

Assessing the Impact of Community-Based Universal Prevention on Adolescent Gang  
Association: An Examination of the Effects of Communities That Care

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**Abstract**

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Despite the severe consequences of adolescent gang involvement, both for youth and their communities, little is known about how to effectively prevent it. Communities That Care (CTC), a community-based universal prevention system, has been found to effectively reduce problem outcomes among youth, including delinquency, violence, and substance use. Although it was not designed to address gang involvement as a primary outcome, CTC's approach toward reducing ecological risks may prevent gang involvement to the extent that these risk factors also predict gang involvement. This dissertation examines the effectiveness of CTC in preventing adolescent gang involvement among a sample of rural youth through three aims: 1) it examines whether the prevention system's targeted risk factors are predictive of gang involvement among rural youth; 2) it examines the degree to which CTC is effective in preventing adolescent gang involvement; and 3) it evaluates whether CTC's universal implementation is equally effective in reducing gang involvement for youth with different types and levels of risk. Data come from the longitudinal panel (n=4,407) of the Community Youth Development Study, a community-randomized trial of the CTC prevention system. Youth from 24 rural and small town

communities in 7 states were surveyed from Grades 5 to 12 regarding behavioral outcomes and associated risk and protective factors. Latent profile analyses identified three classes of gang involvement among youth in Grades 7 to 12: gang members, gang associates, and non-affiliates. Multilevel (2- and 3-level) multinomial regressions then tested the predictive ability of baseline (Grade 5) ecological and cumulative risk factors on gang involvement, the effect of CTC on gang involvement, and the moderation of intervention effects relative to different levels of baseline community, school, family, peer, and individual risk. Results of the first aim indicate that most CTC risk factors were predictive of both gang association and gang membership. Results of the second aim find that CTC significantly reduced the odds of gang association by 31%, and results from the third aim find that these effects were equal among youth with different types and levels of ecological risk; however, CTC had no effect on gang membership. The findings of this dissertation suggest that broad, community-based prevention addressing multiple domains of risk are an effective method for the prevention of youth gang involvement. These results also provide further evidence that CTC is an efficient method toward reducing a broad range of problem behaviors among youth.

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## INTRODUCTION

For decades, researchers and community workers have sought to identify methods through which schools and communities could intervene with youth to reduce the likelihood that they would become gang-involved. Many approaches have been attempted, including targeting youth at greatest risk for involvement with behavioral and skills programs, developing afterschool programs to provide prosocial alternatives to gang involvement, and teaching youth in schools about the consequences of crime (Esbensen et al., 2011; Howell, 2000), but few have been found to be effective after rigorous evaluation. This dissertation examines an alternative approach to gang prevention by examining the effects of Communities That Care (Hawkins & Catalano, 1992), a universal prevention system that did not originally include gang involvement as a primary outcome, but has had significant impact in reducing other youth problem behaviors by targeting risk across multiple ecological domains.

The lack of effective approaches belies the sheer scope and severity of consequences of gang membership in the United States. Street gangs in their current form have existed in the U.S. for more than a century, with the earliest known research examining their behavior being conducted in the 1920s (see Thrasher, 1927). Since that time, membership numbers across the U.S. continued to rise, with current estimates ranging from 850,000 to more than one million youth members (National Gang Center, 2015; Pyrooz and Sweeten, 2015). Historically, gangs were more localized within larger cities, but by the 1990s were also found in rural areas, small towns, and suburbs in all 50 states and the District of Columbia (Howell, 2013). By 2010, one in three exurban locales reported the presence of gangs (Egley, Jr. & Howell, 2012). This diversification of gangs into other types of communities presents new challenges for understanding the contextual factors that influence the etiology, and therefore the prevention, of

gang involvement.

The association between gang membership and delinquency, violence, and criminal behavior has been well-established (Barnes, Beaver, & Miller, 2010; Battin, Hill, Abbott, Catalano, & Hawkins, 1998; Esbensen & Huizinga, 1993), but in understanding the impact of gang membership, it is important to note the other adverse effects it has on youth. Youth involved in gangs, even for a short period of time, face lower educational attainment (Pyrooz, 2014), greater rates of violent victimization (Pyrooz, Moule Jr., & Decker, 2014), and drug use (Ariza, Cebulla, Aldridge, Shute, & Ross, 2014), with many of these effects extending well into adulthood (Gilman, Hill, & Hawkins, 2014; Krohn, Ward, Thornberry, Lizotte, & Chu, 2011). The range of consequences that gangs have for youth shows a need to prevent gang involvement, not only to reduce community levels of crime, but to improve the opportunities for youth to succeed and avoid morbidity and mortality associated with gang membership.

The key to developing and implementing effective prevention approaches is determining the predictors of these outcomes and developing appropriate steps to target, mitigate, or bolster these predictors. Many studies have been successful in identifying risk factors that increase the likelihood that an individual will join a gang, such as a criminogenic neighborhood, a low commitment to school, a hostile family environment, association with delinquent peers, and having delinquent beliefs; these diverse factors are most commonly organized into community, school, family, peer, and individual domains (Howell, 2010; Klein & Maxson, 2006; O'Brien, Daffern, Chu, & Thomas, 2013; Thornberry, Krohn, Lizotte, Smith, & Tobin, 2003). Studies using this risk factor approach have noticed that the accumulation of risk, both within and across domains, is strongly associated with youth gang involvement (Hill, Howell, Hawkins, & Battin-Pearson, 1999; Thornberry et al., 2003), with the proportion of youth who become involved in

gangs being greatest among youth with high levels of risk in multiple domains (Thornberry et al., 2003). Less is known about protective factors that may shield or discourage youth from becoming gang-involved, as this research remains limited in both theory and evidence (Howell, 2010; O'Brien et al, 2013). Results of the few studies that have examined protective factors alongside risk factors suggest that increases in protection in multiple environmental domains may have an effect in reducing the likelihood of gang involvement. For example, a parent's attachment to their child, a youth's commitment to school, and higher levels of a youth's self-esteem reduce the odds that a youth will become gang-involved (Maxson, Whitlock, & Klein, 1998; Thornberry et al., 2003).

The impact of predictive factors for gang involvement existing throughout the social ecology of youth suggests that an effective method of gang prevention may be a broad ecological approach toward reducing risk and elevating of protection. Prior prevention approaches have had some positive results, such as reductions in violent behavior and delinquency, but have failed to prevent gang membership (Howell, 2000). Many of these prevention approaches have commonly targeted youth at high risk for gang membership with individual-level skills, such as social skills, refusal skills, and goal-setting, to reduce their likelihood of joining (Howell, 2000). However, such approaches, do little to change these broader environments that have been found to influence gang involvement. An alternative approach is to target broadly risk associated with gang involvement in the community, in schools and families, and among peers, as well as the youth himself or herself. These approaches have shown more promise in reducing a youth's likelihood to join a gang than by targeting a single aspect of that youth's life (Howell, 2000).

This dissertation explores this approach by examining the effectiveness of a community-based universal prevention system targeting youth risk and elevating protection across multiple

domains. The Communities That Care (CTC) prevention system was designed to assist communities in developing the infrastructure to organize, build, and maintain a science-based approach to prevention. Through this system, community coalitions are trained in the assessment and prioritization of youth behavioral outcomes and evidence-based risk and protective factors, and the selection and implementation of evidence-based prevention programming to target those priorities. The risk factors identified and targeted by the prevention system address broad risk in the community, school, family, peer and individual domains, providing communities the capacity to select prevention programs that address risk throughout youths' environment. Although originally designed for, and found effective in, reducing the incidence of youth delinquency, violence, and substance use throughout adolescence and into young adulthood (Hawkins et al., 2009; Hawkins et al., 2012; Hawkins Oesterle, Brown, Abbott, & Catalano, 2014), this approach may also be effective in reducing the likelihood of gang involvement due to its targeting of broad ecological risk factors for problem youth behaviors.

### **Dissertation Aims**

This dissertation, through its three original research articles, builds evidence of whether Communities That Care can prevent gang involvement. The dissertation has three aims: 1) To examine the ability of CTC's ecological risk factors to predict gang involvement in a rural and small town sample; 2) To examine whether CTC is effective in reducing levels of youth gang involvement in adolescence; and 3) To determine whether the effects of CTC are equal for youth with different types of baseline risk.

To examine this approach, this dissertation uses data from the longitudinal cohort sample (n=4,407) of the Community Youth Development Study, a community-randomized trial of the CTC prevention system (Brown et al., 2009). Twenty-four rural and small town communities in

seven states (CO, IL, KS, ME, OR, UT, & WA) were matched within state on demographic factors, with intervention communities being selected by coin-flip. Through this study, a great deal of research has been published regarding the effectiveness of CTC, not only about its effects in preventing youth problem outcomes, but also the changes in community-targeted risk and protective factors (see Hawkins et al., 2008; Kim, Gloppen, Rhew, Oesterle, & Hawkins, 2015), the universality of its effects with respect to gender and baseline behaviors (see Oesterle, Hawkins, Fagan, Abbott, & Catalano, 2010; Oesterle, Hawkins, Fagan, Abbott, & Catalano, 2014; Oesterle et al., 2015), the cost-effectiveness of the approach (see Kuklinski, Briney, Hawkins, & Catalano, 2010), as well as other examinations of the patterns and development of youth outcomes.

The three aims of the dissertation, described below, each constitute an original research paper that contributes to the overall assessment as to the application and effectiveness of CTC in preventing gang involvement:

**Paper #1: “Risk Factors for Gang Involvement among Rural and Small Town Youth”**

As part of assessing whether CTC is effective in preventing gang involvement, it is necessary to first know whether the risk factors targeted by CTC are indeed predictive of gang involvement. Many studies have comprehensively examined these and similar risk factors for gang involvement (see Klein & Maxson, 2006 and Howell & Egley, 2005), but few have done so specifically with rural samples like those of the communities participating in CYDS. Although nearly one fifth of gang members reside in rural and small town locales (National Gang Center, 2015), relatively little is known about whether the range of ecological risks found for gang involvement in urban samples is similar for rural youth. Rural youth are commonly assumed to be protected from the kinds of risks and problems associated with urban areas by the nature of their kinship and community ties (Crockett, Shanahan, & Jackson-Newsom, 2000). However,

although the levels of risk in rural and urban contexts may be different, evidence suggests risk factors, such as community, school, family, peer, and individual risks, are actually quite similar for rural youth in the functionality of these associations, and are therefore just as likely to increase the likelihood of gang involvement. This study aims to fill the gap in the literature by assessing CTC's broad set of established risk factors for their associations with gang involvement in a rural sample.

**Paper #2: “Preventing Gang Involvement with Communities That Care”**

The second aim of the dissertation examines to what degree CTC is effective in preventing gang involvement. Few studies have rigorously evaluated universal prevention for gang involvement and none yet has examined the effects of a community-based approach that addresses youth risk across multiple ecological domains. The CYDS implementation of CTC is a randomized-community trial testing its effectiveness on multiple problem outcomes among youth in 24 communities. Through multilevel, multivariate analyses, this study provides strong scientific rigor for assessing whether the CTC approach is effective in reducing gang involvement.

**Paper #3: “Assessing the Universality of Effects of the Communities That Care Prevention System on Adolescent Gang Involvement”**

Because of CTC's universal, multi-domain approach to prevention, and the many types of risk factors that have been found to be associated with gang involvement, it is possible that CTC may be more or less effective for youth with different types or levels of risk factors. Although the system is intended to have universal effects, some types of risk factors, such as elevated substance using or antisocial peer association, may make youth more resistant to prevention effects. This third aim of the dissertation explores the effects of CTC relative to youth with different types of baseline ecological risk. In addition, because differential effects by gender

have previously been observed for CTC for some outcomes (Oesterle et al., 2010; Oesterle et al., 2014), and because finding effective solutions to gang involvement among girls has been commonly overlooked in the literature (Chesney-Lind, 2013), this study also examines whether CTC has the same effects for males and females. Exploring the universality of effects of CTC will provide further insight into for whom this approach is most effective.

This assessment of the effects of the CTC prevention system on gang involvement is unique for several reasons. First, it examines gang involvement more broadly than is commonly considered in either etiological or evaluation research. Existing research most often identifies gang-involved youth as a gang member or not through an individual's self-nomination: asking an individual if they are currently, or have ever been, a member of a gang. Self-nomination has been described and validated as providing a strong and pragmatic threshold for identifying youth gang members apart from non-members, but it is also insufficient for capturing the diverse levels and patterning of gang involvement, such as distinguishing more central gang members from peripherally-involved youth, or youth with different degrees of depth or longevity of association (Decker, Pyrooz, Sweeten, Moule Jr., 2014; Esbensen, Winfree, He, & Taylor, 2001). Attention to different levels of involvement may provide greater insight into the effectiveness of prevention approaches, as some may have effects specifically for more- or less-involved youth (Pyrooz, 2013).

Using Latent Profile Analyses, this study examines two levels of gang-involvement measured from grade 7 to 12 and compares them to youth who are not involved with gangs. *Gang members* are youth who consistently across adolescence report gang membership and having multiple close friends in a gang. *Gang associates* are youth who consistently report having some close friends in gangs, but are less likely to report that they are gang members

themselves. More information about the measurement of these classes can be found in the appendix.

Second, this dissertation also presents a unique approach to evaluation of potential secondary effects of CTC that have not been examined previously, as the approach was not originally intended to prevent gang involvement. Unlike other prevention approaches that aim to reduce or mitigate factors unique to gang involvement, such as targeting low empathy in youth by increasing their awareness of the effects of crime on victims (Esbensen et al., 2011), CTC targets ecological risk factors that are associated with multiple youth problem behaviors, including delinquency, violence, and substance use. This dissertation thus examines the applicability of these risk factors, as well as the effectiveness and universality of the CTC prevention model, to gang involvement.

By examining a universal, ecological approach to problem behaviors for its possible relevance in preventing gang involvement, this dissertation seeks to provide evidence of alternative methods for gang prevention than those previously examined. Youth who become gang-involved face a great range of negative outcomes, both during their time of involvement and well into adulthood. The findings of this dissertation will thus provide an evidence base for both researchers and communities in finding and implementing the best solutions to further reduce the potential for a diverse set of risky problem outcomes among youth.

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PAPER 1  
RISK FACTORS FOR GANG INVOLVEMENT AMONG RURAL AND  
SMALL TOWN YOUTH

Abstract

*Objectives:* This study examines early ecological risk factors for multiple levels of adolescent gang involvement among a sample of rural and small town youth, an understudied context for research on gang membership. The objective is to understand similarities and differences with risk factors found for urban gangs. *Method:* Longitudinal panel data (n=2,002) come from a population sample of 5<sup>th</sup> graders followed longitudinally in the twelve control communities of the Community Youth Development Study, a community-randomized trial of the Communities That Care prevention system. Multilevel multinomial logistic regressions assess the associations between fifteen risk factors from community, school, family, peer and individual domains with latent classes representing gang involvement across Grades 7 to 12. The number of elevated risk factors across these latent classes, both within-domain and overall, was also compared.

*Findings:* Risk factors from all domains, as well as overall risk, were found to be predictive of both gang association and gang membership latent classes, with the exception of community risk and the gang association latent class. *Discussion:* Similar to studies with urban youth, results indicate broad ecological and cumulative risks are predictive of gang involvement among rural youth, with patterns of risk being generally similar for both gang association and gang membership. Prevention and intervention efforts addressing these identified risk factors may have the capacity to reduce community levels of gang involvement.

Despite the fact that rural and small town youth make up nearly one-fifth of the nation's gang members (National Gang Center, 2015), few studies have examined the relevance of the kinds of comprehensive ecological risk factors found for urban gang membership to rural samples. Multiple studies have examined risk factors for gang membership in urban contexts and have identified predictors not only in the individual, but among broader ecological contexts, including in the community, school, and family (Klein & Maxson, 2006; O'Brien, Daffern, Chu, & Thomas, 2013; Thornberry, Krohn, Lizotte, Smith, & Tobin, 2003). These studies have examined many possible individual developmental and contextual deficits (e.g. criminogenic neighborhood, low commitment to school, poor parental supervision, low self-esteem) that are associated with gang membership, but have tended to focus on urban or high-risk samples, or have used cross-sectional national samples with limited rural participation, providing only a partial understanding of the types of risk that may lead to later gang involvement among rural youth. While a few comparative studies (see Evans, Fitzgerald, Weigel, & Chvilicek, 1999; Watkins & Taylor, 2016) have examined the similarity of risk factors for urban and rural gang joining, these studies have been limited by measuring only a narrow set of risk factors in a few social contexts and cannot speak to differences among broader domains of risk for rural and urban youth gang involvement.

Because of the large number of gang members in rural areas, there is a clear need to identify the types of risk that lead to gang involvement in these contexts to provide a more thorough understanding of risk among rural youth and to improve our ability to develop meaningful preventive and interventive services for this population. Although many risk factors for youth gang involvement, such as having early favorable attitudes toward antisocial behavior, would likely be considered to have similar associations with gang involvement in both rural and

urban contexts, some, such as a low attachment to the neighborhood, may be commonly thought of as less prevalent for rural youth due to the perception that rural towns are safer and have stronger community ties, therefore reducing the levels of such risks (Pruitt, 2009). However, evidence suggests that rural communities actually have similar, if not greater levels of some risks, such as family risk factors, but it is not clear as to whether or to what degree these necessarily associate with gang involvement. Identification of the patterns of diverse risk factors for gang involvement for youth in non-urban locales would provide a more thorough understanding of the influence of context on gang involvement, as well as offer community programs a more specific set of evidence-based tools to target at-risk youth behaviors and outcomes in diverse settings. In addition, similar to some longitudinal studies with urban youth (see Hill, Howell, Hawkins, & Battin-Pearson, 1999; Thornberry et al., 2003), longitudinal examination of these relationships would provide insight into the predictive nature of rural contexts of late childhood risk, prior to when most youth become involved in gangs, on subsequent gang involvement.

### **Rural Gang Involvement**

In comparison to urban gangs, relatively little is known about the nature of rural gangs, but what little we know suggests that rural youth have a similar likelihood for gang involvement as urban youth. The National Gang Center (2015) estimates that more than half of the more than 30,000 gangs in the United States are located outside urban areas, with nearly one fifth of the estimated 850,000 gang members in the country residing in rural and small town jurisdictions. Comparative studies have found levels of gang membership in rural, suburban, and urban geographies to be similarly proportionate to their population sizes (Evans et al., 1999; Watkins & Taylor, 2016), indicating that the prevalence of gang involvement among youth is quite similar in scope across various community contexts.

Although the proportions are similar, there is a perception that the nature of gangs, such as their stability and engagement in crime, may be different in rural communities than in urban ones, which may influence what factors lead to youth involvement. A study of law enforcement agency employees in 2001 observed a common belief among them that rural gangs tended to be short-lived and engaged in only minor delinquency (Weisheit & Wells, 2001). Some have suggested that rural gangs are therefore less criminogenic than urban gangs, due to a less organized structure resulting from their more transitory nature (Weisheit, Falcone, & Wells, 2006). Although there is evidence that these gangs are indeed more short-lived (Weisheit & Wells, 2004), the available evidence suggests that rural youth gangs are actually quite similar in organization and criminogenic influence on members. A study by Esbensen and Lynskey (2001) examining data from 8<sup>th</sup> grade youth in 11 survey locations, including large cities, such as Philadelphia, PA, a small town, (Pocatello, ID), and a rural county (Will County, IL), found that gang-involved youth across all locations reported similar organizational structures of their gangs, including initiation rites, leaders, and rules, as well as similar levels of involvement among members in delinquent behaviors, such as stealing cars and selling marijuana. A study by Watkins and Taylor (2016) using data from the National Longitudinal Study of Adolescent to Adult Health, directly compared the criminogenic effects of gang-membership on subsequent delinquency among urban, suburban, and rural adolescents, finding that being a gang member similarly increased the rate of delinquency for each group at one year follow-up. Beyond delinquency, there is also some evidence that gang involvement among rural youth similarly leads to other behavioral and developmental outcomes found among urban gang members, with rural gang-involved youth having substantially greater odds than non-affiliated youth of substance use, early pregnancy, and high school dropout during young adulthood (Fleming,

Oesterle, Hill, & Catalano, *under review*). These findings suggest that although some differences may exist in the stability of gangs in different community contexts, their function as a criminogenic and otherwise negative influence on youth remains the same.

