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**INVESTIGATING THE ROLE OF SOCIAL AND EMOTIONAL
COMPETENCIES AS PREDICTORS OF PROBLEM BEHAVIORS
AMONG A SAMPLE OF SOUTH AFRICAN YOUTH**

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by

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ABSTRACT

Adolescent substance use and delinquency are important problem behaviors to prevent because they increase the likelihood of future negative outcomes such as criminal activity, risky sexual behaviors, and substance dependence. Although these behaviors are known to co-occur, these behaviors are usually studied separately. Understanding the psychosocial correlates of SU and delinquency, such as social and emotional competencies (SEC), can guide the development of effective preventive intervention programs in high risk contexts. The current study identified patterns of co-occurring SU and delinquency among a South African adolescent sample and examined the roles of gender, age, and social and emotional competencies in predicting these patterns. The current study analyzed survey data collected from the control group sample of a randomized effectiveness trial of the HealthWise: South Africa program ($N=1,953$; $M_{age}=16.7$ years; 55% female, 93.6% Coloured). Latent class analysis (LCA) with covariates and multiple-groups LCA were employed using SAS PROC LCA. Four patterns of SU and delinquency were identified: Abstainers had low probabilities for all SU and delinquency behaviors; those in the Gateway Drugs class reported high probabilities of having used alcohol, cigarettes, and marijuana in the past month; those in the Aggressive Gateway Drugs class had high probabilities of past month alcohol and cigarette use and hurting someone; and the Multiple Problems class consisted of those with high probabilities of using gateway drugs and involvement in all delinquency behaviors in the past month. Gender differences were found in the prevalence but not types of patterns. For both genders, older age was associated with an increased likelihood of membership in the Gateway Drugs and Multiple Problems groups and a decreased

likelihood of membership in the Aggressive Gateway Drugs group, relative to the Abstainers group. Higher levels of self-reported anger management, decision-making, risk management, and conflict resolution skills were associated with decreased likelihood of membership in all problem behavior groups relative to the Abstainers group, for both genders. Study findings provide a more complete picture of adolescent problem behaviors and highlighted potentially high risk groups. Universal preventive interventions of co-occurring SU and delinquency behaviors should consider utilizing screening protocols to identify adolescents engaging in high risk, multiple problem behaviors for referral to targeted interventions. Helping adolescents develop social and emotional competencies may be a promising way to address co-occurring adolescent problem behaviors, particularly for females.

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1. INTRODUCTION

Teaching social and personal life skills is part of a competence-enhancement approach for reducing adolescent problem behaviors (Botvin, 2000; Botvin, Griffin, & Nichols, 2006; Payton, Wardlaw, Graczyk, Bloodworth, Tompsett, & Weissberg, 2000) and promoting positive youth development (Mangrulkar, Whitman, & Posner, 2001). One U.S.-based program that utilizes the life skills approach to address adolescent substance use and some delinquency is the Life Skills Training (LST) program. LST derives its theoretical basis from social learning theory (Bandura, 1977) and problem behavior theory (PBT; Jessor & Jessor, 1977). These theoretical perspectives suggest that problem behaviors are learned from an adolescent's context and peers, and result from an interplay of personal and social risk factors. The teaching of life skills is theorized to increase adolescents' abilities to buffer the impact of risk factors by managing their emotions and making good decisions to avoid getting involved in problematic behaviors.

A similar but alternative perspective to the life skills framework is social and emotional learning (SEL). As the name suggests, SEL focuses on the social and emotional skills, or competencies, that are a part of the general concept of life skills. SEL is a comprehensive approach to preventing problem behavior by developing youth who are "knowledgeable, responsible, and caring, thereby contributing to their academic success, healthy growth and development, ability to maintain positive relationships, and motivation to contribute to their communities" (Payton, Wardlaw, Graczyk, Bloodworth, Tompsett, & Weissberg, 2000, p. 179). The Collaborative to Advance Social and Emotional Learning (CASEL) has identified key SEL competencies which are organized under the themes of awareness of self and others, positive attitudes and values,

responsible decision making, and social interaction skills. CASEL believes that school-based programs that promote positive youth development in these areas will simultaneously reduce risks for problem behaviors.

Adolescent substance use (SU) and delinquency are important problem behaviors to understand and prevent because they increase the likelihood of future negative outcomes such as criminal activity, risky sexual behaviors, and substance dependence. Most research to date on adolescent SU and delinquency examine these behaviors separately. However, examining problem behaviors together captures a more complete picture of adolescents' experiences as SU and delinquency are likely to co-occur (Flisher, Ziervogel, Chalton, Leger, & Roberts, 1996; Reddy, James, Sewpaul, Koopman, Funanl, Sifunda, et al., 2010). Further, previous studies suggest that co-occurring problem behaviors result in worse outcomes than problem behaviors occurring independently (Tubman, Gil, & Warner, 2004). Among members of an early adolescent, longitudinal sample, Tubman and colleagues (2004) found that at each time point, the mean levels of substance use and delinquency were significantly higher among adolescents engaged in both problem behaviors compared to the levels for adolescents engaged in only one of the behaviors.

Another reason for looking at combinations of different problem behaviors together is that it allows for the identification of higher risk subgroups not addressed in most research, such as patterns that include the use of methamphetamines, for example—a substance known to be highly addictive and to have severe psychopharmacological effects. Examining problem behaviors separately to the exclusion of considering co-occurring problem behaviors ignores the fact that co-occurring problem behaviors may

have different implications for outcomes, prevention, and intervention. The implications of co-occurring problem behaviors—such as higher mean levels of each problem behavior, involvement in the criminal justice system, or the treatment of substance use disorders—place a high demand on the personal, financial, and social resources of adolescents’ immediate environment and society more broadly.

Compared to Western countries, the consequences for co-occurring problem behaviors may be even more prevalent in high risk contexts such as South Africa, where there are multiple and chronic risk factors for adolescent problem behaviors (Fishbein, Herman-Stahl, Eldreth, Paschal, Hyde, Hubal, et al., 2006). One major risk factor in South Africa is that the prevalence of HIV among young people ages 18 to 24 is 10 times greater than in the U.S. (Pettifor, Levandowski, Macphail, Miller, Tabor, Ford, Stein, Rees, & Cohen, 2011). Understanding the psychosocial correlates of SU and delinquency, such as social and emotional competencies (SEC), can guide the development of effective preventive intervention programs in high risk contexts.

In the current study, I will examine the role of SEC in predicting SU and delinquency among a sample of adolescents in South Africa. It is also important to consider gender and age because there are gender differences in delinquency and developmental differences in SU and delinquency. Thus, I will address four research questions:

1. Are there distinct patterns of behavior representing different combinations of SU and delinquency?
2. Are there gender differences in (a) the types of patterns or (b) the prevalence of patterns of SU and delinquency?

3. Does age predict involvement in different patterns of SU and delinquency?
4. How do levels of SEC (e.g., anger management, anxiety management, decision making, risk avoidance, and conflict resolution) relate to more advanced involvement in SU and delinquency?

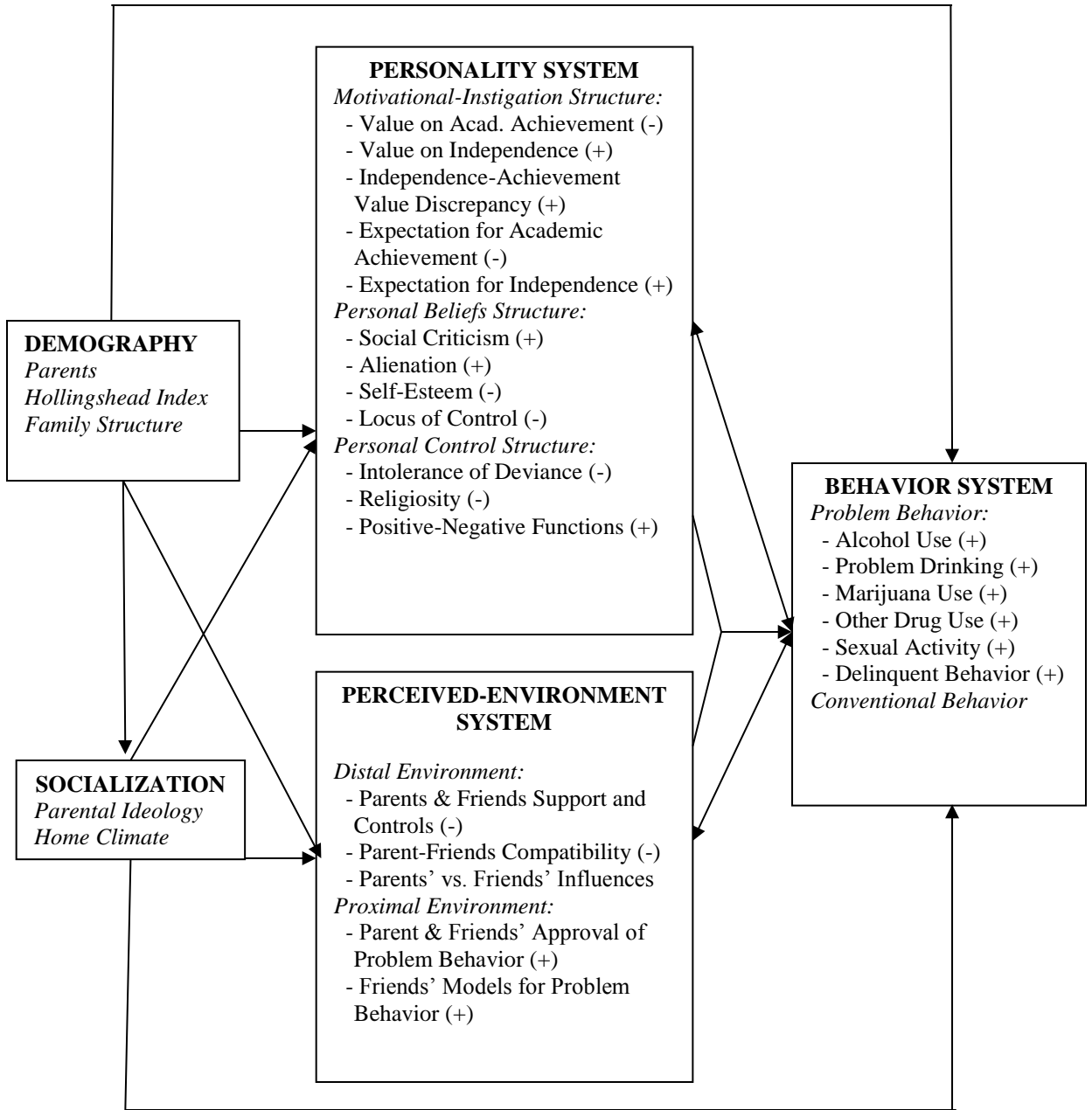
To examine the research questions above, I will use latent class analysis (LCA) with covariates to identify patterns of SU and delinquency and examine how SEC and age predict these patterns. To establish whether or not the latent structure of SU and delinquency is the same across gender, I will use multiple-groups LCA to test whether the patterns of SU and delinquency are the same for males and females.

2. LITERATURE REVIEW

Theoretical support for the current study

As one of the theoretical foundations of the life skills approach, problem behavior theory (PBT; Jessor & Jessor, 1977) posits that adolescent SU, delinquency, and other socially defined problem behaviors tend to cluster together as part of a problem behavior syndrome, sharing common risk and protective factors. Figure 1 shows the conceptual model for PBT which describes risk and protective factors organized by Personality, Perceived Environment, and Behavioral Systems. Problem behaviors such as alcohol use, marijuana use, and delinquency are part of the Behavior System. The variables within each of the Personality, Perceived Environment, and Behavioral Systems are mutually reinforcing and influence each system. The dynamic balance between these influences contributes to an adolescent's proneness for problem behaviors. Engagement in one problem behavior increases the risk for engaging in other problem behaviors, suggesting that these problem behaviors will co-occur.

Figure 1. Conceptual structure of Problem Behavior Theory*



*Reproduced and adapted from Donovan (2005).

Note. Plus and minus signs in parentheses reflect the direction of relation of these variables to problem behavior involvement.

A major limitation of PBT is that specific social and emotional skills—such as anger and anxiety management, decision-making, risk avoidance, and conflict resolution—are missing from the Personality and Perceived Environment Systems. Another limitation of PBT is that although this theory suggests that problem behavior can co-occur, the clustering of problem behaviors is viewed from a variable-centered perspective and does not address the possibility of patterns of problem behaviors.

The social and emotional learning (SEL) framework addresses these limitations by focusing on skills or competencies that may be learned rather than focusing on personality attributes that are much less malleable. Social and emotional competencies (SEC) include such skills as becoming aware of self and others, prosocial interaction, positive attitudes and values, and responsible decision-making (Payton et al., 2000). Further, similar to PBT, the SEL framework is based on the idea that similar risk factors underlie multiple negative outcomes. Research suggests that social and emotional learning programs have been effective in addressing a variety of problem behaviors. For example, Greenberg and colleagues (2003) reviewed meta-analyses of school-based, SEL programs that have been effective in enhancing positive youth development and mental health and reducing substance use and antisocial behavior (Greenberg, Weissberg, O'Brien, Zins, Fredericks, Resnik, & Elias, 2003). In contrast to prevention approaches that utilize one particular strategy (e.g., cognitive behavioral therapy) to address one particular problem behavior outcome, it is believed that teaching SEC within the educational system could more effectively address multiple problem behaviors if implemented in a coordinated and integrated way at the school level (Greenberg, et al., 2003). Within the larger context of advancing coordinated and integrated school-based

SEL programming, it may be helpful for program development purposes to better understand how SEC are linked to problem behavior outcomes.

