Facebook Responses	Total Responses
Tiverton (ACTIVE)	70 (64.8%)	38 (35.2%)	108
Ponaganset (PASSIVE)	113 (83.1%)	23 (16.9%)	136
Chariho (NONE)	180 (82.9%)	37 (17.1%)	217

Figure 3. Rural schools recruitment rates

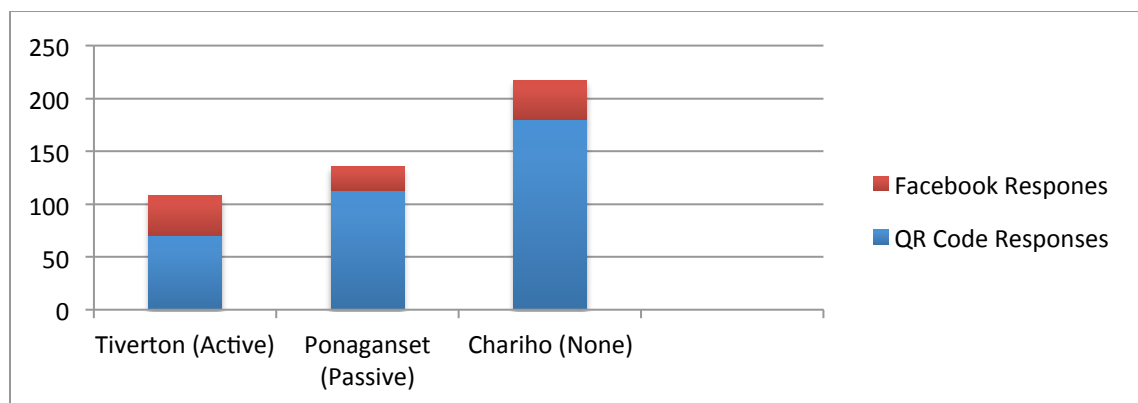
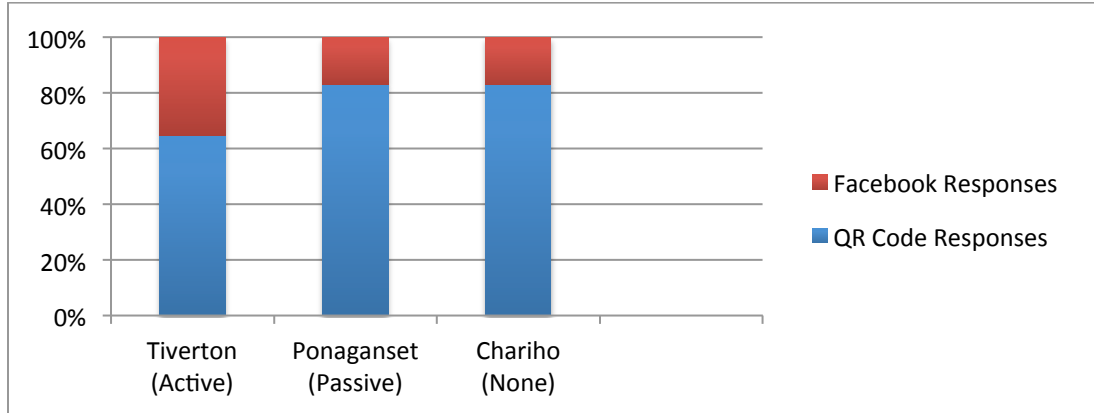


Figure 4: *Rural schools recruitment percentages*



Cost Analysis: Cost Per Subject

Cost per subject was calculated for each recruitment combination by evaluating incentive costs, purchasing costs, and labor costs. The incentive used in each condition was a school raffle drawing for an iPad Air, valued at \$500 each. Total costs for purchasing QR Code postcards were \$790. Total costs for using Facebook advertisements were \$213.

Existing literature highlights the importance of implementing a system for keeping track of personnel costs involved in the recruitment process. Human labor costs were systematically monitored in this present study by weekly logs, and were translated into dollar expenses by referencing the Bureau of Labor Statistics salaries (BLS, 2015). Total labor hours expended at each of the none-school involvement conditions (QR Code-none, QR Code plus FB-none) was zero hours, equaling \$0. Total labor hours expended at each of the passive school involvement conditions (QR Code-passive, QR Code plus FB-passive) was one hour per week, which calculates to approximately \$23,

totaling \$69 throughout the three-week study duration. Total labor hours expended at the active school involvement conditions (QR Code-active, QR Code plus FB-active) were three hours per week, totaling \$207 throughout the duration of the study.

