THE ROLE OF SOCIAL NETWORKS IN ADOLESCENT SUBSTANCE ABUSE PREVENTION

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by

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ABSTRACT

Although prevention programs targeting substance abuse have been studied and developed for decades, little attention has been paid to conversations among participants about prevention programs (i.e., social talk). This dissertation focuses on adolescents’ social talk about prevention programs and how adolescents’ social talk may influence program-effects program effects. In order to investigate adolescents’ social talk about prevention program, this dissertation includes two studies that focus on 8th graders in one rural middle school (N =185).

Study One provides a conceptualization of social talk in relation to prevention programs and operationalizes it through adolescents’ social networks. Participants were eighth-grade students receiving Keeping it Real (kiR), a middle school substance-abuse prevention program. The findings showed that students engaged in both positive and negative social talk about kiR. In addition, students’ social networks were associated with social talk: Students with higher friendship centrality were more likely to have higher social-talk indegree centrality, indicating that youth who most classmates considered friends were reported as speakers of positive social talk on kiR. Also, social talk was associated with important program outcomes. Youth who talked positively about kiR tended to report anti-substance personal norms. On the other hand, those who engaged in negative social talk appeared to have pro-substance personal norms.

Study Two explored subgroups based on adolescents’ patterns of social talk and social relationships. Three subgroups were identified and were labeled as Speakers, Listeners, and Both Listeners and Speakers. Males were more likely to be Speakers. Program outcomes, refusal self-efficacy and perceived anti-substance norms, did not predict subgroup membership.
These dissertation findings support the idea that program participants actively process prevention interventions through their social channels. Both intervention and evaluation designs should include social talk about prevention programs.
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CHAPTER 1
INTRODUCTION

One goal for substance abuse prevention researchers is to create programs that prepare adolescents to resist future substance offers from others and change adolescents’ perceptions of substances. Substance use in this case is defined as using any type of illegal drug for teenagers. Many adolescents (71%) in the US have experienced substance use before graduation from high school (Johnston, O’Malley, Bachman, & Schulenberg, 2010) and most substance offers come from peers (Trost, Langan, & Kellar-Guenther, 1999; Substance Abuse and Mental Health Services Administration; [SAMHSA], 2011). When adolescents fail to resist offers and try substances, they may become regular substance users. Failing to resist substance offers, then, has short- and long-term consequences, including substance addiction (Colby, Tiffany, Shifman, & Niaura, 2000; Sheehan, Oppenheimer, & Taylor, 1988), poor academic performance (Bryant, Schulenberg, Bachman, O’Malley, & Johnson, 2000), and numerous health issues (Ezzati & Lopez, 2000; Warrant, Johne, Eriksen, & Asma, 2006).

Risk factors for adolescent substance use can be roughly classified into three categories: (a) societal/cultural factors, (b) individual, and (c) interpersonal factors (Hawkins, Catalano, & Miller, 1992). Societal/cultural factors include income disparities with the finding that economically disadvantaged youth (e.g., low SES) are more likely to engage in problem behaviors, including substance use (Bursik & Webb, 1982; Farrington et al., 1990). Psychological traits such as sensation-seeking, harm avoidance and impulse control are related to use of illegal substances (Cloninger, Sigvardsson, & Bohman, 1988; Shedler & Block, 1990). Interpersonal factors include personal beliefs toward substances (Elek, Miller-Day, & Hecht,
and the ability to refuse influence attempts, more specifically to refuse substance offers (Trost et al., 1999).

Although all three categories of risk factors can increase the likelihood of substance use, interpersonal factors may be easier to change than societal or personality factors. Thus, it is important not only to understand the interpersonal factors such as how adolescents resist substance offers and how they perceive using substances, but also to apply this knowledge to improving prevention programs.

**Problem Statement**

Many prevention programs targeting adolescents’ substance use have focused on changing interpersonal factors such as increasing refusal self-efficacy and correcting normative beliefs related to substance use (e.g., Botvin & Griffin, 2007; Hecht, et al., 2003) in order to reduce interpersonal risk factors (Hawkins, Catalano, & Miller, 1992). These prevention programs have demonstrated effectiveness, although the effect sizes are relatively small (Flay, 2009; Tobler et al., 2000; Hwang, Yeagley, & Petosa, 2004). Several components have been suggested to improve program effects (Greenberg, 2004). This dissertation focuses on adolescent social relationships in an attempt to understand how adolescents talk to each other, informally, about a prevention program to which they have all been exposed. Referred to as social talk, the dissertation also explores how adolescents’ social talk can potentially explain and increase program effects. Social talk will be briefly described in the next section.

**Social Talk: Communicating about Prevention Programs.**

Individuals share a wide range of information and opinions (Keller & Libai, 2009; Carl, 2006; Rogers, 2000). Several studies have shown that these conversations can form and enhance knowledge, attitudes and feeling (Bennett, Flickinger, & Rhine, 2000; Eveland, 2004; Eveland &
Thomson, 2006; Lee, 2009; Mutz, 2002; Pattie & Johnston, 2008; Searing, Solt, Conover, & Crewe, 2007; Wyatt, Katz, & Kim, 2000). As a result, communication among peers may have important implications for prevention programs. A meta-analysis of school-based prevention programs showed that programs using a participatory teaching strategy are more effective than programs using a lecture-based teaching style (Tobler, 1986, 1992; Tobler et al., 1999, 2000; Tobler & Stratton, 1997). One difference in these teaching styles is in how much students talk with the teacher or with each other. Informal conversations among students, particularly conversations outside of the formal class setting, have received no attention. Thus, the first goal of this dissertation is to describe social talk about substance abuse prevention interventions in order to address an important gap in the health message design literature. The second goal of the dissertation is to examine how social talk might function in prevention interventions.

Clearly, social talk occurs within a social context. The networks or social relationships within which social talk occurs are crucial for understanding drug use decisions as well as, perhaps, designing and implementing prevention interventions. We know, for example, that network positioning influences adolescent substance use. Meta-analyses have shown that isolates were more likely to smoke than group members (Choi & Smith, in press). It seems logical, then, that people occupying different networks and/or different network positions may require targeted interventions for maximal impact. The task of influencing, for example, central people in friendship networks may require targeted messages that differ from those sent to isolates.

Currently, the majority of school-based interventions take a universal approach (SAMHSA, 2003) where the audience is not segmented but rather understood as general population (Institute of Medicine [IOM], 1994). Selective- or indicated-approach programs, on the other hand, segment and target based on membership in subgroups. Selective programs that
segment audiences and target messages to sub-groups have been shown to be more effective than universal approaches (Noar, Benac, & Harris, 2007), although they are less prevalent in substance abuse prevention programs. Thus, to move school-based prevention in this direction, a better understanding of audience segmentation is needed. This dissertation examines the role of social talk in networks as a potential means of segmenting audiences.

In summary, this dissertation attempts to provide insights into improving prevention programs by investigating adolescents’ social talk with two studies. In this introduction, I provide background into theoretical explanations of social influences on adolescents’ substance-use and programs’ attempts to address them.

**Theoretical Explanation of Youth Decision on Substance Use**

Three theories are particularly relevant for understanding the social factors in adolescents’ substance-use: social cognitive theory ([SCT] Bandura, 1977), primary socialization theory ([PST] Oetting, Deffenbacher, & Donnermeyer, 1998), and the theory of planned behavior (TPB) (Fishbein & Ajzen, 1975; Ajzen, 1988). I will describe each theory.

**Social Cognitive Theory**

SCT (Bandura, 1977) posits that social processes and cognitions play important roles in initiating and sustaining behaviors, such as using substances. Individuals learn behaviors by observing and modeling others’ behaviors and making associations between behaviors and rewards or punishments. In this context, youth tend to use substances when they see someone else receive a reward for such use, but are less likely to use it when they see someone else punished. This tendency to model another person increases when the relationship between a youth and the observed substance user becomes important to the youth (e.g., role-model & followers, close friends). Consistent with this view, many empirical studies have shown that
significant others influence a youth’s decision to use substances (e.g., Engels, Knibbe, De Vries, Drop, & Van Breukelen, 1999; Bailey& Hubbard, 1990; Kandel, Kessler, & Margulies., 1978; Huba, Wingard, & Bentler, 1980).

In SCT, Bandura (1977) theorized that observing rewarded behavior and listening to positive statements about the behavior from significant others can promote behavioral adoption. Thus, hearing about substances from significant others may promote youth’s substance use. Bandura (1977, 1982) also stated that significant others can shape both use self-efficacy and refusal self-efficacy. Youth can learn not only to obtain substances but also to resist substance offers by observing how their significant others do so.

As a result, SCT can be seen as a theoretical rationale for the current studies. While individual behavior and cognition are important to this theory, the social nature of modeling and observed behaviors suggests an examination of the social talk that connects people as well as the networks within which this modeling occurs. SCT is interested in how people learn behavior through modeling, which can be seen as a socialization process. Primary Socialization Theory shares this focus.

**Primary Socialization Theory**

PST (Oetting, Deffenbacher, & Donnermeyer, 1998) suggested that adolescents learn pro-social behaviors from school and family, while they learn deviant behaviors (e.g., substance use) from their peers. When bonds within the family or school weaken, adolescents are more likely to become involved with their peers. Thus, youth with weak family-bonds and strong peer-bonds may learn unhealthy behaviors from their peers instead of traditional behaviors. Consequently, their likelihood of engaging in deviant behavior increases. Several studies showed that adolescents’ substance use is associated with a lack of parent-child closeness (Brook, Lukoff,

A focus on social talk among peers within social networks is a natural extension of work based on PST. The influence of these peers is likely to be exerted through social talk, suggesting that prevention research examine types of influencers as well as the flow of influence through peer networks through social talk.

**Theories of Reasoned Action and Planned Behavior**

The Theory of Reasoned Action (TRA), developed by Fishbein and Ajzen (1975), argues that behavior is best predicted by someone’s intentions to act. This intention is influenced by the attitudes toward substance use which are predicted by the expected consequences of that behavior and the affective value placed on those consequences and peer’s norms which are influenced by peer’s expectation to engage in a specific behavior and one’s willingness to comply for it. Based on TRA, Theory of Planned Behavior (TPB) (Ajzen, 1988) includes another variable, perceived behavioral control, which is defined as “the perceived ease or difficulty of performing the behavior” (Schifter & Ajzen, 1985, p. 844) to explain intention of a behavior. In youth’s substance-use context, youth tend to engage in substance use when they have a positive attitude toward substances, strong peer’s norms toward using substances, and perceive it as easy to use. Many empirical studies of substance use supported these themes of TRA and TPB (Ajzen, Timko, & White, 1982; Malmberg, Overbeek, Vermulst, Monshouwer, Vollebergh, & Engels, 2012; Kam, Matsunaga, Hecht, & Ndiaye, 2009).

TRA and TPB suggest that norms and perceived behavioral control are key factors in the relationship of substance use to youth relationships and social talk in peer networks. Norms and
feelings of control are formed in social talk and exist with respect to these networks. It should be noted that similar constructs are discussed by SCT, with behavioral control labeled efficacy in the latter theory. Thus all three of these theories suggest that norms and efficacy/behavioral control are important to understand and are related to social talk in peer networks.

**Peer Influences in Adolescents’ Substance Use**

Although there are differences among these theories, all emphasize the importance of peer relationship networks. This emphasis is supported by many empirical studies that demonstrate that peers play an important role in substance use (Ennett & Bauman, 1994; Ennett, et al, 2006; Fang, Li, Stanton, & Dong, 2003; Go, Green, Kennedy, Pollard, & Tucker., 2010; Mercken, Snijders, Steglich, Vertiaine, & de Vries, 2010). The role of peers in substance use decisions is discussed in the next few paragraphs.

Adolescence is a sensitive time period to “learn” about substance use (Duncan, Tildesley, Duncan, & Hops, 1995). While use is low in late childhood it becomes increasingly frequent as people move through adolescence. For example, approximately one fifth of 8th graders report having drunk alcohol in the past month while half of 12th graders drank alcohol during the same period (National Adolescent Health Information Center, [NAHIC], 2007). Concurrent to this progression, many adolescents perceive that it is not difficult to obtain substances. For example, in 2009, half of adolescents aged 12 to 17 reported that it would be “very easy” or “fairly easy” to get marijuana (Substance Abuse and Mental Health Services Administration; [SAMHSA], 2010). Substance availability increases even further in later adolescence. While approximately 20 % of youth aged 12 or 13 report that it would be fairly or very easy to obtain marijuana, 73% of those aged 16 or 17 report so (SAMHSA, 2010). Thus, as youth age they are surrounded by increasing numbers of peers who have access to and are using substances. This suggests that adolescents
are exposed to the influence of substance-use peers either directly (e.g., offering substances) or indirectly (e.g., norms) (Ennett & Bauman, 1994; Ennett, et al, 2006; Fang, Li, Stanton, & Dong, 2003; Go, Green, Kennedy, Pollard, & Tucker., 2010; Mercken, Snijders, Steglich, Vertiaine, & de Vries, 2010).

**Direct Influence.** Most adolescents received substance offers from their peers (Trost, et al., 1999), as compared to substance dealers (approximately 15% of adolescents (SAMHSA, 2010). Many youth (40%) reported that they obtained substances from people under-age 21 or parents, guardians or other adult family members (SAMHSA, 2010). Many scholars (Alberts, Miller-Rassulo, & Hecht, 1991; Pettigrew, Miller-Day, Hecht, & Krieger, 2011) also reported that adolescents received substance offers mostly in social situations such as parties or restaurants.

Moreover, adolescents’ social networks are a particularly salient influence on initiation of substance use (Bewley, Bland & Harris, 1974). Adolescents reported that they experienced smoking their first cigarette after receiving offers from peers (Bewley, et al., 1974). Youth’s social network also can also provide a place to use substances. For instance, more than half of adolescents who reported drinking alcohol in the past 30 days said their alcohol use occurred in someone else’s home (SAMHSA, 2010). Thus, it is clear that substance offers received through youth’ networks are positively associated with initiation and continued substance use (Friedman et al., 1985).

**Norms.** Adolescent social network can also be an intangible influence on substance use by providing norms. As noted in SCT (i.e., vicarious learning) and TRA/TPB (i.e., norms), the presence of others performing a behavior is a powerful source of influence, especially when performed by significant other peers according to both SCT and PAT. These implicit or indirect
influences (e.g., norms) are consequential for substance use decisions (Alberts et al., 1991; Flannery, Vazsonyi, Torquati, & Fridich, 1994) and networks are a primary source of this influence. Scholars reported that adolescents use substances because their friends use it (Bewley, et al., 1974) and the number of friends who use substances is positively associated with youth’ substance use (Eiser et al., 1991; Ennett et al., 1994). The relationship between best friends and substance use is well documented (Morgan & Grube, 1991; Van Roosmale & McDaniel, 1989, 1992). When youth’ best friends use a substance, they are more likely to use it. That is, a youth’s social network serves as direct and indirect support for deviant behaviors such as substance use.

To sum up, both theory and empirical evidence indicate that U.S. adolescents are likely to experience a substance offer in their lifetime and these offers are likely to come from a peer. Consequently, many prevention programs teach how to resist peers’ direct and indirect influence (Botvin & Griffin, 2007). For example, the Life Skills Training prevention program teaches refusal skills, develops efficacy, and corrects perceived norms (Botvin, Mahalic, & Grotpeter, 1998). Several studies have showed that the keepin’ it REAL prevention program increases refusal self-efficacy and corrects normative beliefs (Hecht et al., 2003). We turn, next, to how these constructs are integrated into prevention curricula.

**Refusal Skills and Refusal Self-efficacy in Prevention Program**

While prevention programs contain many components, the next section focuses on the theoretically derived constructs of refusal self-efficacy and perceived norms that are central to understanding social talk in peer networks. I will explain substance refusal skills and refusal self-efficacy in prevention programs.

Because one of the main reasons youth initiate substance use is peer pressure (Friedman, et al., 1985; Nichter, Nichter, Quintero, & Ritenbaugh, 1997; Urberg, Shyu, & Liang1990),
specific skills are required for youth to refuse substance offers. That is, youth need to know how to refuse substance offers given a situation and the specific skills should be age-appropriate. In substance refusal, communication skills, more specifically negotiation skills, are central because a youth has to produce effective refusal messages while maintaining relationships with significant peers such as friends. In fact, substance refusal skills require having the ability to account for or take the perspective of others because achievement of one’s goal (e.g., resistance to substance offer) depends on one’s ability to communicate effectively with them (Adler & Towne, 2003). Furthermore, different types of refusal skills can be employed, depending on situations created by youth’ social network. As a result, curricula not only teach refusal skills, but also try to encourage beliefs about refusal self-efficacy so that the skills are more likely to be used. We start with a discussion of the skills themselves.

**Substance Refusal Skills**

According to Beauchamp and Anderson (2010), age-appropriated social skills are required to resist peer influence in adolescence. According to Beauchamp and Anderson, social skills include three components: attention-executive, communication and socio-emotional.

First, the attention-executive component refers to the ability to regulate oneself within environments (e.g., friendship, school) and consists of three subcategories: attentional control such as self-monitoring, self-regulation, and selective attention; cognitive flexibility such as working memory, and attentional shift; and goal setting such as initiating, planning, and solving problems (Beauchamp & Anderson, p.48). Individuals can fail to generate relevant information to refuse substance offers due to lack of this component. The social information processing model (Crick and Dodge, 1994) provides an explanation of these processes, suggesting that self-regulation plays an important role in effective interactions with others. For example, a youth who
cannot wait his or her participation turn during the class discussion is likely to experience negative reaction from others. Impulsiveness or aggressiveness may lead to fewer friends. That is, adolescents with few friends may not refuse peer influence due to a lack of social support.

Second, communication components provide insights into how to produce and understand effective communication messages. Researchers argued that communication is a key to establishing relationships and being accepted by peers (Landa, 2005; Rubin, 1972). Mostow and his colleagues (2002) pointed out that youth with good verbal communication are more likely to express their emotions to others, which consequently increases the quality of their relationships. Many researchers found that good communication skills lead to better quality social relations (Adams, 2002; Turkstra, McDonald, & Kaufmann, 1996; Hadley & Schuele, 1995; Galejs, Dhawan, & King, 1983). When a youth fails to recognize nonverbal communication via social interactions, he or she produces inappropriate responses and has poorer peer relations (McCann, Peppe, Gibbon, O’Hare & Rutherford, 2007; Edwards, Manstead, & Macdonald, 1983). That is, when youth do not have good communication skills, they may not provide appropriate responses when encountering substance offers.