The current dissertation examines patterns of SU and delinquency and the role of specific SEC skills (such as anger and anxiety management, decision-making and risk avoidance, and conflict resolution skills) in relation to these patterns. The theoretical framework for the current dissertation utilizes both PBT to examine co-occurring problem behaviors, as suggested by PBT's Behavior System, and SEL to examine the competencies that may be learned to prevent or reduce co-occurring problem behaviors. Additionally, the current dissertation will examine whether there are gender differences in patterns of problem behaviors and how age plays a role in these patterns. It is important to note here that the proposed dissertation does not examine school-based life skills *programs* but the life skills themselves as the life skills approach is comprised of additional components such as interactive teaching methods, drug resistance skills, and specific content knowledge (Mangrulkar et al., 2001).

Empirical research linking social and emotional competencies and problem behaviors

Empirical research supports the link between SEC and problem behaviors such as SU and delinquency. The majority of this research has been conducted among Western samples but provides a starting place for the exploration of this link in the South African context. This section summarizes research demonstrating the connection between adolescent problem behaviors and the SEC of anger and anxiety management, decision-making and risk avoidance, and conflict resolution.

Anger management. Adolescents who have difficulty managing their anger are at higher risk of engaging in SU and delinquency. The inability to manage anger could lead to situations involving aggression and fighting (Loeber & Burke, 2011), as well as coercive cycles of interactions with parents, peers, or teachers that could lead to maladjustment and substance use (Conger, Neppl, Kim, & Scaramella, 2003; Loeber & Hay, 1997; Patterson, DeBaryshe, & Ramsey, 1989). Anger has been significantly and positively associated with violent (physical fights) and non-violent delinquency (damaging property, carrying weapon; Aseltine, Gore, & Gordon, 2000), and adolescent substance use (Hussong & Chassin, 1994; Swaim, Oetting, Edwards, & Beauvais, 1989; Wills, Sandy, Yaeger, Cleary, & Shinar, 2001). It is unclear whether these associations vary by gender as some studies have shown that anger was associated with adolescent substance use for girls but not boys (Colder & Stice, 1998).

Anxiety management. Anxiety and other internalizing problems have been linked to substance use (Loeber, Stouthamer-Loeber, & White, 1999). The association between anxiety disorders and substance use disorders has been well established in the clinical literature (Kendall, Safford, Flannery-Schroeder, & Webb, 2004; Merikangas, Mehta, Molnar, Walters, Swendsen, Aguilar-Gaziola, et al., 1998; Saban & Flisher, 2010; Simkin, 2002). However, research on the association between anxiety and substance use at the lower end of the severity spectrum is not as consistent. For example, anxiety was not associated with any form of delinquency or with marijuana use in a study by Aseltine, Gore, and Gordon (2000). However, it is possible that this association may be stronger in high risk contexts that present more opportunities and experiences that may increase feelings of anxiety. In this case, an adolescent's internal ability to manage his or her

anxiety may help to prevent substance use as a coping strategy for anxiety. More information is needed to better understand the link between anxiety and problem behaviors at lower levels of severity in order to inform approaches to preventing these behaviors from escalating.

Decision-making and risk avoidance. Cognitive skills such as the ability to make good decisions and avoid risks are also important for helping adolescents avoid peer pressure to use substances or to get involved in delinquent activities. Research shows that cognitive skills such as decision-making are related to adolescent substance use. The lack of personal competence skills (such as decision-making, self-control, and self-regulation) was associated with higher levels of adolescent SU (Griffin, Botvin, Scheier, Epstein, & Doyle, 2002; Griffin, Scheier, Botvin & Diaz, 2001). In another study, decision-making skills were associated with less alcohol use among 6th graders (Epstein, Griffin, & Botvin, 2002).

Conflict resolution. The presence of conflict in the home, school, or neighborhood may lead to delinquency as outward expressions of conflict or to substance use as a coping strategy. There is some support for linking conflict resolution skills with adolescent problem behaviors. In a study of conflict resolution styles, Colman and Wulfert (2002) found that adolescents with a maladaptive conflict resolution style (i.e., observed as being less cooperative and more contentious during role-playing conflict scenarios) were more likely than their peers to report that they smoked cigarettes, drank alcohol, smoked marijuana, and fought with others. Low social competence (a factor comprised of aggression, hostility, and conflict resolution style) was significantly

associated with substance use (Fishbein et al., 2006). Thus, the ability to deal with conflict may inhibit adolescents' involvement in problem behaviors.

South Africa as a high risk context

Social and emotional competencies are especially important in high risk contexts because of the presence of multiple and chronic risk factors for adolescent problem behaviors. While adolescents typically face discrete stressful life events (e.g., moving, accidents, natural catastrophes, or death of a loved one), those who live in extreme adversity face challenges on an ongoing and regular basis. In a high risk context, adolescents may experience anger and anxiety as a result of inequalities and hardships caused by poverty, family dysfunction, and perceived lack of opportunities (Holborn & Eddy, 2011). High risk contexts increase the need for adolescents to develop these competencies because of the constant presence of negative role models and stressors as well as the widespread availability of opportunities to be involved in delinquency and substance use.

Based on the preceding description, the South African context can be characterized as a high risk context. South African adolescents face challenges related to racial discrimination, violence, crime, poverty, and family dysfunction (Brook et al., 2006; Holborn & Eddy, 2011; Moore & Lemmer, 2010; Snodgrass & Blunt, 2009; van der Westhuizen & Maree, 2009). It is reasonable to assume that some adolescents who develop within this context may feel anger or anxiety from their experience or circumstances, and attempt to cope with these feelings by using substances or engaging in delinquency. Furthermore, South Africa is a high risk context for adolescent problem behaviors particularly as alcohol use may have a devastating impact on health. Research

indicates that alcohol use is a risk factor for HIV in sub-Saharan African countries including South Africa (Chersich et al., 2009; Kalichman et al., 2007), where the prevalence of HIV among young people ages 18 to 24 is 10 times greater than in the U.S. (Pettifor et al., 2011).

Conflict resolution skills are especially relevant for South African adolescents as high levels of conflict have been noted in South African schools (Moore & Lemmer, 2010; van der Westhuizen & Maree, 2009). The ability to avoid conflict could also help with negotiating out of situations involving substance use, aggression, or other delinquency, particularly as these situations are prevalent in the South African context. Cognitive skills, such as decision-making and risk avoidance, are particularly relevant in high risk contexts where gangs, crime, violence, and drug use are commonplace and there are many opportunities to engage in these activities at school and in their neighborhood. SEC may protect South African adolescents by helping them to deal with and overcome multiple risks for substance use and delinquency.

Thus, SEC related to managing one's feelings of anger and anxiety, decision-making, and negotiating conflict become particularly important for adolescents in high risk contexts such as South Africa. As a result of the popularity and relevance of teaching SEC in South Africa, the department of education adopted this approach in their Life Orientation curriculum.

Prevalence rates of adolescent substance use and delinquency in South Africa

High prevalence rates for adolescent SU and delinquency in South Africa underscore the importance of investigating SEC that may protect adolescents from involvement in these problem behaviors. Adolescent substance use is a pressing problem

in South Africa, with alarmingly high rates in some regions of the nation, such as the Western Cape (where the data from the current dissertation were collected). The 2008 South African National Youth Risk Behaviour Survey (NYRBS) was conducted among adolescents ages 11 through 20 (grades 8 through 11). NYRBS findings indicated that the prevalence of substance use among adolescents in the Western Cape province of South Africa is nearly twice the national average. Lifetime substance use rates for alcohol, cigarettes, and dagga (marijuana) are 71%, 54.8%, and 24.5%, respectively, in the Western Cape and 49.6%, 29.5%, and 12.7% nationally (Reddy et al., 2010).

Empirical research on delinquent behaviors among South African adolescents is limited, but surveillance data indicate that many adolescents have been involved in delinquent behaviors, such as fighting. The 2008 NYRBS reported that 31.3% of adolescents have been in a fight in the past six months, 19.4% belonged to a gang, and 11% have threatened or injured someone else with a weapon at school (Reddy et al., 2010). In addition, over a third (37.3%) of adolescent survey participants reported that they have been bullied in the past month. As with the rates of adolescent substance use, the rates of bullying victimization and being involved in a fight in the Western Cape province were higher than national rates, at 41.3% and 33.9%, respectively. This suggests that that while national delinquency rates are already relatively high, some areas of the country may be at increased risk for delinquency.

While there is limited research on delinquency in South Africa, it is widely acknowledged that crime and gang violence is a major public health concern (Gilbert, 1996; Naude, 2001; Ryan, 1997; Seedat, Van Niekerk, Jewkes, Suffla, & Ratele, 2009) and presents increased opportunities for adolescents to engage in delinquent behaviors.

Clearly, given the large number of South African adolescents who use substances or engage in delinquency, more data are needed to better understand how to prevent adolescent problem behaviors in this high risk context.

Gender differences in adolescent substance use and delinquency in South Africa

Gender is an important consideration in understanding adolescent substance use and delinquency in South Africa, given that males have higher rates of lifetime use for alcohol, cigarettes, marijuana, and methamphetamines. Lifetime substance use rates for alcohol, cigarettes, marijuana, and methamphetamines among South African adolescent males are 54.4%, 36.8%, 17.9%, and 8.7%, respectively; corresponding rates for females are 45.1%, 22.4%, 7.6%, and 4.6%, respectively (Reddy et al., 2010). Kandel and colleagues (Kandel & Yamaguchi, 1993; Kandel, Yamaguchi, & Chen, 1992) found gender differences in the substance use progression model among U.S. adolescents: alcohol use among males was a critical step before marijuana use; among females, however, cigarette use (more so than alcohol) was critical for determining drug use progression. These gender-specific patterns in adolescence substance use are supported by later research, which also found that females are more likely to become dependent on nicotine in late adolescence and adulthood (e.g., cigarettes; Brandy & Randall, 1999; Young et al., 2002) whereas alcohol and marijuana are the drugs of dependence for males (Young, Corley, Stallings, Rhee, Crowley, & Hewitt, 2002).

With respect to delinquency, more males (41.5%) than females (27%) have been in a fight in the past six months among adolescents in the Western Cape (Reddy et al., 2010). Research shows that girls tend to engage in relational (or indirect) aggression whereas boys engage in physical or overt aggression (Crick & Grotpeter, 1995; Merrell,

Buchanan, & Tran, 2006; Rys & Bear, 1997). In addition, some research suggest that females have lower arrest rates than males due to earlier acquisition of social cognitive skills, such as interpreting and considering risks, weighing benefits of actions, and deciding a behavioral response (Bennett, Farrington, & Huesmann, 2005). Thus, a better understanding of gender differences in patterns of adolescent substance use and delinquency is needed. Just as it is important to identify patterns of co-occurring problem behaviors because the outcomes and prevention and intervention approaches may differ from independently-occurring problem behaviors, it is also critical to consider potential gender differences in patterns of co-occurring problem behaviors. Gender differences include whether the types and prevalence of patterns are the same for both males and females; this information would inform prevention and intervention efforts.

Research on patterns of adolescent substance use and delinquency in South Africa

This section reviews research on patterns of SU and delinquency in South Africa, including research that provides information about categories of SU and delinquency behaviors, separately as well as co-occurring. The selected studies were included due to their person-oriented approaches toward the study of SU and delinquency in South Africa. In contrast to what is known as “variable-centered approaches,” person-oriented methods of data analysis do not assume that developmental associations between variables are universal across individuals; in fact, person-oriented approaches operate under the assumption that developmental processes vary across different subgroups of individuals that can be identified based on their patterns of behavior.

Most research focuses on the prevalence or correlates of SU and delinquency; however, three studies examine patterns of SU and delinquency in South Africa. Brook

and colleagues (Brook, Morojele, Brook, Zhang, & Whiteman, 2006) categorized smoking patterns by frequency of cigarette smoking. Adolescent participants were assigned one of three groups based on their responses: non-smokers, experimental smokers, and regular smokers. The authors found that variables from various psychosocial domains differentially predicted each of the three smoking groups. For example, internalizing (interpersonal difficulty, depressive symptoms, and low ego-integration) and externalizing (self-deviance and tolerance of deviance) attitudes and behaviors increased the risk of smoking, through increased odds of being an experimental smoker as compared to a non-smoker, as well as being a regular smoker as compared to an experimental smoker. Risks for smoking were also identified in the parental, peer, and cultural domains.

Liang and colleagues (2007) examined patterns of bullying and victimization, and corresponding associations with other risk behaviors. The authors found that in comparison to students who had reported being neither a perpetrator nor a victim of bullying, South African adolescents who engaged in bullying behaviors were more likely to report fighting, weapon carrying, vandalism, theft, and use of alcohol and marijuana within the past month. The authors also found that adolescents categorized in both the bully and joint bully-victim groups were similar in their involvement in multiple risk behaviors.

Although adolescent substance use has been associated with delinquency in the South African context (Taiwo & Goldstein, 2006) and as part of a general adolescent risk syndrome (Flisher et al., 1996), only one study has examined co-occurring adolescent substance use and delinquency in South Africa. The 2008 NYRBS primarily examined

prevalence rates of various health risk behaviors of South African adolescents; however, the report included a special section examining clusters of risk behaviors, including SU and delinquency (Reddy et al., 2010). Researchers described a 3-cluster solution characterizing low-risk behaviors, intermediate-risk behaviors, and high-risk behaviors. Notably, means for substance use (a cumulative index of various substance use behaviors) in the high-risk cluster were at least twice as high as the national average while means for delinquency (an index of threatening and fighting others, and interpersonal violence) were four times the national average. The limitation of this study, however, is that the SU and delinquency indices used to create the clusters obscure patterns of *specific* SU and delinquent behaviors. In other words, the clusters did not provide information on whether gateway substances were likely to co-occur with covert delinquency, for example. This level of specification about patterns of SU and delinquency is important to know because prevention and intervention efforts may differ depending on the particular combination of problem behaviors being targeted.

Research using HealthWise data

One research project, HealthWise: South Africa (HWSA), has produced several studies on patterns of adolescent problem behaviors in South Africa. The multi-year HWSA project involved three cohorts of students from nine high schools in South Africa and was conducted primarily as an efficacy study of a program to prevent and reduce adolescent SU and risky sex through promoting healthy leisure (Caldwell, Smith, Wegner, Vergnani, Mpofu, Flisher, & Mathews, 2004; Smith, Palen, Caldwell, Flisher, Graham, Mathews, et al., 2008; Wegner, Flisher, Caldwell, Vergnani, & Smith, 2008). This section will describe the relevant studies that have been conducted using data from

this project, including several studies from HWSA project that have examined patterns of adolescent problem behaviors. These studies provide particularly relevant information as the proposed dissertation will also examine HWSA data.