The no school involvement condition, in both rural and urban school communities, was the most cost-effective strategy when paired with social media recruitment, measured as the lowest cost per recruited subject, as summarized in Table 5 and Figure 5. The *QR Code-none* condition had a total recruitment cost of **\$658.20** (\$158.20 in postcards; \$0 in labor; \$500 in iPad incentive), which resulted in an average **cost per recruited sample of \$4.70**. The *QR Code plus FB-none* condition cost a total of **\$845.03** (\$245.21 in postcards; \$99.82 in Facebook ads; \$0 in labor; \$500 in iPad incentive), with an average **cost per recruited sample of \$3.89**.

The passive school involvement condition, in both rural and urban school communities, was the second most cost-effective strategy when paired with social media recruitment. The *QR Code-passive* condition acquired a total recruitment cost of **\$617.59** (\$48.59 in postcards; \$69 in labor; \$500 in iPad incentive), with an average **cost per recruited sample of \$14.36**. The *QR Code plus FB-passive* condition acquired a total recruitment cost of **\$785.24** (\$153.68 in postcards; \$62.56 in Facebook ads; \$69 in labor; \$500 in iPad incentive), with an average **cost per recruited sample of \$5.77**.

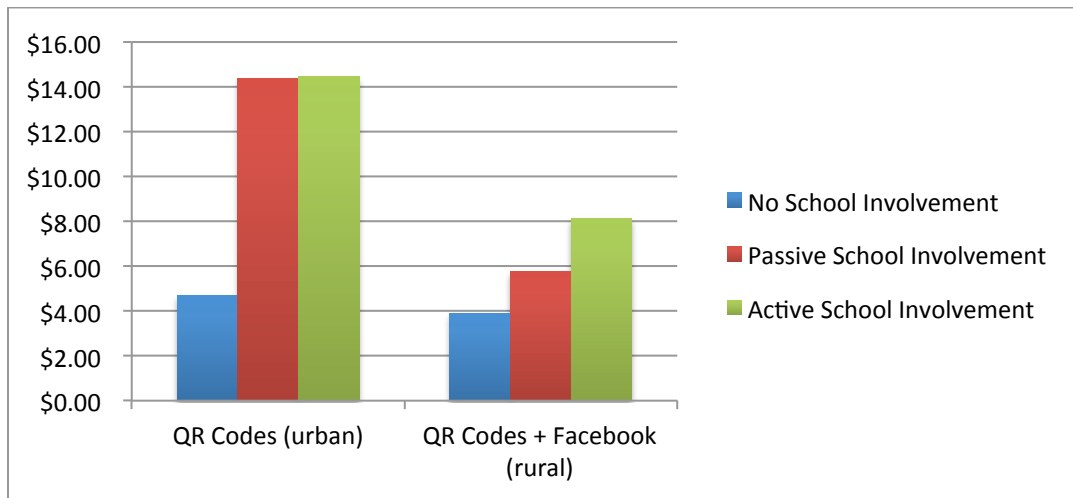
The active school involvement condition, in both rural and urban school communities, was the most expensive and the least cost-effective strategy when paired with social media recruitment. The *QR Code plus FB-active* condition acquired a total recruitment cost of **\$878.72** (\$122.04 in postcards; \$49.68 in Facebook ads; \$207 in

labor; \$500 in iPad incentive), with an average **cost per recruited sample of \$8.14**. The *QR Code-active* condition acquired a total recruitment cost of **\$766.89** (\$59.89 in postcards; \$207 in labor; \$500 in iPad incentive), with an average **cost per recruited sample of \$14.47**.

Table 5: *Cost per recruited respondent calculations*

		Recruitment Channels	
		QR Codes (Urban)	QR Codes & Facebook (Rural)
School Involvement Levels	Active (3 hours/week)	53/171= 30.9% response rate (53)(1.13)= \$59.89 [QR costs] \$207 [labor costs] \$500 [incentive costs] = \$766.89 = \$14.47 per sample	108/563= 19.2% (108)(1.13)= \$122.04 [QR costs] (108)(0.46)= \$49.68 [FB costs] \$207 [labor costs] \$500 [incentive costs] = \$878.72 = \$8.14 per sample
	Passive (1 hours/week)	43/230= 18.7% (43)(1.13)= \$48.59 [QR costs] \$69 [labor costs] \$500 [incentive costs] = \$617.59 = \$14.36 per sample	136/651= 20.9% (136)(1.13)= \$153.68 [QR costs] (136)(0.46)= \$62.56 [FB costs] \$69 [labor costs] \$500 [incentive costs] = \$785.24 = \$5.77 per sample
	None (0 hours/week)	140/742= 18.9% (140)(1.13)= \$158.20 [QR costs] \$0 [labor costs] \$500 [incentive costs] = \$658.20 = \$4.70 per sample	217/1137= 19.1% (217)(1.13)= \$245.21 [QR costs] (217)(0.46)= \$99.82 [FB costs] \$0 [labor costs] \$500 [incentive costs] = \$845.03 = \$3.89 per sample