Finally, the socio-emotional dimension is associated with understanding social cues (Beauchamp &Anderson). That is, how youth process information about social cues is critical. Identifying social cues such as facial expression and emotions is important for effective social interaction (McClure, 2000; Edwards, Manstead, & Macdonald, 1983). Fujiki, Spackman, Brinton and Illig (2008) suggested that misinterpreting social cues (e.g., facial and body language) leads to selecting inappropriate responses during social interaction, which consequently decreases the quality of a relationship. As a result, youth are less likely to have friends and to refuse substance offer.
Substance refusal skills, like other skills, are basically composed of three components: attention-executive, communication and socio-emotional components. Each component is separate but not mutually exclusive. Particularly, “communication” is emphasized at steps. That is, youth who can quickly decode social cues through nonverbal/verbal communication and also encode good verbal/nonverbal communication are likely to have many friends who can serve as social supports (Gottman, Gonso, & Rasmussen, 1975) and they can effectively refuse substance offers (Alberts, Miller-Rassulo, & Hecht, 1991).

**Teaching Refusal Skills in Prevention**

The idea of teaching youth substance refusal skills came from Evans (1976) work, which adopted SCT (Bandura, 1977) and inoculation theory (McGuire, 1964). Several substance abuse prevention programs including Life Skills Training (Botvin, Baker, Dusenbury, Botvin, & Diaz., 1995), Project Northland (Komro, et al., 2001), and Project STAR (Pentz, et al., 1989) adopted Evans’ approach to teaching refusal skills as a central element of their prevention strategy. Many studies showed that enhancing refusal skills is an effective way for youth to decrease substance use and/or delay onset of use (Barkin, et al., 2002; Botvin & Botvin, 1992; McKay, et al., 1993). In addition, a meta-analysis (Tobler, et al., 2000) about substance abuse prevention programs showed that substance refusal skill is an important component of effective programs.

Prevention program curricula for teaching social resistance skills address how to identify social situations in which students are likely to experience peer pressure to use substance and how to avoid these high-risk situations (Botvin & Griffin, 2007). Botvin and Griffin stated that programs based on substance refusal skills focus on “techniques to handle these situations when they are unavoidable, including what to say and how to communicate it in the most effective way” (p. 610).
Substance refusal skills training includes teaching youth effective techniques to recognize explicit offers of substances, practicing refusal skills techniques (i.e., role-playing), and developing cognitive scripts that can be invoked in situations where resistance skills would be effective (Corbin, Jones, & Schulman, 1993; Jones, McDonald, Fiore, Arrington, & Randall, 1990; Scheier, Botvin, Griffin, & Diaz, 1999). According to Botvin and his colleagues (1995), “the main objective of resistance skills training is to provide adolescents with a repertoire of verbal and nonverbal skills that they can call on when confronted by peer pressure to use substances in a variety of situations” (p.32). The programs including refusal skills have been shown to effectively to decrease or delay substance use for adolescents (Flay, 1985; Tobler, et al., 2000).

Teaching social skills includes how to understand and recognize social cues and to make good arguments. Examples of social skills to teach include “assertive skills (e.g., asking questions and making new friends), defense of right (e.g., returning defective merchandise or asking friends who borrow thing to return them), social facilitation (e.g., expressing a countervailing opinion), and confrontation (e.g., telling a friend who is embarrassing you to stop)” (Scheier, & Botvin, 1998, p.23). Refusal skills are extensions of social skills that include the following strategies for how to refuse substances: 1) simply saying “no”, 2) explaining the reason, 3) avoiding and 4) leaving the situation (Alberts, et al, 1991).

**Refusal Self-Efficacy**

Even skilled communicators are sometimes ineffective. That is, just because skills are taught, even if there is objective mastery, does not mean they will be used. SCT argues that one must not only master skills, but also have self-efficacy, or the belief that one can perform the skill effectively (Bandura, 1977). Hansen and his colleagues (1998) showed that youth with
greater skills in substance resistance do not necessarily have high confidence to resist substance offers.

Individuals evaluate their ability to behave before they act. Bandura (1977) defined this evaluation of one’s ability to perform a behavior as self-efficacy. If they believe they can do something, or have high self-efficacy, they are likely to perform the behavior. On the other hand, if they perceive they are unable to be effective (i.e., have low self-efficacy) they are unlikely to perform the behavior. Many empirical studies have shown that self-efficacy predicts actual behavior in this way (Frayne & Latham, 1987; Gist, Schwoerer, & Rosen, 1989; Latham & Frayne, 1989).

By learning skills and practicing them, youth can increase their refusal self-efficacy. Because youth know how to effectively refuse a substance offer in a given situation, they are more likely to resist substance offers in reality. At the same time, there appear to be a set of substance refusal skills that can be learned.

One’s positive evaluation of personal mastery determines behavior in any given situation (Bandura, 1977). SCT argues that previous performance episodes and related evaluation of performance generate self-efficacy in a specific domain. Particularly, when consistent outcomes occur due to personal effort and persistence, the behavior and response outcome (e.g., cognitive expectation) become connected to one another (Bandura). Thus, refusal self-efficacy functions of substance refusal skills and self-confidence to resist substance offer.

Refusal self-efficacy is an important component of prevention programs. Without efficacy, skills can languish. In addition, youth must be motivated to use the skills to refuse substance offers. In many prevention programs, this involves correcting perceived norms based
on SCT and or TRA/TPB. As a result, I turn into what perceived norms are and how programs help change youth’s perceived norms toward substance use.

**Perceived Norms toward Substance Use and Prevention Programs**

Based on TRA/TPB, perceived norms are an important influence on substance use for youth (Elek, Miller-Day, & Hecht, 2006), but many youth overestimate the number of students who use and who approve of substance use (Chassin, et al, 1984). Consequently, by correcting the misperception, youth can delay the onset of substance use (Donaldson et al., 1994). I provide an overview of perceived norms and explain how prevention program can change them.

**Perceived Norms**

Norms can be classified as actual norms versus perceptions of norms. Actual norms are the observable frequency of a behavior. Perceived norms are an individual’s perception of that frequency. Except for a few cases, it is not easy to detect actual norms in society. For example, adolescents cannot exactly estimate the average of alcohol consumption in the youth population and cannot accurately estimate the social approval for alcohol consumption in the population. According to Miller and Prentice (1996) individuals can perceive norms through observation and communication. By observing what other youth do, a youth can gain information about what a person should do (Miller & Prentice). In addition, a person can confirm his observation through communication (Miller & Prentice). Thus, while overlapping, these constructs can be quite different, and when they are, research suggests that perceived norms are more important than actual norms in governing behavior (Perkins and Berkowitz, 1986; Berkowitz, 2004). There are actually several types of perceived norms. According to Cialdini, Reno, and Kallgren (1990), descriptive norms are defined as a belief of what others do and injunctive norms describe a belief of what other should do. Many studies have showed that descriptive and injunctive norms
predicted behaviors, separately (Rah, Hasler, Painter, & Chapman-Novakofski, 2004; Hausenblas & Downs, 2004; Rivis & Sheeran, 2003; Campo, Cameron, Brossard, & Frazer, 2004; McMillan, Higgins, & Connor, 2005; Kopfman & Smith, 1996; Morgan, 2004). That is, individuals are more likely to perform a behavior when they believe that many people (should) conduct the behavior.

These perceived norms can be further classified as personal and societal norms. Personal norms are defined as “internalized values and expectations for behavior, irrespective of external reward or evidence” (Elek, Miller-Day, & Hecht, 2006, p. 148). Societal norms are defined as “individuals’ beliefs regarding the behavior in question in their society” (Park & Smith, 2007, p. 196). Park and Smith (2007) have distinguished these four different types of norms: personal descriptive norm, personal injunctive norms, societal descriptive norms, and societal injunctive norms.

Several previous studies have shown that perceived norms influence youth’s substance use (Kosterman, Hawkins, Guo, Catalano, & Abbott, 2000; Elek, et al., 2006; Weaver, Cheong, MacKinnon, & Pentz, 2011; Zehe, Colder, Read, Wieczorek, & Lengua, 2012). When Youth believe substance use is what most teenagers do, they are more likely to use it (Elek, et al., 2006). Also, when youth perceive most of their peers approve of using use substance, the likelihood of using substance increases (Zehe, et al., 2012; Elek, et al., 2006). Furthermore, perceived norms can differently influence teenagers’ substance initiation depending on type of substance (Kosterman, et al., 2000) and youth’s growth trajectories on alcohol use depending on ethnicity (Weaver, et al., 2011). Consequently, there are different types of perceived norms and they can influence substance use for youth.

**Correcting Perceived Norms**
When youth believe most of their peers use substances, they are more likely to consume themselves (Elek, et al., 2006; Aas & Klepp, 1992; Grube, Morgan, McGree, 1986; Simons-Morton, 2002; Wang, Fithugh, Westerfield, & Eddy, 1995; Webb, et al., 1991). This tendency increases when they overestimate the actual prevalence (descriptive norms) and acceptability (injunctive norms) of substance use (Chassin, et al, 1984; Grube, et al, 1986; Sussman, et al., 1988; Graham, Marks, & Hansen, 1991). This overestimation may encourage youth to think that substance use is appealing and acceptable. In order to correct overestimates of use, prevention programs provide actual prevalence or acceptability of youth’s substance use based on national survey data or school-wide surveys (Botvin & Griffin, 2007; Botvin, 2000). Several studies have showed that youth were less to engage in substance use after receiving information to correct perceived norms (Donaldson, et al., 1994; Botvin et al., 1992; Orlando, Ellickson, McCaffrey, & Longshore, 2005).

It is clear, then, that a number of components are needed for an effective substance use intervention, including resistance skills, self-efficacy, and correcting social norms. As we see from the first part of this chapter, these components are immersed in a social context of peer relationships, and student process the interventions through social talk within these networks.

**Introduction Summary**

In summary, adolescent substance use is a serious public health concern (NAHIC, 2007). Health communication scholarship has the potential to contribute to ameliorating these effects. Social influence theories were applied to the analysis of the literature that identified refusal self-efficacy and perceived norms as crucial to adolescents’ decision-making regarding substance use. Furthermore, adolescent substance abuse prevention programs mainly focused on these three factors: refusal skills, refusal self-efficacy and perceived norms. Although most scholars agree
that communication may influence conversationalists’ perception, attitudes and behaviors (Bloch, Sherrell, & Ridgway, 1986; Bone 1995; Godes & Mayzlin, 2004; Gruen, Osmombev & Czaplewski 2006; Iyengar, Van den Bulte, & Valente, 2011; Lee, Lee, & Feick 2006, Maxham, 2001, Mayzlin 2006), few studies have addressed the process of communication and its implications. Thus, the dissertation includes two studies that will broadly contribute to two bodies of knowledge: social talk and prevention.

The two studies of this dissertation investigate whether social talk is related to perceived norms and refusal self-efficacy, which will help us understand whether such social talk contributes to the effectiveness of prevention programs. Very little research to date has examined how these prevention messages are processed through social channels, including the effects of social talk on substance abuse prevention outcomes. Thus, first, I will investigate whether youth engage in positive or negative social talk regarding substance abuse prevention program, specifically, “keepin’ it REAL” [kiR]. I will also examine how the social talk influences self-efficacy and perceived norms, which are considered mediators in most school-based substance abuse prevention program (Hecht, et al., 2003; Botvin, et al., 1995; Komro, et al., 2001; Pentz, et al., 1989). The second study mainly addresses whether there are important and meaningful youth subgroups based on their social positions and social talk, and whether refusal self-efficacy and perceived norms predict membership in these subgroups.
CHAPTER 2
DO INTERPERSONAL CONVERSATIONS BOOST REFUSAL SELF-EFFICACY AND PERCEIVED NORMS?

Researchers rarely consider participants’ social relationships in the design, implementation, or evaluation of prevention interventions (Valente, Ritt-Olson, Stacy, Unger, Okamoto, & Sussman, 2007; Miller-Rassulo, Alberts, Hecht, Trost, & Krizek, 2000). Social relationships among participants, if considered at all, are designated as “contamination”, such as when exposed participants share what they have learned with unexposed participants (Campbell & Stanley, 1963). This contamination is seen as detracting from evaluating program effects because the control group also receives some exposure to the program. Most of these social-prevention programs assume that: (1) leaders communicate with participants, but (2) participants do not (or should not) communicate with each other. While the first assumption is reasonable, the second is questionable.

This study is based on the assumption that everyday interactions among participants in prevention programs are a normal part of prevention efforts. One might argue that successful intervention should motivate interactions among participants because people talk about topics that interest and engage them (Larkey & Hecht, 2010). The goal of this study is to explore informal conversations, referred to as social talk, among adolescents exposed to a substance abuse prevention program. The study explores how social talk influences adolescents’ self-efficacy and normative beliefs related to substance use after exposure to prevention interventions. The literature review starts with a description of social talk and follows with a description of the theoretical framework guiding this study.

Overview of Social Talk
Every day, people communicate with each other in order to share a wide range of information and opinions (Keller & Libai, 2009). They talk about everything from what they ate for lunch to the TV news they watched last night (Carl, 2006; Rogers, 2000). These relatively short, unplanned, easily interrupted interpersonal conversations are referred to as social talk (Whittaker, Frohlich , & Daly-Jones, 1994). Definitions of social talk span a wide spectrum from phatic talk to persuasion (Klüwer, 2011). For example, social talk would include moments when two patients in a waiting room at a hospital greet each other or talk about the weather. This type of social talk serves to establish and/or maintain relationships (Malinowski, 1949; Bickmore & Cassell, 2000). On the other end of the spectrum, social talk includes persuasive discourse that occurs when one person tries to convince another to do what the persuader wants (Miller & Boster, 1988). For instance, in the waiting room example, social talk may be defined as moments when one patient tries to convince the other that a particular health treatment is better than another. Conversations in which people exchange information and opinions or share news also fit within this definition. The marketing literature refers to these discussions as Word-of-Mouth or situations where individuals talk about products or services (e.g., Burger & Schwartz, 2011). In other social science literature, social talk includes stories that individuals share with others (e.g., Peter, & Kashima 2007) or more narrowly, any conversations about social relationships (e.g., Pong, Hao, & Gardner, 2005) or “social targets” (Peter, Kashima, & Clark, 2009, p. 207).

Definition of social talk.

Within this study, social talk is defined as voluntary, informal, interpersonal communication about a product, brand or service. Informal communication is voluntary and less task-oriented conversation (Fay, 2011). Professional presentations, job interviews, commercial talk (e.g., sales), typical doctor-patient communication, or class discussions are not included in
this definition of social talk. Second, social talk is interpersonal. Computer-mediated-communication is not considered in this study because CMC conversations may have different features (e.g., emotional intensity, language style) compared with face-to-face conversations (Walther, 1992). Thus this study’s definition of social talk most closely aligns with Pollach (2006)’s definition of word-of-mouth as “informal, noncommercial, oral, person-to-person communication about a brand, a product or a service between two or more consumers” (p. 1). This definition assumes that prevention programs are a product or service and participants are consumers. Furthermore, Lee and Hecht (2011) demonstrate that certain prevention programs have their own “brand.” As a result, in this study social talk occurs when individuals talk face-to-face about products, brand or services (e.g., prevention program) in an informal setting.

Social Talk about Prevention Programs

After exposure to a prevention program, individuals share their (1) experiences, (2) feelings, or (3) opinions about a prevention program. Individuals tend to spread positive or negative comments to others depending on the satisfaction or involvement with products or services (Westbrook, 1987; Richins, 1983; Dichter, 1966; Berger & Milkman, in press). By doing so, people can obtain reassurance of their positive or negative view or can reduce negative feelings (Rosen, 2009; Sundaram, Mitra, & Webster, 1998).

It may be important to focus on not just the occurrence of social talk, but whether the content is positive or negative, because the content may be persuasive. Even if people are not intending to persuade others through social talk, most scholars agree that positive and negative communication about a product or service may influence related perceptions, attitudes and behaviors (Bloch, Sherrell, & Ridgway, 1986; Bone 1995; Godes & Mayzlin, 2009; Gruen, Osmonbekov & Czapelewski 2006; Iyengar, Van den Bulte, & Valente, 2009; Lee, Lee, & Feick
2006, Maxham, 2001, Mayzlin 2006). Although previous word-of-mouth studies (Westbrook, 1987; Richins, 1983; Dichter, 1966) have shown that people engage in social talk, no research is available describing whether adolescents engage in social talk after they have been exposed to a prevention program, such as a substance use program in their classrooms. Thus, the study starts by describing whether positive or negative social talk occurs. The following research question is proposed:

*RQ1*: Do adolescents engage in positive or negative social talk about a prevention program to which they have all been exposed?

**Patterns of Social Talk**

Beyond the mere presence of social talk, the conversations that youth have with each other about the prevention program may have particular patterns. These patterns may be understood through social network analysis (Wasserman & Faust, 1994). In this section, I explain two social network concepts relevant for social talk: 1) centrality and 2) density. Then, I explore possible associations among social-talk networks and other social networks (e.g., friendship).

A social network can be defined as “a set of social actors and a collection of social relations that specify how these actors are relationally tied together” (Wasserman & Pattison, 1996, p. 402). The situation analyzed in this study is when youth who are exposed to a prevention program at school, talk positively or negatively about the prevention message with each other outside of class (e.g., not in a formal in-class discussion). In the social-talk network, the classmates are the set of social actors and their conversations about the program are the ties. These ties are directional. That is, A can say that B talked with him/her about the program, but B may not say that A talked with him/her about it. The direction comes from the report, not the
event they are supposed to be reporting. The dyad either conversed about the program or did not, so the asymmetry comes from memory rather than a genuinely directional relationship (e.g., liking or asking advice). Social network analysis provides means by which to quantitatively estimate the attributes of actor’s network positions and to summarize the network overall. I will describe each in the next section.