Patrick et al. (Patrick, Collins, Smith, Caldwell, Flisher, & Wegner, 2009) examined the progression of substance use among South African adolescents using HealthWise data and Kandel's theory of substance use. Kandel's (1975) theory of adolescent substance use proposes a model of sequential progression linking licit and illicit drugs. As predicted by Kandel's theory, Patrick and colleagues found that inhalant use in the final stage of the substance use progression was accompanied by the use of alcohol, cigarettes, and marijuana. The findings of Patrick et al.'s study support the notion that the gateway hypothesis, which states that SU starts with either alcohol or cigarette use, then marijuana use, followed by the use of other illicit substances (hence, alcohol, cigarettes, and marijuana are referred to as "gateway" drugs) may hold true in the South African context (Kandel, 2002). The results of Patrick et al.'s study suggest that potential patterns of SU among South African adolescents may include gateway SU and illicit (or "hard") SU.

Palen and colleagues (Palen, Smith, Caldwell, & Flisher, 2008) examined smoking patterns among adolescent girls, using repeated measures latent class analysis. The authors identified three longitudinal cigarette use patterns: non-smokers, consistent smokers, and initiators (adolescents who started smoking after the first time point). Results indicated that the majority of the sample (65%) was non-smokers and the rest were consistent smokers or initiators. The authors also examined the role of various covariates in predicting the different smoking patterns and found that alcohol and

marijuana use at baseline significantly predicted membership in the initiator and consistent smoker groups.

Lai, Bray, Smith, Caldwell, Wegner, Flisher, Vergnani, and Mathews (2009) examined the relation between patterns of SU and patterns of delinquency among South African adolescents. In this study, authors identified three classes of adolescent SU of non-substance-users, alcohol and cigarette users, and polydrug users (alcohol, cigarette, marijuana, and inhalants). Using the same sample, the authors also identified a separate 3-class model of delinquency consisting of non-delinquents, those who engaged in aggressive delinquency (bullying and fighting), and adolescents who engaged in multiple delinquent behaviors. When the SU classes were associated with the delinquency classes, only 4.1 percent of the sample was likely to be multiple delinquents, but members of this group were also likely to be polydrug users. This finding echoes patterns found among U.S. adolescent samples, in which a small proportion of delinquent youth exhibit the highest risk behaviors (Elliott, Huizinga, & Menard, 1989). The results of this study suggest a link between adolescents who engage in multiple forms of delinquency and those who use multiple substances; however, it does not examine the co-occurrence of these problem behaviors. The current dissertation will consider patterns that include both SU and delinquency behaviors rather than examining each problem behavior separately. Doing so would allow for the identification of high risk subgroups of adolescents who engage in both problem behaviors – a group which research suggests has significantly higher rates of SU and delinquency compared to adolescents who only engage in one of these problem behaviors (Tubman et al., 2004). Thus, it is important to examine whether there are patterns of co-occurring SU and delinquency and whether these patterns of

problem behaviors are differentially associated with different risk factors to inform the prevention and intervention of these problem behaviors.

Potential patterns of delinquency from other research

Based on the HWSA studies reviewed above, it is clear that distinct patterns of SU (i.e., gateway versus “hard” drug use) can be identified among South African adolescents, though little research has studied them in a systematic way. Given this dearth of scientific evidence from South African samples, it may be helpful to draw from delinquency research based on non-South Africa adolescent samples. For example, Loeber and colleagues (Loeber & Burke, 2011; Loeber, Keenan, & Zhang; 1997) posited two typologies of delinquent behaviors for the mid- to late adolescent period: covert delinquency, which includes stealing, vandalism, and trespassing, and overt delinquency, which includes acts of interpersonal aggression or violence, such as bullying and fighting.

Loeber et al.’s categories of delinquency may also be linked to Moffitt’s taxonomy of adolescent-limited and life-course-persistent antisocial behavior (Moffitt, 2006, 1993). Research suggests that overt delinquency is characteristic of life-course-persistent antisocial behavior (begins in childhood and continues as a lifelong pattern) whereas covert delinquency is characteristic of adolescence-limited antisocial behavior (increases during and is limited to the adolescent period; Moffitt, 2006). For example, tests of Moffitt’s taxonomy have found that adolescent-limited delinquents engage in rebellious (i.e., rule-breaking) rather than aggressive behavior (Piquero & Brezina, 2001), and life-course-persistent delinquents are characterized by aggressive behavior (Moffitt, Caspi, Harrington, & Milne, 2002). Although Loeber et al.’s typologies and Moffitt’s taxonomies describe longitudinal patterns of delinquent behaviors, these

conceptualizations may be useful for guiding studies of delinquency that utilize cross-sectional data. The proposed dissertation will examine patterns of SU and delinquency and hypothesizes the emergence of categories that include gateway and “hard” SU, and covert and overt delinquency.

Developmental trends in adolescent substance use and delinquency

Developmental trends in delinquency indicate that (a) involvement in delinquency tends to decrease over adolescence (Thornberry, 2005; White, Loeber, Stouthamer-Loeber, & Farrington, 1999) and (b) delinquent adolescents tend to specialize in those behaviors as they get older, moving from engagement in multiple forms of delinquency (e.g., fighting, stealing, lying) to one particular type of delinquency (e.g., just stealing) (Piquero, Paternoster, Mazerolle, Brame, & Dean, 1999). In contrast, SU is known to increase over adolescence (White, et al., 1999; Young, et al., 2002). Because of these trends, it is important to examine whether age predicts involvement in the patterns of SU and delinquency among South African adolescents.

Research on social and emotional competencies and problem behaviors in South Africa

Two studies—one based on HealthWise data—have examined the links between SEC and problem behaviors in South Africa. In a cross-sectional study of South African 8th and 11th graders (Saban, Flisher, & Distiller, 2010), results showed that controlling for demographic variables, anxiety was significantly associated with marijuana use but not in the expected direction. Among 11th graders in the study, a one point increase in the anxiety score was associated with a 4.5 percent decreased risk for marijuana use. While this study did not specifically examine anxiety management skills, it is possible that

anxious adolescents in this sample may be utilizing anxiety management skills to buffer against using marijuana. The unexpected association found in this study suggests more research is needed on the association between anxiety management skills and SU.

In a preliminary study using HealthWise data, Lai, Graham, Caldwell, Smith, Bradley, Vergnani, Mathews, and Wegner (in press) examined the association between life skills and adolescent substance use and delinquency outcomes and found that conflict resolution skills were significantly and negatively associated with “hard” drug use (methamphetamines and inhalants) and delinquency. Interestingly, emotional coping (anger and anxiety management) were not associated with substance use or delinquency, but decision-making and risk management was marginally yet positively associated with gateway drug use.

While the results of the Lai et al. study provided greater insight into how particular SEC concepts were related to adolescent problem behaviors, several questions remain. First was the unexpected result that anger/anxiety management skills were not related to any of the problem behaviors. Research suggests that these life skills should be associated with drug use and overt delinquency. Although the anger and anxiety items were conceptually related and thus combined into a single scale in the Lai et al. study, the proposed study will examine each of these life skills separately to clarify whether anger and anxiety management are associated with adolescent problem behaviors.

Another issue is that the analyses conducted in the Lai et al. study assumed that that the relations between life skills and our outcomes of interest were the same across the sample, and does not consider the possibility of subgroups within the sample. Research suggests that adolescent substance use and delinquency can and do co-occur,

providing support for exploring patterns of these problem behaviors. Thus, the question that is left unanswered is, how are life skills, or SEC, associated with *patterns* of adolescent substance use and delinquency in South Africa? The proposed study will also address this question.

3. CURRENT STUDY

Previous literature on patterns of SU and delinquency in South Africa have focused on a specific substance such as cigarette smoking (Brook et al., 2006), delinquent behavior such as bullying (Liang et al., 2007), or clusters of adolescent problem behaviors (Reddy et al., 2010). Given the high risk context of South Africa it is likely that some adolescents will use multiple substances or engage in multiple delinquent behaviors. The proposed dissertation will use a person-oriented approach to examine patterns of SU and delinquency, including co-occurring behaviors, as a first step to understanding how specific SEC might protect against these patterns of behavior.

Research questions

RQ1: Are there distinct patterns of behavior representing different combinations of SU and delinquency?

Table 1 presents a synopsis of the combinations of concurrent adolescent substance use and delinquency that can be expected based on prior research, followed by a brief discussion of the theoretical and conceptual support for each hypothesized pattern (numbered in parentheses). The substance use categories on the left column of the table follow known prevalence rates of these substances among South African adolescents from most to least frequent. These are likely substance use categories as found by previous research using HealthWise data (Lai et al., 2009; Lai et al., under review; Patrick et al., 2009). Although the current study focuses on methamphetamines as a hard drug rather than inhalants as in the Patrick et al. study, it is reasonable to assume that methamphetamines would follow the same pattern as both methamphetamines and inhalants share

similar psychopharmacological symptoms as stimulants as well as being highly addictive. Both of these substances are considered illicit, hard drugs that adolescents typically use after gateway drugs.

The delinquency groupings along the top row of the table represent the distinct delinquent and antisocial pathways as proposed by Loeber et al. (Loeber & Burke, 2011; Loeber, et al., 1997) of overt and covert delinquency discussed above. Although in their preliminary study Lai and colleagues (2009) did not find evidence of a covert delinquency category when examining patterns of SU and delinquency separately, it is possible that covert delinquency may occur in a pattern with some SU so it is included here.

Table 1. Hypothesized Patterns of Adolescent Substance Use and Delinquency.

		Delinquency			
		No delinquency	Overt delinquency	Covert delinquency	Overt & covert delinquency
Substance use	No substance use	(1)	Unlikely	Unlikely	Unlikely
	Alcohol only	(2)	Unlikely	Unlikely	Unlikely
	Cigarettes only	(3)	Unknown	Unknown	Unlikely
	Both alcohol and cigarettes	(4)	Unlikely	Unlikely	Unlikely
	Alcohol, cigarettes, and marijuana	Unlikely	(5)	(6)	Unlikely
	Alcohol, cigarettes, marijuana, and methamphetamines	Unlikely	Unlikely	Unlikely	(7)

The first hypothesized group consists of adolescents who do not engage in either SU or delinquency (1). Although there is a relatively high prevalence of SU and

delinquency among South African adolescents, the prevalence is not so high that it can be assumed that all adolescents are involved in one or both of these problem behaviors. It will be informative to compare this group of non-users and non-delinquents with groups of other combinations of problem behaviors.

The next three hypothesized groups are the alcohol use only with no delinquency (2), cigarette use only with no delinquency (3), and alcohol and cigarette use with no delinquency (4). These three groups are likely to occur because alcohol and cigarettes are the most frequently used substances among South African adolescents and adolescent SU typically begins with either alcohol or cigarette use (Flisher, Parry, Muller, & Lombard, 2002; Kandel & Yamaguchi, 1993). It is reasonable to assume that adolescents in this group engage in alcohol and cigarette use as socially normative acts, which occur in social settings with other peers.

The link between alcohol, violence, and aggression has been well established (e.g., Huang, White, Kosterman, Catalano, & Hawkins, 2001; White, Brick, & Hansell, 1993). Thus, it is possible to have a group of alcohol drinkers who are also engaged in overt delinquency. However, I think it is likely that adolescents who engage in overt delinquency will also have tried marijuana, which previous research suggests occurs along with alcohol and cigarette use (Kandel & Yamaguchi, 1993; Kandel, et al., 1992; Patrick et al., 2009). Because marijuana has also been associated with violence (Moore & Stuart, 2005), the next hypothesized group consists of adolescents who use all gateway drugs and engage in overt delinquency (5).

Within the framework of Moffitt's (2006, 1993) typologies of antisocial behavior, life-course-persistent delinquents are characterized by patterns of aggression and violent

behavior across the life course, and in this way are linked to overt delinquency during the adolescent period. In contrast, adolescent-limited delinquents engage primarily in rule-breaking and rebellious behaviors, linking them to covert delinquency behaviors during adolescence. The adolescent-limited taxonomy of antisocial behavior is the basis for the hypothesized group of adolescents who engage in all gateway drugs and covert delinquency (6). It is assumed that youth whose delinquency is limited to their adolescent period will also engage in the use of alcohol, cigarettes, and marijuana, representing a more severe level of substance use than adolescents who use alcohol or cigarettes in social settings as is normative during adolescence.

The final hypothesized group consists of adolescents who engage in methamphetamine use in addition to alcohol, cigarettes, and marijuana, as well as both overt and covert delinquency (7). It is known that methamphetamine use has severe psychopharmacological effects (Wermuth, 2000). The association between methamphetamine use and violence has also been established (Sommers & Baskin, 2006; Tyner & Fremouw, 2008), suggesting that adolescents who use methamphetamine are likely to engage in overt delinquency. Methamphetamine use is also linked to covert delinquency because it is assumed that adolescents who use methamphetamines are engaging in a more severe level of substance use and correspondingly, a more severe level of delinquency that includes both overt and covert behaviors.

In summary, the proposed study hypothesizes seven likely patterns of adolescent SU and delinquency: 1) neither SU nor delinquency, 2) alcohol use only with no delinquency, 3) cigarette use only with no delinquency, 4) alcohol

and cigarette use only with no delinquency, 5) gateway drug (i.e., alcohol, cigarette, and marijuana) use and overt delinquency, 6) gateway drug use and covert delinquency, and 7) methamphetamine and gateway drug use and both overt and covert delinquency.

RQ2: Are there gender differences in (a) the types of patterns or (b) the prevalence of patterns of SU and delinquency?