Figure 5: *Cost per recruited respondent*



Discussion

This study examined the differences in recruitment effectiveness and cost per recruited sample of combinations of two social media channels (QR Code only; QR Code plus Facebook) and three levels of school involvement (none, passive, active). With respect to overall recruitment combinations, using only QR Codes with active school involvement produced the highest overall response rate. However, this recruitment combination was the least cost-effective of the six tested conditions (QR Code-active, \$14.47 per recruited sample).

With respect to school involvement levels, the no-school involvement condition, which did not require additional recruitment solicitation work from school personnel, was the most cost-effective in targeting high school youths to participate to online surveys in both rural and urban public school communities. Conversely, the assessed cost-efficiency uncovers only one element of the conditions' value. Another dimension of interest is the

representativeness of the sample that is recruited in each condition across the three-week study interval. Respondent demographic data in this follow-up study appeared to support prior findings that QR Codes have the potential to recruit a representative sample in both rural and urban school populations.

The schools that utilized no or passive school involvement, in combination with the social media recruitment channels, generated more than 80% of their respective total responses through only the QR Code leg of recruitment channels (see Figure 3 and Figure 4). These participation trends when examined alongside the overall recruitment response percentage and cost-per-recruited-sample could provide valuable information regarding how different recruitment strategies differ in their penetration patterns.

With respect to financial costs associated with each recruited participant, there appeared to be a clear pattern of decreasing cost-effectiveness as level of school involvement increased. Schools that implemented no school involvement generated the lowest cost-per-recruited sample in both rural and urban school communities. Meanwhile, schools that implemented the active school involvement generated the highest cost-per-recruited sample in both rural and urban school communities. All six-study conditions revealed promising results in the sense that they were more cost-effective, ranging from \$3.89 to \$14.47 per recruited sample, than previous investigation of traditional recruitment methods, at approximately \$51.59 per recruited sample (Lenhart, 2012).

It is worth noting that the lowest response percentage in this phase-two pilot study is higher than the highest school response percentage in the initial pilot study, which ranged from 2% to 18% across recruitment channel (Gu et al., 2015). It may be the case that by building upon strategies learned in the previous pilot, and incorporating from

a more nuanced approach of negotiating school access while working to minimize disruption of classroom activities, this follow-up study benefitted from a more efficient implementation process. Future recruitment campaigns should make all efforts to continue incorporating effective sampling and tracking systems to evaluate recruitment effectiveness.

Another dimension of attention in this study is the average household income discrepancy between the urban and rural communities in this study. The average median household income of the urban communities was, on average, \$25,000 less than that of the rural communities. There is an expanding body of literature emphasizing the correlation between income inequality and health outcomes (Chetty et al., 2016; Coburn, 2015; Lillard, Burkhauser, Hahn, & Wilkens, 2014; Pickett & Wilkinson, 2014; World Health Organization, 2017). Specifically, inequalities in health are acknowledged in the literature such that groups with lower household incomes systematically suffer from worse health outcomes than groups with higher average household incomes (Chetty et al., 2016; World Health Organization, 2017). One cited method of reducing health inequalities is to creatively engage members in disadvantaged communities in public health initiatives and related interventions (Omara-Eves et al., 2015). A meta-analysis examined discrepancies in community participant engagement, and hypothesized that higher engagement in community public health interventions is correlated with a “fit for purpose” approach, rather than a “one size fits all” approach, of community engagement (O’Mara-Eves et al., 2015). Sustainable implementation strategies that are cost effective for communities to adapt appear to be a key objective across fruitful models of community engagement. The current study attempts to further refine recruitment

strategies and increase implementation cost-effectiveness from the initial pilot, in the hopes of learning how to better engage school communities with income discrepancies in the future.

QR Code Postcards only

QR Code postcards continue to show feasibility in recruiting an adolescent sample (Gu et al., 2016; Pulliam & Landry, 2011; Dou & Li, 2008). Potential rationale for effectiveness in each of the combination of approaches are considered, and may be beneficial for understanding the current set of pilot findings and guiding future investigations.