**Actor centrality.** Centrality estimates are “actor indices which attempt to quantify the prominence of an individual actor embedded in a network” (Wasserman & Faust, 1994, p.169). There are many ways to estimate centrality within a network. I will use degree centrality, which is defined as the number of one’s direct connections to others among a set of actors (Freeman, 1979; Wasserman & Faust, 1994). Degree centrality is an important estimate of activity or engagement; thus, adolescents with higher degree centrality in a social-talk network are more actively involved. In networks with directed ties, such as the social-talk network, each person in the network can be central because of how many other classmates they name (they mention more classmates than others, referred to as outdegree) or because of how many classmates nominate them (they are mentioned by more classmates; referred to as indegree) (Wasserman & Faust, 1994).

**Network Density.** One summary statistic for degree centrality is the density of a class’s social-talk network. Density refers to the proportion of possible social relations that are actually present in a network (Wasserman & Faust, 1994). The density of a social-talk network can illustrate how frequently or collectively youth engage in conversations regarding a prevention message. Density is important because it shows youth’ communication and information exchange systems (Haythornthwaite, 1996). Because the network links are communication, high density generally indicates that adolescent frequently interact with each other, which can
facilitate information flow. Therefore, a high density network can display mutual obligation and trustworthiness compared with less a dense network (Coleman, 1988).

Network density and actor centrality provide different types of information. For instance, if a class has a positive overall atmosphere and all classmates are collaborative, they can frequently or collectively engage in social talk regarding prevention messages. On the other hand, if a class has numerous conflicts or disruptions, classmates may not be engaged in social talk about prevention, or they may engage in social talk with lots of disagreement about the program. Because the characteristics of classes (e.g., all friends or many conflicts) in the US vary (National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network [ECCRN], 2003), and different sets of actors contribute to these class characteristics, each class can have different density or centrality. Thus, the following overall research questions will be addressed:

RQ2: What is the range of centrality (indegree and outdegree) in social-talk networks (positive vs. negative) in each class?

RQ3: What is the density in social-talk networks (positive vs. negative) in each class?

**Associations with other social networks.** Youth peer relationships are complex (Gifford-Smith & Brownell, 2003). As a result, social talk may be associated with other existing social networks; for example, youth may talk with classmates who are friends and/or leaders. The literature identifies at least three kinds of social networks: friendship, leadership, and liking (Gest et al., 2001; Lansford et al, 2009; Newcomb, Bukowski, & Patte, 1993).

Friendship, liking, and leadership networks reflect important, distinct social relations among youth (Gifford-Smith & Brownell, 2003). Friendship (e.g., Susan says John is her friend) is mutual and voluntary relations, while liking (e.g., Susan likes John) is viewed as peer
acceptance (Gest et al., 2001; Hartup, 1996). That is, friendship and liking networks are different because adolescents may not befriend those whom they like the most (Asher, Parker, & Walker, 1996; Bigelow, Tesson, & Lewko, 1996; Brendgen, Little, & Krappmann, 2000; Hoza, Molina, Bukowski, & Sippola,. 1995; Ladd, Kochenderfer, & Coleman, 1997; Parker, Saxon, Asher, & Kovacs, 1999). As a result, youth who are selected as the-mostLiked persons do not necessarily have the largest number of friends (Rodkin et al., 2000). Leadership connections (e.g., Susan identifies John as a leader in the classroom) also have unique information regarding youth’s peer relations, because they are more hierarchical (Pearce &Sims, 2002).

Friendship, liking, and leadership networks are likely to be associated with social-talk networks because individuals tend to engage in social talk with their close social relations (Brown & Reingen 1987; Gilly, Graham, Wolfinbarger & Yale 1998; Goldenberg, Libai & Muller 2001; Yale, Mary, & Gilly, 1995). Thus, the patterns of the youth’s friendship network may be similar to the youth’s social-talk network about the prevention program. However, a previous study (Wheeless & Grotz, 1976) showed that individuals are more likely to talk about negative information to intimate others. As a result, not only the association between positive and negative social-talk networks but also the association between social-talk networks and three types of networks are likely to be differently associated. Based on this reasoning, the following two overall research questions were posed:

RQ4: How much is the configuration of friendship, leadership, and liking social networks associated with the configuration of social-talk networks?

RQ5: How much is the configuration of positive social talk networks associated with the configuration of negative social-talk networks?

Predictors of Centrality in Social-Talk Networks
Youth’s centrality is likely to be consistent across networks. Given the fact that central people are more likely to express their opinions to others (Berdahl & Martorana, 2006), youth who are central in social-talk networks are likely to be central in other types of networks such as leadership, liking or friendship. Friendship, leadership and liking networks, like social-talk networks, have directional ties because A can nominate B as leader, but B may not nominate A as a leader. As a result, outdegree and indegree centrality will be relevant for these other social networks.

Centrality in friendship, liking, and leadership networks are likely to predict centrality in the social-talk network, due to social power, opportunity, and spurious factors. Youth who are mostly nominated by others as friends, leaders, or the-most-liked persons (e.g. indegree centrality) are more likely to engage in conversation than those who are less nominated by others. Individuals in more central positions in a network may have more opportunities to engage in social talk because they can have more social power than others (e.g., isolates) and these people can easily access resources and information (Burt, 2005; Buss, 1996; Chance, 1967; Derber, 1979; Eibl-Eibesfeldt, 1989; Ellis, 1993; French & Raven, 1959; Keltner, Young, Heerey, Oemig, &Monarch, 1998; Mazur, 1973; Operario & Fiske, 2001; Savin-Williams, 1979). Furthermore, youth who expand social relationship by nominating many others as friends, leader, or the-most-liked persons (e.g., outdegree centrality) probably find several opportunities to hang out with others so that they can maintain relationship with others. Consequently, youth with higher outdegree centrality face more chances to engage in social talk than those with relatively lower outdegree centrality because they can reach many others. Lastly, social talk about prevention interventions may be shaped by the fact that some individuals simply speak more than others, and may have high centrality in social-talk and social-relations networks.
(Boster et al., 2012; Feick and Price, 1987; Higie, Feick, & Price, 1987). Thus, centrality in social-talk and social-relation networks may be spuriously driven by talkativeness. Thus, following research question is posed:

RQ6: Is youth’s centrality (indegree and outdegree) in social networks (friendship, leadership, or liking) associated with their centrality in the positive or negative social-talk network?

**Do Adolescents’ Social Networks Predict Prevention Programs Outcomes?**

The overall question investigated in this study is whether adolescents engage in social talk about substance abuse prevention programs, particularly at the network perspective, and whether this social talk influences program outcomes. However, very little is known about the effects of social talk on substance abuse prevention outcomes. This is important for prevention science because social talk may shape important outcomes. The social influence model is one of the most prevalent theoretical bases for prevention intervention design (Botvin, 2000; Tobler et al., 2000). The model assumes that peer relationships and peer pressure are a key determinant of adolescent substance use and is one of the more powerful strategies (Tobler, et al., 2000).

Substance abuse prevention programs based on social influence models are expected to increase substance refusal self-efficacy and to correct personal norms toward substance use (Hansen & Graham, 1991). Substance refusal self-efficacy is defined as youth’s perception of ability to refuse substance offer (Carpenter & Howard, 2009; Bandura, 1977). Personal anti-substance norms are considered as one’s belief on of disapproval on substance use (Elek, Miller-Day, & Hecht, 2006; Cialdini et al., 1991). Norms often serve as proximal outcomes of prevention interventions (Crutzen, et al., 2009); self-efficacy is an indicator of effective program outcomes (Komro, Perry, Williams, Stigler, Farbakhsh, & Veblen-Mortenson, 2001). Previous
Empirical studies have showed that substance refusal self-efficacy (Choi, Krieger, & Hecht, 2013) and personal anti-substance norms (Elek, Miller-Day, & Hecht, 2006) were negatively related to substance use for youth. Thus, in this study, substance refusal self-efficacy and personal anti-substance norms are considered as two important program outcomes.

**Do network centralities in social-talk networks predict program outcomes?**

Social talk helps to form or enhance social beliefs (Sommerfeld, Krambeck, Semmann, & Milinski, 2007). As a result, adolescent social talk about programs may be associated with one’s normative beliefs toward prevention (e.g., “I believe that most youth in the school support the substance abuse prevention program.”) or relative topics (e.g., “Using substances is wrong.”). In addition, many substance abuse prevention programs focus on developing social and life skills (Flay, 1985; Tobler, et al., 2000; Botvin, et al., 1995; Komro, et al., 2001; Pentz, et al., 1989). Social talk can increase or decrease these skills through application and reinforcement. Thus, this study investigates: (1) whether youth who engage in positive or negative social talk regarding a substance abuse prevention program, and (2) how this social talk influences self-efficacy and perceived norms, which are proximal outcomes in most school-based substance abuse prevention programs (Hecht, et al., 2003; Botvin, et al., 1995; Komro, et al., 2001; Pentz, et al., 1989).

In addition, many studies have shown that social talk is positively associated with knowledge (Bennett, Flickinger, & Rhine, 2000; Kim, Wyatt, & Katz, 1999; Lenart, 1994; Scheufele, 2000, 2002). Because refusal self-efficacy comes from “knowledge” about how to refuse substance offers, speakers who engage in positive social talk about a prevention program probably have higher refusal self-efficacy. Although there are some adolescents who mostly listen to what others say, this positive message can “reinforce” recipients’ communications, which, in turn, enhances self-efficacy. On the other hand, speakers who engage in negative social
talk may have lower refusal self-efficacy because they may not be interested in refusing substance offers, may have positive attitude toward substance use, or may have a strong intention to use. The listeners in negative social talk about kiR may have low self-efficacy because the listeners are friends of speakers and they may have a similar degree of self-efficacy. That is, youth intend to engage in negative social talk with their friends because they know their friends think prevention program is useless as well. Thus, the following hypotheses were offered:

*Hypothesis 1*: Youth who have higher a) indegree or b) outdegree centrality in positive social-talk network will have higher refusal self-efficacy.

*Hypothesis 2*: Youth who have higher a) indegree or b) outdegree centrality in negative social-talk network will have lower refusal self-efficacy.

Previous research illustrated that social talk shapes peoples’ attitudes, opinions, and norms (Fraser, Gouge, & Billig, 1971; Stoner, 1968; Moscovici & Zavalloni, 1969; Turner, 1991). In general, individuals do not talk about something disapproved by society because it is “taboo” (Walter, 1991). When individuals positively and publicly state opinions about a certain topic, they believe that opinion is approved by others. Furthermore, when they support a certain topic, they are more likely to speak about it (Bone, 1992). Also, when individuals are against a certain opinion or products, they tend to express their own opinions (Bone, 1992). In a similar vein, youth who mostly engage in positive social talk about a prevention program have strong personal anti-substance norms because they support the substance abuse prevention program. Also, it is possible that young listeners are influenced by these speakers through conversation because these listeners learned what other people think about program. In turn, these listeners are more likely to believe that substance use can be approved or disapproved by others depending on
the speaker’s valence of message (e.g., positive vs. negative conversation). Thus, the following hypothesis was posed:

*Hypothesis 3*: Youth with higher a) indegree or b) outdegree centrality in the positive social-talk network will have higher personal anti-substance use norms.

*Hypothesis 4*: Youth with higher a) indegree or b) outdegree centrality in the negative social-talk network will have lower personal anti-substance use norms.

**Are network centralities in friendship, liking, and leadership networks associated with program outcomes?**

In addition to centrality in social-talk networks, centrality in friendship, liking and leadership can be associated with program outcomes because an individuals’ position in the networks also influence self-efficacy and perceived norms. Many previous studies have reported that youth with higher centrality are more likely to be vulnerable in terms of substance use (Valente, Unger, & Johson, 2005; Santor Messervey, & Kusumakar, 2000; Alexander Pizza, Mekos, & Valente., 2001; Killeya-Jones, Nakajima, & Costanzo, 2007) because these youth can experience more peer pressure (Michell, 1997; Michell & Amos, 1997; Alexander, et al., 2001). Also, youth in central positions can play a substantial role in peer-led prevention programs (Cuijpers, 2002). Regardless of social talk, centralities in friendship, liking and leadership networks can be associated with program outcomes.

Youth with centralized positions (e.g., high outdegree/indegree centrality) in peer relationship networks (e.g., liking, friendship, leadership) are likely to have higher substance refusal self-efficacy regardless of participation in prevention program because of their social power. Youth with high indegree centrality can be considered socially powerful because many others think of them as “leaders”, “friends” or “the-most-liked persons.” Since power is likely to
be unevenly distributed, these youth have higher social standing than others. Because individuals with greater social power can control influence (Georgsen & Harris, 2006), they are more likely to pursue their own interests (Anderson & Berdahl, 2002; Galinsky, Gruenfeld, & Magee, 2003) and are less likely to be interrupted by others (Keltner, Young, Heerey, Oeming, & Monarch, 1998). As a result, youth with high indegree centrality are more likely to be confident about their ability to refuse substance offers.

Conversely, youth with high outdegree centrality may have low social power because they have to establish and keep their relationships with others (Torrance, & Mason, 1956). When person $i$ wants to be closer to person $j$ because of $i$’s attraction to $j$ (e.g., liking), $i$ has less social power than $j$ (French & Raven, 1959). Due to their lower social power, youth with high outdegree centrality may feel more peer pressure on substance use and they may not easily perceive to refuse substance offer. Thus, the following hypotheses were posed:

**Hypothesis 5:** Youth who have higher indegree centrality in a) friendship, b) leadership, and c) liking networks will have higher substance refusal self-efficacy.

**Hypothesis 6:** Youth who have higher outdegree centrality in a) friendship, b) leadership, and c) liking networks will have lower refusal self-efficacy.

In addition, degree centrality in youth’s social networks is likely to be associated with personal anti-substance norms. Individuals learn normative beliefs through observation of other people’s behavior (Cialdini, Reno, & Kallgren, 1990). Personal norms function to the extent that individuals feel personally tied to behaviors that seem to be broadly supported by society (Miller & Prentice, 1996; Sherif, 1936). Previous studies illustrated that certain social positions based on degree centrality influence normative beliefs (Paluck & Shepherd, 2012; Fagyal, Swarup, Escobar, Gasser, Lakkaraju, 2010). Although research on the association between personal anti-
substance use norms and degree centrality has been less developed, youth with high indegree centrality are more likely use substances (Valente, et al., 2005). In addition, youth with high indegree centrality in schools where substance use is prevalent were more likely to use substance than those in low prevalent substance use of schools (Alexander et al., 2001). Besides, because youth with high outdegree centrality want to develop and maintain their relationships and have more opportunity to learn peer norms, they may have higher personal anti-substance norms.

Thus, I propose the following research questions:

**RQ7**: Do youth who have higher indegree centrality in a) friendship, b) leadership, c) and liking networks have lower personal anti-substance norms?

**RQ8**: Do youth who have higher outdegree centrality in a) friendship, b) leadership, and c) liking networks have higher personal anti-substance norms?

**Method**

**Overview of design**

The data were collected to examine adolescent social networks and substance use. An intervention based on the keepin’ it REAL (kiR) curriculum (Hecht et al., 2006; Hecht et al., 2003) was implemented. Eighth grade students in a middle school located in rural Pennsylvania participated in a version of kiR and then completed an online posttest including the relevant variables.

**Background into the kiR Program.** “keepin’ it REAL” is a middle school substance abuse prevention curriculum that is one of the few evidence-based multicultural programs listed on Substance Abuse and Mental Health Services Administration (SAMHSA)’s national registry of evidence-base programs and practices(www.nrepp.samsha.gov). The highly interactive curriculum is based on the social influence model (Tobler & Stratton, 1997).
The program focuses on four substance refusal strategies: 1) Refuse (simply saying no), 2) Explain ("giving an explanation"), 3) Avoid ("avoiding the situation") or 4) Leave ("leaving the situation") based on the findings in previous research across a wide range of adolescents (Alberts et al., 1991, 1992; Hecht et al., 1992; Miller-Day et al., 1998; Miller-Rassulo et al., 2000; Moon, Hecht, Jackson, & Spellers, 1999; Trost et al., 1999). The REAL, acronym, is based on these four strategies. The teacher-led prevention curriculum also teaches risk assessment, decision making, social support, and conflict resolution. In a randomized clinical trial conducted in 35 middle schools in Phoenix, Arizona, kiR was found to be successful in reducing substance use (Hecht et al., 2006; Hecht et al., 2003), even among those who had initiated substance use prior to the pretest (Kulis, et al., 2007).

In the present study, researchers implemented a short version of kiR, which taught the core components of the intervention through five narrative videos that teach communication and relationship skills, impart norms. The first video gives an overview of programs and the other focus on a single resistance skill and norms. The videos are produced by local high school students (Colby et al., 2013) and include substance resistance stories and students’ interviews regarding resistant skills. Since stories in media content help to increase self-efficacy and to correct perceived norms (Moyer-Gusé, 2008), watching videos can lead to positive outcomes such as higher substance resistance self-efficacy and lower substance-related personal norms. A quasi-experimental study shows that these five lessons, alone, appear to produce independent effects (Warren, et al., 2006).

**Participants**

A total of 185 8th graders in 10 classes at one middle school were recruited in rural Pennsylvania. Most of the participants were Caucasian (90.3.1%), with small numbers of African
Americans (1.6%), Native Americans (1.6%), Asian Americans (1.6%), and unidentified others (5%). Half were female students. The ages of the participants ranged from 13 to 15 years old ($M = 13.76$, $SD = 0.45$, Median = 14).

Procedure

Before administrating the online survey, parental consent and student assent were obtained. Students then watched the videos over five days. There was no formal class discussion after watching the videos. A few days after participants watched the last video, the survey was administered. A survey research center prepared linking information sheets containing each consented student’s name and with a unique URL to access the online survey and sent it to the study manager. The survey manager tore off the unique URL code and offered this to each student. This login procedure ensured continuity in tracking consented students. To insure the confidentiality of responses students sat at their own computers in the school library or computer lab where others could not view the screen and entered the unique URL code they were given by the manager.