General delinquency research and prevalence rates in South Africa indicate that males are more likely to be involved in interpersonally aggressive or overt delinquency. Therefore, it is hypothesized that males will have a higher prevalence of membership in patterns involving delinquent behaviors. No hypotheses are proposed for SU although it will be interesting to see whether gender differences exist in the types of patterns.

RQ3: Does age predict involvement in different patterns of SU and delinquent?

Based on known developmental trends in SU and delinquency, the proposed study hypothesizes that older age will predict less involvement in patterns involving multiple forms of delinquency and more involvement in multiple substance use patterns.

RQ4: How do levels of social and emotional competencies relate to more advanced involvement in SU and delinquency?

Although the positive program effects of some life skills and SEL programs are well-documented, less is known about the association between specific SEC and adolescent substance use and delinquency outcomes. This is an important step in

understanding the “active ingredients” of prevention programs, which is critical for refining programs and maximizing limited resources for prevention and intervention. While some life skills are known to be associated with problem behaviors independently (Lai et al., in press), it is unknown whether specific SEC (anger and anxiety management, decision making, risk management, and conflict resolution) are directly related to adolescent substance use and delinquency and whether they are differentially predictive of subgroups of adolescents who engage in various combinations of these problem behaviors.

Based on the literature reviewed, the following associations are hypothesized:

a) Anger management skills: It is predicted that lower anger management skills will be associated with an increased likelihood of membership in delinquency groups;

b) Decision-making skill: It is predicted that lower decision-making skills will be associated with an increased likelihood of membership in groups involving substance use;

c) Conflict resolution skills: It is predicted that lower conflict resolution skills will be associated with an increased likelihood of membership in groups involving substance use and/or delinquency.

No specific hypotheses are posited for anxiety management skills, risk management skills, or for the prediction of groups engaged in both substance use and delinquency.

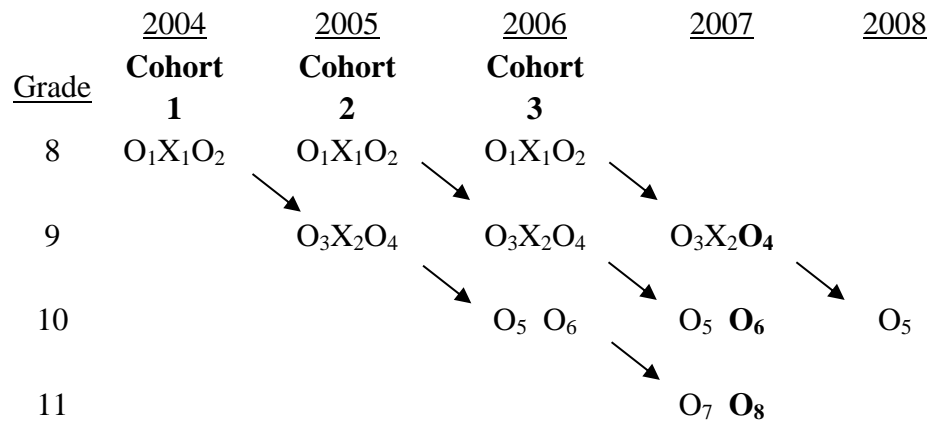
4. METHOD

Research design

The current study uses data drawn from a randomized effectiveness trial of Health Wise: South Africa (HWSA), an intervention program to prevent risky problem behaviors and promote healthy leisure use among 8th and 9th graders in South Africa (Caldwell et al., 2004; Wegner et al., 2008). Random selection procedures identified 4 treatment schools that delivered the HWSA curriculum. Five comparison schools were then matched with treatment schools based on the percentage of Afrikaans-speaking classrooms. Only data from the control schools will be used for the current study.

The HWSA study used a cohort-sequential design, collecting data from 3 successive 8th grade cohorts (beginning in 2004, 2005, and 2006) and continuing through the 2008 school year (see Figure 2).

Figure 2. Health Wise: South Africa Research Design



Where: O₁ = 8th grade pretest, X₁ = 8th grade HWSA curriculum, O₂ = 8th grade posttest, O₃ = 9th grade pretest, X₂ = 9th grade HWSA curriculum, O₄ = 9th grade posttest, O₅ and O₆ = 10th grade surveys, and O₇ and O₈ = 11th grade surveys.

The bolded posttest/surveys indicate the cohorts and waves of data used in the current study (described in the Participants subsection below). These data collection waves were

selected because the delinquency items were included in the Spring 2007 administration of the student survey; adolescent substance use and life skills items have been part of the student survey since the first administration and through subsequent data collection waves.

Institutional Review Board approval for the HWSA study was received from both Pennsylvania State University and Stellenbosch University in South Africa. Parental consent and youth assent were collected prior to students' participation in the HWSA study. Self-report surveys were administered during class time twice each school year and were available in English and Afrikaans. Data were collected using hand-held personal digital assistants (PDAs) by project staff from the University of Western Cape.

Participants

The current study used data collected from the control group schools for cohorts 1, 2, and 3 in Spring 2007 (N=1,953). The majority of the sample was female (55%) and the mean age was 16.7 years. Students who self-identified as Coloured (a combination of African, Asian, and European ancestries) comprised the largest racial group (93.6%), followed by Black (3.6%), White (1.6%), and Indian or Other (1.2%). Students reside in the Mitchell's Plain township in the Western Cape of South Africa where 48% of households earn less than the household subsistence level of R19,200 (\$2,743 US) per year (Statistics South Africa, 2003). The most commonly spoken language at home is English and nearly 60% speak both English and Afrikaans at home.

Measures

The substance use, SEC, and delinquency items used in the HWSA survey have been used in previous studies (Bearman, Jones, & Udry, 1997; Botvin, Baker, Filazzola,

& Botvin, 1990; Centers for Disease Control, 2007; Developmental Studies Center, 2005; Liang, et al., 2007). Additionally, substance use and SEC items were piloted with South African youth in 2002. The SEC items used in the current dissertation were drawn from a survey evaluating the Life Skills Training program (Botvin et al, 1990) because the life skills approach includes teaching SEC skills as well as additional components such as interactive teaching methods.

Substance use. Past month substance use was assessed for alcohol (including beer and wine), cigarettes, marijuana, and a lifetime use measure assessed methamphetamine use. These substance use items have been used in previous studies (Bearman, et al., 1997; Botvin, et al., 1990), except that locally used terms *dagga* (i.e., marijuana) and *tik* (i.e., methamphetamines) were used to increase face validity of the items. For alcohol, cigarette, and marijuana, participants responded to a series of skip patterned questions: if they first indicate ever using (i.e., lifetime use) the substance in the previous question, then they were asked whether or not (i.e., 0 = No, 1 = Yes) they used a substance in the past month. For example, for alcohol use, participants first indicated the number of drinks they have ever had in their lifetime on a 3-point scale where 0 = *None, or only sips in church services*, 1 = *Part or all of 1 drink*, and 2 = *More than 1 drink*. Participants were asked the follow-up question about past month use if they responded something other than “None, or only sips in church services” for alcohol, “None, or a few puffs of 1 cigarette”, or “Never” for marijuana use in the corresponding lifetime use question. Responses to the past month alcohol, cigarette, and marijuana use questions were recoded to include participants who indicated never using the substance and those who did not use in the past month (both coded as 0); those who indicated using the substance in the past

month were coded as 1. Responses to the lifetime methamphetamine use question were re-coded to reflect no lifetime use (never using in their entire life), or any lifetime use (1 or more times). Table 2 presents the frequencies of the substance use items by gender.

Delinquency. Tables 2 and 4 present the delinquency items to be included in the current study. Items were adapted from various large-scale youth surveys (Centers for Disease Control, 2007; Developmental Studies Center, 2005; Elliott, 1995; Liang, et al., 2007). Students reported their past month occurrence of overt and covert delinquency. Overt delinquency questions included bullying others at school and physically fighting (“hit, slapped, or physically hurt someone”). Covert delinquency questions included trespassing (“broken into a house, school, shop, or other building without permission”), vandalism (“caused serious damage to property that did not belong to you”), and stealing something worth more than 100 Rand (approximately \$15 US). It is important to note that the covert delinquency items used in the current study do not include lower level delinquency or antisocial behavior, such as lying or cheating. Response options were dichotomous such that a higher value represented past month occurrence of the behavior. Table 2 presents the frequencies of the delinquency items by gender.

Social and emotional competence. Students reported their level of confidence in their ability to use, as well as their use of, social and emotional skills. Items were adapted from the survey used to evaluate the Life Skills Training program (Botvin et al., 1990); two items measured each life skill of anger and anxiety management, decision-making, risk avoidance, and conflict resolution. Students rated these items on a scale of 0 = *Strongly disagree* to 4 = *Strongly agree*. Items included: “When I feel angry I stop and count to ten before I react” and “I am confident I can avoid risky situations.” For conflict

resolution, students rated these items on a scale of 0 = *Very often* to 4 = *Never*. The items were reverse-coded such that higher values on these items represented more agreement with resolving conflicts, parallel to the response options for the other life skills items. Sample questions included: “If I am in a conflict situation, I feel confident I could successfully resolve it.” Tables 3 and 4 present the frequencies for males and females, respectively.

Gender was assessed using a binary variable indicating male (0) or female (1).

Age was a continuous variable calculated by subtracting participant’s year of birth from the year of survey administration (2007).

Analytic strategy

To address the research questions of the current study, latent class analysis (LCA) with a covariate will be conducted using SAS PROC LCA version 9.2. LCA groups individuals into latent classes based on their responses on categorical manifest variables and is conceptually analogous to factor analysis (Collins & Lanza, 2010; Lanza & Collins, 2008). Latent variable models are advantageous over simple crosstabulation methods and other grouping techniques (e.g., cluster analysis) because LCA can: (1) account for measurement error, providing a statistically accurate representation of the data; (2) manage and identify patterns of responses in large contingency tables of all possible groups given the items used and response options per item; (3) include grouping variables to test whether the latent structure is the same across groups (i.e., multiple groups analysis) as well as covariates; and (4) test the fit of a model of the underlying latent structure (Collins, & Lanza, 2010; Lanza & Collins, 2002; Lanza, Collins, Lemmon, & Schafer, 2007; Lanza, Flaherty, & Collins, 2003).

The LCA program treats ignorable missing data (i.e., data missing completely at random [MCAR] or missing at random [MAR]) using the full-information maximum likelihood (FIML) procedure (Collins & Lanza, 2010). Collins and Lanza (2010) recommend planning ahead in regards to conducting LCA with covariates because the LCA procedure deletes cases missing data on the covariates. In order to fit the baseline LCA model on the same sample as for the covariate models, cases missing data on the covariates will be excluded from all analyses. At most, the items included in the analyses of the current study are missing data on 0.7 percent of cases and it is assumed any potential bias due to missing data will be minor. The analytic strategy for addressing the research questions of the proposed study are described below.

RQ 1: Are there distinct patterns representing different combinations of SU and delinquency?

To address the first research question, latent class analysis (LCA) using SAS PROC LCA was used to identify subgroups of adolescents based on the patterns of their past month use of alcohol, cigarettes, and marijuana, lifetime use of methamphetamines, and past month delinquency (bullying, hurting others, stealing, trespassing, vandalism). LCA will be used to determine the number of latent classes (subgroups) needed to describe the patterns of adolescent substance use and delinquency in the data. The categorical items measuring substance use and delinquency for cohorts 1, 2, and 3 were entered into the program. Then, the analytic steps included the following:

(1) *Model estimation and identification.* First, maximum likelihood (ML) estimates were computed for a baseline model using the Expectation Maximization (EM) algorithm. Due to the likelihood that ML and EM may produce multiple solutions, 100

random starting values were used in the estimation process. In the event that the estimation process produces several solutions, the most common solution that is computed with the lowest log-likelihood value was considered the optimal solution for that model (Lanza, et al., 2007). This step was repeated for a 2-class model. If a 2-class model is identified, it will be compared to the baseline model according to the G^2 (likelihood ratio) test statistic, Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC). The better fitting model will ideally have the lowest G^2 , AIC, and/or BIC values. This model estimation and identification procedure was repeated for 3 or more class models until the fit statistics were not improved when the current model was compared with the additional class model (i.e., G^2 , AIC, and/or BIC values begin to increase with the additional class model).

(2) *Model selection.* Model selection is a subjective process that involves evaluation of fit statistics, theory, and interpretability (Collins & Lanza, 2010). In terms of interpretability, the best-fitting model will ideally be one in which the latent classes show strong homogeneity (degree to which rho parameters for each latent class are close to 0 or 1) and separation (degree to which latent classes can be distinguished from each other). These characteristics indicate that the classes (subgroups) are distinct. This strategy is recommended for heuristic purposes only and not for subsequent analyses.

(3) *Subgroup description.* Once the best model was selected, two parameters were interpreted to describe the subgroups of adolescent substance use and delinquency. The gamma parameter (i.e., class membership probabilities) indicates how South African adolescents in our sample are distributed across the subgroups. The rho parameter (i.e.,

item-response probabilities) indicates the probability that an individual belonging to a particular subgroup will respond affirmatively to each substance use or delinquency item.

RQ2: Are there gender differences in (a) the types of patterns or (b) the prevalence of patterns of SU and delinquency?

There are two options for assessing gender differences in patterns of adolescent SU and delinquency. One option to examine gender differences is to test for measurement invariance across gender using multiple groups LCA to determine whether the number and type of subgroups (i.e., the latent structure) of patterns of SU and delinquency are the same for both males and females. Gender would be entered into PROC LCA as the grouping variable. Cases missing data on gender will have been omitted from analyses. A model that is freely estimated (no parameter restrictions) is compared to a restricted model where the rho parameters (item response probabilities) are set to be equal across males and females. The null hypothesis that the latent structure is the same across genders is tested using a G^2 difference test. The difference in the G^2 statistics for each model is compared to a Chi-square distribution with the difference in degrees of freedom between the two models. Thus, a significant p -value indicates that the null hypothesis should be rejected, and that the latent class structure (i.e., definitions of the subgroups) may differ across gender. In this case, the model identification and selection process will be conducted separately for each gender using multiple groups LCA.