In this present study, we examined which factors of previously successful social media methods are related to optimal responding. More specifically, we investigated the use of QR code postcards and Facebook ads, paired with varying levels of school involvement by use of school liaisons to understand how best to capitalize on valuable time and efforts of school personnel. Findings in this study suggest that by implementing active school involvement, which involved in-person solicitations and communications with the students intended to maximize the study's contact with the target youth population, was the most effective at generating student participation (Williams et al., 2010). However, it is worth noting that in the active school involvement condition using QR codes, the school had a relatively smaller overall sample size when compared with the other five schools. Since experimental manipulations were limited in this study, further investigations are needed in order to accurately assess whether this smaller school population was a deterring factor in this pilot study. Perhaps results would be different if the target schools were more similar in student population.

QR Code Postcards plus Facebook Advertisements

The addition of Facebook advertisements to QR Code postcards revealed added benefits in cost-effectiveness within the urban school communities. Sample recruitment using two social media channels did not, however, appear to significantly increase the percentage of successfully participants when compared with only using QR Codes. These three conditions were collectively more cost-effective than the conditions that only used QR Codes. There may be several plausible explanations for this finding. First, the total target populations in the urban communities were much larger than the rural communities and may have confounded these results. Caution should be exercised when examining these findings, as their generalizability are limited due to various factors that were outside of the study's experimental manipulation.

While the addition of Facebook to QR Codes for recruiting young people to research reveals slightly higher response rates, it may not be fiscally meaningful. Schools can be efficient and rely on QR Codes exclusively and optimize their recruitment strategies by adjusting the level of school involvement that is desired or available.

Nonetheless, these participation trends can lend valuable information about how different recruitment strategies differ in their penetration patterns. For instance, given the comparatively low participation rates generated by adding the Facebook leg of recruitment channel, it can be concluded that adding a Facebook as a secondary social media channel to QR Codes for recruiting young people from school settings may slightly decrease cost-per-recruited-participant, but may not necessarily yield a higher recruited percentage of the target population. However, recent data compiled by the Pew Research Center reveal that over 71% of surveyed teenagers prefer using multiple social

platforms, such as Instagram, Snapchat, and Facebook, throughout the course of their day (Pew, 2016). Future investigations into whether supplementing Instagram and/or Snapchat to QR Codes can generate higher response rates and better cost-efficiency will be valuable information for community researchers to recruit school-based participants.

Varying levels of school recruitment

This is the first known study that seeks to understand how adjusting the amount, or level, of school involvement relates to recruitment effectiveness in a high-school population. The study used a systematic tracking system for school involvement in each of the six school communities. School involvement levels varied from no additional contribution of recruitment strategies beyond passing out the QR Code postcards (none conditions), to providing logistics support, announcements, bulletins, but no direct or individual solicitation of students (passive conditions), to all aspects of the passive involvement conditions mentioned above with the addition of direct solicitation of students in an attempt to further encourage study participation (active conditions).

Results appear to show that altered levels of school involvement are related to different degrees of response rates and cost-effectiveness. The passive school involvement conditions seem to be a sufficient strategy in capitalizing the recruitment potential in this present study given the overall percentage of the target population successfully recruited and cost-effectiveness. An essential factor to consider in research is the sustainability of the methods used, such that the strategies that prove to be most effective can be integrated in real world settings. While the active level of school involvement did appear to generate higher response rates as a whole, more research is needed to assess the viability of school involvement in conjunction with social media

platforms in order to understand how best to optimize recruitment efficiency and further expand on current findings.

Cost-Effectiveness of Recruitment Combinations

Recruitment combinations that required no additional school involvement were the most cost-efficient conditions of recruiting both rural and urban young people within a three-week study recruitment period. Final cost per subject was calculated for each condition by evaluating incentive costs, purchasing costs, and labor costs.

The lowest final cost incurred was \$3.89 per recruited sample, by using a combination of QR Codes plus Facebook with no school involvement. The second lowest cost per recruited sample was \$4.70 by using QR Codes only with no school involvement. It is noteworthy that both of these recruitment conditions were more cost-effective than the most cost-effective method in the first-phase of this pilot study, which was \$6.57 per recruited sample using QR Codes only. One plausible theory for this may be that this current study benefitted from further refinement of the recruitment approaches learned from the previous pilot, including strategies to better negotiate for school access and reducing disruption of classroom activities. This study may have also profited from the recency effect of the previously implemented recruitment campaign, in which one student from each participating school won the incentive drawing.

It may be the case that by building upon strategies learned in the previous pilot, and incorporating from a more nuanced approach of negotiating school access while working to minimize disruption of classroom activities, this follow-up study benefitted from a more efficient implementation process. Future recruitment campaigns

should make all efforts to continue incorporating effective sampling and tracking systems to evaluate recruitment effectiveness.