### **Risk Factors for Rural Gang Involvement**

Although both the prevalence of gang involvement and the influence of gangs on rural youth behavior appear to be similar as for urban gangs, it is not yet clear whether the types of risk that contribute to gang membership are themselves different among rural youth. Research using primarily urban samples, such as Seattle, WA, San Diego, CA, and Rochester, NY (e.g. Hill et al., 1999; Maxson, Whitlock, & Klein, 1998; Thornberry et al., 2003) or nationally representative samples with either limited representation or no distinction of rural youth (e.g. Esbensen, Peterson, Taylor, & Freng, 2009; Lenzi et al., 2014), has identified risk factors for gang membership across a variety of domains, including individual risk factors such as antisocial beliefs and substance use, and broad environmental factors such as delinquent peers, a poor school environment, and poor family management. Although much of the research into risk factors for gang membership has used empirically-driven, and not theoretically-derived, risk factors (Esbensen et al., 2009), such findings are evidence of the influence of a broad social and developmental predictors across socialization domains that create an environment conducive to many youth problem behaviors, including substance use, violence, and delinquency (Jessor, 1991), and likely, to gang involvement (Howell & Egley, Jr., 2005). Although how particular mechanisms prompt gang membership is not clear, studies have repeatedly found that the accumulation of multiple risks, both within and across domains, is a strong predictor of gang membership (Esbensen et al., 2009; Hill et al., 1999, Thornberry, 2003).

Rural youth are often perceived as being shielded from the problems and risks associated with urban areas, as the small size of these communities is believed by many to create deeper

kinship and community ties, resulting in greater social capital and more restrictive informal social control, reducing the potential for youth to learn about and engage in problem behaviors (Crockett, Shanahan, & Jackson-Newsom, 2000; Pruitt, 2009). Contrary to this notion of rurality being protective, evidence instead suggests that rural youth may actually have elevated risk in some domains in comparison to urban youth. Studies comparing rural and urban youth risk factors for different outcomes have often found similar, if not greater, levels and associations of risk for problem outcomes among rural youth, particularly in the family domain. This is coupled with rural youth having similar or greater odds of multiple problematic behaviors than their urban peers, including substance use (Coomber, et al., 2011; Johnson et al., 2008; Lambert, Gale, & Hartley, 2008), violence and victimization (Johnson et al., 2008), and contact with the juvenile justice system (Blackmon Robison, & Rhodes, 2016). Studies comparing rural and urban youth risk factors for these outcomes have found greater cumulative levels of family and individual risk for substance use (Spoth, Goldberg, Nepl, Trudeau, & Ramisetty-Mikler, 2001) and stronger correlations of family risk with externalizing and internalizing behaviors (Nelson, Coleman, & Corcoran, 2010) among rural youth. Rather than being protective, the smaller size of rural communities may increase the relative influence of some forms of risk, for example by providing few positive alternative opportunities for peer socialization and support outside the home.

Few studies have examined the associations of ecological risk for gang involvement specifically among rural youth. The study by Watkins and Taylor (2016) is one of few that examined risk factors in several ecological domains for their impact on gang involvement among rural, suburban, and urban youth. Although limited by the use of somewhat narrow available measures to represent these domains, the study found few significant differences between rural, suburban, and urban youth in the strength of association of these risk factors with gang

membership (Watkins & Taylor, 2016). However, they did observe a marginally stronger influence of school-based risk factors for rural youth than for suburban or urban youth. The authors suggest that the geography of rural communities may make gangs more school-based, due to a lower importance of neighborhood boundaries in rural communities, thus making school-based risk more influential to rural youth gang involvement. Of note, neither of the community-level risk factors, neighborhood disadvantage and neighborhood density, were significant predictors of gang involvement for any of the three subgroups of youth, making it unclear as to whether community-level risk or perceptions of risk actually differentially impact youth in these contexts. An earlier study, comparing urban and rural gang members on a small set of concurrent ecological risk and protective factors, did find that rural youths' perceptions of risk and lack of support in the neighborhood was less predictive of gang membership than for urban youth (Evans et al., 1999), adding support that other ecological influences, such as school and family factors, may be more strongly related to rural youth gang involvement.

Although the limited evidence suggests that the relationships of different ecological risk factors with youth gang involvement and the prevalence and consequences of gang membership are similar for urban and rural youth, there are also reasons to believe that important differences exist. Rural gangs tend to exist for shorter periods of time, and because rural communities tend to have more vague geographic boundaries than urban neighborhoods, community risk factors may not be as influential for rural youth gang involvement (Watkins & Taylor, 2016). An examination of rural youths' risk for gang involvement that is more broadly representative of different ecological domains and attentive to how early risk environments can subsequently lead to gang involvement would provide a broader understanding of how different types of risk are influential for rural youth becoming involved in gangs. Further, this would provide prevention

research and implementation with a broad set of risk factors to target before youth become gang-involved.

### **Present study**

Using a comprehensive set of risk factors from multiple domains, longitudinal data, and a sample of youth from twelve rural and small town locales across the United States, this study examines the association of community, school, family, peer and individual risk at grade 5 to gang involvement in grades 7 to 12, through associations with both specific risk factors and indices of elevated risk within domains.

In addition, this study examines whether these risk factors vary in their predictive capacity for different levels of gang involvement. Recent studies have begun to examine the degree of gang involvement, rather than binary indicators of gang membership (Alleyne & Wood, 2010; Fleming et al., *under review*; Merrin, Hong, & Espelage, 2015). Most gang-involved youth are peripheral to the gang, seldom staying involved for more than one year (Hill et al., 1999; Pyrooz, Sweeten, & Piquero, 2013). Similarly, many youth may associate with gangs, but reject or not obtain formal membership (Merrin et al., 2015). The present study therefore examines whether being a more formal gang member may have different types or levels of risk than those who are more peripheral, providing an understanding of whether research and community programs should address a broader category of at-risk youth.

## **Method**

### **Sample**

Data come from the Community Youth Development Study (CYDS; Hawkins et al., 2008), a community-randomized trial of the effectiveness of the Communities That Care (CTC) prevention system (Hawkins, Catalano, & Arthur, 2002). CYDS includes 24 rural and small

town communities in seven states (CO, IL, KS, ME, OR, UT, and WA) that were matched in pairs within state and randomized to condition by a coin flip. To avoid contamination from possible intervention effects, data for the current analyses come from only the 12 control communities. At the beginning of the study in 2003, these communities ranged in population size from 1,921 to 32,885 (M=13,996), according to the 2000 Census.

Data for this research come from a longitudinal panel study of youth in these communities. Data were collected from a population sample of 5<sup>th</sup> grade students in each community followed longitudinally in seven administrations of the survey, beginning in 2004 until 2011, when respondents were in the 12th grade. Youth whose parents consented to the study (77% of eligible) and who completed a Wave 1 or Wave 2 survey and remained in their community for at least 1 semester (n=2,002) were included in the longitudinal panel, with 91.6% retained in the study through grade 12. Of the respondents, 51.9% were male, 61.4% were white, 3.5% were black, and 35% were from another race; additionally, 27% of respondents of any race identified as Hispanic. Respondents completed the CYDS youth development survey, answering questions about youth behavioral outcomes, as well as risk and protective factors in community, school, family, and peer and individual domains (Brown et al., 2009; Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996). Surveys were designed to be completed within a single class period, but to reduce response fatigue used a randomized planned missing design beginning in Grade 7, resulting in missing data that are assumed to be missing completely at random (MCAR; Brown et al., 2009; Graham, 2012).

## **Measures**

*Gang Involvement* was defined via latent profile analyses. Latent classes of youth gang involvement were derived from two questions measured five times each from grade 7 to grade 12 (Fleming et al., *under review*). Respondents were asked “Have you ever belonged to a gang?”

(yes/no) and “Of your four closest friends, how many belong to a gang?” (0 to 4). Results of the latent profile analyses identified three latent classes: non-affiliates (67.2%), gang associates (23.5%), and gang members (9.3%). [*Additional explanation of the latent profile analyses, including fit statistics and model selection, can be found in the Appendix.*]

*Risk factors* include 15 CTC risk factors (Arthur, Hawkins, Pollard, Catalano, & Baglioni, Jr., 2002) representing community, school, family, and peer and individual domains, used by communities as part of the CTC process to assess levels of youth risk and select prevention programming. *Table 1* shows the risk factors, the number of items included in each scale, a sample item, and the scale’s reliability (Cronbach’s alpha). Many of the CTC risk factors are derived from the Social Development Model (SDM; Catalano & Hawkins, 1996), a theory hypothesizing that youth behavior results from processes of socialization in relation to both antisocial and prosocial environmental contexts. Opportunities for socialization in these environments provide the context for youths’ interactions with others. Through these interactions, youth learn the skills necessary to navigate these contexts. If they receive positive recognition and rewards from others, they are likely to develop a social bond and attachment to the environment, leading to the youths’ adoption of its values and standards of behavior. To the extent that these opportunities and interactions are prosocial, positive developmental outcomes are expected. If these opportunities and interactions are antisocial, antisocial outcomes are predicted. Social developmental risk factors, such as opportunities for, involvement with, and bonding to prosocial and antisocial others and contexts, have been consistently found to be predictive of youth health and behavioral outcomes, such as delinquency, substance use, and depression (Arthur et al., 2002; Bond, Toumbourou, Thomas, Catalano, & Patton, 2005; Monahan, Oesterle, Rhew, & Hawkins, 2014) and the majority of these risk factors also

Table 1  
Grade 5 Youth Survey Risk Factors

Risk Factor	Number of Items	Example Item	$\alpha$
Community			
Low Neighborhood Attachment	3	<i>I'd like to get out of my neighborhood.</i>	.84
Laws and Norms Favorable to Drug Use	6	<i>How wrong would most adults in your neighborhood think it is for kids your age to use marijuana?</i>	.76
Perceived Availability of Drugs	3	<i>If you wanted to get some marijuana, how easy would it be for you to get some?</i>	.73
School			
Academic Failure	2	<i>Putting them all together, what were your grades like last year?</i>	.45*
Low Commitment to School	6	<i>How interesting are most of your school subjects to you?</i>	.66
Family			
Poor Family Management	6	<i>The rules in my family are clear.</i>	.69
Family Conflict	3	<i>People in my family often insult or yell at each other.</i>	.73
Family History of Antisocial Behavior	6	<i>Have any of your brothers or sisters ever smoked marijuana?</i>	.69
Peer and Individual			
Friends' Use of Drugs	3	<i>In the past year, how many of your best friends have used marijuana?</i>	.76
Interactions with Antisocial Peers	3	<i>In the past year, how many of your best friends have been suspended from school?</i>	.65
Attitudes Favorable towards Antisocial Behavior	4	<i>How wrong do you think it is for someone your age to pick a fight with someone?</i>	.73
Attitudes Favorable to Drug Use	3	<i>How wrong do you think it is for someone your age to smoke cigarettes?</i>	.75
Perceived Risk of Drug Use	4	<i>How much do you think people risk harming themselves if they try marijuana once or twice?</i>	.93
Intention to Use	3	<i>When I am an adult I will smoke cigarettes.</i>	.67
Rewards for Antisocial Involvement	3	<i>What are the chances you would be seen as cool if you smoked cigarettes?</i>	.88

Note. \*Correlation between the two items presented for Academic Failure

have been found to be predictive of gang involvement (Howell & Egley, Jr., 2005; Klein & Maxson, 2006). In addition, the SDM has been demonstrated to be a valid representation of the developmental pathways leading to gang membership in an urban sample (Bishop, Hill, Gilman, Howell, Catalano, & Hawkins, 2017). In the present study, risk factor scales were created using data from the study's baseline wave (Grade 5) to represent late childhood risk, when most youth were not yet involved with gangs, to understand the associations of early risk with gang involvement later in adolescence. All scales were created using the mean of the included items, standardized within the Grade 5 wave.

Because the accumulation of risk has been found to be a strong predictor of youth gang involvement in urban samples (Hill et al., 1999; Thornberry et al., 2003), indices that reflect the number of elevated risk factors in each domain were created to assess the impact of domain-level and overall elevated risk on later gang involvement. Domain-level indices were created by adding the number of risk factors in each domain in which youth were in the top quartile of risk. An index of the overall number of elevated risk factors, which examines cross-domain elevated risk, was also created by summing the scores of all domain-level elevated risk indices (range 0-15).

Individual-level control variables include the youth's age, gender (1=male, 0=female), race (1=White versus 0=non-White), Hispanic ethnicity (1=Hispanic vs. 0 = non-Hispanic), parent's education (0=No high school diploma to 5=Graduate education), and standardized scales for rebelliousness (three items, e.g. "I ignore rules that get in my way"  $\alpha=.69$ ) and religious attendance (one item, "How often do you attend religious services or activities?") in grade 5. Community-level covariates include two variables assessed in the 2003-2004 school year when students were in the 5<sup>th</sup> grade: the total population of students in the community and

the percentage of youth who qualified for free or reduced-price school lunch (National Center for Education Statistics, 2002-2003)

## **Analysis**

Multinomial logistic random intercept models examine the impact of individual risk factors and the number of elevated risk factors in each domain and overall on the odds of youth being identified as gang associated and gang members, relative to being non-affiliated and to each other. Because youth were nested in communities, regression models included a second level of analysis with random effects on the level 1 intercept to account for community-level variation in the outcome. Based on the prior LPA (Fleming et al., under review), individuals were categorized into latent classes of gang involvement based on the highest posterior probability to facilitate further analysis in multilevel models. The entropy value of the LPA model was adequately high (.83), limiting the chance of misclassification. Because Grade 5 risk factors were not intended to influence the definition of the gang involvement classes, the LPA and regression analyses were conducted in two separate steps (Clark & Muthén, 2009). All study variables were multiply imputed ( $k=40$ ) to retain sufficient power and to increase the accuracy of standard errors. Latent profile analyses and imputations were conducted in MPlus 7.0 (Muthen & Muthen, 2012), and regression analyses were conducted in HLM 7.0 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2013).

## **Results**

Table 2 shows control variable characteristics and mean values of risk factors for each of the three gang involvement groups. A pattern of higher levels of risk with increasing degree of gang affiliation is observed across all risk factors, indicating that youth who were most likely to be not affiliated with gangs between grade 7 and 12 had the lowest mean levels of risk in grade 5

Table 2

*Demographic Characteristics and Mean Level of Risk, by Gang Involvement*

<u>Variable</u>	<u>Non-Affiliated (n~1,345)</u>	<u>Gang-Associated (n~471)</u>	<u>Gang Members (n~186)</u>
<b>Demographic Characteristics</b>			
<i>Age</i>	12.06	12.12	12.20
<i>Male</i>	49%	55%	65%
<i>White</i>	72%	44%	27%
<i>Black</i>			
<i>Hispanic</i>	17%	40%	60%
<i>Parental Education</i>	3.19	2.71	2.51
<i>Grade 5 Rebelliousness</i>	-0.11	0.15	0.56
<i>Grade 5 Religious Attendance</i>	-0.05	-0.15	-0.04
<b>Community Risk Factors</b>			
<i>Low Neighborhood Attachment</i>	0.04	0.15	0.25
<i>Laws and Norms Favorable to Drug Use</i>	-0.03	0.03	0.29
<i>Perceived Availability of Drugs</i>	-0.04	0.11	0.37
<i>Number of Elevated Community Risk Factors</i>	0.67	0.84	1.12
<b>School Risk Factors</b>			
<i>Academic Failure</i>	-0.04	0.23	0.46
<i>Low Commitment to School</i>	-0.03	0.12	0.28
<i>Number of Elevated School Risk Factors</i>	0.42	0.61	0.82
<b>Family Risk Factors</b>			
<i>Poor Family Management</i>	-0.05	0.12	0.25
<i>Family Conflict</i>	-0.06	0.12	0.23
<i>Family History of Antisocial Behavior</i>	-0.07	0.19	0.42
<i>Number of Elevated Family Risk Factors</i>	0.27	0.61	0.79
<b>Peer and Individual Risk Factors</b>			
<i>Friends' Drug Use</i>	-0.08	0.18	0.58
<i>Interactions with Antisocial Peers</i>	-0.07	0.22	0.62
<i>Attitudes Favorable towards Antisocial Behavior</i>	-0.05	0.12	0.42
<i>Attitudes Favorable to Drug Use</i>	-0.07	0.10	0.47
<i>Perceived Risk of Drug Use</i>	-0.02	0.25	0.22
<i>Intention to Use Drugs</i>	-0.04	0.14	0.40
<i>Rewards for Antisocial Involvement</i>	-0.02	0.08	0.27
<i>Number of Elevated Peer and Individual Risk Factors</i>	1.42	2.21	2.95
<b>Overall Risk Index</b>			
<i>Lowest Risk Quartile</i>	30%	16%	11%
<i>Second Quartile</i>	28%	23%	13%
<i>Third Quartile</i>	24%	27%	26%
<i>Highest Risk Quartile</i>	18%	34%	50%
<i>Number of Overall Elevated Risk Factors</i>	2.77	4.26	5.68

*Note.* Mean estimates for risk factors are based on standardized values. Estimates are based on k=40 imputed datasets. The number of elevated risk factors is defined as the sum of risk factors within domain in which the participant was in the top quartile.

and gang members had the highest. Generally, gang associated youth had mean levels of risk between those of non-affiliated respondents and gang members. For example, non-affiliated youth had a mean Academic Failure value of -0.04, gang associated youth 0.23, and gang members 0.46. The sole exception to this pattern is Perceived Risk of Drug Use, for which gang associates had a slightly higher level of risk (0.25) than gang members (0.23).

Indices summing the number of elevated (top quartile) risk factors within domain also follow a similar pattern. In the community domain, gang members had 1.12 elevated risk factors on average, whereas gang associates average 0.84, and non-affiliated youth 0.67. In most domains, gang members had two times or more the number of elevated risk factors as non-affiliated respondents. In the overall number of elevated risk factors, gang members had a mean average of 5.68 elevated risk factors, gang associates 4.26, and non-affiliates 2.77, indicating that gang members had more than twice the number of elevated risk factors, and gang associates 50% more, than non-affiliated youth, overall.

Results of the hierarchical multinomial logistic regressions (Table 3) indicate significant associations between many risk factors and both gang association (7 of 15) and gang membership (9 of 15 risk factors). In the community domain, Perceived Availability of Drugs predicted gang membership (AOR=1.26,  $p=.013$ ), but no risk factors were significantly predictive of gang association. In each of the other domains, risk factors that were significant predictors of gang membership were generally also significant predictors of gang association, showing great similarity among school, family, peer and individual risk factors for both levels of gang involvement. Perceived Risk of Drug Use was the only risk factor significantly predictive of gang association (AOR=1.22,  $p=.008$ ), but not also gang membership (AOR=1.16,  $p=.18$ ).