Given the low percentages of some of the delinquent behaviors, it is possible that the multiple groups LCA will have problems due to sparseness of data. In this case, another option to examine gender differences is to include gender as a covariate in the LCA which will indicate whether being female or male (depending on which gender is

coded as 1) increases the likelihood of membership in the latent classes relative to the reference class. It is important to note that the LCA with a covariate model is conceptually different from the multiple group LCA model. The covariate model assumes the latent structure is the same for both genders (i.e., measurement invariance) and that the participants vary only in their latent class membership. Multiple group LCA assumes that that males and females, for example, represent different and distinct populations, each with their own latent structure (i.e., measurement variance). In sum, using the LCA with covariate model will provide different information about gender differences than multiple group LCA.

Given these two options, multiple group LCA was used to address RQ2 in order to examine whether there are gender differences in the types of patterns (i.e., testing measurement invariance in the structure of the latent classes) and the prevalence of patterns (i.e., testing equality constraints on the latent class prevalences) of SU and delinquency.

RQ3: Does age predict involvement in different patterns of SU and delinquency?

Age was included as a covariate in the LCA model to examine whether older age increased the likelihood of membership in the latent classes relative to the reference class. Age was centered before inclusion into the model to aid with interpretation. A significant result for the G^2 difference test for age would indicate that it significantly predicted class membership.

RQ4: How do levels of SEC (anger management, anxiety management, decision-making, risk avoidance, and conflict resolution) relate to more advanced involvement in SU and delinquency?

LCA with covariates was conducted to address this research question. Each set of SEC items was turned into a scale and entered independently into the LCA model as a covariate to determine the effect of each life skill on predicting class membership using multinomial logistic regression. A latent class was selected as the reference group. Cases missing data on any of the covariates were omitted from analyses. In LCA with covariates, the item response probabilities and regression coefficients, instead of the latent class prevalences, are estimated. A significant G^2 test comparing the baseline model with the covariate model would indicate that the covariate is a significant predictor of latent class membership. Odds ratio estimates were provided by SAS, indicating the effect of the covariate on the odds of membership in particular classes relative to the reference class.

Descriptive statistics

Table 2. Substance use and delinquency item frequencies (by gender).

Substance use ^a	Males			Females		
	Frequency	N (% Yes)		Frequency	N (% Yes)	
		Original	Recoded ^b		Original	Recoded ^b
Alcohol (including beer and wine)	323	550 (58.7%)	879 (36.7%)	363	700 (51.9%)	1071 (33.9%)
Cigarettes	311	439 (70.8%)	879 (35.4%)	402	559 (71.9%)	1071 (37.5%)
Marijuana	172	440 (39.1%)	879 (19.6%)	140	458 (30.6%)	1071 (13.1%)
Methamphetamine	122	877 (13.9%)		130	1071 (12.1%)	
Past month delinquency	Males			Females		
	Frequency	N (% Yes)		Frequency	N (% Yes)	
Bullied anyone at school	177	879 (20.1%)		103	1073 (9.6%)	
Hit, slapped, or physically hurt someone	275	879 (31.3%)		264	1072 (24.6%)	
Broken into a house, school, shop, or other building without permission	59	878 (6.7%)		15	1072 (1.4)	
Stolen something more than R100	60	879 (6.8%)		20	1072 (1.9%)	
Caused serious damage to property that did not belong to you	131	877 (14.9%)		46	1071 (4.3%)	

^aAlcohol, cigarette, and marijuana use were assessed using a past month measure for respondents who first indicated lifetime use of the substance; methamphetamine use was assessed using the lifetime use measure.

^bRecoded past month alcohol, cigarette, and marijuana use includes participants who responded never using these substances.

Table 3. Frequencies of social and emotional competence items for males.

	N	Mean	SD
Anger Management			
1. When I feel angry I stop and count to ten before I react.	873	2.25	1.24
2. I am confident I can control my anger.	872	2.56	1.19
Anxiety Management			
3. When I feel anxious or nervous, I take deep breaths until I feel more relaxed.	872	2.6	1.16
4. When I feel anxious or nervous, I imagine myself being calm and relaxed.	873	2.56	1.16
Decision Making			
5. When I make an important decision I talk with someone who can help me.	870	2.71	1.08
6. I am confident I make good decisions.	873	2.9	1
Risk Avoidance			
7. I am confident I can avoid risky situations.	873	2.81	1.05
8. I am confident I can identify when situations might turn risky.	871	2.83	1
Conflict Resolution			
9. I think it is important to resolve conflicts (fights or arguments) peacefully.	871	2.04	1.26
10. If I am in a conflict situation, I feel confident I could successfully resolve it.	870	2.06	1.22

Note. For all life skills items above, responses ranged from a minimum of 0 (Strongly disagree/Never) to 4 (Strongly agree/Very often).

Table 4. Frequencies of social and emotional competence items for females.

	N	Mean	SD
Anger Management			
1. When I feel angry I stop and count to ten before I react.	1071	2.11	1.21
2. I am confident I can control my anger.	1071	2.63	1.14
Anxiety Management			
3. When I feel anxious or nervous, I take deep breaths until I feel more relaxed.	1072	2.74	1.08
4. When I feel anxious or nervous, I imagine myself being calm and relaxed.	1070	2.74	1.06
Decision Making			
5. When I make an important decision I talk with someone who can help me.	1069	2.91	0.97
6. I am confident I make good decisions.	1069	3.01	0.91
Risk Avoidance			
7. I am confident I can avoid risky situations.	1070	2.99	0.92
8. I am confident I can identify when situations might turn risk.	1069	2.96	0.94
Conflict Resolution			
9. I think it is important to resolve conflicts (fights or arguments) peacefully.	1068	2.28	1.24
10. If I am in a conflict situation, I feel confident I could successfully resolve it.	1069	2.18	1.18

Note. For all life skills items above, responses ranged from a minimum of 0 (Strongly disagree/Never) to 4 (Strongly agree/Very often).

5. RESULTS

Data preparation

Missing data. Prior to conducting data analysis, any cases missing data on gender, age, or any of the SEC items were deleted (N = 58). The final sample used for data analysis consisted of 1895 cases.

Age. A new variable was created with the centered age value for inclusion in the analyses.

Social and emotional competence. A mean variable was created comprising the two items for each SEC. The distribution of the mean variables for four of the five competencies (anxiety management, anger management, decision-making, and risk avoidance) were observed to be positively skewed; thus, these mean variables were recoded into dichotomous variables where 0 = mean of 2 or less (i.e., a low score) and 1 = mean of greater than 2 (i.e., a high score). The distribution of the conflict resolution mean variable approximated a normal distribution and was not recoded, remaining a continuous variable.

Patterns of adolescent substance use and delinquency

The first research question (RQ1) asked whether there are distinct patterns representing different combinations of adolescent substance use and delinquency. To address RQ1, a baseline latent class model was fit to the data. Nine dichotomous indicators (four adolescent substance use items and five delinquency items) were included in the latent class analysis using PROC LCA in SAS v. 9.3. Starting with a one-class model and for each consecutively higher class model, a 100-seed macro was used to

identify a seed that corresponded to the most frequently identified model; this seed was used in subsequent analyses to produce the same order of latent classes for each model.

Table 5 presents the model fit statistics for the 1- to 6-class models. The 4- and 5-class models appeared to have the best fit to the data based on their G^2 values relative to the degrees of freedom; this assessment was further supported by low Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values for the 4- and 5-class models. An interpretation of the classes for both models indicated that the 5-class model produced the same classes as the 4-class model as well as an additional class with low latent class heterogeneity (i.e., item response probabilities are not close to 0 or 1). Thus, the more parsimonious, and easily interpretable 4-class model was retained ($G^2 = 298.63$, $df = 472$, $AIC = 376.63$, $BIC = 592.96$).

Table 5. Model Fit Statistics for 1-6 Latent Classes

Number of Latent Classes	G^2	df	AIC	BIC
1	2010.21	502	2028.21	2078.14
2	836.76	492	847.76	980.15
3	494.91	482	552.91	713.77
4	298.63	472	376.63	592.96
5	276	462	374	645.81
6	258.43	452	376.43	703.7

Table 6 presents the latent class prevalences and item response probabilities for each of the four classes in the model. Based on the item response probabilities, Class 1 was labeled “Abstainers” for low probabilities for all substance use and delinquency items although nearly half had used cigarettes (47.7%). Class 2 was labeled “Gateway

Drugs” for high probabilities of having used alcohol, cigarettes, and marijuana in the past month (26.1% latent class prevalence). Class 3 was labeled “Aggressive Gateway Drugs” for high probabilities of past month alcohol and cigarette use and hurting someone (23%). Class 4 was labeled “Multiple Problems” for high probabilities for using gateway drugs and involvement in all delinquency behaviors in the past month (3.2%). It is interesting to note that the highest probability for using methamphetamines occurs in this class, with half of the participants in this class reporting methamphetamine use in the past month.

Table 6. Latent Class Prevalences and Item Response Probabilities for 4-Class Model

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
Latent Class Prevalence	.48	.26	.23	.03
Item Response Probabilities				
<i>Response = Yes</i>				
Bully	.03	.00	.44	.70
Hurt	.12	.15	.65	.85
Vandal	.00	.03	.23	.83
Trespass	.00	.01	.03	.84
Steal	.00	.01	.04	.81
Alcohol	.30	.80	.68	.79
Cigarette	.49	1.0	.74	.86
Marijuana	.10	.56	.40	.68
Methamphetamines	.03	.16	.24	.50

In summary, four distinct patterns were identified representing different combinations of adolescent substance use and delinquency. These patterns were labeled Abstainers, Gateway Drugs, Aggressive Gateway Drugs, and Multiple Problems. The majority of the sample was expected to be Abstainers (47.7% latent class prevalence),

26.1% were expected to be Gateway Drug Users, 23% for Aggressive Gateway Drug Users, and the smallest latent class was the Multiple Problems group (3.2%).

Gender differences in types of patterns

The second research question (RQ2) asked whether there are gender differences in the types and prevalence of patterns of adolescent substance use and delinquency.

Multiple-group LCA was conducted with gender as a grouping variable to test for measurement invariance between males and females. As an initial step to multiple-group LCA, Collins and Lanza (2010) recommend first exploring whether the number of classes is the same in both groups. Thus, LCA with the nine indicators was conducted separately for males and females.

As with the analyses for RQ1, each model was estimated using 100 random seeds; a seed was selected that produced the most identified solution for each model. Table 7 shows the model fit statistics for the LCA for 1-6 class models using a random seed, by gender.

Table 7. Model Fit Statistics for 1-6 Latent Classes by Gender

Number of Latent Classes	G ²	df	AIC	BIC
Males (<i>N</i> = 845)				
1	1232.71	502	1250.71	1293.36
2	563.02	492	601.02	691.07
3	391.5	482	449.5	586.94
4	262.66	472	340.66	525.49
5	Not well identified			
6	Not well identified			
Females (<i>N</i> = 1050)				
1	885.06	502	903.06	947.66
2	384.6	492	422.6	516.77
3	273.31	482	331.1	475.05
4	163.04	472	214.04	434.34

5	143.69	462	241.69	484.56
6	Not well identified			

For both male and female subsamples, the 1- to 4-class models were clearly identified. The identification of the 5-class model for females produced several solutions but presented a well-enough identified solution to include in the model selection. The 6-class models for both genders were not well identified, thus were not considered in the model selection. For males, the 4-class model had the lowest AIC and BIC values. Thus, I conclude that the 4-class model offers the optimal balance of model fit and parsimony for the male subsample. For females, the 4-class model was also the best fit to the data because it had the lowest AIC and BIC values. Based on these results, I conclude that it is appropriate to fit both genders with a 4-class model.

To determine whether gender differences exist in the types of patterns identified among our sample, multiple-group LCA was conducted using the 4-class baseline model with gender included as a grouping variable. The seed used to produce an identified, baseline 4-class solution was also used to initiate the estimation procedure for the multiple-group LCA. The fit of a freely estimated (unrestricted) model (Model 1) was compared to a model with item response probabilities restricted to be equal across gender (Model 2). Table 8 presents the model fit statistics for both models.

Table 8. Model Fit Statistics Testing Measurement Invariance of a 4-Class Model by Gender

	G^2	df	AIC	BIC
Model 1: Item response probabilities vary by gender	556.99	945	712.99	1145.65
Model 2: Item response probabilities equal across gender	611.9	981	695.9	928.87
Difference between M1 & M2:	54.91	36	$p = .023$	

Comparing the two models, the difference in G^2 values is 54.91, $df = 36$, $p = .023$. This difference is statistically significant, suggesting that measurement invariance does not hold across gender and that at least one of the item response probabilities differs across gender. However, the AIC and BIC values suggest that Model 2 is the better fitting model. Collins and Lanza (2010) note that AIC and BIC values may be more helpful when examining multiple groups than difference in G^2 . To explore whether or not gender differences are meaningful, the item-response probabilities were examined for each gender. Meaningful gender differences suggest that it would be appropriate to proceed to examining the fit of a partially-invariant model; otherwise, Model 2 would be acceptable.

Table 9 presents the item-response probabilities for the freely estimated multiple-group LCA by gender (i.e., Model 1 above). An examination of the item-response probabilities suggest that three of the four latent classes—Abstainers, Gateway Drugs, and Multiple Problems—can be interpreted as being identical across gender. However, the third class shows a different interpretation by gender: males have relatively a higher probability of engaging in bullying in the past month (.55) compared to females (.22) as well as drinking alcohol (.56 for males, .34 for females). Thus, the third class may be more appropriately labeled “Aggressive Drinkers” for males and “Aggressive” for females. Although the latent class heterogeneity is low for these items, it is notable that the probabilities are higher for males relative to females, and also for other items such as vandalism and the use of cigarettes, marijuana, and methamphetamines. These differences lend support for a partially invariant measurement model.