Measurements

Demographic information such as gender, age, and ethnicity was measured. Network data were collected by providing a list of everyone in the class and using a single network question for each type of relational network (e.g., Ibarra, 1992, Borgatti & Cross, 2003). For each network question, binary indicators were employed (presence: 1 vs. absence: 0). Students nominated as many as other students they wanted for each network type. All measurement indicators are shown in Appendix A.

Network Matrices. Students were provided a roster of everyone in the classroom. Friendship, liking, and leadership relationships were assessed by having students indicate who
they: a) considered friends, b) liked the most, and c) considered the best leaders for a class project. For positive social talk, adolescents were asked to indicate which of their classmates had talked with them about kiR positively. For negative social talk, youth were asked to indicate which of their classmates had made fun of KiR. For all network measures, adolescents could mark as many students as they thought appropriate for all five matrices.

**Network density.** Network density was calculated for each network as the total number of social talk ties divided by the total number of possible ties (Wasserman & Faust, 1994).

**Actor degree centralities.** Youth indegree and outdegree centralities were calculated for each network type. Outdegree centrality was based on the number of classmates a youth nominated for a given matrix. Indegree centrality was based on the number of other classmates who nominated each youth (Wasserman & Faust, 1994). UCINET was used to calculate degree centrality and density for each matrix. The data for negative and positive social talk reflect whether the youth indicated that s/he heard any type of conversation with particular classmates. Due to how the questions were asked, indegree centrality for social talk (the number of classmates who said that a given youth had talked with them about KiR) indicates speakers, whereas outdegree centrality reflects listeners. Degree centrality estimates were standardized by dividing the network size (e.g., the number of classmate each class) (Wasserman & Faust, 1994). For easy interpretation, centrality estimates were multiplied by one hundred. For instance, 20 referred to 20% of classmates indicated youth i was involved in social talk. For outdegree centrality, zero indicated that youth i did not listen to anyone’s social talk whereas one hundred denoted that youth i reported everyone else in his or her class engaged in social talk. For indegree centrality, zero indicated no one reported that youth j talked about kiR whereas one hundred meant that everyone reported that youth j talked about kiR.
**Alcohol refusal self-efficacy.** Four items for alcohol refusal self-efficacy were modified based on previous research (Moon, et al., 1999; Hecht & Miller-Day, 2009; Miller, Alberts, Hecht, Trost, & Krizek, 2000; Pettigrew, Miller-Day, Hecht, & Krieger, 2011). The following scenario was given: “Suppose someone you know offered you a drink of alcohol, and you did not want it. How easy would it be for you 1) to refuse it, 2) to explain why you didn’t want it, 3) to avoid the situation in the first place, and 4) to just to leave the situation?” A 4-point response was used (1 = very easy to 4 = very hard). These items were recoded such that higher scores indicated greater efficacy in order to facilitate interpretation ($M = 3.29, SD = 0.74, \alpha = .83$).

**Personal anti-substance norms.** Three items were used to measure personal anti-substance norms (Hansen & Graham, 1991). Students answered the following questions: “How wrong do you think it is for someone your age to 1) drink alcohol regularly (beer, wine, or hard liquor), 2) use tobacco (cigarettes, chewing tobacco), and 3) smoke marijuana.” Four-point response scales were used (1 = no, not at all to 4 = very wrong). Higher scores indicated greater personal anti-substance norms ($M = 3.53, SD = 0.72, \alpha = .82$).

**Analytical Plan**

For RQ1, mean, standard deviation, skewness, kurtosis, and histogram of centrality in positive and negative social talk network were calculated. Although social-talk networks had directionality, by considering only social-talk ties not considering direction of ties, social-talk networks were made symmetrical in order to answer only RQ1, whether adolescent engage in social talk about prevention program or not. For RQ2 and RQ3, density and centrality were calculated with UCINET, separately. For RQ4 and RQ5, Quadratic Assignment Procedures [QAP] correlation was employed because QAP calculates correlation coefficient between relations in two matrices. QAP correlation tests whether the association between two networks is
statistically significant by a method involving at least 1,000 permutations. Each classroom had their own QAP correlation among matrices. QAP correlation ranges from -1 (exactly reverse relation and opposed direction) to 1 (exactly same relations with same direction). For instance A liked B and C, but B didn’t like A and C and C didn’t like A and B. Furthermore, A indicated B and C as friends, but B and C did not indicated A as a friend and B and C did not think they were a friend to each other. In this case, the QAP correlation between liking and friendship network become 1. On the other hand, A did not indicated B and C as a friend but B and C indicated A as a friend. In addition, B and C thought they were friends to each other, QAP correlation for the liking and friendship networks become negative one.

Meta-analysis using the comprehensive meta-analysis Version 2 developed by Biostat was used (Borenstein, Hedges, Higgins, & Rithstein, 2005) because it provides the average correlations by combining the findings from different cases (e.g., classes) to test claimed (e.g., hypothesized) associations between two relationship (e.g., friendship and negative conversation) (Hunter et al., 1982). Before answering RQ4, the association among three peer relationships networks was calculated. Table 4 shows the associations among friendship, liking and leadership networks for each class and the average correlations. None of the average associations was significant, indicating these network structure were independent.

For RQ6, robust regression in UCINET (Borgatti, Everett, and Freeman, 2002) was computed. Standard inferential statistics (e.g., ordinary least square approach) cannot be used for dependent data because they assume “independent observations” (Hanneman & Riddle, 2005). Particularly, data independency can lead to inappropriate standard error which inflates Type I error and overestimates “significant” effects (Kenny et al., 2006; Murray, 1998). In UCINET, robust regression takes a bootstrapping and permutation approach. The standard errors derive
from a sampling distribution that is produced from thousands of permutations of observed data, assuming the null hypothesis is true (Hanneman & Riddle, 2005). Because there are four dependent variables (i.e., indegree/outdegree in positive/negative social-talk networks), four separate robust regressions were conducted to answer RQ6.

For H1 to H6 and RQ7 and 8, hierarchical linear regression was computed. Even though there are 10 classes at a school, refusal self-efficacy and personal anti-substance norms did not significantly vary across classes (p > .05). Instead, which of two teachers taught these classes was included as a dummy variable. Also, lifetime alcohol experience (0 = no experience vs. 1 = experience) and gender were included in these models as covariates. For H1, H2, H5, and H6, multiple linear regression was employed including all variables: indegree/outdegree centrality in friendship, liking, leadership, positive and negative social-talk networks to examine the association with refusal alcohol self-efficacy. Because the dependent variable (e.g., personal anti-substance norms) is the same for H3-H4 and RQ7-8, all independent variables (e.g., indegree/outdegree centrality in friendship, liking, leadership, positive/negative social talk) were include in one regression model. Table 9 showed the estimates, standard errors, and t-values for these two multiple regression models.

Results

RQ1: Existence of Social Talk on kiR

RQ1 asked whether youth engaged in positive or negative social talk about the prevention program they experienced in their classroom. Figures 1 and 2 show that youth engaged in both positive and negative social talk. For negative social talk (see Figure 1), centrality was positively skewed (see Table 1). Almost half of youth (N = 94) reported they engaged in negative social talk about kiR with less than 20% of their classmates. In other words, in general, negative talk
was concentrated among relatively few people. Interestingly, however, certain youth engaged in negative social talk with almost all of their classmates (80-100 centrality). It appeared that negative social-network was centralized \( M_{\text{centralization}} = 66.52, SD = 16.81 \).

\textit{Figure 1}. Frequency of centrality in the negative social-talk network

On the other hand, for positive social talk (see Figure 2), the distribution of centrality estimates was bimodal. Approximately one third of the youth \((N = 53)\) engaged in positive social talk with between 40 and 60\% of their classmates. Another third \((N = 54)\) engaged in positive social talk with almost all their classmates (80-100 centrality).

Overall, the findings show that youth do engage in social talk, answering RQ1, and more youth engage in positive social talk than negative social talk. The discussion turns to RQ2 and 3 that specifically address each class’ social-talk networks.

\textbf{RQ 2 and 3: Social-Talk Centrality and Density}

RQ2 addressed youth’ outdegree and indegree centrality in positive and negative social-talk networks. The outdegree centralities ranged from 0 to 100 in almost every classroom, and both the positive and negative social-talk networks. Thus, there were youth in each classroom who did not report being involved in a negative or positive conversation about kiR (listening; minimum centrality = 0). The ranges for outdegree centrality in negative social-talk network were mostly 100 except for class 3 and 4. Because classroom 3 and 4 had relatively low density, it was suspected that some youth in these classes had never engaged in negative social talk. Ad hoc analysis using NetDraw showed that there were three youth in class 3 and six students in class 4 who did not engage in negative social talk, respectively.

Unlike the ranges for outdegree centrality in social-talk network, ranges for indegree centrality in both positive and negative social-talk network varied across classes and showed more small ranges, indicating that youth were more likely to remember who talked about kiR.
positively or negatively. Although ranges for indegree centrality in negative social-talk network and ranges for indegree centrality in positive social-talk network had similar values, the maximum and minimum values for ranges of indegree centrality in positive social-talk network were usually greater than those in negative social-talk network. In general, more youth were identified by classmates as talking about kiR positively than were identified as talking negatively.

RQ3 addressed the density of social-talk each class from 100% (i.e., all youth engage in social talk with all of their classmates) to 0% (i.e., no one talked with anyone). Density of social-talk networks varied across classrooms (see Table 2). Even within a classroom, densities for positive social-talk network and for negative social talk differed. On average, 32% of possible inter-classmate conversations occurred about KiR positively ($SD = 14.56$), which was double the amount of negative conversations ($M = 16.06\%, SD = 7.95$). The findings suggest that social-talk networks are not very dense.

**RQ 4 and 5: Associations with Other Social Networks**

RQ4 addressed whether the pattern of friendship, leadership, and liking ties were related to the pattern of positive or negative social-talk ties. Across classrooms, the ties between youth in the friendship network were not significantly related to those in the positive social-talk, $r = .14, z = 1.75, p = .08$ or negative social-talk networks, $r = .05, z = 0.67, p = .50$. These effect size were homogenous, $Q(9) = 2.63, p = .98$ and $Q(9) = 2.93, p = .97$ across classrooms. In addition, there were no significant associations between ties in the leadership and positive social-talk network, $r = .10, z = 1.26, p = .21$, or negative social-talk network, $r = -.01, z = -0.09, p = .93$. These associations were consistent across classrooms, $Q(9) = 1.08, p = 1.00$ for positive social talk and $Q(9) = 1.08, p = 1.00$ for negative social talk, respectively. Furthermore, there were no
associations between liking and positive social-talk network, \( r = -.03, z = 0.42, p = .68 \) and negative social-talk network, \( r = -.00, z = -0.05, p = .96 \). These associations were homogenous \( Q(9) = 0.70, p = 1.00 \) for positive social-talk and \( Q(9) = 2.63, p = 0.98 \) for negative social-talk. The (lack of an) association between the ties in the liking and social-talk networks was consistent across classrooms.

RQ5 addressed the association between the ties between classmates in the positive and negative social-network structure. There was negative association between ties in the two social-talk networks, \( r = -.17, z = -2.75, p < .05 \), indicating two possibilities. First, while youth engaged in both positive and negative social talk, some listened to one type of social talk (e.g., positive) and while speaking about the other type (e.g., negative). For example, A reported B and C talked about kiR negatively whereas B and C reported A talked about kiR positively. As a result, A, B, and C were all engaged in both positive and negative social talk but had different roles. A second possible interpretation is that some youth did not talk about kiR negatively, only positively or vice versa. The association was homogenous, \( Q(9) = 4.62, p = .87 \), indicating that there was no substantial moderation of this association.

**RQ6: Associations among Networks**

RQ6 asked whether youth with greater indegree or outdegree centralities in friendship, leadership, or liking networks predicted participation (e.g., indegree/outdegree centrality) of positive or negative social talk. Four robust regression was conducted, one for each dependent variable (positive/negative and indegree/outdegree centrality). The results of these analyses are reported in Table 5.

First, outdegree centrality of positive social-talk network was predicted from outdegree and indegree centralities for leadership, liking and friendship networks. The overall model was
not significant, \( F(6, 179) = 2.59, p = .06, \text{ adjusted } R^2 = .04 \). The model did not fit the data even though outdegree centrality in friendship network was positively associated with outdegree centrality in positive social-talk network, \( b = 0.44, p < 0.01 \). Thus, social network centralities of liking, friendship, and leadership networks did not predict how many classmates youth reported as positive speakers on KiR.

Second, outdegree and indegree centralities for leadership, liking and friendship network predicted indegree centrality of positive social-talk network. The overall model was significant, \( F(6, 179) = 2.72, p < .05, \text{ adjusted } R^2 = .05 \). Indegree centrality in friendship networks was positively associated with indegree centrality in positive social-talk networks, \( b = 0.16, p < 0.05 \). The youth who were nominated as friends by more classmates were more likely to be identified as positive-speakers by their classmates.

Third, outdegree in negative social-talk was not predicted by the six independent variables (two centralities x three peer relationships), \( F(6, 179) = 2.05, p = .12, \text{ adjusted } R^2 = .03 \). The models did not fit the data although the outdegree centrality in friendship network was positively associated with outdegree centrality in negative social-talk network was significant, \( b = 0.27, p < .01 \). Thus, social network centralities did not predict how many classmates they reported as talking to them negatively about KiR.

Fourth, the overall model predicting the indegree centrality in negative social-talk network with the total six centralities (outdegree/indegree centrality x three peer relationships: liking, leadership and friendship) was significant, \( F(6, 179) = 3.25, p < .05, \text{ adjusted } R^2 = .06 \). However, none of predictors were significant. This suggests that six centralities did not predict indegree centrality in negative social-talk network.

**Refusal self-efficacy: Hypothesis 1, 2, 5, and 6**
H1, H2, H5 and H6 were considered together because they had the same distal outcome, refusal self-efficacy. The model including two types of centrality (e.g., indegree/outdegree centrality) in five networks (e.g., friendship, leadership, liking, positive social-talk and negative social-talk) as independent variables and the refusal self-efficacy as dependent variable was significant, $F (13, 168) = 3.13, p<.001, R^2=.19, Adj R^2=.13$.

H1 predicted that youth with higher indegree or outdegree centrality in positive social talk network would report higher refusal self-efficacy; H2 predicted that youth with higher indegree or outdegree centrality in negative social talk network would report lower refusal self-efficacy. Indegree or outdegree centrality in positive or negative social-talk networks were not significant predictors for refusal self-efficacy. That is, whether youth talk more or less about prevention program either positively or negatively, they reported the similar degree of refusal self-efficacy. Also, listening to positive or negative social talk on kiR was not significantly related with refusal self-efficacy. Consequently, the data were not consistent with H1 and H2.

H5 predicted that indegree centrality in friendship, leadership, or liking networks would be positively related to refusal self-efficacy. None of these variables were significant predictors, indicating whether youth more or less nominated as friends, leaders or the-most-liked persons did not necessarily report the different degree of refusal-self-efficacy. In other words, receiving many peer-nomination from their classmates did not predict refusal self-efficacy. That is, the data were not consistent with H5 either.

H6 predicted that outdegree centralities at three peer relationships (e.g., friendship, leadership, and liking network) were negatively associated with refusal self-efficacy. However, none of these variables were significantly related, indicating that adolescent with higher outdegree centrality at these three peer relationship did not have significantly lower refusal self-
efficacy. In other words, sending many peer-nominations for their classmates did not necessarily explain their refusal self-efficacy. Thus, the data were not consistent with H6 as well.

**H3-H4 and RQ7-RQ8: Personal anti-substance norms:**

Due to the same distal outcome, personal injunctive anti-substance norms, H3, H4 and RQ7-RQ8 were considered together. The overall model including two types of centrality (e.g., indegree/outdegree centrality) in five networks (e.g., friendship, leadership, liking, positive social-talk and negative social-talk) as independent variables and the personal anti-substance norms as the dependent variable, was significant, $F (13, 171) = 8.66, p < .001, R^2 = .40, Adj R^2 = .35.$

H3 predicted that adolescents that more frequently a) received indegree or b) sent outdegree in positive social talk on kiR were more likely to have stronger personal anti-substance norms. Indegree centrality in positive social talk significantly reported stronger personal anti-substance norms ($b = 0.71, se = 0.34, t = 2.06, p < .05$) whereas outdegree centrality was not significantly associated with personal anti-substance norms. It indicated that youth who positively talked about prevention program have stronger personal anti-substance norms. However, listening to positive things about prevention program was not associated with one’s perceived norms against substance use. Thus, the data were partially consistent with H5.

H4 predicted that youth who had higher a) indegree or b) outdegree centrality in negative social talk network would have weak personal anti-substance norms. Outdegree centrality was not a significant predictor for personal anti-substance norms, indicating that youth who frequently reported as listeners in negative social-talk network did not have weak personal anti-substance norms. However, indegree in negative social talk was marginally significant, ($b = -0.92, se = 0.47, t = -1.97, p = .05$), indicating that youth nominated as speakers in negative
social talk by more classmates were less likely to have strong anti-substance norms. Hence, the data were partially consistent with H6.

RQ7 asked whether adolescents with higher indegree centrality in a) friendship, b) leadership, or c) liking networks were less likely to have personal anti-substance norms. The finding showed that indegree centrality in leadership network was a significant predictor of personal anti-substance norms, $b = 0.80, se = 0.30, t = 2.64, p < .05$ (See Table 9). That is, those nominated by more students as the best leaders were more likely to report stronger personal anti-substance norms. However, youth who were nominated by more students as friends or the-most-liked persons did not show higher personal anti-substance norms. Having many friends in a network or being liked by many classmates might not predict personal anti-substance norms.

RQ8 inquired that youth with higher outdegree centrality in a) friendship, b) leadership, or c) liking networks were more likely to have strong personal anti-substance norms. Outdegree centralities across these three networks were not significantly associated with personal anti-substance norms (See Table 9). That is, adolescent who nominated many classmates as their friend, leaders or the-most-liked persons did not report stronger personal anti-substance norms. Youth sending many peer-nominations to their classmates might not be sensitive to peer influence, particularly, substance use.