Odds ratios of those risk factors significantly predicting gang association were generally

Table 3

## Multinomial Regression of Gang Involvement on Risk Factors

Variable	Gang Associates (ref: non-affiliated)				Gang Members (ref: non-affiliated)				Gang Members (ref: Gang Associates)			
	est	se	AOR	95% CI	est	se	AOR	95% CI	est	se	AOR	95% CI
<b>Community Risk Factors</b>												
<i>Low Neighborhood Attachment</i>	0.04	0.08	1.04	[0.89, 1.21]	0.03	0.11	1.03	[0.82, 1.29]	-0.01	0.12	0.99	[0.78, 1.26]
<i>Laws and Norms Favorable to Drug Use</i>	0.02	0.11	1.02	[0.82, 1.27]	0.25	0.13	1.28†	[0.99, 1.67]	0.23	0.15	1.26	[0.94, 1.67]
<i>Perceived Availability of Drugs</i>	0.14	0.09	1.15	[0.96, 1.39]	0.30	0.12	1.35*	[1.07, 1.70]	0.15	0.11	1.17	[0.93, 1.46]
<i>Number of Elevated Community Risk Factors</i>	0.10	0.09	1.11	[0.93, 1.32]	0.23	0.11	1.26*	[1.01, 1.58]	0.13	0.13	1.14	[0.89, 1.46]
<b>School Risk Factors</b>												
<i>Academic Failure</i>	0.24	0.09	1.27**	[1.07, 1.51]	0.46	0.13	1.58**	[1.23, 2.03]	0.22	0.13	1.25†	[0.97, 1.60]
<i>Low Commitment to School</i>	0.23	0.13	1.26†	[0.98, 1.62]	0.33	0.20	1.39†	[0.94, 2.04]	0.10	0.20	1.10	[0.74, 1.64]
<i>Number of Elevated School Risk Factors</i>	0.28	0.11	1.32*	[1.06, 1.65]	0.48	0.16	1.62**	[1.18, 2.20]	0.20	0.16	1.22	[0.90, 1.67]
<b>Family Risk Factors</b>												
<i>Poor Family Management</i>	0.22	0.11	1.25†	[1.00, 1.56]	0.25	0.17	1.28	[0.91, 1.79]	0.02	0.18	1.03	[0.73, 1.45]
<i>Family Conflict</i>	0.21	0.09	1.24*	[1.03, 1.48]	0.30	0.14	1.36*	[1.04, 1.77]	0.09	0.14	1.10	[0.83, 1.44]
<i>Family History of Antisocial Behavior</i>	0.55	0.12	1.73***	[1.35, 2.21]	0.81	0.16	2.25***	[1.64, 3.09]	0.26	0.16	1.30†	[0.95, 1.78]
<i>Number of Elevated Family Risk Factors</i>	0.31	0.09	1.37**	[1.16, 1.62]	0.39	0.11	1.48**	[1.19, 1.85]	0.08	0.12	1.08	[0.85, 1.38]
<b>Peer and Individual Risk Factors</b>												
<i>Friends' Drug Use</i>	0.36	0.10	1.43***	[1.18, 1.73]	0.52	0.11	1.68***	[1.35, 2.08]	0.16	0.08	1.17†	[1.00, 1.37]
<i>Interaction with Antisocial Peers</i>	0.37	0.10	1.45***	[1.19, 1.76]	0.58	0.12	1.78***	[1.40, 2.28]	0.21	0.11	1.23†	[1.00, 1.52]
<i>Attitudes Favorable toward Antisocial Beh.</i>	0.17	0.10	1.19†	[0.97, 1.46]	0.34	0.15	1.40*	[1.05, 1.87]	0.16	0.15	1.18	[0.88, 1.56]
<i>Attitudes Favorable to Drug Use</i>	0.20	0.11	1.22†	[0.98, 1.53]	0.38	0.12	1.46**	[1.16, 1.85]	0.18	0.11	1.20	[0.96, 1.50]
<i>Perceived Risk of Drug Use</i>	0.20	0.08	1.22**	[1.06, 1.42]	0.15	0.11	1.16	[0.93, 1.45]	-0.05	0.11	0.95	[0.76, 1.18]
<i>Intention to Use Drugs</i>	0.20	0.10	1.22†	[1.00, 1.49]	0.31	0.13	1.36*	[1.06, 1.74]	0.11	0.12	1.12	[0.88, 1.42]
<i>Rewards for Antisocial Involvement</i>	0.05	0.09	1.05	[0.88, 1.24]	0.09	0.11	1.09	[0.89, 1.34]	0.04	0.10	1.04	[0.86, 1.27]
<i>Number of Elevated Peer and Individual Risk Factors</i>	0.20	0.05	1.22***	[1.11, 1.34]	0.28	0.06	1.32***	[1.17, 1.50]	0.08	0.06	1.09	[0.96, 1.23]
<b>Overall Risk Index</b>												
<i>Second Quartile (Ref: Lowest Risk Quartile)</i>	0.34	0.20	1.41†	[0.94, 2.10]	0.07	0.37	1.08	[0.52, 2.23]	-0.27	0.40	0.76	[0.35, 1.67]
<i>Third Quartile (Ref: Lowest Risk Quartile)</i>	0.55	0.22	1.73*	[1.13, 2.64]	0.66	0.35	1.94†	[0.97, 3.88]	0.12	0.36	1.12	[0.55, 2.29]
<i>Highest Risk Quartile (Ref: Lowest Risk Quartile)</i>	0.96	0.24	2.61***	[1.65, 4.14]	1.20	0.34	3.33**	[1.70, 6.52]	0.24	0.37	1.27	[0.62, 2.62]
<i>Number of Overall Elevated Risk Factors</i>	0.13	0.03	1.14***	[1.08, 1.21]	0.20	0.04	1.22***	[1.13, 1.31]	0.06	0.04	1.07†	[0.99, 1.15]

Note. †p<.10 \*\*p<.05 \*\*\*p<.001. AOR = Adjusted Odds Ratio. CI = Confidence Interval. Estimates are based on k=40 imputed datasets. Estimates come from sequential regression models including only each individual risk factor and controls. Level 1 control variables include age, race, Hispanic ethnicity, grade 5 rebelliousness, and grade 5 religious attendance. Level 2 control variables include total community student population and percent of students eligible for free or reduced price school lunch.

lower in magnitude than those predicting gang membership, when comparing each to non-affiliation. This indicates that although both classes of gang involvement included individuals with greater baseline risk in comparison to non-affiliated youth, gang members included a larger proportion of individuals with this greater risk. For example, after adjusting for controls, an increase of one standard deviation in Academic Failure increases the odds that an individual will become a gang member versus being not affiliated with a gang by 58% (AOR=1.58,  $p=.001$ ) and the odds of becoming a gang associate versus being not affiliated with a gang by 27% (AOR=1.27,  $p=.007$ ). However, risk factors in grade 5 did not significantly distinguish gang members from gang associates, indicating similarities in the association of risk to gang involvement of either type. Although most risk factors did not significantly distinguish gang associates from gang members at the standard  $p < .05$  level, four risk factors did at a  $p < .10$  level, providing some tentative evidence that gang members had some unique risks compared to gang associates. Academic failure increased the odds of gang membership over gang association by 25% (AOR=1.25,  $p=.087$ ), Family History of Antisocial Behavior by 30% (AOR=1.30,  $p=.098$ ), Friends' Drug Use by 17% (AOR=1.17,  $p=.057$ ), and Interaction with Antisocial Peers by 23% (AOR=1.23,  $p=.056$ ).

The number of elevated risks in each domain were also significant predictors of gang involvement, again with the exception that elevated risk in the community-domain did not predict gang association. These findings indicate that both gang associates and gang members more commonly had elevated baseline risk levels in each domain, and overall, than non-affiliated youth. For example, in comparison to non-affiliated youth, a higher overall number of elevated risk factors predicted a 14% increase in the odds of being gang associated (AOR=1.14,  $p<.001$ ) and a 22% increase in the odds of becoming a gang member (AOR=1.22,  $p<.001$ ). In addition,

being in the top quartile of overall risk compared to the lowest quartile was associated with three times the odds of gang membership and more than two and a half times the odds of gang association. Youth with elevated risk, both within domain and overall, are shown in these results as far more likely to be gang-involved, of either type, than non-affiliated after adjusting for covariates. A greater number of elevated risk factors overall increased the odds of being a gang member over being a gang associate by 7%, but this was a marginally significant difference (AOR=1.07,  $p=.09$ ), indicating that although the level of overall risk exposure was in the expected direction, there was not a significant difference in the strength of its association between gang associates and gang members.

### **Discussion**

Contrary to the notion that rural youth may be shielded from certain types of risk that lead to problematic outcomes such as gang involvement, the current study finds evidence that rural youth are influenced by many of the same ecological risk factors for gang involvement as urban youth. Similar to studies with urban samples assessing comprehensive ecological risk factors and a dichotomous assessment of gang membership (member vs. not member) (see Hill et al., 1999; Thornberry et al., 2003), results indicate that early risks, measured in late childhood (grade 5) and within and across most ecological domains, are associated with increased odds of gang involvement among rural youth in adolescence. Further, similar to these studies, the number of elevated risk factors in the individual, peer, school and family domains are also significantly associated with gang involvement among rural youth. These findings add to the evidence suggesting that the etiology of gang involvement among rural youth is largely similar to that of urban youth.

These findings also further identify a group of gang associated youth that are typically

overlooked in gang literature: youth who associate with gangs, but who may not identify as gang members. The results generally indicate a similar pattern of predictors for gang association as for gang membership suggesting that there is not much difference in the etiology of late childhood ecological risk factors leading to these different levels of involvement and that the kinds of individual and contextual deficits that may prompt involvement with gangs are functionally similar for both groups. With little exception, most risk factors that were predictive of gang membership were also predictive of gang association, and most domain-level and overall elevated risks similarly predicted both outcomes. Results indicate only a few predictors marginally distinguished gang membership from gang association. These provide some tentative evidence that gang members may have greater early interactions than associates with antisocial peers and family members, and greater academic risk. However, some differences may not have been detected due to the smaller sizes of gang member and gang associate groups in the sample, providing less statistical power than the comparisons with the non-affiliated group. Because the same late childhood risk factors generally predicted both levels of gang involvement, further research is needed to identify unique contributors that may prompt youth to cross from lower levels of involvement into gang membership. This may include examining more proximal risk on different levels of involvement. For example, immediate threats of victimization may have a stronger influence on youth becoming more deeply involved in gangs than late childhood risks, as a youth's fear may motivate a youth to seek the type of protection that a deeper level of involvement is perceived to offer (Melde, Diem, & Drake, 2012).

Although prior studies suggested that community risk may be less of a risk factor for rural gang involvement, this study finds that Perceived Availability of Drugs in the community, as well as a greater number of elevated community risk factors (including Perceived Availability

of Drugs, Low Neighborhood Attachment, and Laws and Norms Favorable to Drug Use), are significant predictors of gang membership, but not gang association, over non-affiliation. This study's use of more specifically-defined classes of gang involvement may account for this; by defining gang membership as inclusive of both self-identification and association with gang-involved peers, the predictive effect of community risk is likely more relevant to this higher-risk category of youth. Prior studies using only dichotomous indicators may be capturing some lower-risk youth who identify briefly as gang members, but who lack the community-level risk associations with gang-involved peers. The lack of findings for gang associated youth here may also be indicative of the specific community risk variables examined, which focus on youths' perceptions of their communities, as opposed to community-level indicators of risk such as neighborhood gang activity or community arrest rate, which have been found to be predictive of gang membership in other studies (O'Brien et al., 2013; Thornberry et al., 2003). Future research of community-level risk and degrees of gang involvement should further examine the influence of youths' risk perception and objective measures of community disadvantage to more completely understand what aspects of community risk may be associated with gang association versus joining a gang.

### **Implications**

Prior studies comparing urban and rural youth have found that they share a similar prevalence of gang-involvement and that rural and urban gang-involved youth have similar behavioral outcomes (Dukes & Stein, 2003; Evans et al., 1999; Watkins & Taylor, 2016). The findings from the present study provide evidence that predictors of urban gang involvement are also relevant in rural contexts. Furthermore, the present study expanded on prior work by assessing early risk for later gang involvement in adolescence comprehensively within and across multiple ecological domains (community, school, family, peers, and individual). This not

only expands the scope of known antecedents for rural gang involvement, but provides insight into the similar etiology of gang involvement across multiple contexts, expanding the capacity to implement prevention and intervention programming in different locales and to generalize those findings to broader populations.

Prevention programs for problematic youth outcomes assess risk and protective factors so that they can target certain factors and address behavioral outcomes, including delinquency, violence and substance use. These programs can be more broadly effective and efficient if the factors being targeted are shared by multiple outcomes (Bailey, 2009). The results of this study add further evidence that the Communities That Care Youth Survey risk factors are meaningful antecedents to diverse problem behaviors. These risk factors have been found to predict not only delinquency, violence, and substance use (Arthur et al., 2002), but other problematic youth outcomes, including depression and obesity (Bond et al., 2005; Monahan et al., 2014; Williams, Canterford, Toumbourou, Patton, & Catalano, 2015). That this study finds these risk factors also to be largely predictive of gang involvement suggests that prevention approaches that capitalize on targeting risk factors shared for multiple behavioral outcomes may also have some effect in preventing gang involvement.

### **Strengths and Limitations**

The use of latent classes of gang involvement is a person-centered, probabilistic approach that identifies categories of involvement while allowing for an estimation of measurement error. While the approach used here is able to examine involvement broadly over an extended period of time, allowing for the encapsulation of varied patterns of gang involvement into more accessible categories, this approach is also limited as the use of groups that are fixed over time limits the ability to examine the impact of more proximal relationships. For example, it is likely that a risk factor at grade 5, such as family involvement in antisocial behavior, is a stronger predictor of

gang membership at an earlier time point, but that the magnitude of this impact grows more diffuse over time. Future research would be well-served to further specify the time-linked associations of these risk factors to the diverse patterns of gang involvement. Further, it would be beneficial to assess how these risk factors are subsequently associated with the long-term consequences of these different patterns of involvement.

The present study assessed many ecological risk factors that have been previously explored using urban samples (see Hill et al., 1999; Klein & Maxson, 2006; O'Brien et al., 2013; Thornberry et al., 2003), but lacked an urban comparison sample which prevented the ability to directly compare populations. Although the results of this and prior studies indicate that many of these risk factors have been generally predictive of gang involvement in both contexts, caution should be taken when inferring similarities in the strength of these associations between the different contexts. Replication of these findings, preferably with rural, suburban, and urban comparison populations would provide greater insight into the degree of similarity or difference in the effects of these risk factors on gang involvement across contexts. Although not addressed in the current paper, such approaches, particularly when many significance tests are conducted similarly across groups, should account for multiple testing to reduce the chance of false positive results.

Lastly, evidence from this study benefits from a longitudinal design, using grade five predictors for outcomes later in adolescence, as well as from a broad set of control variables at both the individual and community levels, thereby further specifying the observed results. Although this strengthens the interpretation of the findings due to the time-ordered nature of the results, caution should be taken when inferring causation, as this study did not examine mediational or more diverse moderating effects of these associations. Researchers have

examined multiple theoretical models that attempt to explain the factors leading to gang-involvement, made challenging due to the complexity of temporal ordering and mediation of these risk factors (Howell & Egley, 2005; Thornberry et al., 2003). However, the risk factors used here are based on the SDM, an empirically supported theoretical model of the development of pro- and antisocial behaviors, including gang membership (Bishop et al., 2017), so evidence from this study may therefore be useful in future examinations of theory, including moderating and mediating effects.

## **Conclusion**

The current study adds to the gang literature by examining a comprehensive set of established ecological risk factors for their effects on gang involvement among a sample of rural youth in multiple communities. Further, it examines these relationships longitudinally and with respect to multiple levels of involvement, to present a more complete understanding of the nature of risk relative to realistic interpretations of gang youth. This study is particularly important for understanding the etiology of gang involvement across diverse contexts. The current findings find great similarity of ecological risk factors for youth gang involvement in rural areas as has been observed in urban samples. This suggests that research and preventive interventions developed with samples from diverse contexts may likely share applicability in urban, small town, and rural settings.

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## Paper 2

### Preventing Gang Involvement with Communities That Care

#### Abstract

*Background:* Few prevention programs have been effective at reducing youth gang membership. Communities That Care (CTC) is a universal community-based prevention system that has been found in a 24 community randomized trial to reduce problematic youth outcomes including delinquency, violence, and substance use by targeting locally determined priority risk and protective factors across multiple socialization domains with tested and effective preventive interventions. *Objectives:* This study examined whether CTC was also effective at reducing youth gang involvement, including gang association and gang membership. *Methods:* Data came from the longitudinal panel of youth (N=4407) followed in the trial of CTC and surveyed annually between grades 5 to 12. Multinomial regression models that accounted for nesting of youth in communities and communities in matched pairs tested the extent to which CTC reduced the likelihood of being associated with gang members or of being in a gang across grades 7 to 12. *Findings:* Results indicate that CTC significantly reduced gang association (Adjusted Odds Ratio = .69), but not gang membership, after controlling for individual and community characteristics. *Discussion:* Given that there are few existing prevention programs that have been shown to reduce gang involvement, this study provides promising evidence that a universal prevention approach like CTC that is focused on broad risk reduction and positive youth development can reduce gang association.

Since the peak of gang membership in the mid-1990s, the number of gang members has ebbed and flowed, but is now approaching peak levels again due in part to the spread of gangs beyond urban areas and also into rural and suburban contexts (Howell, 2013; Klein & Maxson, 2006; National Gang Center, 2015). Although the overall rate of violence and property crime in the United States has diminished during this time, gangs and their impact on crime persist (Howell, 2013). Research in the past several decades has come to identify the breadth and depth of consequences for gang-involved youth themselves, both during adolescence and into adulthood, motivating the need to find effective prevention methods. Although much is known about the risk factors that lead to gang involvement, few gang prevention approaches exist. This study examines the effects of Communities That Care (CTC) on adolescent gang involvement. CTC is a prevention system designed to assess and prioritize local levels of comprehensive, ecological risk for youth problem behaviors such as delinquency, violence, and substance use and choose and implement with fidelity evidence-based programs that address community selected priorities. Although gang involvement was not a primary targeted outcome of the prevention system, the system's broad approach to reducing youth risk factors shared with gang involvement suggests that it may prevent gang involvement.

Gang membership is associated with a wide variety of both short and long-term negative consequences for youth (Krohn, Ward, Thornberry, Lizotte, & Chu, 2011) beyond increasing the likelihood of delinquency and substance use during adolescence and young adulthood (Barnes, Beaver, & Miller, 2010; Gilman, Hill, & Hawkins, 2014). Gang membership has a substantial impact on other areas of development, including negatively impacting educational outcomes (Pyrooz, 2014), mental health (Watkins & Melde, 2016), and later parenting (Augustyn, Thornberry, & Krohn, 2014). In addition, gang members, particularly those who are black or

Hispanic, are more likely to be arrested (Tapia, 2011), leading to additional social, economic, and psychological consequences (Schnittker, 2014). As a developmental turning point, gang membership presents a shift toward behavioral trajectories and attitudes that initiate serious long-term costs for youth (Melde & Esbensen, 2011).

Reducing gang membership is a relevant focus for crime prevention because gangs significantly increase the chance that their members will engage in criminal offending, delinquency, substance use, and other associated antisocial behaviors (Battin, Hill, Abbott, Catalano, & Hawkins, 1998; Esbensen & Huizinga, 1993; Howell, 2013; Melde & Esbensen, 2014; Thornberry, Krohn, Lizotte, Smith, & Tobin, 2003; Watkins & Taylor, 2016). Intervention efforts, including knowledge and skill-building interventions in schools, communities, and courts and the prosecution and removal of the more serious and chronic offenders (Howell, 2010), are commonly used to encourage desistance from gangs to reduce levels of crime in the community, but are usually not intended to prevent youth from joining gangs (Hennigan, Maxson, Sloane, Kolnick, & Vindel, 2014). Unlike most existing intervention approaches, the goal of gang prevention is instead to minimize the risk that youth will join gangs in the first place, as even minor involvement with gangs (e.g., knowing or being friends with gang members) is associated with a substantial increase in problem behaviors and consequences (Fleming, Oesterle, Hill, & Catalano, *under review*; Melde & Esbensen, 2014).