Table 9. Item Response Probabilities from Multiple-Group LCA Unrestricted Model by Gender (Model 1)

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Drinkers (M) / Aggressive (F)	Multiple Problems
Response = Yes				
<i>Males</i>				
Bully	.05	.03	.55	.69
Hurt	.11	.21	.71	.88
Vandal	.02	.09	.31	.82
Trespass	.01	.00	.02	.81
Steal	.01	.06	.02	.74
Alcohol	.17	.72	.56	.54
Cigarette	.14	.82	.49	.53
Marijuana	.03	.47	.33	.45
Methamphetamines	.01	.27	.26	.48
<i>Females</i>				
Bully	.04	.13	.22	.79
Hurt	.06	.36	.98	.72
Vandal	.01	.04	.13	.77
Trespass	.00	.00	.00	.62
Steal	.00	.02	.03	.57
Alcohol	.17	.72	.34	.73
Cigarette	.18	.88	.26	.57
Marijuana	.02	.43	.02	.47
Methamphetamines	.04	.33	.02	.49

To achieve the most parsimonious model, parameter restrictions were imposed across gender on the item-response probabilities for the Abstainers, Gateway Drugs, and Multiple Problems classes. Table 10 shows the 30 equivalence sets imposed across gender in Model 3.

Table 10. Parameter Restrictions Constraining Item-Response Probabilities to be Equal Across Gender (Model 3)

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Drinkers (M) / Aggressive (F)	Multiple Problems
Response = Yes				
<i>Males</i>				
Bully	a	b	*	c
Hurt	d	e	*	f
Vandal	g	h	i	j
Trespass	k	l	m	n
Steal	o	o	q	r
Alcohol	s	t	*	u
Cigarette	v	w	*	x
Marijuana	y	z	*	aa
Methamphetamines	bb	cc	*	dd
<i>Females</i>				
Bully	a	b	*	c
Hurt	d	e	*	f
Vandal	g	h	i	j
Trespass	k	l	m	n
Steal	o	o	q	r
Alcohol	s	t	*	u
Cigarette	v	w	*	x
Marijuana	y	z	*	aa
Methamphetamines	bb	cc	*	dd

Note. Item-response probabilities with the same letter are constrained to be equal across gender.

* Parameter free to vary

Table 11 presents the model fit statistics comparing Model 1 with Model 3. Comparing the model fit statistics for Models 1 and 3, the difference in G^2 values is 34.68, $df = 30$, $p = .254$. This difference is statistically nonsignificant, suggesting that the more parsimonious Model 3 fits the data as well as Model 1. However, an examination of the item response probabilities for Model 3 (Table 12) provides conflicting results.

Table 11. Model Fit Statistics Comparing Model 1 and Model 3

	G^2	df	AIC	BIC
Model 1: Item response probabilities vary by gender	556.99	945	712.99	1145.65
Model 3: Partial measurement invariance across gender (30 parameter restrictions)	591.67	975	687.67	953.92
Difference between M1 & M3:	34.68	30	$p = .254$	

Table 12. Item Response Probabilities from Multiple-Group LCA Partially Restricted Model by Gender (Model 3)

	Latent Class				
	Abstainers	Gateway Drugs	Aggressive Drinkers	Aggressive Gateway Drugs	Multiple Problems
Response = Yes					
<i>Males</i>					
Bully	.04	.07	.49		.66
Hurt	.12	.25	.64		.80
Vandal	.01	.03	.29		.78
Trespass	.01	.00	.00		.82
Steal	.00	.03	.04		.70
Alcohol	.17	.71	.56		.54
Cigarette	.15	.88	.47		.53
Marijuana	.02	.43	.33		.43
Methamphetamines	.03	.31	.23		.45
<i>Females</i>					
Bully	.04	.07		.42	.66
Hurt	.12	.25		.99	.80
Vandal	.01	.03		.29	.78
Trespass	.01	.00		.00	.82
Steal	.00	.03		.04	.70
Alcohol	.17	.71		.57	.54
Cigarette	.15	.88		.53	.53
Marijuana	.02	.43		.18	.43
Methamphetamines	.3	.31		.18	.45

As Table 12 shows, the item-response probabilities for the first three classes of Model 3 are identical across gender because measurement invariance was imposed on these classes. When most of the items in the 4th class were left free to vary, however, the profile of this class looked very similar across gender. Based on this result and taking into consideration that the full measurement invariance model (Model 2) had favorable AIC and BIC statistics compared to Model 1 and essentially produced a similar profile, the model imposing full measurement invariance across gender was accepted for further analyses. The decision to select the more parsimonious model comes with a risk of ignoring potential gender differences in the profile of the 4th class but I feel the risk is small that this generalization would lead to serious erroneous conclusions being drawn about gender differences. In fact, proceeding with Model 2 will increase interpretability of gender differences in latent class prevalences and for addressing research questions 3 and 4 which will involve adding covariates to this model. Table 13 shows the item-response probabilities for Model 2.

Table 13. Item Response Probabilities from Multiple-Group LCA Measurement Invariance Imposed by Gender (Model 2)

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
Response = Yes				
Bully	.04	.05	.51	.67
Hurt	.13	.27	.71	.82
Vandal	.01	.04	.29	.81
Trespass	.00	.00	.03	.83
Steal	.00	.03	.04	.78
Alcohol	.17	.71	.55	.57
Cigarette	.15	.89	.48	.56
Marijuana	.02	.43	.29	.45
Methamphetamines	.02	.31	.23	.49

Based on these analyses, it is reasonable to conclude that there are no substantial gender differences in the types of adolescent substance use and delinquency patterns found for the male and female subsamples. The interpretation and labeling of the four classes remain as described above: individuals who belong to the Gateway Drugs group are likely to have used alcohol and cigarettes in the past month; individuals who belong to the Multiple Problems group are likely to engage in all the delinquency behaviors, use alcohol and cigarettes in the past month, and are most likely to have ever used methamphetamines; Abstainers have low probabilities in engaging in any delinquency or substance use behaviors; and the Aggressive Gateway Drugs group are individuals likely to bully and hurt others, using alcohol in the past month, and having the highest likelihood of using cigarettes in the past month.

Gender differences in prevalence of patterns

To address the second part of Research Question 2, potential gender differences in the latent class prevalences were examined. Table 14 shows the latent class prevalences for the four groups in Model 2.

Table 14. Latent Class Prevalences for Multiple-Group LCA Measurement Invariance Imposed by Gender (Model 2)

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
Males	.55	.15	.23	.06
Females	.66	.23	.10	.01

Abstainers are the most prevalent latent class for both males and females (55% and 66%, respectively) while Multiple Problems are the least prevalent latent class for

both genders (6% and 1%, respectively). Among males, the next most prevalent class after Abstainers are Aggressive Gateway Drugs (23%) followed by Gateway Drugs (15%). Among females, the next most prevalent class after Abstainers are Gateway Drugs (23%) followed by Aggressive Gateway Drugs (10%).

Multiple-group LCA was conducted, each specifying four latent classes and constraining the item-response probabilities to be equal across gender. The first model, Model 2, allowed the latent class prevalences to vary while Models 4 through 7 consecutively alternated the equality constraints on the prevalences for each latent class. The fit of these models were compared to the fit of Model 2 to see whether gender differences exist in the latent class prevalence of each class.

Table 15 presents the model fit statistics for Model 2 and Models 4-7. Table 16 presents the comparisons of Model 2 (latent class prevalences free to vary) with the other models constraining the prevalences for each latent class.

Table 15. Model Fit Statistics for Models 4-7 Testing Equality Constraints on Latent Class Prevalences

Latent Classes Constrained Equal Across Gender	G^2	df	AIC	BIC
Model 2: None	611.94	981	695.94	928.91
Model 4: Abstainers	659.75	982	741.75	969.18
Model 5: Gateway Drugs	621.76	982	703.76	931.19
Model 6: Aggressive Gateway Drugs	647.12	982	729.12	956.55
Model 7: Multiple Problems	640.47	982	722.47	949.89

Table 16. Model Comparisons Testing Equality Constraints on Latent Class Prevalences

Latent Classes Constrained Equal Across Gender	Diff. in G^2	Diff. in df	p -value
Model 4: Abstainers	47.81	1	<.001
Model 5: Gateway Drugs	9.82	1	0.002
Model 6: Aggressive Gateway Drugs	35.18	1	<.001
Model 7: Multiple Problems	28.53	1	<.001

Note. Each model is compared to Model 2.

Results of comparing Model 2 with the other models support Model 2 as the best fitting model. Significant p -values for the chi-square tests of the differences between Model 2 and each of the subsequent models indicate that each of the models with equality constraints did not fit the data as well as Model 2. The low AIC and BIC values for Model 2 provide further support of this interpretation of the data. Thus, there are gender differences in the latent class prevalences for all four latent classes.

Age as a predictor of patterns

The third research question (RQ3) asked whether age predicts involvement in different patterns of adolescent substance use and delinquency. To address this question, a four-class model was fit to the data using age as a covariate and gender as a grouping variable. Abstainers were specified as the reference class. Measurement invariance across gender was imposed based on the results from RQ2.

Results indicated that the pattern of latent class membership across gender was similar to the results from RQ2. The majority of males and females were likely to be in the Abstainers group (55% and 66%, respectively) with the smallest proportions in the Multiple Problems group (7% for males, 1% for females). After the Abstainers group, males were next likely to be in the Aggressive Gateway Drugs group (23%) then the

Gateway Drugs group (15%). In contrast, after the Abstainers group, females were next likely to be in the Gateway Drugs group (23%) then the Aggressive Gateway Drugs group (10%).

The log-likelihood ratio test for including age as a covariate in the model was significant ($\Delta 2LL = 17.03$, $df = 6$, $p = .009$), indicating that age is a significant predictor of class membership. Table 17 presents the beta coefficients and odds ratios (ORs) for understanding the effect of age on predicting class membership.

Table 17. Beta Parameters and Odds Ratios for Multiple-Group LCA with Gender as Grouping Variable and Age as Covariate, Item-Response Probabilities Constrained Across Gender

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
<i>Males</i>				
Intercept				
β_0 's	Reference	-1.27	-0.91	-2.09
Odds		0.28	0.40	0.12
Age (Centered)*				
β_1 's	Reference	0.35	-0.09	0.02
Odds Ratios		1.42	0.92	1.02
<i>Females</i>				
Intercept				
β_0 's	Reference	-0.99	-1.97	-3.96
Odds		0.37	0.14	0.02
Age (Centered)*				
β_1 's	Reference	0.19	-0.25	0.29
Odds Ratios		1.21	0.78	1.34

*Change in 2LL = 17.03, $df = 6$, $p = .009$.

The ORs for each gender indicate that a one-year *increase* in age corresponds to increased odds of being in the Gateway Drugs or Multiple Problems groups and decreased odds of being in the Aggressive Gateway Drugs group, compared to being in the Abstainers group. As shown in Table 17, a one-year increase in age for males corresponded to a 42% increase in the odds (OR = 1.42) of being in the Gateway Drugs group and a 2% increase in the odds (OR = 1.02) of being in the Multiple Problems group compared to being in the Abstainers group. However, an OR of 0.92 (inverse OR = 1.09) indicates that a one-year *decrease* in age corresponded to a 9% increase in the odds (OR = 0.92, inverse OR = 1.09) of being in the Aggressive Gateway Drugs group relative to being in the Abstainers group.

For females, a one-year increase in age corresponded to a 21% increase (OR = 1.21) in the odds of being in the Gateway Drugs group and a 34% increase (OR = 1.34) in the odds of being in the Multiple Problems group, relative to being in the Abstainers group. The inverse OR indicates that a one-year *decrease* in age corresponded to a 28% increase (OR = 0.78, inverse OR = 1.28) in the odds of being in the Aggressive Gateway group relative to the Abstainers group.

Thus, in response to RQ3, I conclude that age predicts involvement in different patterns of substance use and delinquency where a one-year increase in age corresponds to the greatest increase in odds of being in the Gateway Drugs group for males and for being in the Multiple Problems group for females. Both males and females were more likely to be in the Aggressive Gateway Drugs group relative to being in the Abstainers group for every one-year *decrease* in age.

Social and emotional competencies as predictors of patterns

The fourth research question (RQ4) asked whether social and emotional competencies (SECs) independently predict involvement in different patterns of adolescent substance use and delinquency. Similar to RQ3, four-class models were fit to the data with a SEC as a covariate and gender as a grouping variable. For all models, Abstainers were specified as the reference class and measurement invariance was imposed across gender.

The log-likelihood ratio tests for including anxiety management as a separate covariate in the model was not significant ($\Delta 2LL = 6.34$, $df = 6$, $p = .386$) indicating that it did not significant predict class membership. However, anger management ($\Delta 2LL = 24.40$, $df = 6$, $p = .0004$), decision-making ($\Delta 2LL = 17.7$, $df = 6$, $p = .007$), risk avoidance ($\Delta 2LL = 20.04$, $df = 6$, $p = .003$), and conflict resolution ($\Delta 2LL = 21.7$, $df = 6$, $p = .0014$) were significant predictors of class membership. The effects of each SEC that significantly predicted class membership are described below.

Anger management. Table 18 presents the beta coefficients and ORs for understanding the effect of anger management skills on predicting class membership.

Table 18. Beta Parameters and Odds Ratios for Multiple-Group LCA with Gender as Grouping Variable and Anger Management as Covariate, Item-Response Probabilities Constrained Across Gender

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
<i>Males</i>				
Intercept				
β_0 's	Reference	-1.12	-0.60	-2.05
Odds		0.33	0.55	0.13
Anger Management				

β_1 's	Reference	-0.42	-0.47	-0.12
Odds Ratios		0.66	0.62	0.89
<i>Females</i>				
Intercept				
β_0 's	Reference	-1.01	-1.38	-3.43
Odds		0.36	0.25	0.03
Anger Management				
β_1 's	Reference	-0.14	-0.96	-2.13
Odds Ratios		0.87	0.38	0.12

*Change in 2LL = 24.40, $df = 6$, $p = .0004$.