**Discussion**

This study is one of the first to conceptualize social talk about prevention program as an essential implementation process. It is argued that successful intervention should engage participants, resulting in social proliferation or talk (Larkey & Hecht, 2010). Instead of treating such talk as contamination, the current study begins to articulate a model and method for considering social talk as a normal part of prevention implementation.
The model used to accomplish this goal is social network analysis. While networks have been used to examine substance use (e.g., Valente, et al., 2007), it has rarely been used to examine the implementation process and program effects. From this perspective, the current study examined: 1) whether adolescent’s social talk about prevention program existed, 2) the patterns of these social-talk networks, 3) whether adolescents’ peer relationship networks (e.g., friendship, leadership, liking) were related to positive/negative social talk networks and 4) whether degree centralities in these networks were related to refusal self-efficacy and personal anti-substance norms.

**Social talk on keepin’ it REAL**

It is clear that that youth do, indeed, engage in social talk and that they engage in more positive social talk about *keepin’ it REAL* than negative social talk (RQ1 & RQ3). It appears to be unique patterns of these social talk: 1) there may not have many reciprocated negative social-talk ties whereas many reciprocated positive social-talk ties and 2) youth who negatively talked about kiR and youth who positively talked about kiR probably differed. Further support for this view comes from the finding that configurations of positive and negative social-talk network were negatively associated (RQ5) and correlations among indegree and outdegree centrality in positive and negative social-talk networks (See table3). Thus, it appears that opinions were fairly consistent, with more participants disliking the curriculum and smaller, subgroup who was at least somewhat negative (i.e., only engaged in negative social talk). One prevention implication would be to design a feedback system to identify those engaging in negative social talk in order to target them with a different style of prevention message.

These findings are consistent with the narrative engagement model on which kiR is based that assumes positive talk results when engagement is high (Miller-Day & Hecht, in press). It is,
however, possible that youth engage in negative social talk only with a small number of very close friends. In general, individuals tend to talk about negative things only within their intimate relationships (Wheeless & Grotz, 1976). Thus, negative social talk may have been suppressed because it was considered inappropriate to be negative among the general class relationships. However, previous literature showing that individuals who are satisfied with their products or service engage in positive social talk (Ranaweera, & Prabhu, 2003) suggests the kiR videos were successful in engaging most of the participants (Miller-Day & Hecht, in press) and that this led to positive social talk.

A third salient finding was that certain youth were more likely to engage in either positive or negative social talk than others. It was consistent with previous literatures, which were some individuals were more likely to talk about products or services than others (Feick and Price, 1987; Higie, Feick, & Price, 1987, Carl, 2006). Interestingly, “popular” students (e.g., higher friendship nomination by classmates) were more likely to have positive social talk about the prevention program. These popular students probably had greater social power than others. Previous studies showed that persons who had strong social power were more likely to state their opinion than their counterparts (Berdahl & Martorana, 2006). Social power probably helps youth to tell their opinions to others. This finding merits further examination.

The findings for other aspects of the social network analyses were mixed. First, the study was concerned with whether network positioning was related to positive and negative social talk. Analyses show that popular youth were more likely to engage in positive social talk (RQ6). Furthermore, youth who were indicated as leaders by their classmates tended to have higher personal anti-substance norms (RQ7). Other comparisons, including those for centrality were not significant.
It is noteworthy, however, that the entire structure of friendship, leadership, and liking networks were not associated with the entire structure of negative or positive social talk on kiR. There were two possible explanations about the finding. First, youth with relational ties such as friendship, leadership, or liking might have different perceptions of the prevention program. If two friends with different evaluations of kiR discussed the “prevention program”, one would speak positively about it while the other spoke it negatively. This would result in the null findings. Second, the method only measures active involvement in conversations. Some youth probably overheard conversations regardless of their relationship (e.g., friendship). Because they were all classmates, there is a high probability of this occurring. If the overheard conversations were among people with no relational ties with them it would explain the null findings.

The centralized youth in peer networks are positively associated with program outcomes. The paper turns, next, to a more detailed discussion of the practical implications of these findings as well the limitations of the study.

**Practical and Theoretical Implication**

This study supported the viability of peer-lead programs (Cuijpers, 2002). Peer leaders can play an important role in prevention program. Particularly, the more youth were nominated as leaders, the stronger the personal anti-substance norms they reported. Several studies showed that leaders can help change normative beliefs (Fagyal, et al., 2010). Because correcting youth’s personal norms is one of important lessons in successful prevention programs (Hansen & Graham, 1991), utilizing these leaders can help to form or correct personal anti-substance norms for youth, which, in turn, increases the effectiveness of prevention program.

In addition, “popular” students (e.g., highly nominated as friends by others) also can help to increase the effect of prevention program. The findings showed that popular students were
more likely to play a role as a positive speaker in social talk about prevention program. Besides, these speakers reported strong personal anti-substance norms. Normative beliefs can be learned through direct observation including communication behaviors (Cialdini, Reno, & Kallgren, 1990). For example, belief that smoking behavior was approved by peers was spread out through adolescent social network (McAlister et al., 1984). Thus, one prevention implication is to identify these popular students for inclusion in classroom activities so that the prevention messages are more likely to proliferate.

This finding is important because it suggests an approach to measuring program design effects by examining social talk. If health messages are designed to be engaging they should result in such talk and the present study provides a model for examining these effects. Variations in the amount positive and negative social talk existed across classes (RQ2 & 3), indicated that, like implementation quality, the degree of engagement may vary by not only implementer but also other factors. It should be further examined what other aspects (e.g., class climates) can influence social talk.

Limitations and Future Directions

This study should be carefully interpreted due to several limitations. First of all, the data did not include every 8th grader (20% missingness) in the middle school. That is, some “important” youth could be removed from the dataset. Although degree of centrality is less influenced by missingness (Valente et al., 2005), it was possible that size of associations could have been suppressed.

Second, social talk can occur under one-to-one situations or one-to-multiple people situations. This study did not differentiate these situations. That is, the measurement including question instructions did not allow youth to distinguish between dyadic conversation and and
those in which everyone witnessed someone broadcasting his or her opinion about KiR. Depending on this situation, the interpretation and peer influence may change and thus future research is required. Furthermore, this study did not examine reciprocated relationships or triangle relationships. These types of relationship can influence program distal outcomes.

Third, the characteristics of participants should be considered. Given the fact that relatively low prevalence of substance use in middle schools (Johnston, O'Malley, Bachman, & Schulenberg, 2010), both the leaders and popular students were likely to have stronger personal anti-substance norms. However, this finding can be different with students in high schools which have a high prevalence rate of substance use.

Fourth, because network item was measured with a single item, measurement error exists in some degree. Although some scholars have questioned the validity of using a single network question to measure a theoretical concept (e.g., Rogers & Kincaid, 1981), Marsden (1990) argued that the single network question method appears “appropriate in light of what is known” (p.456). Nevertheless, measurement error in single item should not be disregarded.

Finally, the use of cross-sectional data collected in a post-test only research design may have limited the findings. For instance, merely listening to others’ opinions may not be related with one’s normative beliefs. However, by listening to similar ideas several times, individuals can change. As a result, a longitudinal study is needed to understand whether listeners can change their normative beliefs over time.

Furthermore, post-test research design provides limited information about causality. It is possible that popular student were more likely to talk positively about the prevention program and their engagement in these positive social talk enhances their personal anti-substance norms. That is, positive social talk can function as a mediator to understanding norms. However, it is
also possible that popular students might have talked positively about the prevention program because they already had positive personal norms against substance use. Another possibility is that because of strong anti-substance norms, youth were more likely to talk about prevention program positively and because of their speech, they could be more popular. Although it is extremely difficult to make inference causality with network data (Sgakuzu & Thomas, 2011), further studies are required to understand these relationships.

**Conclusion**

This study examined the concept of social talk, and the role of adolescents’ social networks in relation to a substance abuse prevention program delivered in a middle school. The clearest and strongest finding was that both positive and negative social talk about kiR existed and that positive social-talk was more frequent. These findings support the idea that program participants actively process prevention interventions through social channels and suggest that both intervention and evaluation designs should take these informal conversations about prevention programs into account. In addition, the structures of positive social-talk and negative social-talk networks were negatively associated. While individual participants did not express two conflicting emotions toward the program, two clear subgroups emerged: positive social-talkers and negative social-talkers. This suggests that targeted interventions should be addressed to those engaging in negative talk.

Youth who received more nominations as friends from their classmates tended to talk about kiR positively. In addition, youth who positively talked about kiR were more likely to report personal anti-substance norms. In contrast, speakers in negative social talk on kiR were less likely to have personal anti-substance norms. Finally, youth who were selected as the best class leaders were more likely to have personal anti-substance norms. While the causal direction
of these relationships could not be determined, they suggest that adolescents’ network positions might be important for successful peer-led interventions.
Table 2.1.

*Descriptive Statistics for Centrality in Negative and Positive Social-talk Networks*

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</table>
Figure 2.1: Frequency of Centrality in Negative Social-talk Network
Figure 2.2. Frequency of Centrality in Positive Social-talk Network
Table 2.2.

*Density and Indegree and Outdegree Centrality in Positive and Negative Social-talk Network Each Class*

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<td>23%</td>
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*Note. C: Class, D: Density, IR: Indegree centrality range, OR: Outdegree centrality range, Mim: minimum value, Max: Maximum value*
Table 2.3.

*Mean, Standard Deviation, and Correlations for Each Variable*

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<th>FRI</th>
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<th>NCI</th>
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<th>SE</th>
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<td>0.3***</td>
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<td>0.37***</td>
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<td>0.12</td>
<td>0.37***</td>
<td>0.35***</td>
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<td>0.08</td>
<td>0.23**</td>
<td>-0.08</td>
<td>-0.27***</td>
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<td>0.07</td>
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<td>-0.11</td>
<td>0.15*</td>
<td>0.30***</td>
<td>0.03</td>
<td>-0.32***</td>
<td>-0.44***</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* BLO: outdegree in class-project leader network, BLI: indegree in class-project leader network, LMO: outdegree in the most liked network network, LMI: indegree in the most liked network, FRO: outdegree in friendship network, FRI: indegree in friendship network, NCO: outdegree in talking about kiR negatively network, NCI: indegree in talking about kiR negatively network, PCO: outdegree in talking about kiR positively network, PCI: indegree in talking about kiR positively network, SE: refusal self-efficacy, PN: anti-substance personal norms. * < .05, ** < .01, *** < .001.
Table 2.4.

Meta Analysis Results: Associations among Friendship, Leadership, and Liking

<table>
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<tr>
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<th>Leadership and Liking</th>
<th>Friendship and Liking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>N</td>
<td>r</td>
</tr>
<tr>
<td>---</td>
<td>-------</td>
<td>---</td>
<td>-----</td>
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<tr>
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<tr>
<td>10</td>
<td>18</td>
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<td>-0.05</td>
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</tbody>
</table>

Note. C: class, LL: lower limit, UP: upper limit, Random effect is same as fixed effect.
Table 2.5.

Meta Analysis Results: Associations between Talking KiR Positively and Friendship, Leadership, and Liking

<table>
<thead>
<tr>
<th></th>
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<th>Positive Social Talk and Leadership</th>
<th>Positive Social Talk and Liking</th>
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<td>-0.36</td>
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<td>13</td>
<td>0.07</td>
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<td>18</td>
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<td>19</td>
<td>0.13</td>
<td>-0.34</td>
</tr>
<tr>
<td>10</td>
<td>18</td>
<td>0.24</td>
<td>-0.26</td>
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</table>

Note: C: class, LL: lower limit, UP: upper limit, Random effect is same as fixed effect.

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Table 2.6.

Meta Analysis Results: Associations between Talking KiR Negatively and Friendship, Leadership, and Liking

<table>
<thead>
<tr>
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<th>Negative Social Talk and Friendship</th>
<th>Negative Social Talk and leadership</th>
<th>Negative Social Talk and Liking</th>
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<tr>
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<td>r LL UL z-score p-value</td>
<td>r LL UL z-score p-value</td>
<td>r LL UL z-score p-value</td>
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<td>-0.04 -0.44 0.38 -0.18 0.86</td>
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<td>-0.05 -0.50 0.43 -0.18 0.86</td>
<td>-0.14 -0.57 0.35 -0.54 0.59</td>
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<tr>
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<tr>
<td>6</td>
<td>0.05 -0.46 0.53 0.17 0.86</td>
<td>-0.08 -0.56 0.43 -0.30 0.76</td>
<td>0.08 -0.43 0.55 0.29 0.77</td>
</tr>
<tr>
<td>7</td>
<td>0.20 -0.39 0.68 0.65 0.52</td>
<td>-0.05 -0.59 0.51 -0.16 0.87</td>
<td>-0.12 -0.63 0.46 -0.39 0.70</td>
</tr>
<tr>
<td>8</td>
<td>0.14 -0.35 0.57 0.56 0.57</td>
<td>0.12 -0.36 0.56 0.48 0.63</td>
<td>-0.01 -0.48 0.46 -0.05 0.96</td>
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<tr>
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<td>10</td>
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<td>-0.08 -0.52 0.40 -0.30 0.77</td>
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</table>

Fixed 0.05 -0.10 0.21 0.67 0.50 -0.01 -0.16 0.15 -0.09 0.93 0.00 -0.16 0.15 -0.05 0.96

*Note.* LL: lower limit, UP: upper limit, Random effect is same as fixed effect.
**Table 2.7.**

*Meta Analysis Result: Associations between Talking kiR Positively and Talking kiR Negatively*

<table>
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<th>p-value</th>
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<td>0.76</td>
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<td>-0.01</td>
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*Note.* LL: lower limit, UP: upper limit, Random effect is same as fixed effect.
Table 2.8.

*Influence of Centrality in Friendship, Liking, Leadership on Centrality in Positive- and Negative social Network*

<table>
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<th>Outdegree centrality in positive social-talk network (Listeners in positive conversation)</th>
<th>Indegree centrality in positive social-talk network (Speakers in positive conversation)</th>
<th>Outdegree centrality in negative social-talk network (Listeners in negative conversation)</th>
<th>Indegree centrality in negative social-talk network (Speakers in negative conversation)</th>
</tr>
</thead>
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<td>p-value</td>
<td>Est</td>
<td>p-value</td>
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<td>1.00</td>
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<td>.17</td>
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<td>.54</td>
</tr>
<tr>
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<td>.95</td>
<td>0.16</td>
<td>.03*</td>
</tr>
</tbody>
</table>

Note: EST: estimates, BL: best class-project leaders, LM: like the most, UCINET doesn’t provide standard errors. * < .05 **Although outdegree in friendship was significant, the overall model was not significant.
### Table 2.9.
**Influence of Centrality in Friendship, Liking, Leadership, Positive- and Negative-social Network on Substance Refusal Self-efficacy and Personal Anti-substance Norms**

<table>
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<td>Intercept</td>
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<td>0.33</td>
</tr>
<tr>
<td>Teacher dummy</td>
<td>-0.17</td>
<td>0.14</td>
</tr>
<tr>
<td>Male</td>
<td>0.03</td>
<td>0.10</td>
</tr>
<tr>
<td>Dummy lifetime experience on alcohol (experience=1 vs. non experience=0)</td>
<td>-0.54</td>
<td>0.11</td>
</tr>
<tr>
<td>Outdegree in class-project leader network</td>
<td>0.39</td>
<td>0.35</td>
</tr>
<tr>
<td>Indegree in class-project leader network</td>
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<td>0.37</td>
</tr>
<tr>
<td>Outdegree in the most liked network network</td>
<td>-0.03</td>
<td>0.41</td>
</tr>
<tr>
<td>Indegree in the most liked network</td>
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<tr>
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<tr>
<td>Indegree in talking about kiR positively network</td>
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<td>0.41</td>
</tr>
</tbody>
</table>

*Note.* *< .05, ** <.01, EST: estimates, SE= standard error,
CHAPTER 3
INVESTIGATING SUBTYPES OF LEADERSHIP IN SOCIAL NETWORK:
A LATENT PROFILE ANALYSIS IN TYPOLOGY CREATION

People’s reactions to health promotion interventions are likely to fluctuate based on a variety of personal and situational factors (Rubin et al., 2002). For this reason, audience segmentation, which is defined as the process of identifying homogenous subgroups within a larger heterogeneous population in terms of demographical, psychological, social, environmental and/or behavioral factors (e.g., attitude, perception) (Slater, 1996), plays a critical role for targeting and tailoring messages (Atkin & Freimuth, 1989; Donahew, 1990; Grunig, 1989). However, audience segmentation is infrequently applied to many areas of message design, including those with significant public health implications such as youth school-based substance abuse prevention programs (Gottfredson & Wilson, 2003). In order to advance segmentation methods and apply them to substance abuse prevention messaging, this study applies person-center typology methods to identify network-based audience segmentation (Amirkhanian et al, 2003; Smith & Findeis, 2012; Latkin, et al., 2009; Valente, et al., 2007).

The purpose of this paper, then, is twofold. First, the study will discuss a network approach to identifying audience segments or subgroups. Various social network positions will be considered, framed by an opinion leadership typology (Boster, Kotowski, Andrews, & Serota, 2011). Latent profile analysis (LPA) is used to create the subgroups. Second, the study investigates whether an association exists between these different subgroups and youth substance refusal self-efficacy and perceived substance norms. In the next few paragraphs, I will describe youth audience segmentation based on network methods and explain why subgroups can have different demographic and psychological factors such as self-efficacy and perceived norms.
Audience Segmentation

The concept of audience segmentation has been introduced (Smith, 1956) and used in social sciences (Bonomo & Shapiro, 1983; Kotler & Andreason, 1987; Weinstein, 1987; Slater, 1996; Atkin & Freimuth, 1989) including health communication and social marketing campaigns (Andreasen, 1995; Chapman-Walsh, Rudd, Moeykens, & Moloney, 1993; Maibach, Kreps, & Bonaguro, 1993; Slater, 1995; Slater & Flora, 1994; Parrott, Silk, Weiner, Condit, Harris, & Bernhardt, 2004). Segmentation is advantageous because it maximizes message impact by targeting appropriate messages to the appropriated persons through the right channels (Kotler & Roberto, 1989; Slater, 1996). For example, audience segmentation has been used in several health campaigns addressing nutrition education (Campbell, Farrell, Carbone, & Brasure, 1999), smoking cessation (DijkstraConijn, & de Vries, 2006; Hoffman et al., 2006; Meyer et al., 2008), diet (Elder, Ayala, Slymen, Arredondo, & Campbell, 2009), mammography (Champion et al., 2006; Kreuter et al., 2005; Vernon, et al., 2008), and injury prevention (Gielen, et al., 2007).