### **Prior Prevention Efforts**

Dozens of gang prevention efforts have been implemented. The bulk of these efforts have been selective, or targeted, prevention programs (Klein & Maxson, 2006). These programs, such as Gang Prevention Through Targeted Outreach (GPTTO), Project B.U.I.L.D. (Building, Uplifting and Impacting Lives Daily), and the National Youth Gang Drug Prevention (NYGDP) program identify children and young adolescents who have high levels of known antecedents of

gang membership, such as arrest, prior engagement in disruptive or violent behavior, or scoring highly on validated risk measures. Youth are selected for inclusion in a program delivered at school or elsewhere in the community and are trained, for example, in conflict resolution skills (Arbetron & McClanahan, 2002; Parker, Wilson, & Thomas, 1996). However, even though some programs, such as GPTTO and Project B.U.I.L.D., have seen initial, but limited, evidence of delinquency, crime, and gang-involvement reductions, none have been rigorously evaluated with experimental designs and multivariate analyses and shown to prevent gang membership (Howell, 2010). Others with quasi-experimental designs and large samples, such as the NYGDP, have observed no significant effects (Cohen, Williams, Bekelman, & Crosse, 1996).

Universal, or primary, prevention programs provide an intervention to a broader community of individuals, usually all in the age range appropriate to the intervention, to reduce the overall incidence of a chosen outcome in a population (Howell, 2013). Changes occur not only through direct intervention with individuals, but also by altering the social environment to reduce risk factors that predict such outcomes (Rose, 1981). Universal gang prevention programs have been rare, likely due to the cost and other resource requirements, such as available staff for coordination and implementation. . To date, the only prevention program found through rigorous evaluation to be successful in preventing gang membership is the universal, school-based program Gang Resistance Education and Training (G.R.E.A.T.). The G.R.E.A.T. program was originally created by law enforcement agencies and included implementation protocols modeled on the Drug Abuse Resistance Education (DARE) program, which used police officers to provide drug-related information to youth (Esbensen, 2002). The G.R.E.A.T program has three primary goals: “(1) teach youths to avoid gang membership; (2) prevent violence and criminal activity; and (3) assist youths to develop positive relationships

with law enforcement” (Esbensen, Peterson, Taylor, & Osgood, 2012). Following a national implementation study on the initial form of the program, a revision later incorporated classroom management techniques for officers, youth self-management and social skills, and expanded the number of classroom-based lessons from 9 to 13 (Esbensen 2002; Esbensen et al., 2011; Esbensen et al., 2012). An extensive, randomized classroom evaluation of 3,820 6<sup>th</sup> and 7<sup>th</sup> graders in 31 schools in 7 large American cities found that youth who attended the revised curriculum of the G.R.E.A.T. program had lower odds of becoming gang members at 1 and 4 years following the intervention (Esbensen, Osgood, Peterson, Taylor, & Carson, 2013). However, this approach did not have a significant impact in reducing overall levels of delinquency, one of the principal aims of gang prevention (Pyrooz, 2013; Klein & Maxson, 2006). Providing universal preventive interventions, such as G.R.E.A.T., to a population can more thoroughly reduce the overall incidence of an outcome, even if most in the population are not at risk. Applying this “prevention paradox” (Rose, 1981) to gang involvement, it is arguable that by capturing within the intervention a larger number of individuals exposed to low levels of risk for gang involvement, the intervention may have a larger overall preventive effect in the population than by capturing fewer individuals with greater risk. Such approaches may also be effective by making the broader environment less conducive to gang involvement.

Another issue is that risk for gang involvement has been found in multiple socialization domains across development. Prevention programs, whether targeted or universal, that focus on singular domains of risk, such as peer environments or a lack of afterschool opportunities, may have weaker overall effects than those that address risk more comprehensively across multiple domains and types of risk since they do not address the complexity of social environmental risks leading to gang involvement. Focusing on a single risk leaves multiple risks unabated.

Although risk factors in many domains (including community, school, family, peers, and individual) have been identified for youth gang involvement (see Klein & Maxson, 2006; Thornberry et al., 2003), one of its strongest predictors is cumulative risk, with the greatest odds of gang membership falling on youth whose risk crosses multiple domains (Hill, Howell, Hawkins, & Battin-Pearson, 1999; Thornberry et al., 2003; *see Paper 1*). Prevention programs impacting multiple risks or risks in multiple areas of youths' lives may thus be more effective at preventing gang involvement than programs targeting only individual domains (Howell, 2010). No existing program designed for gang prevention takes such a broad, multi-domain approach to the youth risk environment. However, some prevention programs for other behavioral outcomes, such as delinquency, violence, and substance use, do take a broader approach to reducing multiple risk factors (e.g. Raising Healthy Children), and have found significant effects in reducing these outcomes (Brown, Catalano, Fleming, Haggerty, & Abbott, 2005; Catalano et al., 2003; Hale, Fitzgerald-Yau, & Viner, 2014; Hale & Viner, 2012). Given the known overlap of these behavioral outcomes with gang membership, as well as similarities among risk factors, these approaches may have secondary preventive effects on gang involvement, opening new avenues to effective research and program design for gang prevention.

### **Communities That Care**

Communities That Care (CTC; Hawkins & Catalano, 1992; Hawkins, 1999) is a universal community-based prevention building support system shown to be effective in reducing community levels of youth delinquency, violence, and substance use as tested in a quasi-experimental study (Feinberg, Jones, Greenberg, Osgood, & Bontempo, 2010) and a 24-community randomized controlled trial (Hawkins et al., 2008; Hawkins et al., 2012; Hawkins, Oesterle, Brown, Abbott, & Catalano, 2014). CTC establishes a public health prevention model that builds prevention infrastructure to support community stakeholders in creating a coalition to

assess local levels of risk and protection for youth problem behaviors and to prioritize which elevated risks and suppressed protective factors to target with preventive efforts. The coalition learns how to match evidence-based prevention approaches to their priorities and how to implement with fidelity and evaluate chosen programs and policies. Communities select from a menu of tested and effective programs and policies (i.e., Blueprints for Healthy Youth Development) that includes targeted and universal school, family-based, and after-school programs and practices, such as Life Skills Training, Lion's Quest Skills for Adolescence, Big Brothers Big Sisters, and Guiding Good Choices (Fagan, Hanson, Hawkins, & Arthur, 2008; Quinby et al., 2008).

CTC is theoretically guided by the Social Development Model (SDM; Catalano & Hawkins, 1996). The SDM theorizes that behaviors arise from the adoption of beliefs and standards of behavior relative to socio-ecological contexts. Individuals are socialized through interactions in prosocial and antisocial ecological contexts (e.g. community, school, family, peers) through the opportunities these contexts provide. By being involved in activities and interacting with others in these contexts, individuals develop the skills necessary for navigation of these social environments. If youth receive positive recognition and approval for their successful interactions, they are more likely to develop strong social bonds and attachment to others in these contexts. These bonds ultimately motivate the adoption of the beliefs and standards of behavior necessary to conform to these contexts. The type of behavior--positive or antisocial--that results depends on the preponderance of positive and antisocial opportunities, involvements, and bonding. For example, youth will be more likely to become gang-involved if they are surrounded by gang-involved peers and family, receive social approval for successfully interacting with gang-involved friends and, consequently, develop the social bonds to gang

networks that ultimately lead to their adoption of the beliefs of the gang. Tests of the SDM have shown that it explains a variety of problem behaviors including adolescent and young adult delinquency, violence, and substance use (Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996; Huang, Kosterman, Catalano, Hawkins, & Abbott, 2001; Lonczak et al., 2001), including predicting gang membership in adolescence (Bishop, Hill, Gilman, & Howell, 2017). Additionally, in prior studies of risk factors for gang membership, such as Hill and colleagues' examination of Seattle youth (1999), Thornberry and colleagues' 2003 study using the Rochester Youth Development Survey, and my study (*see Paper 1*) with rural youth, the majority of risk factors measured by CTC have been found to be predictive of gang involvement (see Klein & Maxson, 2006).

As the theoretical guide for CTC, the SDM risk and protective factors provide the structure for identifying and addressing the needs relevant to preventing problem behaviors. In addition to prioritizing elevated risk factors for targeting with evidence-based programs, community members are encouraged to employ the Social Development Strategy (SDS) in their interactions with youth to boost protective factors and to encourage the adoption of healthy standards of behavior among youth. The SDS is a framework for community members that encourages them in their daily lives to provide developmentally appropriate opportunities and activities for youth, actively teach youth the skills for successful prosocial interactions, and consistently recognize youth for their positive behaviors. Although CTC was not designed to target gang membership as one of its identified outcomes, it has been found to have short and long-term efficacy in reducing the prevalence of multiple other behavioral outcomes (including delinquency, violence, and substance use) by targeting a set of community prioritized risk factors

that are also generally predictive of gang involvement (i.e. interactions with antisocial peers, family history of antisocial behavior).

### **Present Study**

Using longitudinal data from the Community Youth Development Study (CYDS; Hawkins et al., 2008; Brown et al., 2009), a 24-community randomized trial of the CTC prevention system, the present study examines whether CTC was effective in preventing gang involvement, including association with gang members as well as gang membership.

Although nearly all evaluations of gang prevention interventions have relied on binary indicators of gang involvement (i.e., gang member or not), it is also important to prevent other forms of gang involvement (Pyrooz, 2013), such as association with gang members, because these associations have been shown to have similarly negative consequences. Recent studies have begun to examine gang involvement more broadly than these traditional binary indicators, with theorists arguing that gang-involved youth follow a diverse set of trajectories into, out of, and within the gang, and may hold varying levels of positionality over time (Egan & Beadman, 2011; Gallupe & Gravel, 2018; Pyrooz, Sweeten, & Piquero, 2013). My prior work with data from the CYDS identified two types of gang-involved youth: (1) those who consistently reported across adolescence that they were members of a gang and those who were associated with gangs primarily through friendships with gang members, but not necessarily because they were in a gang themselves. Both types of gang involvement showed significantly elevated patterns of risk and problematic behaviors compared to youth who were not affiliated with gangs in any way (Fleming et al., *under review*; see *Paper 1*). Although gang members had generally higher levels of risk across multiple domains and worse outcomes, they were not significantly different from gang-associated youth. To examine the extent to which CTC reduced not only gang membership but also gang association, the present study used the trichotomous operationalization of gang

involvement identified in my prior work (no gang affiliation, gang association, and gang membership).

## **Methods**

### **Sample**

Data come from the longitudinal cohort sample of the Community Youth Development Study (CYDS), a community-randomized trial examining the effects of Communities That Care (Brown et al., 2009; Hawkins et al., 2008). CYDS includes 24 rural and small communities in seven states (CO, IL, KS, ME, OR, UT, and WA) that were matched in pairs according to demographic factors (e.g. race, ethnic diversity, population size) and randomized to experimental condition within pair via coin flip. Communities are geographically distinct, incorporated towns with population size ranging from 1,578 to 40,787 (M=14,646) as of the 2000 Census. CTC communities received training by certified CTC trainers beginning in 2003 with six training sessions delivered over the course of 6 to 12 months. Training began with the orientation of community leaders to CTC and the creation of coalitions of community stakeholders (i.e. residents, teachers, business owners). These coalitions were then trained in the interpretation of biennial survey data collected from students in the community, the prioritization of risk factors and outcomes, and the selection, implementation, and monitoring of selected evidence-based programs and policies designed to address these priorities. Although CTC is designed as an intervention covering neonatal periods to young adulthood, CTC communities in the CYDS were asked to focus their prevention programs on youth ages 10 to 14 years so that results could be observed within the original 5-year grant period. CTC communities received technical assistance (weekly phone calls, emails, and at least annual site visits) from CYDS staff throughout the study, as well as funding for a full-time local coordinator and \$75,000 to support

the implementation of programming. Control communities received no training, technical assistance, or financial support from the study, but received data from the CTC youth survey every two years.

Youth in control communities (n=2,002) and CTC communities (n=2,405) were surveyed annually from 2004 to 2011, when students were in 5<sup>th</sup> through 12<sup>th</sup> grades. In 11<sup>th</sup> grade, students were tracked, but not surveyed. All 5<sup>th</sup> grade students in each of the communities were eligible for participation, with recruitment continuing in 6<sup>th</sup> grade to increase the rate of participation. The fifth grade sample thus represents a pre-intervention baseline sample. A total of 4,420 youth were consented for participation by their parents, representing 76.1% of the total eligible population in CTC communities and 76.7% of control communities. The sample is gender balanced (50% male), with 64% of respondents identifying as non-Hispanic white, 20% as Hispanic, 3% as non-Hispanic African American, 5% as non-Hispanic Native American, 1% as non-Hispanic Asian American, and 6% of other non-Hispanic races (Hawkins, Oesterle, Brown, Abbott, & Catalano, 2014). The final sample of youth (n=4,407) includes all consented youth who completed either a wave 1 or wave 2 survey and remained in their community for at least 1 semester.

All youth participants were surveyed and tracked, including after changing schools, communities, or dropping out of school. Participation was consistently high, with 91.4% of participants completing the survey in at least 6 of the 7 waves. Participants were surveyed each year on a variety of problem behaviors, as well as risk and protective factors, on self-administered paper and pencil surveys designed to be completed in one class period. Other than identification numbers, no identifying information was included on the surveys. Participants received small incentive gifts worth \$5-\$10 after completing the survey each year. Data

collection procedures were approved by the University of Washington's Human Subjects Review Committee.

## **Measures**

*Gang involvement* was assessed as a categorical variable derived from a latent profile analysis of two sets of variables measured in Grades 7, 8, 9, 10, and 12 (Fleming et al., under review). The first question asked, "Have you ever belonged to a gang?" with dichotomous yes or no response options. The second question asked, "Of your four closest friends, how many belong to a gang?" Based on fit statistics (Log-likelihood, AIC, BIC, sample size-adjusted BIC), model parsimony, and interpretation (Collins & Lanza, 2010), analyses indicated three latent classes represented the data best: gang members (9.3% of control, 5.7% of CTC), gang-associated youth (23.5% of control, 15.9% of CTC), and non-affiliated youth (67.2% of control, 78.3% of CTC). Although prevalence of the three groups differed by condition, class definitions were the same. A model that constrained the conditional probabilities to be equal across intervention conditions did not have worse fit than the unconstrained model. In each of the five waves, non-affiliated youth had a near zero (0.00 - 0.01) probability of being in a gang, gang associates had a low, but non-zero (0.08 - 0.16) probability of being in a gang, and gang members had an elevated (0.36 - 0.66) probability of being in a gang. Similarly, non-affiliated youth had a low (0.09 - 0.10) number of close friends in a gang, gang associates had a greater number (0.61 to 0.95) of close friends in a gang, and gang members had the greatest number (1.49 to 2.60) of friends in a gang. [See appendix for additional information on the latent profile analyses, including fit statistics and model selection].

Individual level covariates in regression analyses included age (in years as calculated in Grade 6), gender (male=1, female=0), race (white=1, non-white=0), ethnicity (Hispanic=1, non-

Hispanic=0), and parent's education (0=No high school diploma to 5=Graduate degree). In addition, covariates included Grade 5 rebelliousness (scale of three standardized items,  $\alpha = .69$ , e.g. "I ignore rules that get in my way") and religious attendance (one item, "How often do you attend religious services or activities?"). Prior studies using this longitudinal sample have found no significant differences by condition at baseline in these covariates (Hawkins et al., 2014). Community-level covariates included the percentage of youth in the community who were eligible for free or reduced price school lunches in the year prior to baseline and the total population of students in the community as a measure of population size (National Center for Education Statistics, 2002-2003).

### **Analysis**

To facilitate analyses of the CTC effect on gang involvement in multilevel regression models, individuals were assigned to gang classes according to their highest posterior probabilities. Because the chance of misclassification was fairly low (entropy=.83), this procedure was deemed appropriate (Clark & Muthén, 2009; Collins & Lanza, 2010). As a second step, multilevel multinomial logistic regressions examined the effect of CTC on gang membership and gang association as measured variables, relative both to non-affiliation and to each other. Multilevel analyses accounted for the nesting of individuals (Level-1) in communities (Level-2) and communities in matched pairs (Level-3). Since randomization occurred at the community-level, the experimental condition was included in analyses as a community-level dichotomous predictor, with CTC communities having a value of 1 and control communities a value of 0. Models were specified with random intercepts, including level 1 and level 2 random effects.

A planned missing design for survey questions was used to reduce respondent fatigue and

the potential for missing data (Brown et al., 2009; Graham, 2012). Due to this design, data were multiply imputed (k=40) to increase statistical power and reduce standard errors, with imputations conducted separately within experimental condition to preserve intervention effects. To improve imputation accuracy, auxiliary variables related to gang involvement, such as individual and peer delinquency in each wave, were included in the imputation model. Descriptive statistics were averaged across the 40 imputations, and regression coefficients were averaged with standard errors calculated according to Rubin's rules (Rubin, 1987). Imputation and latent profile analyses were conducted in MPlus 7 (Muthén & Muthén, 2012) and multilevel models were estimated in HLM 7.0 (Raudenbush et al., 2012).