The ORs for each gender indicate that youth who reported lower levels of anger management skills were more likely to be in the Gateway Drugs, Aggressive Gateway Drugs, and Multiple Problems groups relative to being in the Abstainers group. As Table 18 shows, males who reported *lower* levels of anger management skills had a 52% increase in the odds of being in the Gateway Drugs group (e.g., OR = 0.66, inverse OR = 1.52), and 61% increased odds of being in the Aggressive Gateway Drugs group (OR = 0.62, inverse OR = 1.61), and 12% increased odds of being in the Multiple Problems group (OR = 0.89, inverse OR = 1.12) relative to being in the Abstainers group. Females who reported lower levels of anger management had 15% increased odds of being in the Gateway Drugs group (OR = 0.87, inverse OR = 1.15), more than doubled their odds (263%) of being in the Aggressive Gateway Drugs group (OR = 0.38, inverse OR = 2.63), and were 8.33 times more likely to be in the Multiple Problems group (OR = 0.12, inverse OR = 8.33) relative to being in the Abstainers group.

Decision-making. Table 19 presents the beta coefficients and ORs for understanding the effect of decision-making skills on predicting class membership.

Table 19. Beta Parameters and Odds Ratios for Multiple-Group LCA with Gender as Grouping Variable and Decision Making as Covariate, Item-Response Probabilities Constrained Across Gender

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
<i>Males</i>				
Intercept				
β_0 's	Reference	-1.2	-0.40	-1.81
Odds		0.3	0.67	0.16
Decision Making				
β_1 's	Reference	-0.12	-0.67	-0.46
Odds Ratios		0.89	0.51	0.63
<i>Females</i>				
Intercept				
β_0 's	Reference	-0.83	-1.65	-3.02
Odds		0.44	0.19	0.05
Decision Making				
β_1 's	Reference	-0.28	-0.30	-1.72
Odds Ratios		0.76	0.74	0.18

*Change in 2LL = 17.7, $df = 6$, $p = .007$.

The inverse ORs for each gender indicate that youth who reported lower levels of decision-making skills were more likely to be in the Gateway Drugs, Aggressive Gateway Drugs groups, and Multiple Problems groups relative to being in the Abstainers group. Males who reported lower levels of decision management skills had a 12% increase in the odds of being in the Gateway Drugs group (OR = 0.89, inverse OR = 1.12), 96% increased odds of being in the Aggressive Gateway Drugs group (OR = 0.51, inverse OR = 1.96), 59% increased odds of being in the Multiple Problems group (OR = 0.63, inverse OR = 1.59) relative to being in the Abstainers group. Relatively to being in the Abstainers group, females who reported lower levels of decision-making skills had

32% increased odds (OR = 0.76, inverse OR = 1.32) of being in the Gateway Drugs group, 35% increased odds (OR = 0.74, inverse OR = 1.35) of being in the Aggressive Gateway Drugs group, and were 5.56 times more likely (OR = 0.18, inverse OR = 5.56) to be in the Multiple Problems group.

Risk avoidance. Table 20 presents the beta coefficients and ORs for understanding the effect of risk avoidance on predicting class membership.

Table 20. Beta Parameters and Odds Ratios for Multiple-Group LCA with Gender as Grouping Variable and Risk Avoidance as Covariate, Item-Response Probabilities Constrained Across Gender

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
<i>Males</i>				
Intercept				
β_0 's	Reference	-0.80	-0.54	-1.84
Odds		0.45	0.58	0.16
Risk Management				
β_1 's	Reference	-0.76	-0.44	-0.53
Odds Ratios		0.47	0.64	0.59
<i>Females</i>				
Intercept				
β_0 's	Reference	-0.88	-1.74	-3.08
Odds		0.42	0.18	0.05
Risk Management				
β_1 's	Reference	-0.23	-0.27	-1.90
Odds Ratios		0.79	0.76	0.15

*Change in 2LL = 20.04, $df = 6$, $p = .003$.

The ORs for each gender indicate that youth who reported lower levels of risk avoidance skills were more likely to be in the Gateway Drugs, Aggressive Gateway

Drugs, and Multiple Problems groups relative to being in the Abstainers group. As Table 20 shows, males who reported lower levels of risk avoidance skills were 2.13 times more likely (OR = 0.47, inverse OR = 2.13) to be in the Gateway Drugs group, had 69% increased odds (OR = 0.59, inverse OR = 1.69) of being in the Aggressive Drinkers group, and 56% increased odds (OR = 0.65, inverse OR = 1.56) of being in the Multiple Problems group relative to being in the Abstainers group. Relatively to being in the Abstainers group, females who reported lower levels of risk avoidance skills had 27% increased odds (OR = 0.79, inverse OR = 1.27) of being in the Gateway Drugs group, 32% increased odds (OR = 0.76, inverse OR = 1.32) of being in the Aggressive Gateway Drugs group, and were 6.66 times more likely (OR = 0.15, inverse OR = 6.66) to be in the Multiple Problems group.

Conflict resolution. Table 21 presents the beta coefficients and ORs for understanding the effect of conflict resolution skills on predicting class membership.

Table 21. Beta Parameters and Odds Ratios for Multiple-Group LCA with Gender as Grouping Variable and Conflict Resolution as Covariate, Item-Response Probabilities Constrained Across Gender

	Latent Class			
	Abstainers	Gateway Drugs	Aggressive Gateway Drugs	Multiple Problems
<i>Males</i>				
Intercept				
β_0 's	Reference	-1.26	-0.76	-1.58
Odds		0.28	0.47	0.21
Conflict Resolution				
β_1 's	Reference	0.01	-0.36	-0.31
Odds Ratios		1.01	0.94	0.73
<i>Females</i>				
Intercept				

β_0 's	Reference	-0.68	-1.23	-2.55
Odds		0.51	0.29	0.08
Conflict Resolution				
β_1 's	Reference	-0.16	-0.36	-0.88
Odds Ratios		0.86	0.70	0.41

*Change in 2LL = 21.7, $df = 6$, $p = .0014$.

The ORs for each gender indicate that, for the most part, a one-unit decrease in level of conflict resolution skills was associated with increased odds of being in the Gateway Drugs (for females only), Aggressive Gateway Drugs, and Multiple Problems groups relative to being in the Abstainers group. As Table 21 shows, a one-unit increase in conflict resolution skills among males was associated with 1% increased odds of being in the Gateway Drugs group; however, a one-unit *decrease* in conflict resolution skills was associated with a 6% increased odds (OR = 0.94, inverse OR = 1.06) of being in the Aggressive Gateway Drugs group, and 37% increased odds (OR = 0.73, inverse OR = 1.37) of being in the Multiple Problems group relative to being in the Abstainers group. Relative to being in the Abstainers group, a one-unit decrease in level of conflict resolution skills among females is associated with 16% increased odds (OR = 0.86, inverse OR = 1.16) of being in the Gateway Drugs group, 43% increased odds (OR = 0.7, inverse OR = 1.43) of being in the Aggressive Gateway Drugs group, and 144% increased odds (OR = 0.41, inverse OR = 2.44) of being in the Multiple Problems group.

6. DISCUSSION

Co-occurring adolescent problem behaviors are a major problem for adolescents, their families, and society at large. Theory and research suggest that adolescents who engage in both substance use and delinquency are at higher risk for negative outcomes than adolescents who engage in only one of these behaviors. This includes higher levels of both problem behaviors compared to involvement in either SU or delinquency. It is known that involvement in either SU or delinquency increases the risk for engaging in the other problem behavior as well as the risk of increasing severity or frequency of these behaviors, leading to substance abuse and dependency, and entanglement in the criminal justice system. These outcomes negatively impact the financial and the overall well-being and future of adolescents, their families, and society. The negative outcomes of adolescent problem behaviors have an even greater impact in developing countries, such as South Africa, where resources are more limited and systems of care are lacking compared to Western countries.

In an effort to develop a fuller picture of adolescent problem behaviors in South Africa and to highlight a promising prevention/intervention approach, the current study examined patterns of co-occurring SU and delinquency in South Africa and whether social and emotional competencies (SEC) were related to these patterns. Overall, study findings provide a more nuanced perspective on adolescent problem behaviors and potential areas for targeted prevention/intervention.

Patterns of adolescent substance use and delinquency

Four of the seven hypothesized patterns were identified in the aggregate study sample. The most prevalent pattern was the Abstainers group, corresponding to the

hypothesized group of individuals who are not likely to be involved in either SU or delinquency (group #1). The presence of the Abstainers group, at almost half of the study sample, suggests that the majority of adolescents are able to avoid engaging in problem behaviors despite living in a high risk context.

The Gateway Drugs group corresponds to the hypothesized group of individuals who are likely to use alcohol and cigarettes but are not likely to be delinquent (group #4). Approximately a quarter of the study sample belonged to this group. The presence of the Gateway Drugs group is expected given that experimentation with and use of alcohol and cigarettes begins during adolescence, usually in social settings with other peers. The existence of this group supports the linking of alcohol, cigarettes, and marijuana as Gateway Drugs. The risk for individuals in this group is that their initiation and increasing use of Gateway Drugs may lead to the later use of illicit substances, such as methamphetamines (Patrick et al., 2009).

The Aggressive Gateway Drugs group corresponds conceptually to the hypothesized group of individuals likely to use alcohol and cigarettes and engage in overt delinquency (group #5). About 23% of the study sample belonged to this group. The Aggressive Gateway Drugs group is distinguished from the Gateway Drugs group by their involvement in hurting others in the past month. The existence of this group suggests that the alcohol-aggression connection found in the literature based on Western samples may apply to South African adolescents. For example, Valois and colleagues (1993) found that alcohol users were more likely to report fighting and carrying weapons than non-users among a cross-sectional sample of U.S. high school students. In two longitudinal studies, associations between alcohol use and aggressive behaviors were

found over time in both White and colleagues' (1993) sample of male adolescents as well as Huang and colleagues' (2001) sample of both male and female adolescents. However, these studies examined alcohol use and aggression separately whereas the current study considered the possibility of co-occurring alcohol use and aggression. The identification of the Aggressive Gateway Drugs group in the current study provides support that problem behaviors do co-occur in some adolescents.

The identification of the Aggressive Gateway Drugs group also provides tentative support for an overt delinquency category consisting of acts of interpersonal aggression and violence during adolescence (Loeber & Burke, 2011; Loeber, Keenan, & Zhang, 1997). Overt delinquency may be linked to Moffitt's taxonomy of life-course-persistent delinquent adolescents who are characterized by aggressive behavior (Moffitt et al., 2002). This suggests that adolescents who belong in the Aggressive Gateway Drugs group are at risk of continued involvement in aggressive and other delinquent acts over time, possibly transitioning to the Multiple Problems group unless there is a behavioral intervention.

The Multiple Problems group corresponds conceptually to the hypothesized group of individuals likely to engage in co-occurring SU and delinquency (group #7). Comprising about 3% of individuals in the study sample, this group is distinct from the Aggressive Gateway Drug group by involvement in both overt and covert delinquency behaviors. The Multiple Problems group is the smallest yet may be the highest risk group; research indicates there may be an "intensification effect" on rates of adolescent problem behaviors when these behaviors co-occur compared to their independent occurrence (Tubman, Gil, & Warner, 2004). This high risk group most closely fits the

description of Moffitt's life-course-persistent delinquents who become caught in "snares"—such as substance dependence or a criminal record—that make it difficult for adolescents to make a successful transition to adulthood (Moffitt, 1993). Similarly, youth who are the most frequent offenders are those who engage in both overt and covert behaviors according to Loeber's (1996) developmental pathways model of chronic offending. For example, high levels of substance use and dependence were found in a sample of serious juvenile offenders: 57% of the participants reported using marijuana and 27% reported using at least one illicit drug in the past six months (Mulvey, Schubert, & Chassin, 2010).

Additional observations can be made from the identified patterns of adolescent SU and delinquency. First, in any group involving SU, alcohol use was likely to co-occur with cigarette use and with the exception of the Aggressive Gateway Drugs group, also marijuana use. This supports the linking of all three substances as Gateway Drugs (Kandel, 2002). Methamphetamine use was not a characteristic of any of the classes and could be due to the low overall prevalence of this behavior in this sample. Second, no distinct patterns of covert delinquency were found except in combination with overt delinquency in the Multiple Problems group. According to Loeber's developmental pathways, both covert and overt delinquency are distinct pathways that begin during adolescence. It is also possible for an individual to move between pathways, such as adolescents who engage in both covert and overt delinquency who tend to experience the worst outcomes. Although the current study used a cross-sectional sample, the subgroups identified are consistent with conceptualizations of delinquency in the literature in terms of overt and multiple delinquency and Moffitt's life-course-persistent delinquents.

However, it was surprising not to see evidence of a distinct covert delinquency subgroup that is consistent with Moffitt's adolescence-limited delinquents. The results of the current study suggest that covert delinquency among South African adolescents occurs in combination with overt delinquency. This might be because the high risk context of South Africa that includes high rates of interpersonal conflict and violence could facilitate more opportunities for fighting and aggression rather than just covert delinquency. Another reason covert delinquency did not show up might be because the covert delinquency measures used in the current study do not capture what may be considered covert delinquency in the South African context, or the culturally-based equivalent of this concept. More research is needed to better understand the link between covert and overt delinquency in patterns of adolescent problem behaviors.

Gender differences

The aim of RQ2 was to examine gender differences in the types and prevalences of patterns of adolescent SU and delinquency because of gender differences in the rates of SU and delinquency in South Africa as well as gender-specific patterns and processes noted in SU and delinquency more generally. Results indicated that the same number and similar types of patterns represented the data for both males and females; thus, the patterns were not interpreted as qualitatively different across gender.

RQ2 hypothesized that males would have a higher prevalence in patterns involving delinquency because general delinquency research and prevalence rates in South Africa indicate that males are more likely to be involved in interpersonally aggressive, or overt, delinquency. This hypothesis was supported by the results indicating a significantly higher proportion of males in the Multiple Problems and Aggressive

Gateway Drugs groups. Although the proportions of females in these groups were smaller relative to males, the results highlight girls' involvement in high risk behaviors.