Audiences are likely to differ in a variety of ways and that these differences play an important role in message reception. For instance, individuals who believe to have inability to overcome threats tend to avoid the message (Witte, 1992; 1994). In addition, when individuals have low motivation and ability to understand message, they are less likely to focus on issue-relevant information (Petty & Cacioppo 1986). These motivation and ability are influenced by personal involvement on issues (Petty & Cacioppo, 1979) or intelligence (McGuire 1968; Rhodes & Wood 1992). Empirically, audiences have been segmented in a variety of ways, including lifestyle (Slater & Flora, 1991), psychological (Rimal et al., 2009; Silk, Weiner, & Parrott, 2005; Parrott, et al., 2004), behaviors (Dijkstra et al., 2006), media-preference (Roger,
Chen, Duffy, & Fleming, 2007), geography, or/and demographical factors (Holt et al., 2009; Weinstein, 1994).

One important domain where these methods are less prevalent is substance abuse prevention programs. These programs are typically universal in focus, addressing a common set of risk factors (Durlak, 1998) for the overall population (SAMHSA, 2003) with the goal of delaying the onset of substance use (Robins & Przybeck, 1985). Selective interventions have segmented the population based on risk and have concentrated on decreasing substance involvement and stress by supporting and/or monitoring these youth (SAMHSA, 2003). Other segmentation strategies involving cultural grounding that incorporates cultural values and narratives into the design of substance abuse prevention programs have proven effective (Hecht et al., 2003; Hecht, Graham, & Elek, 2006). Thus, identifying subgroups can play a significant role in substance abuse prevention programs because it can boost the program effects (e.g., Smith & Findeis, 2012). However, these segmentation strategies typically rely on audience demographic and other risk factors, neglecting the social nature of adolescent substance use.

**Adolescents’ Social Networks**

Research demonstrates that peers and social relationships are crucial to adolescents’ decisions about substance use (Cleveland & Wiebe, 2003; Crosnoe, Muller, & Frank, 2004; Ennett et al., 2006; Urberg, Degirmencioglu, & Pilgrim, 1997). As a result, substance abuse prevention programs have focused on influencing norms and encouraging self-efficacy in resisting peer influence (Donaldson et al., 1994; Orlando, Ellickson, McCaffrey, & Longshore, 2005). While such constructs can be addressed through individual data, the emergence of network theory and technology suggests an alternative approach to conceptualizing and measuring the social relationship so central to adolescent substance use (Valente, Gallaher,
Mouttapa, 2004). Social positions or roles within a network influence an individual’s vulnerability to peer regarding substance use (Alexander, Piazza, Mekos, & Valente, 2001; Choi & Smith, in press; Ennett & Bauman, 1993; Ennett et al., 2006; Kobus & Henry, 2010; Pearson et al., 2006; Valente, Unger, & Johnson, 2005).

Youth’s social networks, however, are not simple and monolithic. Youth have several social relationships such as friendship or leaders-and-followership (Brown & Larson, 2009) and within each relationship a youth’s social position can vary. For instance, youth who are mostly nominated as friends do not always become leaders (Cairns, Cairns, Neckerman, Gest, & Gariépy, 1988). As a result, friendship and leadership networks will be considered in this study because friendship network can show popularity (Moddy, et al, 2011) while leadership network can show the leaders and followers (Balkundi, & Kilduff, 2006). By both considering friendship and leadership networks, popular leaders and non-popular leaders can be comprehensively understood. Previous studies showed that popular leaders and non-popular leaders can be different: Popular leaders are often characterized as kind, trustworthy, cooperative, and sociable (Coie, Dodge, & Kupersmidt, 1990; Newcoms, Bukowski, & Patte, 1993) whereas peer leaders who are nominated by their own peer groups are characterized as both being studious and cooperative (Farmer & Rodkin, 1996) and aggressive (Lansford et al, 2009; Xie, Cairns, & Cairns, 2002, 2003). Besides, popular leaders are likely to have greater influence than non-popular leader because popular leaders can be accepted by their many peers compared with non-popular leaders (Gest, Graham-Bermann, Hartup, 2001).

Although youth engage in conversation through their network, they do not necessarily talk about the same topic with their all friends. Youth can engage in social talk which refer to interpersonal and informal conversation about products, service, or brand (e.g., prevention
As youth talk about products such as i pad, they can talk about prevention program. However, social talk on prevention programs may not always occurs between friends. For instance, a previous study (Chapter 2) has also showed that there was no significant association between adolescents’ friendship and leadership networks within their classrooms and conversation networks about a substance abuse prevention program that they saw in class. As a result, social-talk network should be separately considered from youth’s peer networks such as friendship network. In social-talk network, some youth play an important role as a spreader of new information or an adviser. Even though there is not a study about social talk on substance abuse prevention program for youth, the marketing literature has suggested that certain individuals are more likely to engage in conversation on products (Carl, 2006). Thus, certain youth were more likely to engage in social talk than others, which can be different from peer networks.

The segmenting audience with social positions within various types of youth networks can help researchers understand the role these youth and their positions in social networks play in prevention interventions. Particularly, social positions in a network are considered in terms of centrality which is defined as “attempts to quantify the structural importance of actors in a network” (Borgatti, 2006, p. 21). The literature of audience segmentation based on social positions (e.g., centrality) in youth networks (e.g., friendship, leadership, and social talk) will be explained further.

**Subgroup: Network Typology**

There are a number of ways an audience can be segmented by social positions in a network (Valente & Fosados, 2006). Some individuals are identified as group members (Coleman, 1998; Dunphy, 1963) or highly popular persons (Moddy, et al, 2011; LaFontana &
Cillessen, 2002; Parkhurst & Hopmeyer, 1998; Rodkin, Farmer, Pearl, & Van Acker, 2000; Rose, Swenson, & Lockerd, 2004). Others are completely isolated or have only one or two friends (Pearson et al., 2006; Pearson & Michell, 2000). In addition, some people play the role of connector between two different groups (Ennett & Bauman, 1994, Kobus & Henry, 2010). Social scientists have shown that some of these positions are more important and prominent than others. Because some network members have greater influence than others (Wasserman & Faust, 1994; Granovetter, 1973; Bonacich, 2007), the identification of these individuals may be important for targeting health messages (Latkin, et al., 2009; Valente et al., 2007; Valente & Fosados, 2006; Laumann & Youm, 1999; Smith & Findeis, 2012). I will focus on two streams of research: opinion leadership and centrality in youth networks.

**Opinion leadership**

Many scholars have argued that opinion leaders are important because they tend to persuade others to adopt new ideas (Chan & Misra, 1990; Valente & Davis, 1999). As a result, identifying and targeting opinion leaders can promote message adoption. In health campaign, the most frequently used method is to ask participants to select their opinion leaders and then examine how the leaders exert influence (e.g., Latkin, et al., 2009; Valente et al., 2003; 2007; Cuijpers, 2002). For instance, Valente and his research teams used group-project leaders selected by their class-roommates and asked the leaders to teach a smoking prevention curriculum to the youth who did the selection (Valente, et al., 2003). Several other prevention programs using opinion leaders have been found to increase self-efficacy and correct perceive norms (Latkin, et al., 2009) as well as prevent substance use (Cuijpers, 2002).

Boster and his colleges (2011) hypothesized that the most influential or powerful individuals have distinct qualities: connectivity, persuasiveness, and health knowledge. Boster et
al (2011) argued that certain individuals, called connectors, are likely to be connected with more than one group (Boster, et al., 2011). This is supported by several empirical studies showing that certain individuals are linked to two main groups (Clauset, Newman, Moore, 2004). This role is distinguishable from other influential people. Connectors play specific roles delivering or hindering the passage of “new” information to different groups (Granovetter, 1973; Shaw, 1954; Burt, 1992) while the other influencers are distinguished by their perceived expertise. These influencers may be further distinguished as persuaders and health mavens (Boster et al., 2011). Boster et al (2011) argued that health mavens are viewed as highly knowledgeable by others and attempt to maintain their expertise in a given area, while persuaders actively attempt to influence others and enjoy debating opinions. Thus, the biggest difference between these latter two influence roles lies in the role of communication. Mavens tend to offer pieces of advice and knowledge whereas persuaders are more likely to convince others to adopt their position on a conversational issue (Boster et al., 2011). Research supports this conceptualization, empirically demonstrating that “most influential” individuals had “one or more of three distinct characteristics” (Boster, et al., 2011, p. 192).

The three types of influential individuals developed by Boster et al. are likely to play a role in adolescent substance use decisions because they can be a role model for youth. Network analysis may be a useful way to being to explore these typologies, because actor centrality can show who key players are (Freeman, 1979). The discussion, then, turns to centrality, specifically betweenness and degree centrality. Betweenness centrality is defined as the degree to which a person lies on the shortest path connecting others in the network (Valente, Gallaher, Mouttapa, 2004). Degree centrality refers to the number of directly connected others who nominate an actor
(Wasserman & Faust, 1994). These two concepts are considered because they align with Boster et al.’s (2011) three types of influential individuals, which is explained next.

**Network centrality in youth**

The three types of opinion leaders may differ in their betweenness centrality and degree centrality in their peer networks (e.g., friendship, leadership) and social-talk network. Youth with high betweenness centrality in a network are referred to as information-deliverers (Freeman 1977, 1979, 1980) whereas youth with high degree centrality in friendship and leadership network show their popularity or leadership (Moddy, et al, 2011; Friedkin, & Slater, 1994). First, because connectors tend to distribute new information one group to another, they may have high betweenness in leadership network. Second, mavens play an adviser role (Boster, et al., 2011). Individuals tend to seek a piece of advice from opinion-leaders (Davis, et al. 2004). As a result, mavens are likely to have a high degree centrality in friendship and leadership networks. Furthermore, due to their role (e.g., adviser) in a network (Boster et al., 2011), maven may engage in social talk regarding prevention program by showing high degree centrality in social-talk network. Third, persuaders may or may not be popular because they frequently try to persuade others but resist being persuaded in turn (Boster et al., 2011). As a result, persuaders may have low degree centrality in friendship networks but high degree centrality in leadership networks. Previous peer relationship studies also showed that popular youth and group leaders do not always match (Cairns,Cairns, Neckerman, Gest, & Gariépy, 1988) and they tend to have different characteristics (Lansford et al, 2009; Xie, Cairns, & Cairns, 2002, 2003; Farmer & Rodkin, 1996). Also, persuaders may appear to have high degree centrality in social-talk network because persuaders are eager to persuade others (boster et al., 2011). While a previous study by Boster et al have examined adult sample and it has never been investigated in youth population.
Opinion leaders may not appear in youth population because hierarchical relationship may not be shown in this age. Thus, the following research question will be posed:

*RQ1*. Does the heterogeneity in network position in friendship, leadership, and social-talk networks among youth correspond with the opinion leadership typology of health mavens, connectors, and persuaders?

**Covariates of Network Position: Self-efficacy & Norms**

While adolescents’ network centrality may provide them resources, the personal and social characteristics of the adolescents occupying those roles are likely to be significantly different, particularly refusal self-efficacy and personal injunctive norms. Previous research suggests that personal efficacy and norms are central to substance use decisions (Barkin, Smith, & DuRant, 2002; Petrakis, Flay, & Miller, 1995; Elek, Miller-Day, & Hecht, 2006). Refusal self-efficacy refers to one’s perception about his or her ability to refuse substance offer (Bandura, 1977; Carpenter & Howard, 2009); personal injunctive norms refer to as one’s perception of approval on a behavior (Cialdini et al., 1991), in this context, substance use.

Refusal self-efficacy may predict network positioning. Powerful or influential individuals are salient in a network (Mizruchi 1982; Mintz and Schwartz 1985). These powerful individuals can have greater refusal self-efficacy because they can control outcomes (Magee & Galinsky, 2008). Besides, previous studies have showed that social power is positively related to self-efficacy (Lammers, Galinsky, Gordijn, & Otten, 2012). That is, powerful or influential youth can refuse substance offer if they do not want it. In other words, higher refusal self-efficacy can predict who the powerful youth is in a network such as maven, persuader or connectors.

Similarly, personal injunctive norms can be differently related to network positioning. By their very nature norms are conceptualized as formulated in a social context (Salancik & Pfeffer,
1978). However, powerful individuals can be less influenced by social norms because they can have more social supports or resources (Anderson and Galisnky, 2006). In contrast, powerful individuals can be more vulnerable in terms of social norms than less powerful individual because they need to maintain their social status. In fact, youth who were mostly nominated as popular girls tended to feel that they should smoke because of their peers (Michell, 1997; Michell & Amos, 1997). As a result, personal injunctive norms can predict social positions in a network.

Consequently, subgroups based on network positions can be differently associated with perceived norms and self-efficacy. As a result, audience segmentation based on social position can facilitate successful message development and adoption (Valente & Davis, 1999; Valente et al., 2006).

**Self-Efficacy**

Substance-resistance self-efficacy varies greatly among youth and is likely to vary among network positions. Health mavens or persuaders are likely to have higher self-efficacy than connectors by virtual of the qualities that put them into these positions in the first place. Boster et al (2011) argued that persuaders have effective communication skills; the same skills that are likely to enable them to easily refuse substance offer and have high efficacy to do so. Similarly, because health mavens are expert in health and many others ask their opinion (Boster et al.), they are likely to have greater social power than others (Fiske, 1993; Gruenfeld, Inesi, Magee, & Galinsky, 2008). Individuals who have social power can resist social pressure more easily than less powerful persons (Anderson, Keltner, & John, 2003; Cast, 2003; Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008) and, as a result, health maven youth are more likely to have high substance resistance self-efficacy.
However, connectors may be in a vulnerable position in a network because they do not belong to any of the groups in a network and they are exposed to a greater diversity of groups. They can also be under more pressure to use substance due to these connections. A recent youth’s smoking study showed that connectors were more likely to try tobacco than others (Henry & Kobus, 2007; Kobus & Henry, 2010). Given the fact that peer relationships become more important than family relationship during adolescence (Brown, 1990; Fergusson, Horwood, & Swain-Campbell, , 2002; Saven-Williams & Berndt, 1990; Urberg, 1992), middle school-aged connectors may want to fit in one of the groups they connect in order to obtain social support and maintain relationship (Goffman, 1959; Petronio, 2000). Thus, when offered substances, they may not easily refuse it and thus have lower efficacy for doing so. Thus, the following research question is posed:

RQ2: Are membership in opinion-leadership profiles associated with substance resistant self-efficacy?

**Personal injunctive norms**

Personal injunctive norms are also likely to be associated with these opinion leader groups. Given their different positions in networks, the three roles are likely to differ in their perceived injunctive norms. For instance, personal injunctive norms regarding substance use are positively associated with connector groups because of great possibility to be exposed of different groups at a school (Valente, Unger, & Johnson, 2004). In addition, because liaisons have experienced more substance use more than other positions in a network (Henry & Kobus, 2007; Kobus & Henry, 2010), positive personal injunctive norms about substance use (i.e., believe it is more acceptable) can be associated with connectors who are likely to have more positive injunctive norms. In contrast, due to the expertise of health mavens (Feick & Price,
1987) they are likely to know about more negative effects of and have more negative expectation about substance use. As a result, they are likely to have stronger perceptions that substance use is unacceptable for themselves (personal injunctive norms). Finally, persuaders may or may not have perception on approval of substance use. Some of persuaders believe that substance is bad whereas others in persuasiveness think that smoking tobacco is cool. Consequently, the association between this group and perceived norms may be weaker and less predictable. Thus, the following research question is posed:

RQ3: Are membership in opinion-leadership profiles associated with personal injunctive norms?

Covariate of Network Position: Gender

Gender influences youth leadership in a variety of ways (Appelbaum, Audet., Miller, 2003). Male leadership is considered as being “structure, transactional, autocratic, instruction-giving, business-oriented” (Appelbaum, Audet., Miller, p. 48) whereas female leadership is thought as being “consideration, transformation, participative, socio-expressive, and people-oriented” (Appelbaum, Audet., Miller, p.48). Many leadership research displays female leaders are good listener’s skills and empathetic (Stanford et al., 1995; Kabacoff, 1998). Moreover, female leaders are more likely to share power and information with others (Rosener, 1995). Because connectors or health mavens are more likely to deliver or share information with others (Boster et al., 2011), these subgroups would likely to have more female than male. In contrast, because persuaders tend to influence through argumentation (Boster et al), this leader group probably has more males than females. Thus, the following research question is posed:

RQ4: Are membership in opinion-leadership profiles associated with gender?

Method
Procedure and Participants

The data for this study were collected in 2010 to examine adolescent social networks and substance use. One hundred eighty six 8th grader students in ten classes in one middle school located in rural Pennsylvania participated after parental consent and youth assent were obtained. Most participants were Caucasian (86.1%). Participants were 13.76 years old on average (SD = 0.45) and just under half were female. As part of a prevention program taught in their classes, youth viewed five substance abuse prevention videos from the keepin’ it REAL (kiR) curriculum and then completed an online questionnaire asking them to indicate their friendship and group project leader, social-talk on kiR networks, belief in their ability to refuse alcohol offers, normative beliefs on substance use. For network questions, classroom roster was given. There were no limitations to the number of relationship they could indicate. Binary indicators were employed (presence: 1 vs. absence: 0) in friendship, leadership, and social-talk network questions.

Network Measures

Networks and centrality Three network questions were measured: friendship, leadership and social-talk networks.

First, the friendship network was measured by asking students whom they think their friends are. Friendship network was directional, indicating person i may report j as i’s friend but j doesn’t necessarily report i as j’s friend. As a result, outdegree centrality and indegree centrality are estimated. Outdegree centrality was estimated as the number of others an actor nominates while indegree centrality was estimated with the number of others who nominate an actor (Wasserman & Faust, 1994). Indgree and outdegree centralities were standardized (range: 0~1).