The highest costs per sample incurred were in the active level of school involvement, which required the most human labor in the recruitment process. The most expensive recruitment combination was \$14.47 per recruited sample, by using QR Codes only with active school involvement. The second most expensive recruitment combination was \$14.36 per recruited sample, by using QR Codes only with passive school involvement. Although both conditions using active level of school involvement were the most costly in this present study, it is worth noting they are both substantially more cost-effective than *both* Facebook and Twitter used during the first-phase pilot study.

These results appear to reveal a clear pattern of increased cost-efficiency associated with decreased school involvement in both the QR codes alone condition and in combining QR Codes and Facebook together. All six combinations of recruitment in this study were less expensive than average costs of \$51.59 incurred per recruited participant using more traditional recruitment channels of flyers and reaching out by telephone (Lohse et al., 2012).

Extending the findings from the first phase of this pilot study, a system was put in place in this second phase to factor in human labor expenses into the cost analysis. What is curious regarding cost-effectiveness in this study was that although increasing school involvement did appear to generate proportionally more participant responses, particularly in the QR Code recruitment combinations, it did not appear to be as fiscally practical.

Perhaps one way to translate these findings into practice is that while school involvement may have the capacity increase overall study participation, monetary costs steadily increase with level of involvement. These pieces of information may be valuable in optimizing future implementation of school-based research. Future studies should take these findings into consideration when assessing recruitment strategies, and investigate whether these cost patterns replicate across communities and settings. Lastly, it is important to note that school and student relationships differ across schools, grades, communities, and regions of the country. Researchers and implementers should remain cautious in overgeneralizing these present findings.

Limitations

When considering these present findings, it is critical to keep in mind that this was the second phase of a two-staged exploratory study. There are several key limitations that should be mentioned. Firstly, this study was conducted in six very different school settings, where experimental manipulation and control were limited. Notably, the school's student populations varied greatly from 117 to 1137, which certainly is not optimum. However, this exploratory study does benefit from the ability to take advantage of naturally occurring variations that takes place within public school systems. This shortcoming offers uniquely practical empirical data for future recruitment potential and cost efficiency associated with these recruitment strategies.

Secondly, this study was conducted in six high schools that implemented different social norms campaigns. This was a shortcoming that remains the same across the two phases of pilot studies. Due to the campaigns being previously implemented within the

high schools that were community-wide prevention initiatives, it was not feasible for manipulation of this factor. However, it remains a further limitation to this study as student recruitment outcomes may have been different if awareness of their respective social norms campaigns were constant across all six schools.

Thirdly, accessibility remains a potential shortcoming of this study. Even though there is increasing evidence that social media and mobile technologies are growing increasingly pervasive, with 89% of all Americans having access to the Internet (Internet Live, 2016) and 88% of all teens having access to the internet (Pew, 2015); the internet is still used somewhat disproportionately across the country. Moreover, access to smartphones and smartdevices such as tablets also differ across the United States. Approximately 65% of Americans own a smartphone as of 2015, which is up from only 58% just one year earlier in 2014 (Pew, 2015). Pew estimates that the trends will continue to proliferate in years to come (Pew, 2015). With respect to the population examined in this present study, 87% of American youths between the ages of 13 to 17 have access to smartphone or smartdevices (Pew, 2015). Even though these growing trends in mobile accessibility do not appear to be decelerating any time soon, researchers must continue to cope with the burden of usability, particularly because QR Codes are still a transitional social technology, and be cautious of overgeneralizing.

Conclusion

This study represents the second phase of a two-staged pilot focused on investigating optimal social media recruitment strategies in adolescent populations. The present study extended the initial pilot study's findings by adding in urban school

communities and varying levels of school involvement alongside the social media channels. Results from this study reveal variations in response rates in recruiting adolescent students using QR Codes only and QR Codes plus Facebook. However, adding Facebook recruitment to QR Codes did not appear to generate significantly higher response rates across any levels of school involvement.

Costs related to the recruitment channels were all relatively inexpensive when compared with more traditional paper-pencil survey methods. The most cost-effective strategies, evaluated by costs incurred per recruited participant, were no school involvement paired with social media channels. Varying levels of personnel efforts provided valuable information about the cost-effectiveness of recruitment strategies: higher levels of school involvement were correlated with higher response percentages but also with diminishing cost-effectiveness.

In the advent of increasingly affordable and accessible web technologies, the future of community research will undeniably be related to a richer understanding of optimizing these strategies for recruitment. This is the only known study that has examined the effectiveness of QR Codes alone and in combination with Facebook while modifying the levels of school involvement in targeting adolescent populations for online community research.

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