Literature shows that females who engage in gender atypical problem behaviors, such as violence and aggression, have worse outcomes such as comorbid internalizing symptoms and poorer social functioning than adolescents who engage in gender-typical problem behaviors (Keenan, Loeber, & Green, 2000; Silverthorn & Frick, 1999; Zoccolillo, 1993).

The identification of a small but high risk group of females involved in both substance use and delinquency in the study sample suggest that it may be useful to implement targeted intervention efforts among females who are referred by a screening protocol.

The results of the current study showed the same patterns for both genders but differences in the prevalence of the patterns. This result is similar to what Moffitt and Caspi (2001) found in their longitudinal study of gender differences in their delinquency taxonomies of the lifecourse-persistent delinquency and adolescence-limited (AL) delinquency. The authors found that the taxonomies fit for both males and females but that female delinquents tended to fit in the AL delinquency path, meaning that they began their delinquency during adolescence. Although longitudinal data is needed to be able to compare the results from their study to the current study, both studies share similar results with respect to gender differences.

Role of age

The third research question examined the role of age. Results showed that age significantly predicted involvement in different patterns of SU and delinquency. Two specific hypotheses were posited regarding the effect of age. The first hypothesis was that older age would predict less involvement in patterns involving multiple forms of

delinquency (i.e., the Multiple Problems group) based on research indicating that involvement in delinquency generally decreases over adolescence. Also, delinquent adolescents tend to specialize in their delinquent behaviors as they get older, moving from multiple forms of delinquency (e.g., fighting, stealing, vandalism) to focusing on one type of delinquency (e.g., just fighting).

The first hypothesis was not specifically supported by the results which showed that older age corresponded with an increased likelihood for being in the Multiple Problems group relative to the Abstainers group for both genders. This finding could reflect adolescents who have, over time, become involved in more serious delinquency and criminal activity that were not measured in the current dissertation. Research among U.S. youth show a decreasing trend of minor delinquency (e.g., fighting) and an increasing trend of serious crimes (e.g., assault, murder) over adolescence (Connor, 2002). Future research is needed using a longitudinal sample to adequately evaluate this hypothesis by following the Multiple Problems group over time and examining whether these individuals tend to transition out of this group as they age. In general, however, study findings provided some support for the first hypothesis given that older age was associated with a decreased likelihood of membership in the Aggressive Gateway Drugs group relative to being in the Abstainers group for both males and females. These findings reflect a known trend in the delinquency literature, namely that delinquency tends to decrease over adolescence.

The second hypothesis regarding the role of age was that older age would predict more involvement in multiple SU patterns based on developmental research that shows an increase in SU over adolescence as well as a progression of using more serious

substances following alcohol and cigarette use. The two subgroups involving multiple SU patterns are the Multiple Problems and Gateway Drugs groups. The results discussed above for the effect of age on predicting involvement with Multiple Problems provide support for the second hypothesis. Further support for the second hypothesis is provided by the results indicating that older age corresponds to increased likelihood of being in the Gateway Drugs group compared to the Abstainers group for both genders.

Overall, as age increases we see the greatest effect on predicting membership in the Gateway Drugs group for males as well as important effects on predicting female involvement in every group relative to the Abstainers group. These findings of increasing involvement in multiple SU and delinquency groups as adolescents age underscore the importance of early prevention and intervention, particularly in early adolescence. Study findings suggest that prevention and intervention targets may differ by gender. For adolescent males, the focus may be on the prevention of gateway drug use. Males' likelihood of membership in the Gateway Drugs group relative to the Abstainers group increases 42% for every one-year increase in age; in comparison, their likelihood of membership increases 2% and 8% for being in the Multiple Problems and Aggressive Gateway Drugs groups, respectively, relative to the Abstainers group.

Given the gender differences noted in RQ2, the findings highlight the need to focus on the developmental needs of girls and identify ways to address their involvement in SU and delinquency. For adolescent females, the focus of preventive intervention efforts may be to prevent the escalation of SU and delinquency into co-occurring behaviors. Among females, study findings indicated a one-year increase in age was associated with moderately increased likelihood of membership in the Gateway Drugs

(21%), Multiple Problems (34%), and Aggressive Gateway Drugs (22%) groups relative to being in the Abstainer group.

Social and emotional competencies

The final research question examined the role of five social and emotional competencies (SEC) on predicting patterns of adolescent SU and delinquency: anger management, anxiety management, decision-making, risk management, and conflict resolution skills. These SEC have been shown in the literature to be amenable to change and related to addressing adolescent problem behaviors. Three hypotheses were posited regarding the effect of the level of SEC skills on predicting class membership. The first hypothesis stated that lower anger management skills would be associated with an increased likelihood of membership in delinquency groups; conversely, higher anger management skills would be associated with a decreased likelihood of membership in delinquency groups. Results supported this hypothesis as higher anger management skills were associated with decreased odds of being in both of the delinquency groups (Multiple Problems and Aggressive Drinkers) relative to the Abstainers group, for both males and females. Higher anger management skills were also associated with decreased odds of being in the Gateway Drugs group relative to the Abstainers group, for both genders. These results extend existing research findings on the positive association between anger and independent adolescent problem behaviors to include the co-occurrence of these problem behaviors. For example, the inability to manage anger has been associated with aggression and fighting (Loeber & Burke, 2011), covert delinquency (e.g., such as damaging property and carrying a weapon; Aseltine, Gore, & Gordon, 2000) and SU (Conger, Neppl, Kim, & Scaramella, 2003; Hussong & Chassin, 1994). While much

research on the association between anger and adolescent problem behaviors have examined delinquency and SU as independent outcomes, the results of the current study suggest that anger management skills are associated with co-occurring delinquency and SU behaviors. Furthermore, results of the current study indicate that this relation applies to both females and males whereas other studies have found that anger has been associated with SU for girls but not boys (Colder & Stice, 1998).

Griffin and colleagues have examined decision-making skills as part of a personal competence concept that includes self-control and self-regulation (Griffin et al., 2002; Griffin et al., 2001) as well as specific skills such as self-control (Epstein et al., 2002) and found that both conceptualizations are related to decreased SU. Thus, the second hypothesis posited that lower decision-making skills would be associated with an increased likelihood of membership in groups involving SU; conversely, higher decision-making skills would be associated with a decreased likelihood of membership in groups involving SU. Results supported this hypothesis as higher decision-making skills were associated with decreased odds of being in the Gateway Drugs, Multiple Problems, and Aggressive Drinkers groups relative to the Abstainers group for both males and females. These results are consistent with previous research that show a negative association between decision-making (or personal competence) skills and adolescent SU as well as extending it to delinquency.

Although risk avoidance skills can be intuitively linked with decision-making skills as part of a personal competence concept or as cognitive skills, little research exists that focuses specifically on risk avoidance skills and its role in relation to SU and delinquency. Thus, no specific hypothesis was posited for risk avoidance skills, but it was

explored in the current study in relation to patterns of co-occurring SU and delinquency. Results showed that higher risk avoidance skills decreased the odds of being in any of the problem behavior groups relative to the Abstainers group. Together with the previously discussed results regarding decision-making skills, these results highlight the utility of teaching skills to adolescents facing frequent opportunities to engage in problem behaviors, particularly in South Africa where substance use risks are linked to the high HIV prevalence rates among young adults. Research on adolescent risk perceptions suggest that adolescents may underestimate health risks if their risk perceptions are not also informed by actual experiences that reinforce more accurate risk perceptions (Greening, Stoppelbein, & Chandler, 2005). Relative to lower risk contexts, high risk contexts such as South Africa may (unfortunately) provide increased opportunities for adolescents to be exposed to or experience the negative consequences of problem behaviors.

The third hypothesis predicted that lower conflict resolution skills would be associated with an increased likelihood of membership in any SU or delinquency group; conversely, higher conflict resolution skills would be associated with a decreased likelihood of membership in any SU or delinquency group. Results confirmed this hypothesis as conflict resolution skills significantly predicted class membership. These results build on previous research on the effectiveness of social competence enhancement and life skills prevention approaches (of which conflict resolution skills is a part) on preventing and reducing adolescent SU and delinquency to show that conflict resolution skills have a specific role to play within larger, comprehensive programs. Mangrulkar and colleagues (2001) posit that successful life skills approaches must include those skills that

are relevant to youths' contexts. Given that violence and substance use are widespread throughout South African adolescents' school, community, and family contexts (Burton, 2008; MIET, 2009), conflict resolution skills may be especially relevant for adolescent well-being.

Anxiety management skills were not significant predictors of class membership. There was some evidence suggesting that this lack of a link was plausible. Research shows that anxiety disorders have been linked with substance use disorders (Kendall et al., 2004; Loeber et al., 1999; Merikangas et al., 1998; Simkin, 2002). However, it is possible that we did not see this association because our results are based on a general, school-going sample and not a clinical sample. Another possible reason why anxiety management skills did not predict the SU and delinquency classes is that anxiety has been found to be a protective factor for antisocial behavior among boys (Kerr, Tremblay, Pagani, & Vitaro, 1997; Tremblay, Pihl, Vitaro, & Dobkin, 1994; Walker, Lahey, Russo, Frick, Christ, McBurnett, et al., 1991). In these studies, anxiety was viewed as an expression of behavioral inhibition, which is the tendency to be fearful of punishment or nonreward. Thus, it is possible that South African adolescents who feel highly anxious are inhibited from involvement in problem behaviors.

Limitations

The current study was limited in several important ways. First, the study sample consisted of school-going youth and does not represent out-of-school youth or those who have dropped out. In particular, there might be a selection bias in terms of the 10th and 11th graders who are still attending school and may be less involved in problem behaviors. Another consideration is that the study sample is predominantly Coloured

adolescents. Further research is needed to see whether the findings of the current study can be generalized to adolescents in other racial/ethnic groups. However, the current study provides a starting point for that research.

The self-report data used in the current dissertation is subject to underreporting of problem behaviors due to social desirability. Although survey procedures ensured the confidentiality of the study participants, adolescents might feel afraid of getting in trouble for reporting that they have been involved in SU or delinquency.

It is possible that the subgroups identified in the current study excluded additional forms of delinquency that our measures did not pick up. As noted previously, the delinquency measure used in the current study did not ask about occurrences of severe delinquency. Thus, it is possible that covert delinquency did not emerge as a distinct category in the current study because it is linked to severe delinquency or violence which was not measured.

The current study did not account for the development of SEC over time in order to focus on identifying subgroups and exploring the roles of gender and age in patterns of adolescent problem behaviors. Future research could examine whether there are interactive effects between SEC, gender, and age in the prediction of class membership.

Conclusion

The current dissertation is the first study to examine co-occurring adolescent SU and delinquency in South Africa, providing a more complete picture of adolescent problem behaviors in this region and identifying higher risk subgroups than traditional approaches which examine these problem behaviors separately. An important contribution of the current dissertation is the examination of the roles of specific SEC that

are part of competence enhancement approaches. Results of the study suggested that a social and emotional learning approach may be effective in addressing co-occurring SU and delinquency in the South African context. This is important for program development purposes and may provide insights on how to better prevent or reduce adolescent problem behaviors and to get a sense of the essential elements of comprehensive prevention programs.

Although the current study was cross-sectional, important developmental information was gained about patterns of co-occurring adolescent SU and delinquency with regard to gender differences and the role of age. In particular, the results of the current study highlight that SEC may have a high impact for girls, whose needs are often overlooked in studies and programs on adolescent problem behaviors.

The study findings underscore the importance of identifying and providing specific prevention/intervention strategies for different subgroups of adolescents, depending on the severity and type of their problem behavior involvement, and at younger ages. Longitudinal data could help with understanding whether and how adolescents transition between classes over time. Gender differences found in the prevalence of the subgroups and in the effects of the age and SEC covariates remind preventionists to consider the role of gender in prevention and intervention efforts.

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APPENDIX

From: **Moeller, Joyel** <jdm35@psu.edu>
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Hi Mary,

The Office for Research Protections (ORP) has reviewed the above-referenced study and determined it to be exempt from IRB review. You may begin your research. This study qualifies under the following category

Category 4: Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that participants cannot be identified, directly or through identifiers linked to the participants. [45 CFR 46.101(b)(4)]

PLEASE NOTE THE FOLLOWING:

- Include your IRB number in any correspondence to the ORP.
 - The principal investigator is responsible for determining and adhering to additional requirements established by any outside sponsors/funding sources.
 - **Record Keeping**
 - o The principal investigator is expected to maintain the original signed informed consent forms, if applicable, along with the research records for at least three (3) years after termination of the study.
 - o This will be the only correspondence you will receive from our office regarding this modification determination.
- § MAINTAIN A COPY OF THIS EMAIL FOR YOUR RECORDS.**
- **Follow-Up**
 - o The Office for Research Protections will contact you in three (3) years to inquire if this study will be on-going.
 - o If the study is completed within the three year period, the principal investigator may complete and submit a **Project Close-Out Report:**
<http://www.research.psu.edu/orp/areas/humans/applications/index.asp#other>
 - **Revisions/Modifications**

- o Any changes or modifications to the study must be submitted to the Office for Research Protections on the *Modification Request Form* available on our website:
<http://www.research.psu.edu/orp/areas/humans/applications/index.asp#mods>

- o Send all modification requests to ORProtections@psu.edu

- o **Modifications will not be accepted unless the Modification Request Form is included with the submission.**

Please do not hesitate to contact me if you have any questions or concerns.

Joyel D. Moeller

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- 2009-2011 Evidence-based Prevention and Intervention Support Center, Penn State (Mr. Brian
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PEER-REVIEWED ARTICLES

- Lai, M. H.**, Graham, J. W., Caldwell, L. L., Smith, E. A., Bradley, S. A., Vergnani, T., Mathews, C., &
Wegner, L. (2013). Linking life skills and norms with adolescent substance use and delinquency in
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implementation quality using a factorial design [Special issue]. *Child and Youth Care Forum*, 41(2),
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youth violence research, practice, and policy [Special issue]. *Aggression and Violent Behavior*, 14(6),
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