Second, leadership network was measured by requesting youth to report whom they
considered as the best leaders for a class project. Indegree centrality and betweenness centrality were calculated in leadership network. Betweenness centrality was estimated as shortest paths between two pairs (Freeman, 1977; 1979). For ease of interpretation, betweenness in leadership matrix was calculated after symmetrizing leadership network, making leadership network as being nondirectional. All these centrality parameters were standardized.

Finally, social-talk network was measured by asking students indicated which student they talked with about kiR. Due to directionality of network, indegree and outdegree centralities were calculated and these centrality parameters were standardized.

**Covariates Measures.**

**Gender.** Participants reported their gender (female: 49%) and it was included as a dummy variable (0 = female, 1 = male).

**Alcohol refusal self-efficacy.** Four items for alcohol refusal self-efficacy were modified based on previous research (Moon, Hecht, Jackson, & Spellers, 1999; Hecht & Miller-Day, 2009; Miller, Alberts, Hecht, Trost, & Krizek, 2000; Pettigrew, Miller-Day, Hecht, & Krieger, 2011). Items for alcohol refusal self-efficacy were measured using a 4-point response format (1= very easy, 4=very hard ). Thus, items were recorded such that higher scores indicate greater efficacy in order to facilitate interpretation (\(M = 3.29, SD = 0.74, \alpha = .83\)).

**Personal injunctive norms.** Three items were asked to measure personal injunctive norms (Hansen & Graham, 1991). Students answered the following questions: “Do you think it is wrong for someone your age to: 1) drink alcohol regularly (beer, wine, or hard liquor), 2) smoke cigarettes, and 3) smoke marijuana.” Four-point response scales were used (1 = no, not at all to 4= very wrong). Higher scores indicated greater personal anti-substance norms (\(M = 3.53, SD= 0.72, \alpha = .82\)).
Analytical Plan

UCINET were used to calculate in/out-centrality for friendship, indegree and betweenness centrality for leadership and in/out-degree for conversation matrices. Mean and standard deviation of six network centrality were shown in the table2.

RQ1 asked if there were separate profiles based on network centrality and RQ 2 asked if these profiles were associated with resistance self-efficacy and personal injunctive norms. In order to answer RQ1, latent profile (regression) analysis (LPA) was conducted with the six network centrality parameters (i.e., indegree/outdegree in friendship and conversation networks, and indegree/betweenness in leadership network). All analyses were conducted with maximum likelihood with robust standard errors using Mplus 6.0 (Muthe´n & Muthe´n, 2010). LPA is a person-centered, latent variable modeling technique to determine discretely hidden groups that explain the heterogeneity of observable and continuous variables and to provide fit estimation of this hypothetical class given the data (Vermunt & Magidson, 2002). The LPA approach assumes unobserved classes that enable to ascertain individuals’ class membership instead of employing cutoff point on scales (e.g. median split). LPA provides estimations of the: 1) likelihood of membership in each latent profile and 2) mean and variance of each item for each latent profile. In other words, LPA offers information about the number of people who are likely to belong to certain profile and average of value and variances among people who belong to the profile. It also offers statistical model fit indices to evaluate which specific model is most suitable given the data (DiStefano & Kamphaus, 2006).

To identify the optimal number of profiles, three criteria were employed: 1) the Bayesian information criterion (BIC; Schwartz, 1978), 2) the bootstrap likelihood ratio test (BLRT) (McLachlan & Peel, 2000), and 3) theoretical interpretation. Several Monte Carlo simulation
studies demonstrated that BLRT and BIC are promising indicators to determine the number of profiles (Nylund, Asparouhov, & Muthen, 2007; Yang, 2006; Tofghi & Enders, 2007). For BIC, a smaller value indicates a better fit. Also, the BLRT is a bootstrapping method with samples to generate the empirical distribution of the log likelihood difference test statistic. BLRT offers a p-value in terms of a model comparison between k-1 and k profiles. That is, when the p-value is less than .05, it indicates that k profiles model is statistically better than k-1 profiles model (Nylund, Asparouhov, & Muthen, 2007). Consistent with previous other LPA studies (e.g., Muthen, 2004; Oxford et al., 2005; Connella & Frye, 2006; Matsunaga et al., 2010), theoretical and practical implications are considered as an important factor to determine the number of profiles. In addition to model fit criteria, entropy is also employed to evaluate how well individuals are classified in k profiles based on observed variables. In entropy, closer to 1 indicates the better classification although there was no specific rule-of-thumb.

All analyses were conducted with maximum likelihood with robust standard errors using Mplus 6.0 (Muthe´n & Muthe´n, 2010). To avoid convergence of local maximum likelihood value, 20000 sets of random starting values for 10 iterations each and then100 best performing starting values to employed to convergence. These final models had the same likelihood value, indicating that converging local maximum likelihood is less likely to occur in LPA model.

After identifying the number of subgroups, gender, self-efficacy and injunctive norms were included as covariates to examine whether these variables predict each profile (Latent Profile Regression Analysis, LPRA) (RQ2-RQ4). In order to examine the RQ2-RQ3, two covariates were examined: self-efficacy and injunctive norms. Gender (RQ4) also was included in the covariate model.

**Results**

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Network-based Groups Typology

The LPA conducted to describe network-based subgroups (RQ 1) was conducted with six network centralities such as indegree and outdegree in friendship/social-talk networks and indegree and betweenness in leadership network. Models with more than four-profiles revealed extremely poor model-fit because they did not converge in spite of increase on the number of set for random starting values up to 30000. Accordingly, models with more than four-profiles model were dropped from further analysis. Although four profiles provided the best fit based on the criteria of fit indices, the number of people in forth subgroup was too small ($n=2$) for theoretically meaningful interpretation. Thus, three profiles are selected (see table 1) as the most parsimonious solution.

Table 2 shows the mean and standard deviation of six centralities for each of the three profiles identified by LPA and Figure 1 displays these graphically. Of sample, 40.1% are likely to be members of profile 1, 7.4% are likely to be members of profile 2, and 52.6% are likely to be members of profile 3. Overall, betweenness centrality in leadership and indegree centralities in friendship and social-talk network appears to be very similar across all three profiles (see figure 1) and thus did not distinguish the profiles from each other. However, outdegree centrality in social-talk network made difference among these profiles.

Students in profile 1 were labeled “Listeners Group (LG)” because they had the highest outdegree centrality in social-talk network. Almost all those in the L profile reported hearing some talk about kiR within their classmates whereas only half of them reported that they spoke to their classmates about this topic. Thus, individuals in L appeared to be “listeners”.

Students in profile 2 were labeled “Both Listeners and Speakers Group (BLSG)” because they had the approximately average-degree of indegree/outdegree centralities in social-talk
network. Students in this group were not leaders of the group by any measures but had similar in/out degree centralities and played roles as both listeners and speakers. This was the smallest group and as a result caution must be exercised in interpretation because the findings may not be replicable.

Finally, students in profile 3 are labeled “Speakers Group (SG)” because the group had the lowest outdegree centrality in social-talk network (see table2). This finding indicated that youth in S mostly did not report other youth who talked about kiR. Compared with outdegree centrality in social talk in this group, indegree centrality in the conversation network was relatively high, indicating that approximately 46% of peers listened to them talking about program. Interestingly, youth in this group had the highest indegree centrality in the leadership network among three profiles. However, this group was not considered as leaders group because of a small gap between the mean of this group (\(M = .17, SD = 0.02\)) and the mean of overall sample in terms of indegree centrality in the leadership network (\(M = .15, SD = 0.17\)). Thus, SG members were characterized as being speakers but not listeners.

**Covariate analysis**

Self-efficacy (RQ2), personal injunctive norms, (RQ3) and gender (RQ4) were included to examine whether these covariates predicted the membership of the subgroups. In addition, gender was included as a covariate to control demographic information (male=1). The SG (profile 3) was specified as the reference group. Shown in Table3, relative to SG, refusal self-efficacy did not predict the membership probability for either LG (\(\beta = 0.35, SE = 0.47, OR=1.41, p=.45\)) or BLSG (\(\beta = 1.87, SE = 1.85, OR=6.46, p=.31\)). Similarly, there were no significant differences between LG (\(\beta = 0.60, SE = 0.39, OR=1.81, p=.12\)) or BLSG (\(\beta = -0.48, SE = 1.01, OR=0.62, p=.64\)) and SG in terms of personal injunctive norms. However, compared with SG,
LG had fewer male students ($\beta = -0.75, SE = 0.34, OR=0.47, p<.05$), but there were no significant differences between SG and BLSG ($\beta = -1.42, SE = 1.37, OR= 0.23, p = .30$) for gender composition. The covariates except for gender were not associated with subgroup membership and possible explanations will be discussed in the discussion.

**Discussion**

The current study examined segmenting youth into subgroups based on youth’s network centrality from three different social networks, and if subgroup membership was associated with, gender, refusal self-efficacy and injunctive norms. The analyses revealed three subgroups: Speakers Group (SG), Listeners Group (LG) and Both Listeners and Speakers Group (BLSG). This finding was not consistent with Boster’s study (2011, 2012) because there was no particular “leaders” group. Instead, membership in the groups could be identified by the roles in social talk (e.g., listeners or speakers). The LPA with three covariates showed that LG had more female students compared with SG, although there were no significant differences between the odds of refusal self-efficacy and personal injunctive norms being associated with group membership. The implications of these findings are discussed next.

**Theoretical and Practical Implications**

The network-based subgroups were not consistent with Boster et al. (2011) study. First, connectors were not clearly detected in the study. This may be explained by the fact that betweenness centrality, the index of connectors, was very low overall in this sample (see table 2), making it difficult to detect this role. Second, an obvious opinion-leadership group in this population was not identified. This may be a developmental issue. Perhaps adolescents, particularly those in rural communities, do not have a clear leadership structure that focuses on an individual or small group of individuals who lead all classmates. Instead, it appears that youth
relationships are segmented into small subgroups, each with its own leaders (Chen, Chang, & He, 2003; Kindermann, McCollom, & Gibson, 1995). Therefore, this study failed to find a noticeable opinion leader groups. As a result of this diffuse leadership pattern, the study did not identify health maven and persuader roles. Furthermore, because of the absence of prominent opinion leader groups, self-efficacy and perceived norms among these subgroup were not significantly different from one another. In any case, it is clear that the social environment for youth at schools is dissimilar to those for “adult” organizations such as government or companies that Boster et al.’s typology (2011) was meant to describe.

The findings do suggest gender differences between SG and LG profiles. There were more male students in the SG than in the LG profile. This may be explained by gender roles. It is consistent with the view that females tended to be “conversation”-orientated (Benenson, Apostoleris, & Parnass, 1997; Maccoby, 1998) and the finding that the LG group was more likely to experience “listening” processes than the SG. Female youth might try to remember who talked about kiR because they tend to establish connection with others (Tannen, 1992). Besides, male youth feel more comfortable to speak in large group compared with female youth (Tannen, 1992). If social talk occur in larger group for male students, it is possible that male students might not recall who talked about kiR.

Finally, these findings support the use of peer-led prevention activities (Valente et al. 2007), although perhaps in a less obvious way than was assumed prior to the study. Without notable opinion leaders, it is less clear who should be selected as peer leaders. In fact, it would appear that peer leaders should span the profiles. Those with a SG profile can be a good instructor because they tended to talk about the prevention program with their classmates. They will spread the word. However, they are less likely to listen to their classmates and thus would be
less appropriate for guiding group discussions. Second, those with an LG profile are likely to be more easily influenced by prevention programs since they tend to remember others’ speech. Their involvement as peer leaders might function to model adoption of targeted skills and practices. Finally, members of all three subgroups exhibited similar degrees of talking about the prevention program with their classmates. It indicates that some youth at least once talked about the prevention program outside of class, which can enhance message effects.

Limitations

There are a few limitations in this study. First, even though the study investigated the opinion leadership typology proposed by Boster et al. (2011), the study did not employ the same measurement (e.g., survey items developed by Boster and his colleagues). Absent these measures, the study could not directly compare the subgroups that emerged with Boster’s opinion leader groups.

Second, the measurement of the conversation network (e.g., talking about the kiR) may not capture the different roles (e.g., advisers vs. salespersons) in terms of communication. In this study, “talking about the kiR” could represent a range of meanings, including the persuader role of influencing others about the goodness of kiR or the maven role of providing advice regarding kiR when asked. As a result, the current measures may have failed to detect persuader or health maven roles.

Third, the sample was drawn from one rural middle school. Due to the low population density in this rural area, most students are highly connected with their school mates. This may have suppressed some of the leadership typologies. Furthermore, youth’s network positions (e.g., network centrality) were measured with a class roster. It could have potentially lowered the betweenness centrality among classmates because most classmates were friends and it failed to
include friends outside of class. This made it difficult to find connectors in this sample. If grade-
level of network centrality were measured (e.g., using rosters of the entire grade), connectors
among groups may be identified.

Fourth, the small sample size \((N = 185)\) lowered the power of significance tests and may
have suppressed the relationship between the subgroups and refusal self-efficacy and perceived
norms.

Finally, a post-test only design was employed in this study due to IRB restrictions that
made it impossible to determine if these subgroups were initially different in their levels of
refusal self-efficacy and personal injunctive norms, but due to “successful prevention effect” of
the program their level of refusal self-efficacy and perceived norms became similar. Large,
urban youth social network with pre-/post –test research design can provide different leadership
typologies and reveal significant associations between subgroups and refusal self-efficacy and
perceived norms.

**Conclusion**

The study identified three subgroups based on youth’ network positions: speakers group,
listeners group, and both listeners and speakers group. These groups differed in their roles in
social talk. Females were more likely to be members of the listeners-profile. These subgroups
can play an important role in prevention program by matching the profile characteristics with the
roles assigned to peer-leaders. They also suggest a model for understanding intervention effects
as channeled through peer networks. Finally, the profiles did not support Boster et al.’s typology
of opinion leadership; there were not clear opinion-leadership groups (e.g., maven, persuader,
and connectors) in this study. Given the fact of uniqueness of social environments in rural middle
schools, youth leadership characteristics including network components should be studied further.
Table 3.1.

Comparison of Latent Profile Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Loglikelihood</th>
<th>BIC</th>
<th>Adjust BIC</th>
<th>LMR</th>
<th>BLRT</th>
<th>Entropy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-profile solution</td>
<td>416.81</td>
<td>-735.07</td>
<td>-795.24</td>
<td>254.22</td>
<td>261.22</td>
<td>0.99</td>
</tr>
<tr>
<td>3-profile solution</td>
<td>470.92</td>
<td>-806.11</td>
<td>-888.46</td>
<td>92.37**</td>
<td>94.89**</td>
<td>0.99</td>
</tr>
<tr>
<td>4-profile solution</td>
<td>461.84</td>
<td>-751.42</td>
<td>-855.94</td>
<td>26.95*</td>
<td>27.69*</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Note. **p < .01, * p < .05
Table 3.2.

*Mean and Standard Deviation Each Profile*

<table>
<thead>
<tr>
<th>Items</th>
<th>Overall Item Means (SD)</th>
<th>Profile 1: Listeners group (n=74)</th>
<th>Profile 2: Both Listeners and Speakers group (n=14)</th>
<th>Profile3: Speakers group (n=97)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>BLI</td>
<td>0.15 (0.17)</td>
<td>0.13</td>
<td>0.02</td>
<td>0.08</td>
</tr>
<tr>
<td>BLBW</td>
<td>0.05 (0.08)</td>
<td>0.06</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>FRO</td>
<td>0.48 (0.25)</td>
<td>0.58</td>
<td>0.03</td>
<td>0.42</td>
</tr>
<tr>
<td>FRI</td>
<td>0.48 (0.18)</td>
<td>0.47</td>
<td>0.02</td>
<td>0.51</td>
</tr>
<tr>
<td>TNPO</td>
<td>0.46 (0.45)</td>
<td>0.98</td>
<td>0.01</td>
<td>0.55</td>
</tr>
<tr>
<td>TNPI</td>
<td>0.46 (0.16)</td>
<td>0.48</td>
<td>0.02</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Table 3.3..

*Gender, Refusal Self-efficacy, and Personal Injunctive Norms as predictors of Membership in Latent Profile*

<table>
<thead>
<tr>
<th>Latent Profile</th>
<th>Profile 1: Listeners group</th>
<th>Profile 2: Both Listeners and Speakers group</th>
<th>Profile 3: Speakers group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-0.75</td>
<td>-0.142</td>
<td>ref</td>
</tr>
<tr>
<td>SE</td>
<td>0.34</td>
<td>1.37</td>
<td>ref</td>
</tr>
<tr>
<td>Odds</td>
<td>0.47*</td>
<td>0.23</td>
<td>ref</td>
</tr>
<tr>
<td>Refusal Self-efficacy</td>
<td>0.35</td>
<td>1.87</td>
<td>ref</td>
</tr>
<tr>
<td>SE</td>
<td>0.47</td>
<td>1.85</td>
<td>ref</td>
</tr>
<tr>
<td>Odds</td>
<td>1.41</td>
<td>6.46</td>
<td>ref</td>
</tr>
<tr>
<td>Personal Injunctive Norms</td>
<td>0.60</td>
<td>-0.48</td>
<td>ref</td>
</tr>
<tr>
<td>SE</td>
<td>0.39</td>
<td>1.01</td>
<td>ref</td>
</tr>
<tr>
<td>Odds</td>
<td>1.81</td>
<td>0.62</td>
<td>ref</td>
</tr>
</tbody>
</table>

*Note. *p < .05, ref: reference group*
Figure 3.1. Mean of item each profile

Note. Class1: Other-centered group, Class2: Non-leaders group, Class3: Self-centered group.
CHAPTER 4
OVERALL DISCUSSION

This dissertation is one of the first to conceptualize the role of social talk in prevention interventions. Social talk, or informal discussion among participants about the prevention program they experienced, is seen as a “filter” through which participants process their experiences. As a result, it is argued that social talk is an essential consideration for designing and evaluating prevention programs. In addition, the dissertation examined who conducted the social talk, specifically the nature of the social network through which the talk is conducted and whether there were different types of opinion leaders based on Boster and his colleagues’ typology (2011). A social network perspective was adopted to examine these processes.