## **Results**

Youth from control and CTC communities did not significantly differ in demographic characteristics (*see Table 4*). In both control and CTC communities, female respondents accounted for more than one-third of all gang members and nearly half of all gang associates. Both gang members and gang associates were more likely than non-affiliated respondents to be non-white, Hispanic, from less-educated families, and rebellious. In CTC communities, religious attendance declines slightly with each additional level of gang involvement, whereas in control communities, gang members and non-affiliated youth were more similar on religious attendance. Multilevel (3-level) regression models were used to predict each covariate to specify whether these significantly differed by gang class and intervention. Results indicated that both gang associates and gang members were significantly ( $p < .01$ ) different from non-affiliates by age, race, ethnicity, parental education and rebelliousness. Religious attendance was not significantly different between any of the three classes, and only gang members had a significantly larger number of males than the other classes. In addition, gang members were significantly older and

Table 4

*Demographic Characteristics by Class and Experimental Condition*

Variable	Control Communities (n=2002)				CTC Communities (n=2405)			
	Full Sample	Non-Affiliated (67.2%)	Gang-Associated (23.5%)	Gang Members (9.3%)	Full Sample	Non-Affiliated (78.3%)	Gang-Associated (15.9%)	Gang Members (5.7%)
Age	12.09	12.06	12.12	12.20	12.08	12.06	12.12	12.26
Male	51.9%	48.9%	55.2%	65.3%	49.3%	47.9%	51.9%	61.3%
White	61.3%	72.1%	44.1%	26.8%	72.5%	77.1%	59.3%	46.2%
Hispanic	26.6%	17.1%	40.2%	60.2%	15.1%	12.9%	22.4%	24.8%
Mean Parental Education <sup>a</sup>	3.02	3.19	2.71	2.51	3.29	3.39	2.97	2.80
Grade 5 Religious Attendance	-0.07	-0.05	-0.15	-0.04	0.00	0.04	-0.13	-0.21
Grade 5 Rebelliousness	0.02	-0.11	0.15	0.56	0.01	-0.06	0.24	0.44

*Note.* Proportions and mean values based on k=40 imputed datasets. <sup>a</sup> Parental Education (0=No high school diploma to 5=Graduate or Professional Degree)

Table 5  
*Multinomial Regression Effects of CTC on Gang Involvement Outcomes*

Effect	Gang Associated (Ref: Non-Affiliated)				Gang Member (Ref: Non-Affiliated)				Gang Member (Ref: Gang Associated)			
	Est.(se)	AOR	95% CI		Est.(se)	AOR	95% CI		Est.(se)	AOR	95% CI	
Intercept	-0.97(0.16)	0.38***	[0.28, 0.52]		-2.47(0.29)	0.08***	[0.05, 0.15]		-1.50(0.28)	0.22***	[0.13, 0.38]	
Intervention (CTC=1)	-0.37(0.15)	0.69*	[0.52, 0.92]		-0.27(0.26)	0.77	[0.46, 1.28]		0.10(0.22)	1.11	[0.73, 1.69]	
Percent Free School Lunch Eligible	0.01(0.01)	1.01	[1.00, 1.02]		0.03(0.01)	1.03*	[1.00, 1.05]		0.02(0.01)	1.02†	[1.00, 1.04]	
Number of Students	0.00(0.00)	1.00*	[1.00, 1.00]		0.00(0.00)	1.00	[1.00, 1.00]		0.00(0.00)	1.00	[1.00, 1.00]	
Age	0.25(0.12)	1.29*	[1.01, 1.63]		0.68(0.15)	1.97***	[1.46, 2.67]		0.43(0.16)	1.53*	[1.11, 2.11]	
Gender (1=Male)	0.14(0.11)	1.15	[0.93, 1.41]		0.52(0.15)	1.68***	[1.26, 2.24]		0.38(0.17)	1.46*	[1.04, 2.05]	
White (1=White)	-0.74(0.12)	0.48***	[0.38, 0.60]		-1.15(0.17)	0.32***	[0.23, 0.44]		-0.40(0.19)	0.67*	[0.46, 0.96]	
Hispanic (1=Hispanic)	0.26(0.14)	1.30	[1.00, 1.69]		0.35(0.19)	1.42†	[0.97, 2.07]		0.09(0.21)	1.09	[0.72, 1.65]	
Parental Education	-0.15(0.04)	0.86***	[0.80, 0.93]		-0.15(0.05)	0.86*	[0.78, 0.96]		0.00(0.06)	1.00	[0.89, 1.13]	
Religious Attendance	-0.09(0.05)	0.92	[0.83, 1.01]		-0.02(0.08)	0.98	[0.84, 1.15]		0.07(0.09)	1.07	[0.90, 1.26]	
Rebelliousness	0.41(0.06)	1.51***	[1.33, 1.72]		0.79(0.08)	2.21***	[1.88, 2.60]		0.38(0.09)	1.46***	[1.23, 1.74]	

*Note.* † $p < .10$  \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$  AOR = Adjusted Odds Ratio. CI = Confidence Interval. Estimates are based on  $k=40$  imputed datasets. Level 2 covariates include Percent Eligible for Free School Lunch ( $df=11$ ) and Number of Students ( $df=11$ ); all others are Level 1 covariates. First two columns represent one model with non-affiliation as the referent; third column represents the same model with the referent switched to compare gang members to gang associates.

had greater levels of baseline rebelliousness than gang associates. However, differences between gang classes did not vary significantly between CTC and control communities.

After adjusting for covariates (Table 5), youth in CTC communities had significantly lower odds of being gang associated (AOR=.69; 18df,  $p=.02$ ), indicating that youth in CTC communities had 31% lower odds of becoming gang associated, relative to non-affiliated, than youth in control communities. No significant CTC effects were observed for gang membership, or for gang membership relative to gang association, indicating that youth from CTC communities did not significantly differ from control community youth in their odds of being a gang member.

## **Discussion**

Prior studies have found CTC to be effective in reducing behavioral health problems including delinquency, violence and substance use. The present study, using a rigorous randomized-community controlled trial and multivariate analyses, finds that these effects extend to reducing the likelihood of gang association, but not gang membership. Youth in communities implementing the CTC prevention system had substantially (31%) lower odds of gang association during adolescence than youth in control communities. This is an important finding for multiple reasons. It provides evidence that an approach like CTC, which seeks to not only reduce risk in multiple ecological domains, but also enhance prosocial opportunities in the youths' environment, can be effective in reducing the likelihood that youth will become associated with gangs. In addition, although gang prevention literature has most commonly focused on gang members, with little attention to effective solutions for other levels of involvement (Pyrooz, 2013), this study's findings highlight a meaningful impact on other gang-involved youth. Previous studies using this sample have identified gang associates as a group

with not only elevated early risk, but also increased odds of multiple negative consequences, including delinquency, arrest, substance use, and early pregnancy, after controlling for baseline risks (Fleming et al., under review; *see Paper 1*). Effectively reducing gang association may help to reduce many of these long-term negative consequences for youth with elevated risk.

However, this study did not observe preventive effects for gang membership as hypothesized. Because both gang association and gang membership are associated with diverse ecological risk factors that are also associated with other problem behaviors which CTC prevented, it was hypothesized that this approach would also have been an effective preventive method for both levels of gang involvement. The lack of findings specifically for gang members in the present study may be due to several reasons. Some specific attributes of gang members may set them apart from gang associates, such as the greater number of early risk factors found among gang members (*see Paper 1*) or the development of an early in-group identity (Vasquez, Wenborne, Peers, Alleyne, & Ellis, 2015), which may make them more resistant to universal prevention approaches. Youth who are deeply involved with gangs at an early age or who have greater levels of early risk, as gang members do, may learn the social norms that formalize youth into a group identity that provides some additional barriers to external messaging. Gang associates, however, with lower levels of ecological risk, may be more strongly impacted by this approach.

In addition, the CTC youth survey was not designed to identify early childhood risk factors for gang membership and communities did not select gang prevention programs (such as G.R.E.A.T) that would be more able to target these risks. For example, known predictors of gang membership include exposure to violence and trauma in early childhood, family involvement in gangs, and low levels of guilt for antisocial or delinquent behavior (Eitle,

Gunkel, & Gundy, 2004; Esbensen, Winfree, Jr., He, & Taylor, 2001; Gorman-Smith, Kampfner, & Bromann, 2013). Because, the CYDS implementation of CTC asked communities to focus their prevention efforts on youth only during the middle school years, some early childhood programs included in the CTC menu that may be more effective in addressing these risks may not have been implemented by communities. Such programs as the High/Scope Approach to Preschool Education, a universal program addressing early childhood (ages 3 to 5) family conflict, economic deprivation, and behavioral risks, may be more beneficial in reducing the likelihood that youth will join gangs due to its focus on reducing the types of influential early risk factors that may accumulate for gang-involved youth. Theorists suggest that prevention of gang membership may need to start with programs in early childhood in order to have the widest exposure and effectiveness (Howell, 2010); as such, although the CYDS implementation did not uncover significant prevention effects on gang membership, implementations of CTC that include early childhood prevention programming may have stronger effects on both gang association and gang membership. Replication of the CYDS evaluation of CTC with inclusion of early childhood programming may uncover stronger effects than what is observed in the current study.

### **Implications**

The effectiveness of CTC in preventing gang association is an important step toward reducing many problematic community and individual outcomes associated with gang involvement and improving overall public health (Pyrooz & Sweeten, 2015; Simon, Ritter, & Mahendra, 2013). More can probably be done within the CTC approach to also improve its effect on gang membership. For example, by measuring risk factors or the accumulation of risk more specific to gang membership, communities could prioritize gang involvement as an outcome and select prevention programming that may be able to more effectively target these

particular risks and more greatly reduce the level of gang involvement in the community. Similarly, prevention programs specifically designed to reduce the risk of gang membership may be included in the CTC menu of programs. Currently, only the G.R.E.A.T. program has been found through rigorous evaluation to prevent gang membership, but as other approaches are evaluated and confirmed they may provide some additional options for effective evidence-based programming available for communities.

Generally, prevention programming, whether targeted or universal, can be more efficient if the program addresses shared risk and protective factors of multiple behavioral and health outcomes (Bailey, 2016; Hale et al., 2014). While the relationship of gang membership to other risk outcomes, including delinquency, violence, and substance use, is well-established (Battin et al., 1998; Melde & Esbensen, 2013; Weerman, Lovegrove, & Thornberry, 2015), gang membership is unique in that it is only a problematic outcome because of the likelihood that it will increase the prospects for youth to engage in these other problem outcomes. Therefore, reducing gang membership is only as important as its related impact on subsequent delinquency and other problematic outcomes (Pyrooz, 2013). This study did not observe an effect on gang membership, but did have an effect on gang association, which is also strongly related to increased risk behaviors (Fleming et al., *under review*). CTC has been found to have an overall impact in reducing youth delinquency, violence and substance use, but it is not yet clear as to whether it is effective in specifically reducing these behaviors among gang-involved youth. It is likely that some programs from CTC's menu may be particularly effective in this regard. Recent research has found that the Functional Family Therapy program, one of the programming options communities can select to target elevated family risk, was found to reduce violence among youth at greatest risk for gang involvement (Gottfredson et al., 2018). Future research should therefore

examine whether CTC is specifically effective in reducing these behaviors among gang members and gang associates.

### **Limitations**

Because CYDS has implemented CTC within only rural communities, it is unclear as to whether the findings of this study can be generalized to urban areas. Similar to other studies of rural youth, this study finds a similar prevalence of gang members in the rural population as has been found in urban areas (Dukes & Stein, 2003; Watkins & Taylor, 2016). This study's findings that CTC was able to significantly reduce gang association nevertheless has important implications for research and community prevention. However, replication of this study's findings in urban areas would be helpful in determining the overall generalizability of the CTC approach for reducing gang involvement.

Using latent profile analysis to capture different classes of gang-involved youth, this study was able to examine intervention effects on patterns of adolescent gang involvement over time. While effective in identifying distinct classes of involvement that are not captured by a dichotomous indicator, this approach does not allow for the ability to pinpoint precisely when the intervention is most effective. For example, the prevention system may be more effective during grades 7-8, during the period when the programming was being implemented in the trial. Similarly, CTC may delay or shorten gang membership, rather than fully preventing it, which may still have an effect in reducing gang-involved youths' long-term frequency and severity of delinquent behavior by limiting the duration of their involvement (Pyrooz, Sweeten, & Piquero, 2013). The over-time measure of gang involvement used in this study did not allow to examine this kind of relationship. On the other hand, the effect of CTC on gang association may come through its impacts on delinquency, a known precursor (Howell, 2013). Additional research is needed to further understand how the patterns of gang involvement in CYDS communities and

how intervention effects are experienced over time.

The CYDS evaluation examines the effectiveness of the CTC prevention system as a community-level implementation of an assessment and implementation protocol for reducing community risk and problematic outcomes. Therefore, each of the 12 CTC communities in the evaluation selected and implemented unique combinations of evidence-based programs to target their identified outcomes. The design of the study therefore does not allow for the examination of the effects of specific programs implemented across communities. With this form of comprehensive programming, it can be difficult to disaggregate the specific effective components of the intervention (Klein, 2011). This is further exacerbated by the fact that none of the programs used in CTC has been examined for prevention effects on gang membership. Although it is likely that addressing some combination of risk factors is more effective than others, future studies would be necessary to examine how CTC directly impacts particular risk factors for gang-involvement to further specify where, how, and for whom specific prevention programming is most effective.

## **Conclusion**

The results of this study indicate some promising effects for the application of Communities That Care as a universal prevention approach to gang reduction efforts. More thorough examination of the contributory factors of the success of these effects, such as community stakeholder commitment or the success of particular programs, as well as examination into the timing and duration of effects, would provide a more complete picture of the potential for CTC to prevent gangs. Many gang prevention programs remain “promising” due to the lack of thorough investigation (Klein, 2011), so further examination of the impact of CTC may give it a place among the small known set of effective gang prevention programs.

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Paper 3  
Assessing the Universality of Effects of the Communities That Care Prevention System on Adolescent Gang Involvement

Abstract

*Background:* Communities That Care (CTC) is a community-based universal prevention system found to be effective in reducing levels of youth problem behaviors including delinquency, violence, and substance use. Recent research has found that this system is also effective in preventing adolescent gang association, but it is not yet known whether this approach is effective for all youth or for youth with different types of pre-intervention risk for gang involvement.

*Objectives:* The present study examines whether the observed prevention effects on gang association by CTC were moderated by varying levels of baseline risk and by gender. *Methods:* Data come from the longitudinal panel (n=4,407) of the Community Youth Development Study, a community-randomized test of the CTC prevention system involving 12 demographically matched pairs of communities in seven states, one of each pair randomly assigned to experimental or treatment as usual control condition. Multilevel multinomial logistic regressions test moderation of indices of elevated community, school, family, peer and individual risk, a cumulative overall elevated risk index, and gender on the prevention system's effects on gang association, as well as on gang membership, to identify if the approach was more or less effective for youth with specific types of pre-intervention risk. *Findings:* Elevated risk in most domains increased the odds of both gang association and gang membership and CTC reduced gang association equally across all types and levels of risk and by gender. There was no impact of the intervention on gang membership overall or by baseline risk or gender. *Discussion:* As a universal approach to reducing youth risk and problem behaviors, CTC also reduces the odds of gang association, equally among youth with different types and levels of pre-intervention risk.

A few universal approaches have had promising results in the prevention of gang involvement, but warrant further study to investigate for whom these approaches are most effective. In contrast to selective prevention methods, which target and recruit individuals who have greater levels of risk for a problem outcome and then selectively intervene with these high risk individuals, universal prevention approaches apply an intervention to all members of a population regardless of risk in an attempt to have a mean population-level effect on reducing the incidence of some problematic outcome (Tolan & Guerra, 1994). However, because the populations receiving the intervention are heterogeneous with regards to risk, many universal prevention approaches have been found to be more effective for some subgroups of the population than for others (Farrell, Henry, & Bettencourt, 2013). It is therefore necessary to assess whether they are indeed functioning universally for youth as intended, or whether the approach is more or less effective, or potentially even damaging, for individuals with different types of risk. Such information can aid in the modification of program designs to further extend the effects of the approach to all individuals (Spoth, Shin, Gyll, Redmond, & Azevedo, 2006).

The current study examines the universality of effects of the Communities That Care (CTC) system (Hawkins & Catalano, 1992), a community-based universal prevention operating system. Investigation of a secondary outcome of gang involvement found CTC to be effective in reducing adolescent gang association, but not gang membership (see *Paper 2*). That study, which assessed the impact of CTC on latent classes of gang involvement in a community-randomized trial, found that the prevention system reduced the odds of youth becoming gang associated by 31%. These effects on gang association may be due in part to communities targeting risk and protective factors common to primary outcomes that are also predictors of gang association, and perhaps, in part, by its effects on the primary outcomes of delinquency,

violence, and substance use (Hawkins et al., 2014). Identifying whether CTC is universally effective in reducing gang association relative to different categories of risk will help to determine for whom this approach is effective in reducing gang association, bolstering the use and understanding of CTC and providing a basis for similar community-based prevention approaches.

## **Background**

Many evaluations of universal preventive interventions for behavioral outcomes such as delinquency, violence, and substance use have uncovered differential effectiveness relative to demographics and baseline risks. Although many evaluations have explored whether program effects generalize to diverse groups based on gender and race (Rowe & Trickett, 2018), other evaluations have examined, for instance, whether the prevention approach is more effective for individuals with or without prior engagement in the behavior or whether the intervention effect varies according to other baseline risk factors that place them at greater theorized risk of a behavior. For example one intervention examined the moderating effect of childhood maltreatment on the effects of a prevention program designed to reduce violent delinquency (Crooks, Scott, Ellis, & Wolfe, 2011). Results of these studies have varied greatly; some of these programs, although observing overall prevention effects, have observed stronger effects for higher risk groups (e.g. Koning, Lugtig, & Vollebergh, 2014; Leflot, van Lier, Onghena, & Colpin, 2013; Smokowski, Fraser, Day, Galinsky, & Bacallao, 2004), while others have found stronger effects for those at lower risk (e.g. Possel, Baldus, Horn, Groen, & Hautzinger, 2005). Further, some evaluations have observed exclusive program effects among youth in certain risk categories only (e.g. Spilt, Koot, & van Lier, 2013) or even iatrogenic effects for particular subgroups. For example, a multi-school evaluation examining the impact of the curriculum, Guiding Responsibility and Expectations in Adolescents Today and Tomorrow, found an overall

iatrogenic effect, the program increased the mean level of aggression among the sample, but observed that the iatrogenic effect was only for students who ranked low on a social and cognitive risk index, while students who ranked high on this index had significant reductions (The Multisite Violence Prevention Project, 2009).

Differential effects have also been observed relative to broader ecological contexts of risk (Farrell et al., 2013). For example, programs implemented universally in schools may be impacted by the school or neighborhood environment. A multi-state randomized school evaluation of the Fast Track PATHS (Promoting Alternative Thinking Strategies) social-emotional learning program observed reduced aggression and increased prosocial behavior among students, but stronger effects among schools with lower rates of student poverty (Conduct Problems Prevention Research Group, 2010). Similarly, a multi-school evaluation of the Resolving Conflict Creatively Program, a school-based violence prevention program, found slower-growth in aggression and slower decline in competence-related processes among students whose teachers provided more program lessons, but this effect was lower for youth in higher-risk classrooms and neighborhoods (Aber, Jones, Brown, Chaudry, & Samples, 1998).

As some universal programs have found significant moderation effects, prevention programs should therefore, be assessed for possible differential effectiveness, particularly relative to specific theorized differences in youth risk. However, few universal prevention approaches have been both effective in gang prevention and rigorously evaluated for these moderation effects. Only the classroom-based gang-prevention program Gang Resistance Education and Training (G.R.E.A.T.) and the community-based delinquency and substance use prevention system Communities That Care (CTC) have been rigorously evaluated, incorporating both an experimental design and multivariate analyses into their evaluations, and have found

positive effects on reducing gang involvement (Esbensen & Matsuda, 2013; *see Paper 2*). Using a multi-site, randomized classroom design, an evaluation of the G.R.E.A.T. program found a 39% reduction in gang membership, amidst other related positive program results, among those who were in the intervention condition compared to controls (Esbensen, Peterson, Taylor, & Osgood, 2012). An evaluation of CTC using a randomized-community design, found a 31% reduction in the odds of gang association, but no significant impact on gang membership (*see Paper 2*). However, neither program has been evaluated for their possible differential effectiveness with respect to risks associated with gang involvement, so it is unclear whether these programs had equal effectiveness for all youth.

### **Identifying Early Risk among Gang-Involved Youth**

One of the challenging issues in implementing both targeted prevention programs for gang involvement and examining the effectiveness of universal prevention programs with respect to different risk groups is the lack of clear understanding as to how to identify specifically those at the greatest risk for gang involvement (Hennigan, Kolnick, Vindel, & Maxson, 2015; Melde, Gavazzi, McGarrell, & Bynum, 2011). Evaluations of prevention programs for delinquency or substance use often use the prior initiation of the target outcome as an indicator of risk, but instituting such a baseline for gang involvement is not as straightforward, as gang involvement is not a discrete behavior at one point in time, like stealing, but an identification that not only varies in strength and definition over time (Maxson, Whitlock, & Klein, 1998), but one that youth typically leave within two years (Hill, Lui, & Hawkins, 2001; Pyrooz, Sweeten, & Piquero, 2013; Thornberry, Krohn, Lizotte, Smith, & Tobin, 2003). However, using a risk factor approach, where youths' personal characteristics or their exposure to external factors are determined to increase their likelihood of joining a gang, multiple studies have thus far identified many individual risk factors, commonly organized in community, school, family, peer, and

individual domains, that are associated with subsequent gang involvement (Hill, Howell, Hawkins, & Battin-Pearson, 1999; Farmer & Hairston, 2013; O'Brien, Daffern, Chu, & Thomas, 2013). A review of 20 studies by Klein and Maxson (2006) examined the quality of evidence for 21 commonly assessed risk and protective factors for gang membership, finding consistently strong support for family, peer, and individual risk factors such as parental supervision, affective dimensions and characteristics of peer networks, and delinquent beliefs, as well as some sparse support for community and school risk factors. Although no single risk factor uniquely predicts gang involvement, multiple studies examining the question of risk broadly from ecological and life course perspectives have found consistent support for cumulative domain-level risk as a strong predictor of gang involvement, with the largest effects related to risk exposure across multiple domains (Hill et al., 1999; Thornberry et al., 2003). However, some domains of risk may be more impactful than others (O'Brien et al., 2013). For example, peer networks have a strong influence on youth behavior, with antisocial peer associations being a consistently strong predictor of later gang association (Klein & Maxson, 2006). Exposure to and association with antisocial or gang-involved peers may also limit the potential for youth to be exposed to prosocial peers' behaviors that would promote the desistance of antisocial behavior (O'Brien et al., 2013; Pyrooz et al., 2012). This may be one explanation why youth with antisocial or gang involved peers may be more resistant to the effects of preventive interventions.