Two studies were conducted that examined social talk and association between social talk and youth’s social status in peer relationship (chapter2) and by combing with their social status in peer relationship (chapter3) as well. In this chapter, I discuss how this dissertation contributes to the body of knowledge theoretically and its implications for prevention science.

Theoretical Contributions

There are five important theoretical contributions. First, these studies were the first to scientifically investigate whether youth engage in social talk among participants in substance abuse prevention programs. Conceptually it makes sense that successful interventions would result in informal social talk within peer networks. Like other effective messages, we can expect youth to discuss prevention curricula that engage and motivate them. The findings showed that adolescents do, indeed, talk about at least one prevention program, and this talk is both positive and negative. The prevalence of positive social talk about this prevention intervention, keepin’ it REAL, suggests that there maybe two important contributions to understand evaluation effects.
Largely, it provides another path (or a possible mediator) to explain how social talk could influence distal outcomes (e.g., perceived norms) within a prevention program. Second, social talk can play as a moderator to explain the program effect. That is, youth with frequent positive social talk can have stronger program effects compared with those with infrequent social talk or frequent negative social talk. Previously, prevention researchers were concerns about the effects of these conversations on their evaluation, especially if talk contaminated treatment and control conditions (Campbell & Stanley, 1963). However, this dissertation conceptualizes social talk as more than contamination; rather it is argued that youth will process engaging messages and process label social proliferation (Larkey & Hecht, 2010; Miller-Day & Hecht, in press). This view is supported by findings showing that social talk can enhance youth’s perceived norms (Chapter 2). In a sense, social talk is reconceptualized as a dynamic emerging from successful interventions rather than merely a concern in evaluation research.

Next, some students engaged in more social talk than others, and these youth appeared to have many friends. These findings are consistent with previous studies, which also showed that certain individuals are more likely to engage in social talk (Feick and Price 1987; Higie, Feick & Price 1987; Carl, 2006). Besides, having many friends can imply greater social power. According to Dynamic Social Impact Theory (Latané, Nowak, & Szamrej, 1990), people who are connected with many people have greater social power. Previous studies have showed that a youth who was indicated as other peer’s friend could have social power such as social support, instrumental aids, and companionship (Criss et al., 2002; Hetherington, 1999). In addition, individuals with great social power were more likely to engage in social talk (Berdahl & Martorana, 2006). Also, some evidence showed that individuals learn social power through social network (Smith & Fink, 2010) and powerful people can control information and resources
(Burt, 2005; Buss, 1996; Chance, 1967; Derber, 1979; Eibl-Eibesfeldt, 1989; Ellis, 1993; French & Raven, 1959; Keltner, Young, Heerey, Oemig, &Monarch, 1998; Operario & Fiske, 2001; Savin-Williams, 1979;) It is possible that these students feel more social power than others and these powerful students could play an important role in social talk.

Third, this dissertation provides insight into work on “word-of-mouth”. Previous studies (Richins, 1983; Pollach, 2006) have shown whether individuals talk about products, service or brand which companies sell. However, it has been rarely examined whether non-profit products or service (e.g., prevention program) are discussed. Furthermore, most WOM studies have focused on adult participants. However, this study focused on teenager and showed teenagers also talked about the products.

Besides, WOM in marketing usually did not distinguish the product conversation between consumers-to –potential-consumers and consumers-to-consumers. The topic of these two groups in social talk about product can vary. For conversation between consumers and potential consumers, the overall function or description of products is more likely to be to be exchanged. For instance, movie viewers mostly focused on the story with non-viewers unless non-viewers were interested to know it. However, when movie viewers talked about the movie with other viewers, they tended to focus on more details such as one very specific moment in the movie (e.g., talking about an actor’s clothing). Thus, the likelihood of specific contents, function, or description about products can increase in social talk among users.

In this study, social talk has mainly focused on conversation after all individuals are exposed to the same product. In other words, this social talk may not be simple conversation to exchange only the overall description of program. Instead, specific contents or descriptions are more likely to occurs among youth. If these specific contents can be developed as narrative with
youth’s life experience, this social talk would be influential because of power of narrative (Botvin et al., 1994; Fisher, 1987; Hecht et al., 1993; Marsiglia & Zorita, 1996; Miller-Day et al., 1998). Even though it is required for future study to examine what social talk about program actually occurred among youth, social talk about program may lead substantial conversation on program.

Finally, communication can be an important factor in shaping youth’s perceived norms. Social Cognitive Theory ([SCT], Bandura, 1977) and Primary Socialization Theory ([PSC], Oetting, Deffenbacher, & Donnemeyer, 1998) argued youth learn behavior through observation and communication. In addition, Planned Behavior Theory (Ajzen, 1988) claimed that perceived norms are significant predictors for a behavior. Since youth’s social talk on prevention program influenced their personal anti-drug norms, this dissertation supports the finding that communication matters to perceive norms or behaviors.

Social Talk, Perceived Norms, and Refusal Self-efficacy

Social talk on prevention program may not influence refusal self-efficacy. Talking about prevention program can not necessarily increase refusal skills or confidence. Simply talking about program might not help youth to increase refusal skills. However, it can change when it is examined whether youth talk about substance, experience of substance offer, or refuse of substance offer. The context of social talk can matter whether youth could have higher refusal self-efficacy. Furthermore, it is unknown what exactly youth talk about the prevention program. In this study, I asked subjects to indicate either positive social talk or negative social talk, but within these two categories of social talk, there can be more specific conversations. Thus, qualitative research about social talk on prevention program should be employed in the future.
However, the study reported in Chapter Two that youth’s social talk about prevention were positively associated with perceived norms. This is particularly true for the speakers in these talks rather than the listeners. This is consistent with previous studies of norms showing that social talk about a topic influence individuals’ beliefs (Sommerfeld, Krambeck, Semmann, & Milinski, 2007; Salancik & Pfeffer, 1978). Besides, discussion on a topic can predict the knowledge of the topic (Bennett, Flickinger, & Rhine, 2000; Kim, Wyatt, & Katz, 1999; Scheufele, 2000, 2002; Lenart, 1994). Consequently, social talk about prevention programs should be considered because it can influence youth’s perceived norms. Particularly, the more youth positively talked about prevention program, the stronger they could have anti-substance norms whereas the more youth negatively talked about it, the stronger they could have pro-substance norms. It seems that social talk about the prevention program influences how youth perceive substance use, or vice versa. Although the causality should be further examined, it appears that there was a positive association between perceived norms and social talk.

In addition, social talk among youth with different perspective (e.g., negative vs. positive) can play an important role in perceived norms although this study could not clearly show how it can make a difference. According to inoculation theory (McGuire, 1964), when individuals encounter opposite but not-very-strong opinions, they can generate counterarguments and their original beliefs can be strengthened. When a youth with strong beliefs on the usefulness of a prevention program listens to the negative comments on prevention program, this youth can produce more counterarguments on negative comments. This process may enhance the youth’s original beliefs. By doing so, he or she can have stronger anti-drug norms than before.

**Practical Implications**
The practical implications of this project revolve around the role of social talk in prevention intervention design and evaluation. First, reconceptualizing prevention science to see social talk as part of an intervention rather than a byproduct has implications for curriculum design. Since social talk was related to substance use norm and norms are a key component of effective interventions, messages or ways to increase positive social talk for youth should be developed. Based on previous studies on WOM, there were several ways to accomplish this goal. First, the topic should be interesting and new for youth (Dye 2000; Hughes 2005; Rosen 2009; Sernovitz 2006). Second, environmental cues (e.g., advertisement on a product) can help to encourage social-talk in general (Berger & Sernovitz, 2011). Berger and his colleges (2011) stated that “products that are more publicly visible, or cued more frequently by the environment, receive more immediate, ongoing, and overall WOM” (p. 27). Creating interesting and visible messages may help to youth to engage in social talk.

The second practical implication involves how interventions are evaluated. While historically social talk was conceptualized as a potential contaminant, the reconceptualized perspective presented above suggests that social talk should be seen as part of the modeling of effects, much in the way norms and intentions are seen as proximal outcomes and mediators. Effective interventions should produce social talk according to this perspective. While the evidence presented in this dissertation only hints at this conclusion, it is a natural outgrowth of the conceptualization that was the basis for both empirical studies. Individuals talked positively about products when they were satisfied with their products (Ranaweera, & Prabhu, 2003) whereas they engaged in negative social talk when they were dissatisfied with the products (Westbrook, 1987). Additionally, when individuals are highly involved in messages/products or intend to share excitement or reassurance from others, they are more likely to engage in positive
social talk (Dichter, 1966; Berger & Milkman, 2011). In contrast, individuals tend to engage in negative social talk because they want to reduce or express negative feelings toward products or service (Rosen, 2009; Sundaram, et al., 1998). Narrative engagement theory (Larkey & Hecht, 2010; Miller-Day & Hecht, in press) make this explicit in their articulation of how and why narrative messages work. As a result, good quality of implementation can help to increase positive social talk.

Also, the centralized youth in leadership network are positively associated with perceived anti-drug norms because these youth may want to adapt prevention messages to maintain their social status. Alexander and her colleges (2001) showed that youth who received the most peer nominations as friends were more likely to use substances when the prevalence of substance use was high at the school whereas popular students were less likely to use substance when the prevalence of substance use was low. In addition, youth who were mostly nominated as popular girls tended to feel that they should smoke because of their peers (Michell, 1997; Michell & Amos, 1997). Thus, the centralized youth can be vulnerable due to peer pressure, but they also may be susceptible to the prevention messages.

Prevention researcher may need to employ not only opinion leader but also speakers to increase program effect. Most peer-led programs encouraged peer leaders to discuss prevention components such as negative consequence of substance use (Mellanby, Rees, & Tripp, 2000), but these programs have never trained other than peer leaders to encourage active discussion on substance use or relevant factors. However, peer-led HIV prevention programs (Kelly et al., 1991, 1992, 1997; Sikkema et al., 2000).trained not only leaders but also group members to discuss beliefs, consequences and skills. That is, the curriculum encouraged to group members to talk about actual normative beliefs and support the curriculum and it appeared to be effective
School-based prevention research may need to include training for some individuals to talk about anti-substance norms with their peers.

The current findings also have implications for evaluating implementation quality. To date, this variable has been conceptualized as implementer behavior. This dissertation argues that students are not passive recipients of prevention messages; rather they act on these messages not only cognitively but, as well, process them through social talk. This is talk not seen as extraneous to the implementation. From this perspective, implementation research should consider audience behaviors, such as social talk, in order to provide a more comprehensive view of the intervention process.

Limitations.

The studies in this dissertation show theoretical and practical implications for youth substance abuse prevention research, yet the overall limitations should be addressed. The participants were rural youth. Compared with urban youth, they tend to know each other. Besides, the size of rural schools is smaller than urban schools (National Center for Educational Statistics, n.d.). Thus, the social talk about program can occurs within the relatively bigger groups compared with urban youth. Possibly, social talks among rural youth can play as a in-group conformity rather than groups competition. However, urban youth are assumed to have smaller size of group and more heterogeneity between-groups due to large school size. Most likely, one type of social talk (positive vs. negative) about program can only occur within a small group and social talk between groups can occur with different perspective (e.g., group with negative perspective vs. group with positive perceptive). Furthermore, if the sample is from high or elementary schools, the phenomena of social talk can differ. After entering schools, children tend to develop their own subgroups based on demographic and personal characteristics (Parker, et al.,
These subgroups can develop social hierarchies with a network (McHale, Dariotis, & Kauh, 2003). This hierarchy based on subgroups (e.g., crowds) can be clearly shown in high schools. Particularly, members in a subgroup at high schools rarely communicate with the ones in other subgroups (Brown, 1989; Eder, 1985; Brwon & Klute, 2003). Thus, the social talk probably circulate only within groups not between groups for high schools whereas the social talk tends to spread out into different groups for elementary students.

Also, by engaging in social talk, the peer-relationship can change over time. For instance, if most members at school have positive attitude toward the program, individuals who negatively talk about program may be isolated, or vice versa. Furthermore, if particular individuals engage in positive social talk and most members endorse it, the particular individuals can be more influential than before. However, this study employed cross-sectional data, so it is impossible to detect dynamics of social talks and peer relationships. The further studies should investigate whether social-talk network changes the social-relations networks.

Future Directions

This dissertation is the first step to investigate social talk, and its role in on the efficacy of prevention programs. There are many areas to study in future research. First, these two studies used a post-test only research design, which makes it difficult to determine causality and examine mediation although it is extremely difficult to understand causality with network data (Shalizi & Thomas, 2011). However, this study showed the possibility, for example, that centrality in social-talk networks can meditate the relationship between the centrality in friendship network and perceived norms. Future study is required to find out this relationship.

Second, because this dissertation has mainly focused on centrality in social talk, frequency of social talk has not been considered. However, frequency can be critical in social
talk, particularly negative social talk. Previous WOM studies showed that dissatisfied customers talked twice as frequently about product negatively compared with satisfied customers (Technical Assistance Research Program, 1986). Accordingly, frequency of social talk should be considered in the future studies.

Third, the process of social talk needs to be further clarified. It is unknown what motivates social talk for youth. If positive social talk helps to enhance to program effects, prevention interventions can be designed to increase positive social talk and decrease negative social talk. Possibly, content can encourage to engage in social talk, or emotion on prevention messages may or may not push to talk about prevention program. For instance, if a youth believe that refusal skills which program has taught are useful, he or she can praise the program with his or her friend. On the other hand, when an individual receives greater threats than efficacy in the messages, he or she may avoid the social talk on prevention program (Witte, 1992). Thus, it is important to understand not only what specific health messages youth talk about but also how these specific health messages are associated with their emotions. Therefore, qualitative research should be required to understand the process of social talk.

Fourth, this dissertation did not examine reciprocated relationship in social talk. In these studies, we do not know whether social talk occurred in dyads, triads, or groups. This different structure can influence perceived norms and can be very complicated depending on who talked with whom about what (negative social talk vs. positive social talk). Thus, how dyad/triad/group structure of social talk can influence perceived norms or refusal self-efficacy.

In addition, measurement of social talk should be developed further. In this study, social talk was measured by single network item but this network item did not distinguish between two-way conversation (e.g., speakers and targeted listeners) among youth and public speech (e.g., one
speaker and non-targeted listeners). It is possible that this network question may not reflect the social talk in this dissertation. It should be studied the phenomenon of social talk about prevention program for teenagers and quantitative items for social talk should be developed to capture the actual social talk.

Finally, although this dissertation focuses on peers, this is not to suggest that family members and others do not engage in social talk. Many studies showed that families, in particular, continue to affect youth’s substance use even into later adolescence (Ahmed, Bush, Davidson, & Lannotti., 1984; Biederman, Faraone, Monuteaux, & Feighner, 2000; Brook et al., 1980; Cleveland et al., 2008; Hansen et al., 1987). For example, parent and older sibling substance use predict a younger sibling’s substance use, respectively (Brook et al., 1980; Cotton, 1979). Certain portion of youth reported that they are with their family when they use substances (Bigland et al., 1984; Alberts, Hecht, Miller-Rassulo, & Krizek, 1992), particularly when they initiate use (Bewley, et al., 1974). While peers are important, families also are a strong influence on youth substance use. Thus, it is possible that social talk occurs in family because prevention program can be new information for parents.

Conclusion

This dissertation investigated the role of social talk in middle school-based substance abuse prevention. The findings demonstrate that both positive and negative social talk about prevention program exist. The dissertation also examined subgroups based on youth’s social network positioning. Both studies showed that social talk is both salient and important and requires understanding the role of listeners and speakers in order to facilitate prevention efforts. Even though the study failed to detect opinion-leadership subgroups, project leaders who were nominated by peer can be key players in prevention program because of their positive anti-
substance norms. While the causal direction of these relationships could not be determined, they suggest that future research examine the directionality of causality in order to determine whether the network positions might be utilized in peer-led interventions.
Reference


doi:10.1002/ejsp.2420010103


among low-income African-American women in urban public health centers. *Preventive Medicine, 41*, 53.


Appendix A.
Social network questionnaire

In this section, I would like you to tell us how you feel about your classmates. Please mark the classmates who fit the descriptions in each column. Please mark all of your classmates who fit the description. Classmates can also appear in more than one column. For example, if you are friends with Bob, like Bob and think that Erica is the best leader in class, then you would fill out the table in this way:

<table>
<thead>
<tr>
<th>Names (class roster)</th>
<th>My Friends</th>
<th>Best leaders for a class project</th>
<th>Like the Most</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bob</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Erica</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Barbara</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samuel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this section, I would like you to tell us about conversations you’ve had with your classmates. Please mark the classmates who fit the description in each column. Please mark all of your classmates who fit the description. Classmates can also appear in more than one column. For example, *IN THE PAST YEAR*, if John talked with you positively about Keeping it Real and Barbara made fun of Keeping it Real, then you would fill the table out this way:

<table>
<thead>
<tr>
<th>Names</th>
<th>Talked about Keeping it Real positively</th>
<th>Made fun of Keeping it Real</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>John</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Barbara</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samuel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Appendix B.
Questionnaire for study 1 and 2

**Drug refusal self-efficacy**
Suppose someone you know offered you <a drink of alcohol/ cigarette/ marijuana>, and you didn't want it. How easy would it be for you....(1: Very easy ~ 4: very hard)

1) to refuse it?
2) to explain why you didn't want it?
3) to avoid the situation in the first place?
4) just to leave the situation?

**Personal anti-norms toward drug**
How wrong do you think it is for someone your age to…(1: Not at all wrong ~ 4: Very wrong)

1) drink alcohol regularly (beer, wine, or hard liquor)?
2) use tobacco (cigarettes, chewing tobacco)?
3) smoke marijuana?
VITAE

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2013 PhD, Communication Arts and Sciences, The Pennsylvania State University
2008 MA, Advertising, Public Relations & Retailing, Michigan State University
2004 BA, Advertising and Public Relations, Ewha Womans University

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2008-2012 Teaching Associate, Department of Communication Arts and Sciences, The Pennsylvania State University
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