Studies have also struggled to clearly identify whether gender moderates pathways to gang involvement. Estimates of female gang membership among mixed samples vary, but have been observed as high as 38% among a sample of 8<sup>th</sup> graders in 11 cities (Esbensen & Winfree, 1998), with some indications that this proportion continues to grow (Snethen, 2010). Although female gang members generally enter and exit gangs at earlier ages than males (Chesney-Lind,

2013), they tend to be involved in the same types of delinquent and violent behaviors as their male peers, albeit at a lower frequency (Esbensen, Deschenes, & Winfree, 1999). Although the research is far from conclusive, the types of risk associated with gang involvement do appear to be at least somewhat different for males and females. The Rochester Youth Study (Thornberry et al., 2003) examined gender differences among a wide range of predictors of gang involvement, finding that although males had significant risk factors within domains of neighborhood characteristics, family/sociodemographic characteristics, parent-child relations, school, peers, individual characteristics, and early delinquency, female risk factors tended to be isolated to the school and early delinquency domains. However, the accumulation of risk was strongly associated with gang membership for both genders. Of youth experiencing elevated risk in all seven domains, 61% of males and 40% of females were gang members.

While commonly considered a male issue (Esbensen et al., 1999), the movement toward acknowledging and assessing female gang involvement in research and practice has led to a greater imperative toward identifying how prevention programs may be uniquely effective for girls (Chesney-Lind, 2013; Snethen, 2010). It is generally suggested that gang prevention programs include both males and females, given the proportion of female gang members and that most gangs have at least some female representation (Esbensen & Deschenes, 1998; Howell, 2000; Howell, 2010); however, as males and females appear to have different risk structures relative to joining gangs, it is plausible that prevention programs administered universally to males and females may observe different levels of effectiveness for each group.

Universal prevention programs may have differential effects relative to these different levels and types of risk experienced by youth. The intent of such programs is to provide the same treatment for all with the expectation that all will be improved, but investigation is

necessary to understand whether these treatment effects are in fact equally effective across all youth, or whether the program is more or less effective for some youth (Farrell et al., 2013; Spoth et al., 2006). The present study examines the degree to which the community-based universal prevention system Communities That Care (CTC) is universally effective for gang association, relative to indices of baseline ecological risk and gender. Because cumulative within-domain risk is a strong indicator of risk for gang-involvement, the present study examines whether the observed intervention effect is moderated by indices of community, school, family, and peer and individual domain risk, as well as with cumulative cross-domain risk. In addition, it examines whether this approach is equally effective for males and females. As some studies of universal prevention program effectiveness have found significant intervention effects only among subgroups of risk, this study also examines differential impact of CTC on gang membership, where an overall prevention effect was not previously observed.

### **Communities That Care**

Communities That Care is a community-based prevention program operating system designed to guide communities in the reduction of risk, the elevation of protection, and the prevention of youth problem outcomes through building community prevention infrastructure through forming a cross sector community coalition, assessment and prioritization of risk and protection, and selection of evidence-based prevention programs matched to priorities. CTC provides guidance to community stakeholders in establishing a community coalition trained to use epidemiologic data to identify and prioritize elevated risk and depressed protection among youth community-wide and to coordinate, implement, and monitor selected prevention programs (Hawkins, 1999). Communities select from a range of evidence-based targeted and universal prevention programs, policies, and practices designed to address the community's prioritized risk factors across domains and representing youth development from the neonatal stage to young

adulthood.

The risk factors assessed and targeted by CTC communities are largely derived from the Social Development Model [SDM], a theory of youth development in conjunction with ecological risk and protection (Catalano & Hawkins, 1996). The SDM posits that behavior is informed by behavioral standards that arise from youths' social bonds with antisocial and prosocial others. Relative to each of the environmental contexts (e.g. community, family, school, peer and individual) of socialization, the SDM hypothesizes that prosocial and antisocial opportunities and interactions with others, their skills necessary for successful interactions, and recognition and reinforcement of these interactions from others in these contexts together lead to the development of attachment and social bonds, motivating the youths' adoption of the standards of behavior of those to whom they are bonded and to the activities to which they are committed. Behavior will be antisocial or prosocial depending on the preponderance of antisocial or prosocial influences. The risk and protective factors derived from this model, such as low neighborhood attachment and interactions with antisocial peers, have been found to be associated with a range of youth and adolescent problem behaviors, including delinquency, violence, and substance use, (Arthur, Hawkins, Pollard, Catalano, & Baglioni, Jr., 2002) and largely with gang involvement (*see Paper 1*). Studies assessing the SDM have also found predictive validity for each of these outcomes, including gang membership (Bishop, Hill, Gilman, Howell, Catalano, & Hawkins, 2017; Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996; Huang, Kosterman, Catalano, Hawkins, & Abbott, 2001; Lonczak et al., 2001).

CTC is a universal prevention approach that does not directly target any subgroup or population, but is applied universally to the youth population; communities, however, as part of their implementation of CTC, may select both universal programs and selective programs that

target higher-risk youth. Through this approach, CTC has been found to be effective in preventing youth initiation of violence, delinquency, and substance use in 8th and 10th grades, with extended effects lasting through grade 12 (Hawkins et al., 2009; Hawkins et al., 2012; Hawkins, Oesterle, Brown, Abbott, & Catalano, 2014). Prior studies examining the universality of a CTC implementation on adolescent delinquency and substance use found that few baseline risk behaviors moderated the effect of CTC on these outcomes; however, they found that the effect of CTC on substance use among 8<sup>th</sup> graders was stronger for boys, the effect on 8<sup>th</sup> grade delinquency was stronger among baseline non-initiators, and the effect on delinquency was marginally stronger in 10<sup>th</sup> grade for boys (Oesterle et al., 2010; Oesterle, Hawkins, Fagan, Abbott, & Catalano, 2014).

Many complex factors are associated with gang involvement, such that no single theory is able to fully capture all possible risks. Prevention programs designed to address only one specific risk may therefore be unlikely to have equal effects across all individuals and contexts (Farrell et al., 2013). However, although CTC was not intended for the prevention of gang involvement, most of the ecological risk factors targeted by the prevention system have been found to be effective predictors of gang involvement (*see Paper 1*), its underlying theoretical model, the SDM, has been used to effectively predict gang membership (Bishop et al., 2017), and its approach broadly targets risk across multiple ecological domains. Although many prevention approaches have observed differential effects, because CTC is intended to reduce risk across multiple domains and does not specifically target any subgroup, it is hypothesized that CTC will not vary greatly by level or type of ecological risk in its observed effects on gang association, nor will it work uniquely among risk groups for gang membership. However, with previously observed gender moderation and stronger effects for baseline non-initiators of

delinquency, it is plausible that the intervention effect may be more successful for low-risk youth or for males.

## **Methods**

### **Sample**

Data for this study come from the Community Youth Development Study (Brown et al., 2009; Hawkins et al., 2008), a community-randomized controlled trial of the Communities That Care prevention system. Twenty-four rural and small communities in seven states (CO, IL, KS, ME, OR, UT, and WA) were selected for inclusion in the study. Communities were matched in pairs within state by demographic factors, such as race, ethnic diversity, population size, and economic indicators, and the experimental condition was assigned within each pair via coin flip. CTC communities were provided training, technical assistance, and funding to support the implementation of prevention programs. Beginning in the summer of 2003 and lasting between 6 and 12 months, CTC communities were provided six training sessions, starting with the orientation of community leaders in setting up coalitions of community stakeholders to coordinate the community's prevention programming. Coalitions were then responsible for assessing epidemiologic youth survey data to assess levels of elevated risk and depressed protection and to prioritize risk factors and outcomes to address with prevention programming. Coalitions were then tasked with the selection, implementation, and monitoring of prevention programming aimed to reduce risk and enhance protection in multiple domains of youths' lives. CTC communities were provided continuing technical assistance by CYDS throughout the study, including phone calls, emails, and site visits, as well as funding for program implementation and a full-time program coordinator. Although the full implementation of CTC includes programming options ranging from pre-natal support to age 21, CTC communities participating

in CYDS were asked to focus prevention programming on youth in middle school for the study's evaluation of effects on youth problem outcomes. Programming in these communities was implemented for youth in grades 6 to 9 through one or more (average of 3) of 16 evidence-based prevention programs designed to address the community's identified and targeted risk factors (Fagan, Hanson, Hawkins, & Arthur, 2008; Quinby et al., 2008). Control communities implemented prevention as usual, but received no training, financial support, or technical assistance, other than summary assessments of risk and protection among community youth every two years as data were collected

The analytic sample for this study comes from youth who were part of a longitudinal cohort across communities. In 2004, all fifth grade students in CTC and control communities were asked for parental consent to participate in the study, with additional recruitment occurring a year later. The final analytic sample, which includes youth who were both consented by their parents (76.2% in CTC communities; 76.7% in control communities) to participate and who completed a wave 1 or wave 2 survey include 2,002 youth in control communities and 2,405 youth in CTC communities. The analytic sample includes 64% of respondents identifying as non-Hispanic white, 20% as Hispanic, 3% as non-Hispanic African American, 5% as non-Hispanic Native American, 1% as non-Hispanic Asian American, and 6% of other ethnicities (Hawkins et al., 2014), and balanced by gender (50% male). No significant differences in baseline risk or outcomes were observed between experimental and control communities (Brown et al., 2009).

Students who remained in their original community for 1 or more semesters were surveyed and tracked throughout the course of the study, regardless of whether they remained in a study community. Youth in CTC communities began receiving prevention programming, as

designated by the community, in 6<sup>th</sup> grade, continuing through grade 9. Participants were surveyed annually until 2011, when most youth were in twelfth grade, with the exception of 2010, when they were tracked, but not surveyed. The study achieved high follow-up completion rates. At grade 12, 92.5% of participants completed the survey (93.2% in CTC communities and 91.6% in control communities).

Participants were surveyed using the Youth Development Survey (YDS), a validated and reliable instrument examining risk and protection relative to a variety of problem behaviors, including delinquency, violence, and substance use (Arthur et al., 2002). Surveys were self-administered paper and pencil surveys designed to be completed in one class period and participants received small (\$5-\$10) incentive gifts upon completion. Given the scope of behaviors and risk and protective factors assessed, surveys used a randomized planned missing design beginning in Grade 7 to reduce response fatigue. No identifying information, other than the use of identification numbers, was included in the survey. Data collection and consent procedures were approved by the University of Washington's Human Subjects Review Committee.

## **Measures**

*Gang involvement* is a three-category variable indicating non-affiliated, gang associated, and gang member youth. The variable was derived from a prior latent profile analysis using only the control group of this sample (see Fleming et al., under review). The models included two sets of variables across five waves (Grades 7, 8, 9, 10, and 12): "Have you ever belonged to a gang?" (yes/no) and "Of your four closest friends, how many belong to a gang?" (0 to 4) and respondents were assigned to classes based on their highest posterior probabilities. The model fit statistics (Log Likelihood, AIC, BIC, sample size-adjusted BIC), parsimony, and interpretability determined the three-class solution was the appropriate and best-fitting model (Collins & Lanza,

2010). Based on the three-class solution, non-affiliated youth were the largest class, including 67.2% of control community youth and 78.3% of CTC community youth. In each of the five waves, non-affiliated youth had a near-zero, (0.00 – 0.01) probability of having been a gang member and a low (0.09 - 0.10) number of close friends in a gang. Gang-associated youth were 23.5% and 15.9% of control and CTC samples respectively, and had a low, but non-zero (.08 - .16) probability of gang membership and 0.61 to 0.95 friends in a gang in each of the five waves. Gang members were 9.3% of control community youth and 5.7% of CTC youth, and had an elevated (.36 - .66) average probability of gang membership and 1.49 to 2.60 friends in a gang in each of the five waves. The prevalence of each group varied by experimental condition, but the definition of the classes was kept equivalent by constraining model estimates to be equal across condition for each class. This model did not have worse fit than the unconstrained model.

*[Additional explanation of the latent profile analyses, including fit statistics and model selection, can be found in the Appendix.]*

*Domain-level elevated risk indices* were created using ecological risk factors from the youth survey that are used by CTC communities to assess and prioritize youth risk for delinquency, substance use, and violence in community, school, family, and peer and individual domains (Arthur et al., 2002). Risk factors are composed of multiple (2 to 6) standardized items measured in the baseline (Grade 5) wave and generally have good reliability (Cronbach's  $\alpha$  = .64 to .93). Table 6 includes the list of risk factors in each domain along with their measure of reliability ( $\alpha$ ) and a sample item from each. To establish each youth's level of risk within domain, indices were created by adding up the number of risk factors in each domain in which youth were in the top quartile of risk. Three community risk factors, two school risk factors, three family risk factors, and seven peer and individual risk factors were included in each

Table 6  
Grade 5 Youth Survey Risk Factors Included in Domain-level Risk Indices

Risk Factor	Number of Items	Example Item	$\alpha$
Community			
Low Neighborhood Attachment	3	<i>I'd like to get out of my neighborhood.</i>	.83
Laws and Norms Favorable to Drug Use	6	<i>How wrong would most adults in your neighborhood think it is for kids your age to use marijuana?</i>	.75
Perceived Availability of Drugs	3	<i>If you wanted to get some marijuana, how easy would it be for you to get some?</i>	.72
School			
Academic Failure	2	<i>Putting them all together, what were your grades like last year?</i>	.47*
Low Commitment to School	6	<i>How interesting are most of your school subjects to you?</i>	.64
Family			
Poor Family Management	6	<i>The rules in my family are clear.</i>	.66
Family Conflict	3	<i>People in my family often insult or yell at each other.</i>	.73
Family History of Antisocial Behavior	6	<i>Have any of your brothers or sisters ever smoked marijuana?</i>	.69
Peer and Individual			
Friends' Use of Drugs	3	<i>In the past year, how many of your best friends have used marijuana?</i>	.76
Interactions with Antisocial Peers	3	<i>In the past year, how many of your best friends have been suspended from school?</i>	.66
Attitudes Favorable towards Antisocial Behavior	4	<i>How wrong do you think it is for someone your age to pick a fight with someone?</i>	.73
Attitudes Favorable to Drug Use	3	<i>How wrong do you think it is for someone your age to smoke cigarettes?</i>	.75
Perceived Risk of Drug Use	4	<i>How much do you think people risk harming themselves if they try marijuana once or twice?</i>	.93
Intention to Use	3	<i>When I am an adult I will smoke cigarettes.</i>	.63
Rewards for Antisocial Involvement	3	<i>What are the chances you would be seen as cool if you smoked cigarettes?</i>	.88

Note. \*Value for Academic Failure is the correlation between the two included items.

respective domain-level index. In addition, an overall cumulative risk index was created by adding the total number of risk factors for which each respondent was in the top quartile. A prior study using the control sample of this group found that the majority of these risk factors, as well as nearly all domain-level elevated risk indices, when measured in Grade 5 were predictive of adolescent gang association and gang membership, with the exception that community risk factors and community-level elevated risk were not predictive of gang association (*see Paper 1*).

A prior study (*see Paper 1*) using the control group of this sample found nearly all risk factors measured by the YDS at fifth-grade baseline significantly increased the odds of gang association and gang membership in adolescence. Additionally, similarly-created domain-level elevated risk indices, as well as the overall risk index, were observed to significantly increase the odds of gang association [AOR=1.14-1.37] and membership [AOR=1.22-1.62]. That study, however, found that community-level risk factors and the community risk index did not have a significant relationship with later gang association. Other studies have found significant associations between many of the CTC risk factors and are described in summary reviews by Thornberry et al. (2003) and Klein and Maxson (2006).

*Covariates* at the individual level included gender (male=1), race (white=1), ethnicity (Hispanic=1), parents' highest level of education (0=No high school diploma to 5=graduate education), and age at grade 6. Models also included a standardized scale for rebelliousness in grade 5, based on three items ( $\alpha = .69$ ) indicating level of agreement with statements such as "I ignore rules that get in my way," and a single item indicating how often a respondent attends religious services or activities. Community-level covariates included the total population of students in the community's school district, as a gauge of community size, as well as the percentage of youth in the year prior to baseline who were eligible for free or reduced priced

lunch, as an indicator of community socioeconomic level (National Center for Education Statistics, 2002-2003).

### **Analysis**

Individuals were first assigned to gang involvement classes based on their highest posterior probabilities as indicated by the latent profile analysis. Because the chance of misclassification from was low (entropy=.83), these classes were used as categories in a measured variable in subsequent multinomial regression models (Clark & Muthén, 2009; Collins & Lanza, 2010) predicting gang association and gang membership, relative to non-affiliation. Due to the structure of the study, where individuals are the unit of analysis, but where the intervention and control conditions take place among matched pairs of communities, the present analyses use three-level mixed effects multinomial logistic regressions with individuals nested in communities and communities nested in community pairs, with the intervention effect used as a level-2 (community) predictor. This regression approach is the standard model used by the study to test intervention effects on youth outcomes (Brown et al., 2009). In addition, a prior study using this sample (*see Paper 2*) used this same approach to test the intervention effect on the classes of gang-involvement. To assess the moderating effect of each risk index on the intervention's effectiveness, the present study retests this model with cross-level interactions between the community intervention condition and each individual-level risk index.

For  $M=3$  gang classes, representing non-affiliated, gang associated, and gang membership as outcomes, the multinomial logit link function

$$\eta_{mijk} = \log(\varphi_{mijk} / \varphi_{Mijk}) = \log(P(R_{ijk}=m) / P(R_{ijk}=M))$$

represents the log-odds of being in category  $m$  relative to the reference category  $M$ . Expressed in multilevel format (Raudenbush & Bryk, 2002), the multinomial equation examines the log-odds of student  $i$  falling into each class as a function of level-1 controls for age (AGE), sex (MALE=1,

FEMALE=0), race (WHITE=1, NON-WHITE=0), Hispanic ethnicity (HISP=1, NON-HISP=0), parental education (PARED), Grade 5 religious attendance (RELIG), Grade 5 rebelliousness (REBEL), and indicators of domain-level or overall cumulative risk (RISK). At level 2, each intercept is modeled as a function of the intervention condition (CTC=1, CONTROL=0), the percentage of students receiving free or reduced price lunch (PCTFRL), and population size (POP).

For  $m=3$  gang classes, where the probability of falling into class  $R$  is expressed as:

$$P(R_{ijk}=1) = \varphi_{1ijk}$$

$$P(R_{ijk}=2) = \varphi_{2ijk}$$

$$P(R_{ijk}=3) = \varphi_{3ijk} = 1 - \varphi_{1ijk} - \varphi_{2ijk}$$

The multilevel equation is:

Level 1 (student  $i$ ):

$$\eta_{mijk} = \beta_{0jk(m)} + \beta_{01jk(m)}(AGE_{ijk}) + \beta_{02jk(m)}(SEX_{ijk}) + \beta_{03jk(m)}(WHITE_{ijk}) + \beta_{04jk(m)}(HISP_{ijk}) + \beta_{05jk(m)}(PARED_{ijk}) + \beta_{06jk(m)}(RELIG_{ijk}) + \beta_{07jk(m)}(REBEL_{ijk}) + \beta_{08jk(m)}(RISK_{ijk})$$

Level 2 (community  $j$ ):

$$\beta_{00jk(m)} = \gamma_{000k(m)} + \gamma_{001k(m)}(CTC_{jk}) + \gamma_{002k(m)}(POP_{jk}) + \gamma_{003k(m)}(PCTFRL_{jk}) + u_{00jk(m)}$$

$$\beta_{01jk(m)} = \gamma_{010k(m)}$$

...

$$\beta_{07jk(m)} = \gamma_{070k(m)}$$

$$\beta_{08jk} = \gamma_{080k(m)} + \gamma_{081k(m)}(CTC_{jk})$$

Level 3 (community-matched pair  $k$ ):

$$\gamma_{000k(m)} = \xi_{0000k(m)} + v_{000k(m)}.$$

$$\gamma_{001k(m)} = \xi_{0010k(m)}$$

$$\gamma_{002k(m)} = \xi_{0020k(m)}$$

$$\gamma_{003k(m)} = \xi_{0030k(m)}$$

$$\gamma_{010k(m)} = \xi_{0100k(m)}$$

$$\gamma_{020k(m)} = \xi_{0200k(m)}$$

...

$$\gamma_{080k(m)} = \xi_{0800k(m)}$$

The inclusion of a cross-level interaction between the CTC predictor at level-2 and the level-1 predictor RISK estimates the moderation of the intervention effect by level (and type) of youth risk. Although the study has a large sample size ( $n=4,407$ ), the spread of individuals among both classes of gang involvement and community does not provide sufficient power for the estimation of random effects for the interaction effect; therefore, this component of the model was expressed as fixed effects only.

To account for missing data and to obtain unbiased model estimates and standard errors, all variables used in the analyses were multiply imputed ( $k=40$ ) and all estimates were averaged with the standard errors calculated according to Rubin's rules (Rubin, 1987). Multiple imputation and latent profile analyses were conducted in MPlus 7 (Muthén & Muthén, 2012) and regression modeling was conducted in HLM7 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2013).

## **Results**

Study variable prevalence and mean values, by experimental condition and gang involvement class, are displayed in Table 7. Within each gang class, covariates were generally similar across experimental condition. For example, gang members had greater levels of baseline rebelliousness than gang associates, and gang associates had greater levels than non-affiliates; however, this pattern was similar in both the control and experimental conditions. Greater proportions of gang members identified as male, as non-white, and as Hispanic, than either gang associates or non-affiliated youth, and gang members also had the lowest levels of parental education. Multilevel (3-level) regression models were used to predict whether each covariate significantly differed both by gang class and by experimental condition. Gang associates and gang members were significantly different from both non-affiliates and each other for all covariates except for religious attendance, which did not differ significantly between any gang classes. Gang members had a significantly greater number of males, were significantly older, and had greater levels of rebelliousness at baseline than other classes. However, gender, age, and rebelliousness were not significantly different between non-affiliates and gang associates. In addition, differences between gang classes did not significantly vary between CTC and control communities. For example, more than twice as many gang-involved respondents in control communities identified as Hispanic than in CTC communities, but this was proportional to the number of Hispanic respondents in the full sample population (26.6% of control communities and 15.1% of CTC communities) and did not constitute a significant difference by condition.

### **Baseline Risk Indices**

For both experimental and control conditions, mean levels of risk for all indices increased with each successive class of gang involvement. In nearly all regression models, the domain-

Table 7

*Demographic Characteristics and Mean Level of Risk, by Class and Experimental Condition*

Variable	Control Communities (n=2002)										CTC Communities (n=2405)									
	Full Sample		Non-Affiliated (67.2%)		Gang-Associated (23.5%)		Gang Members (9.3%)		Full Sample		Non-Affiliated (78.3%)		Gang-Associated (15.9%)		Gang Members (5.7%)					
	Min.	Max.	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD				
Age	10.55	14.23	12.09	0.39	12.06	0.37	12.12	0.41	12.20	0.48	12.06	0.38	12.12	0.44	12.26	0.51				
Male	0.00	1.00	51.9%	-	48.9%	-	55.2%	-	65.3%	-	47.9%	-	51.9%	-	61.3%	-				
White	0.00	1.00	61.3%	-	72.1%	-	44.1%	-	26.8%	-	77.1%	-	59.3%	-	46.2%	-				
Hispanic	0.00	1.00	26.6%	-	17.1%	-	40.2%	-	60.2%	-	12.9%	-	22.4%	-	24.8%	-				
Parental Education <sup>a</sup>	0.00	5.00	3.02	1.32	3.19	1.24	2.71	1.37	2.51	1.48	3.39	1.18	2.97	1.28	2.80	1.43				
Grade 5 Religious Attendance	-4.09	4.50	-0.07	1.01	-0.05	0.99	-0.15	1.05	-0.04	1.06	0.04	1.00	-0.13	1.01	-0.21	1.02				
Grade 5 Rebelliousness	-3.27	4.34	0.02	0.79	-0.11	0.71	0.15	0.82	0.56	0.97	-0.06	0.75	0.24	0.86	0.44	0.95				
Community Risk Index	0.00	3.00	0.81	0.92	0.73	0.88	0.90	0.95	1.19	1.03	0.62	0.80	0.91	0.92	1.18	0.98				
School Risk Index	0.00	2.00	0.53	0.69	0.44	0.65	0.64	0.73	0.85	0.76	0.48	0.67	0.65	0.73	0.84	0.77				
Family Risk Index	0.00	3.00	0.42	0.91	0.29	0.85	0.63	0.97	0.80	0.99	0.39	0.87	0.66	0.95	0.79	0.91				
Peer and Individual Risk Index	0.00	7.00	1.92	1.88	1.59	1.69	2.37	2.00	3.10	2.19	1.58	1.69	2.23	1.94	2.79	1.99				
Cumulative Risk Index	0.00	15.00	3.67	3.29	3.05	2.95	4.54	3.45	5.94	3.71	3.15	2.99	4.46	3.28	5.60	3.37				
Interaction with Antisocial Peers	-3.00	5.63	0.06	0.81	-0.07	0.65	0.22	0.90	0.62	1.22	-0.02	0.75	0.20	0.86	0.71	1.44				

Note. Estimates are based on k=40 imputed datasets. <sup>a</sup> Parental Education (0=No high school diploma to 5=Graduate or Professional Degree)

level elevated risk index predicted an increase in the odds of both gang association and gang membership, and there was a significant effect of CTC in reducing the odds of gang association, but not gang membership. Results from these models did not identify any significant moderation effects of domain-level risk on the intervention effect (see *Table 8*).

*Community risk.* On the three-point community risk index, non-affiliated youth in the control community had a mean level of 0.73 elevated risk factors, gang associates 0.90, and gang members 1.19. Similarly, the CTC community youth had mean levels of 0.62, 0.91, and 1.18 for these classes. In the regression model, the main effect of the intervention showed a significant reduction in the odds of gang association for CTC community youth (AOR=.62,  $p<.05$ , 95% CI [0.44, 0.88]), but elevated community risk had no significant main effects (AOR=1.11,  $p=.19$ , 95% CI [0.95, 1.31]), indicating that an increase in elevated community risk factors was not associated with gang association. In addition, intervention moderation effects were positive, suggesting a slightly weaker CTC effect for those with elevated community risk, but nonsignificant (AOR=1.16,  $p=.19$ , 95% CI [0.93, 1.44]). In this model, increases in the community risk index did predict an increase in the odds of gang membership (AOR=1.32,  $p<.01$ , 95% CI [1.07, 1.61]), but neither the intervention effect nor moderation effect were significant.

*School risk.* Similar to community risk, school risk mean levels at baseline were similar within class for each intervention condition and showed greater risk for gang associates and gang members. In the regression model, school risk main effects predicted both gang association (AOR=1.31,  $p<.05$ , 95% CI [1.06, 1.62]) and gang membership (AOR=1.68,  $p<.001$ , 95% CI [1.27, 2.22]), indicating that an increase in elevated school risk increased the odds of each. The intervention effect, net of any elevated school risk, significantly reduced only gang association

(AOR=0.68,  $p < .05$ , 95% CI [0.48, 0.97]). Interaction effects for gang association (AOR=0.104,  $p = .81$ , 95% CI [0.78, 1.38]) suggested slightly weaker, but nonsignificant CTC effects for youth with elevated school risk, whereas this effect on gang membership was effectively nil (AOR=1.00,  $p = .99$ , 95% CI [0.67, 1.49]).

Table 8

*Multinomial Regression Estimates of Gang Involvement with Intervention Effect Moderation by Baseline Risk and Gender*

Variable	Gang-Association				Gang Membership			
	Est	se	AOR	95% CI	Est	se	AOR	95% CI
<b>Community Elevated Risk Index</b>								
<i>Risk Index Main Effect</i>	0.11	0.08	1.11	[0.95, 1.31]	0.27	0.10**	1.32	[1.07, 1.61]
<i>Intervention Effect</i>	-0.47	0.18*	0.62	[0.44, 0.88]	-0.37	0.31	0.69	[0.38, 1.26]
<i>Intervention X Risk Index</i>	0.15	0.11	1.16	[0.93, 1.44]	0.15	0.15	1.17	[0.87, 1.56]
<b>School Elevated Risk Index</b>								
<i>Risk Index Main Effect</i>	0.27	0.11*	1.31	[1.06, 1.62]	0.52	0.14***	1.68	[1.27, 2.22]
<i>Intervention Effect</i>	-0.38	0.18*	0.68	[0.48, 0.97]	-0.23	0.31	0.80	[0.44, 1.45]
<i>Intervention X Risk Index</i>	0.04	0.14	1.04	[0.78, 1.38]	0.00	0.21	1.00	[0.67, 1.49]
<b>Family Elevated Risk Index</b>								
<i>Risk Index Main Effect</i>	0.35	0.08***	1.42	[1.21, 1.68]	0.50	0.11***	1.64	[1.34, 2.02]
<i>Intervention Effect</i>	-0.30	0.17†	0.74	[0.52, 1.04]	-0.07	0.31	0.94	[0.51, 1.73]
<i>Intervention X Risk Index</i>	-0.07	0.11	0.93	[0.75, 1.16]	-0.16	0.16	0.85	[0.63, 1.15]
<b>Peer and Individual Elevated Risk Index</b>								
<i>Risk Index Main Effect</i>	0.17	0.04***	1.18	[1.09, 1.28]	0.27	0.05***	1.31	[1.18, 1.45]
<i>Intervention Effect</i>	-0.40	0.18*	0.67	[0.47, 0.96]	-0.14	0.33	0.87	[0.45, 1.66]
<i>Intervention X Risk Index</i>	0.03	0.05	1.03	[0.93, 1.15]	-0.01	0.07	0.99	[0.85, 1.14]
<b>Cumulative Elevated Risk Index</b>								
<i>Risk Index Main Effect</i>	0.12	0.03***	1.13	[1.07, 1.19]	0.20	0.03***	1.22	[1.14, 1.29]
<i>Intervention Effect</i>	-0.42	0.20*	0.66	[0.44, 0.97]	-0.15	0.35	0.86	[0.43, 1.72]
<i>Intervention X Risk Index</i>	0.02	0.03	1.02	[0.96, 1.09]	0.00	0.04	1.00	[0.92, 1.09]
<b>Gender</b>								
<i>Gender Main Effect</i>	0.17	0.15	1.18	[0.88, 1.58]	0.55	0.20**	1.73	[1.18, 2.55]
<i>Intervention Effect</i>	-0.34	0.18	0.71	[0.50, 1.02]	-0.23	0.32	0.79	[0.42, 1.49]
<i>Intervention X Gender</i>	-0.05	0.19	0.95	[0.65, 1.38]	-0.07	0.28	0.93	[0.53, 1.63]

† $p < .10$  \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$  CI = Confidence Interval. AOR = Adjusted Odds Ratio.

*Note.* Estimates are based on  $k=40$  imputed datasets. Gang association and gang membership outcomes are in comparison to Non-Affiliated referent. All estimates adjusted by age, gender, race, Hispanic ethnicity, parents' highest level of education, and baseline rebelliousness and religious attendance.

*Family risk.* Baseline mean levels of family risk were greater for gang associates and gang members than non-affiliated youth, and levels were similar by intervention condition. Family risk predicted both gang association (AOR=1.42,  $p<.001$ , 95% CI [1.21, 1.68]) and gang membership (AOR=1.64,  $p<.001$ , 95% CI [1.34, 2.02]), indicating increases in elevated family risk were associated with increased odds of both gang involvement outcomes. The effect of CTC was marginally significant for gang association (AOR=.74,  $p<.10$ , 95% CI [0.52, 1.04]) and was nonsignificant for gang membership. The interaction of elevated family risk and CTC was again non-significant, but slightly indicative of stronger CTC effects on gang association (AOR=.93,  $p=.54$ , 95% CI [0.75, 1.16]) and gang membership (AOR=.85,  $p=.29$ , 95% CI [0.63, 1.15]) for youth with elevated family risk

*Peer and individual risk.* For the seven-item peer and individual risk index, control community non-affiliated youth had a mean of 1.59 elevated risks, gang-associated youth had 2.37, and gang members had 3.10. In CTC communities, these classes had, in comparison, 1.35, 2.23, and 2.79 elevated risks, respectively. As with school and family risk, peer and individual risk significantly increased the odds of gang association (AOR=1.18,  $p<.001$ , [1.09, 1.28]) and gang membership (AOR=1.31,  $p<.001$ , [1.18, 1.45]); however, the intervention effect was only significant for gang association (AOR=0.67,  $p<.05$ , 95% CI [0.47, 0.96]) and the interaction of risk and intervention condition were nonsignificant, with small effect sizes for gang association (AOR=1.03,  $p=.54$ , 95% CI [0.93, 1.15]) and gang membership (AOR=0.99,  $p=.85$ , 95% CI [0.85, 1.14]).

*Cumulative risk.* On the 15-item cumulative risk index, variation between control and CTC youth was greater for each gang class. Non-affiliated youth had, on average, 3.05 top-quartile risks overall in the control communities, and 2.70 risks in the CTC communities. Gang

associates had 4.54 and 4.46 top-quartile risks, and gang members 5.94 and 5.60 risks, respectively, in the control and CTC communities. While cumulative risk increased the odds of gang association (AOR=1.13,  $p<.001$ , 95% CI [1.07, 1.19]) and gang membership (AOR=1.22,  $p<.001$ , 95% CI [1.18, 2.55]), indicating that increases in cumulative risk were strongly associated with increased likelihood of being gang associated or a gang member, the effect of CTC was significant only for gang associates (AOR=0.71,  $p<.05$ , 95% CI [0.44, 0.97]) and was not significantly moderated by risk.

*Gender.* Descriptive statistics indicate a slight difference between the number of gang-associated and gang member males in the control and experimental condition groups. Males in the control communities comprised 55.2% of gang associates and 65.3% of gang members, compared to 51.9% and 61.3%, in the CTC communities, respectively. In the regression models, male gender significantly increased the odds of gang membership (AOR=1.73,  $p<.01$ , 95% CI [1.18, 2.55]), but not gang association. The interaction of intervention and gender on gang associates showed a slightly stronger CTC effect for males, but was non-significant (AOR=0.95, ns, 95% CI [0.65, 1.38], as it was for gang members (AOR=0.93, ns, 95% CI [0.53, 1.63]).

## **Discussion**

As a universal prevention system, CTC is intended to prevent problem behaviors among all individuals. Although gang involvement was not one of the intended outcomes of the intervention, the present study finds that the previously observed reduction in adolescent gang association does not significantly vary relative to youths' baseline community, school, family, peer and individual or cumulative risk, suggesting universal effectiveness of the prevention system for adolescent gang association. Although greater levels of baseline domain-level risk are associated with adolescent gang association, and may otherwise indicate these youth for a

targeted prevention approach, the broad implementation of CTC is an effective alternative approach for reaching these youth and reducing the likelihood of their later association with gangs. This effect is particularly important as gang associated youth, apart from gang members, are a seldom-examined population in gang prevention research and practice. Little is known about what is effective for this population, but the results of the current study suggest that the CTC approach, as a community-based universal prevention system addressing multiple domains of risk, can be equally effective for youth with either low or high indicated risk. These results further establish that CTC's universal approach to prevention is effective for both a diverse set of problem behaviors and diverse baseline risk levels.

This study also finds that CTC does not appear to be uniquely effective for youth with certain types of baseline risk in preventing gang membership. This is particularly important given that the indices of elevated risk examined in this study are not only broadly inclusive and representative of ecological domains of risk, but are found to be strong indicators of youth risk for gang membership. Because CTC targets these domains of risk but did not have an effect in reducing gang membership relative to these domains, the findings of this study suggests that other additional proximal processes for gang membership may be occurring that were not addressed by CTC communities. Because gang involvement was not a primary outcome for CTC, communities did not prioritize risk factors for gang involvement specifically for targeting with evidence-based programs. For example, although the risk factors assessed here are relevant to increased likelihood of gang membership, exposure to violence and trauma in the community and home are also thought to influence youths' beliefs about gangs and may elevate their decision to join, particularly as it relates to a need for immediate protection and support (Quinn, Pacella, Dickson-Gomez, & Nydegger, 2017). Such exposures may be more acute and

immediate risk factors that push youth beyond association and into gangs. Successful gang prevention programs identified in the future may therefore need to target both broad reductions in risk and more immediate processes, but if such programs are found successful, they could be considered for inclusion in the menu of evidence-based programs distributed to communities participating in the CTC prevention system.

The findings of this study that CTC prevents gang association equally for males and females is also important. Gang prevention programs need to be attentive to differential effects both between and within gender groups, particularly related to female gang members' greater risks in the family (Snethen, 2010) and greater risk of abuse and trauma (Chesney-Lind, 2013). Research into gender differences among pathways of gang-involved youth is still underdeveloped, but attention to these initially observed differences in risk has supported the development of gender-specific preventive interventions for targeted programs (Snethen, 2010). Although the present study has insufficient power to investigate these subgroups of risk within gender groups, the findings of this study suggest that universal prevention approaches that target multiple domains of risk may be an efficient and effective approach to reducing the likelihood of gang association among girls and boys.

### **Limitations**

Some noteworthy limitations exist for this study. Although the study has a large sample size, the use of interactions with a small number of clusters has limited available degrees of freedom for calculation of significance. This may have limited the ability to detect significance among the small effect sizes observed in the study. Similarly, the low power available for this modeling required the use of fixed effects for the cross-level interaction. Although the results indicated small, non-significant effect sizes, it is possible that the association between the intervention and each risk domain or gender varied significantly from community-to-community.

Repetition of this study and its methods would be pragmatically challenging, as it would require a larger sample size using a greater number of communities.

Additionally, CYDS communities were matched according to a number of baseline demographic factors, including race, so that experimental and control communities would be as similar as possible (Brown et al., 2009). As matching communities that are also available to participate in an extensive study is a challenging task, not all demographic features, such as Hispanic ethnicity, were able to be matched within community pairs. The present study controls for Hispanic ethnicity to adjust for these differences; however, given the strong overlap between ethnicity and gang membership in this sample, the present study lacked sufficient power to be able to examine this association more thoroughly. The association between ethnicity and risk of gang involvement is not fully clear, so further exploration of these associations is necessary not only to drive more nuanced programming specialization (Klein & Maxson, 2006), but to fully gauge the variation among intended universal effects.

Lastly, this study uses a rural and small town sample and may thus not be generalizable for urban or suburban implementations. Prior studies using this sample identified risk factors for gang involvement, as well as outcomes among gang members, that were in keeping with studies using urban samples (*see Paper 1*; Fleming, Oesterle, Hill, & Catalano, *under review*). However, a lack of comparative studies addressing differences in comprehensive and diverse risk factors between urban and rural gang-involved youths' contribute to the difficulty in inferring whether the results of this study would be generalizable to other communities and samples. More diverse implementation of the CTC approach is needed to further explore the generalizability of the findings of this study and to identify any potential variation in these effects.

## **Conclusion**

Few universal prevention approaches to gang involvement have been thoroughly evaluated, and this study is among the first to include in such evaluation an examination of the universality of its effects. Although CTC did not originally target gang involvement as one of its primary outcomes, its approach to reducing other problem behaviors by targeting and reducing broad risk factors that are shared by gang involvement suggests that a common interventive model may be effective. The findings of this study indicate that the CTC approach to reducing problem behaviors through universal intervention is indeed also effective in reducing the likelihood of gang association for all youth, regardless of their levels of community, school, family, peer, individual and cumulative risk. Because cumulative risk within and across diverse domains is a particularly potent predictor of gang involvement (Hill et al., 1999; Melde et al., 2011; Thornberry et al., 2003), approaches that work equally for youth with these types of risk are an important contribution to gang prevention efforts.

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## Conclusion

Much is known about gang involvement, in terms of its prevalence, patterns, and outcomes, yet research into preventive solutions has thus far provided few effective options (Esbensen & Matsuda, 2013). The studies included in this dissertation take a novel approach to gang prevention by examining the effectiveness of a prevention system that was not originally intended to prevent gang involvement, but which nevertheless was found to have some significant positive effects. The results from these studies indicate that Communities That Care is effective in preventing gang association, but not membership. Results from the first study indicate that most of the ecological baseline risk factors targeted by CTC are generally predictive of both gang association and gang membership in adolescence for this rural sample, providing some initial support that by targeting these risk factors, CTC may be effective in these communities in reducing gang involvement. Results of the second study find that indeed, CTC is able to reduce significantly the odds of gang association, but not gang membership, among adolescents, while results of the third study find that these observed effects are equally effective among youth with different types and levels of baseline ecological risk and gender.

Although much is known about domains of risk for gang membership in urban and national contexts, few studies have sought to establish whether this general pattern of risk holds true for rural youth. The first aim of the dissertation was thus to examine whether CTC's ecological risk factors across community, school, family, peer and individual domains were associated with gang involvement among a rural and small town sample. The key findings from this study were that, similar to their urban peers, risk factors across all domains were predictive of youth gang membership and gang association, with the exception that community risk factors and cumulative community risk were significant predictors for gang membership only and not

for gang association. This study answers a key question in evaluating whether CTC may be effective for gang involvement. CTC operates by providing communities with the tools to assess and target a number of theory and evidence-based risk factors, which are known to be associated with delinquency, violence, and substance use (Arthur, Hawkins, Pollard, Catalano, & Baglioni, Jr., 2002). CTC's logic model suggests that when communities select and implement prevention programs that target their prioritized risk factors, it leads to a reduction of risk, the enhancement of protection, and ultimately more positive youth outcomes. Although the risk factors examined here are not an exhaustive list of the possible risk factors for gang involvement, the first study's establishing that the majority of these risk factors have predictive validity for gang involvement provides initial evidence, consistent with CTC's logic model, that targeting these factors with prevention programming may be a mechanism through which CTC is able to prevent gang involvement.

The second aim of the dissertation examines to what extent CTC is effective in preventing gang involvement in adolescence. One of the challenges for communities in selecting and implementing gang prevention programs and approaches is that very few of these have been rigorously evaluated (Esbensen & Matsuda, 2013). Taking advantage of the rigorous methods employed by the Community Youth Development Study to evaluate CTC (see Brown et al., 2009), including the use of a randomized community design, this paper includes a multilevel, multivariate analytic approach to assess CTC's effects on gang membership and gang association. Because CTC is a community-wide approach, this method allows for the controlling of community-level variation as well as other individual-level demographic and confounding factors that may impact the analyses' results, providing a more accurate assessment of the effect size. CTC was found to reduce significantly the odds of youth becoming gang-associated in

adolescence by 31%. However, although the estimate was in the right direction, the study likely had too limited power to detect a significant preventive effect on gang membership (AOR=0.77, ns, [0.46, 1.28]). These findings support the notion that the universal, ecological approach to youth risk employed by CTC is an effective means for reducing not only the behaviors originally targeted, but multiple problem outcomes, including youth association with gangs.

An important part of examining the effectiveness of a universal prevention approach is determining whether the approach is indeed universally effective or if any observed effects vary for those with different levels of baseline risk factors. The first study confirmed the findings of prior studies (e.g. Hill, Howell, Hawkins, & Battin-Pearson, 1999; Thornberry, Krohn, Lizotte, Smith, & Tobin, 2003) that gang-involved youth were found to experience greater late childhood risk within and across community, school, family, peer and individual domains. Because of the strength of these associations with later gang involvement, it is important to assess whether the effects of CTC are specific to youth with different levels of these types of risk, as they serve to differentiate lower and higher risk youth for whom the prevention effects may vary. The results of this third aim of the dissertation indicate that neither baseline risk, nor gender, significantly moderate these observed effects. As the indices examined are broad indicators of domain-level youth risk, the analyses capture a large proportion of the possible variation in ecological risk among youth, providing strong evidence that the universal approach used by CTC does indeed work effectively for all youth in reducing their risk of gang association.

Unlike other gang prevention approaches, which have tended to be programs that focus on individual-level skills and knowledge specific to helping youth avoid gangs, such as programs that build more positive relationships with law enforcement or teach the consequences of crime (Howell, 2000), CTC more broadly approaches youth risk by not only targeting ecological risk

factors for problem behaviors, but by helping communities to establish a community coalition to build and improve prevention programming and collaboration among service providers. Owned and operated by the community, this approach therefore seeks to reduce youth problem behaviors by creating communitywide changes in risk and protection, for example by implementing parenting programs, changing community policies to be more protective of youth, and by building skills among the youth themselves. Because gang involvement is found to be associated with risk factors beyond those of the individual and in multiple domains of youths' lives, the effectiveness of this approach toward reducing risk more broadly is a positive step in advancing our knowledge of what works in preventing youth gang involvement.

### **Implications**

CTC's effect on gang association is an important finding for communities aiming to develop and implement best prevention practices for reducing problematic outcomes among youth. Youth gang involvement is a complex issue facing communities of all types across the U.S. More than two percent of all youth nationwide are estimated to belong to a gang (Pyrooz & Sweeten, 2015), and these individuals can be responsible for a large portion of communities' crime and violence (Howell, 2013). This association between gang-involvement and criminal behavior and violence is well-established (Barnes, Beaver, & Miller, 2010; Battin, Hill, Abbott, Catalano, & Hawkins, 1998; Bejerregaard, 2002; Melde & Esbensen, 2013) and finds youth who become gang-involved have substantially greater likelihood of incarceration, even well after leaving the gang (Gilman, Hill, & Hawkins, 2014). Although reducing criminal behavior tends to be a primary goal of any gang prevention approach (Pyrooz, 2013), preventing youth from entering into the influence of gangs is likely to have significant effects on other aspects of their lives. Youth who become involved in gangs face lower educational attainment, poorer mental health, poorer economic outcomes, and greater likelihood of being violently victimized due to

this involvement (Gilman et al., 2014; Katz, Webb, Fox, & Shaffer, 2011; Pyrooz, 2014).

Preventing gang involvement among youth, particularly through prevention approaches such as CTC that are implemented at the community-level and are broadly effective among all youth in reducing the likelihood of gang association, can therefore have dramatic effects in reducing the personal and financial burden of gangs, not only for the individuals themselves, but also for their schools, families, and communities.

This is particularly important when taken in the context of the type and level of youth risk observed in the first aim of this dissertation. Youth who became gang-involved experienced more than twice the overall elevated risk observed among non-affiliated youth, and gang-associated youth experienced more than 50% greater risk. This accumulation of risk, which can both lead to and be compounded by the effects of becoming gang-involved, presents these youth with massive hurdles to overcome in achieving a stable and successful adulthood. Through the CTC strategy of mutually targeting risk and fostering the development of prosocial alternatives, youth within CTC communities can be provided with alternative avenues to gang involvement, increasing their potential for long-term positive development.

Although most gang-prevention efforts tend to be narrow in their approach to reducing risk, a comprehensive and ecological approach such as CTC may be more effective. The only prevention approach found through rigorous evaluation to be effective in preventing gang membership is the universal-implementation of the G.R.E.A.T. program, which significantly reduced the odds of gang membership among youth in a multi-site, school-based evaluation (Esbensen, Peterson, Taylor, & Osgood, 2012). Although primarily school-based, the G.R.E.A.T. program does include some implementation in the community, such as fostering collaboration with law enforcement officers; however, the program did not have an effect on

delinquency within the population. Conversely, CTC did not have an explicit effect on gang membership, but its effects on gang association, as well as its effects on delinquency and violence, add to the evidence that reducing ecological risk for all youth may do more to reduce both gang involvement and youth problem behaviors (Howell, 2010).

This, however, leads to the question of how future prevention research should approach gang involvement, and gang membership, more specifically. Researchers planning future prevention approaches may consider combining elements of multiple effective programs and policies. Both CTC and G.R.E.A.T. found success through universal implementation of prevention programming, suggesting that reducing environmental risk may be more effective in reducing gang involvement than targeted approaches. CTC's approach to ecological risk and community investment has shown strong evidence for being effective in reducing multiple problem behaviors, as well as the broader association of youth with gangs, and G.R.E.A.T.'s approach to skill-building and changing youths' attitudes about violence among school-based youth was effective in preventing gang membership. These results indicate the need for communities to invest in targeting a broad range of ecological risks for youth problem behaviors, as well as gang-specific programming, in order to have the most effective impact. This could occur in several ways; for example, by including evidence-based gang-specific programming, such as G.R.E.A.T., within the CTC evidence based program list or by expanding gang-specific programming to include other ecological risk factors, so that these programs may reduce both the rate of delinquency and gang involvement.

Another important implication from this dissertation's findings is the increased legitimacy of expanding the ways in which gang involvement is assessed. Although survey research can pragmatically assess gang membership from a dichotomous self-nomination

question (Esbensen, Winfree, He, & Taylor, 2001), doing so may limit the ability of both etiological and evaluative research to fully assess the reality of gang involvement and the effectiveness of approaches that seek to prevent problem outcomes and intervene with high-risk youth (Pyrooz, 2013). The approach to assessing multiple levels of gang involvement used in this dissertation is unique in that it probabilistically assesses classes of gang involvement relative to responses to questions of gang membership and peer involvement over multiple waves. Although this approach is a step forward in broadening outcomes for evaluations, other analytic methods in both longitudinal and cross-sectional research may find unique benefit with alternative approaches, such as including measures that assess other aspects of the nature of youth gang involvement, such as the degree of criminal activity, or developing scales or latent variable constructions of gang involvement. Such approaches would allow for the diversification of etiological and evaluative findings to be more specifically relevant to different levels, types, and patterns of gang involvement, for example by examining intervention effectiveness while differentiating violent from non-violent gang youth (Pyrooz, 2013). Broadening these definitions is important for identifying when and for whom prevention approaches are effective, so that these may be built upon to develop more comprehensive and effective methods.

Lastly, although this dissertation examined the effects of CTC broadly within the community and with respect to types of baseline risk, additional research is necessary to examine the mechanisms through which CTC is effective in preventing gang association. For example, research should examine whether these effects occurred through reductions in targeted risk, increased protection, or by intervening with specific risk factors for gang involvement. Because one of the main purposes of reducing gang involvement is reducing levels of community crime, research should also examine whether CTC is effective in reducing rates of delinquency and

other problem outcomes specifically among gang involved youth. In particular, although it did not have a significant impact in preventing gang membership, CTC may yet be effective for gang members by helping to reduce their likelihood of delinquency and violence.

Some limitations exist in this dissertation and therefore some caution should be used in the interpretation of its results. For example, in order to maintain consistency across the three papers, covariates were held similar for each set of analyses. While the covariates used are standard for intervention testing in CYDS analyses, the use of Grade 5 religious attendance in Paper 1 may be considered more as an independent variable than as a covariate. Although religious attendance did not significantly differ by gang class or by intervention type, this variable may have had some confounding influence in reducing or elevating the associations of some risk factors and gang involvement. Replication or repetition of these studies may need further investigation into the influence of this and other possible confounding variables, such as baseline delinquency, to further specify the degree of association of risk with gang involvement, as well as the impact of the CTC intervention in reducing these outcomes.

### **Social Justice Implications**

The identification of effective approaches to gang prevention has profound social justice implications. As observed in the first aim, gang involvement is closely associated with elevated risk in childhood. The risk factors examined in this study are also associated with a broad range of outcomes, including health outcomes such as substance use, depressive symptoms, and obesity (Arthur et al., 2002; Bond, Toumbourou, Thomas, Catalano, & Patton, 2005; Williams, Canterford, Toumbourou, Patton, & Catalano, 2015). Gang involvement may very likely exacerbate these issues, particularly given the observations that adolescent gang membership is associated with poorer mental health and substance use later in adulthood, even when controlling for other factors (Gilman et al., 2014). Gang involvement may thus serve to exacerbate what is

already elevated risk among youth. Reducing the likelihood that youth will join gangs, particularly if also reducing the likelihood of other negative health outcomes, may serve to greatly reduce long-term disparities among high risk youth.

This is particularly important when considering the association of gang-involvement with racial and ethnic minority groups. In the present study, nearly 60% of gang members, and 40% of gang associated youth, are of Hispanic ethnicity, and 73% and 56% are of racial minority status, respectively. While race and ethnicity are not inherently predictors of gang-involvement, the marginalization of racial and ethnic minority youth in the U.S. may lead to greater likelihood that they will join gangs (Freng & Esbensen, 2007). Through broad prevention approaches that reduce the risks associated with gang involvement, and by preventing trajectories of further negative outcomes in adolescence and adulthood by increasing the availability of prosocial opportunities for youth, CTC may be able to reduce at least some of the more extreme racial and ethnic outcome disparities in communities in which gang involvement is more prevalent. Although this approach will not necessarily affect structural risk factors, it may help to reduce the multiple marginalization of youth that is associated with gang involvement in the population.

Lastly, because gangs mostly develop within communities, preventing gang involvement is an effort that should also belong to the community. CTC is an approach that emphasizes community self-determination by helping residents take on various roles throughout the community and use prevention science tools and effective prevention programs to improve the outcomes and lives of their youth. A key element of CTC is the Social Development Strategy, an approach to building protective factors in the community by providing opportunities, skills, and recognition to youth, which aids in the youths positive bonding and adoption of clear, prosocial standards of behavior. Such an approach builds on the knowledge and strengths of

diverse community members who are able to represent different aspects and different sectors of the community, such as residents, social service staff, school officials, and faith leaders. Rather than entrusting gang reduction efforts solely to law enforcement and the criminal justice system, CTC is an approach that can help community coalitions build organization and implementation skills (Shapiro, Hawkins, & Oesterle, 2015) that may help to engage community resources to intervene positively with youth before police are necessary. By bolstering the strengths of individuals in the community, CTC is an approach that can allow communities to retain power in confronting gangs.

### **Conclusion**

This dissertation provides evidence that the Communities That Care prevention system, as a universal prevention approach targeting broad ecological domains of risk for youth problem behaviors, also prevents some forms of gang involvement. Although very few preventive interventions have been found successful, the three papers of this dissertation identify the relevance of the risk factors targeted by CTC to gang involvement, the effectiveness of the approach, and the universality of its effectiveness. The findings further indicate that CTC is an effective approach to reducing a diverse set of youth problem behaviors.

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## Appendix

### Gang Involvement Measurement Model

#### Background

Latent Profile Analyses (LPA) were used to identify multiple levels of gang involvement. LPA, a type of Latent Class Analysis, derives latent classes of individuals probabilistically based on their values on multiple measured variables, allowing for an assessment of measurement error. The LPA approach used in this dissertation allows for the examination of different levels of adolescent gang involvement by identifying patterns of responses to two questions across five waves of data.

#### Analysis

Two variables (*gang membership* and *number of friends in a gang*) in each of five waves (Grades 7, 8, 9, 10, and 12) were included in the analyses. Six models, specifying one to six latent classes were compared. Per recommendations for model selection by Collins and Lanza (2010), the models were evaluated by model fit statistics (Log-Likelihood, AIC, BIC, and sample size-adjusted BIC), parsimony, and overall interpretability.

Due to this dissertation testing intervention effects on the latent classes, the interpretability of these derived classes needed to be the same for both experimental and control conditions. To ensure this in their creation, each model constrained all estimates to be equal across intervention types. This approach ensures equivalence in class identification and specification, while allowing for differences in class prevalence by intervention condition.

Due to the planned missing design used in the Community Youth Development Survey, data are assumed to be missing completely at random (Brown et al., 2009; Graham, 2012). Data were multiply imputed ( $k=40$ ), along with all study variables used in the dissertation analyses, and were imputed separately within gender and intervention groups in order to preserve

important interaction effects for subsequent analyses. There is no consensus as to how model fit indices should be calculated for analyses using multiply imputed data; as such, all fit indices are presented as the means and standard deviations of the fit indices across the 40 imputed sets. All analyses were completed in MPlus 7.0 (Muthén & Muthén, 2012).

## **Measures**

*Gang membership.* In each of the five waves, respondents were asked, “Have you ever belonged to a gang?” and “Did the gang have a name?” Gang membership was identified within each wave as positive responses to both items. Although self-nomination is often used as a valid indicator for specifying gang membership (Bjerregard, 2002; Decker, Pyrooz, Sweeten, & Moule Jr., 2014; Esbensen, Winfree, Thomas, & Taylor, 2001), the use of an additional question may help to distinguish youth who are involved in gangs from youth who are involved with less formal peer groups (Barnes et al., 2010).

*Number of friends in a gang.* In each wave, respondents were asked “In the past year (12 months), how many of your four best friends have been members of a gang?” and were provided with response options ranging from zero to four.

## **Results**

Table 9 presents descriptive statistics for each set of variables included in the LPA for respondents in the control and intervention groups. Youth in the control communities reported a greater number of friends in a gang in each wave (0.34 to 0.59) than youth in CTC communities (0.28-0.37). Youth in control communities reported having belonged to a gang in equal or slightly larger proportions than CTC community youth each wave. For example, in 7<sup>th</sup> grade, 5% of both control and CTC youth reported having belonged to a gang, but in 8<sup>th</sup> grade, 11% of control community youth reported this, compared to 7% of youth in CTC communities.

Table 9  
*Descriptive Statistics of Latent Class Variables by Experimental Condition*

<u>Indicators</u>	Control (n=2,002)		CTC (n=2,405)	
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
Mean Number of Friends in a Gang				
7th Grade	0.42	0.90	0.28	0.70
8th Grade	0.59	1.09	0.37	0.85
9th Grade	0.49	0.97	0.32	0.80
10th Grade	0.48	0.91	0.30	0.75
12th Grade	0.34	0.75	0.29	0.73
Proportion of Gang Membership				
7th Grade	0.05	-	0.05	-
8th Grade	0.11	-	0.07	-
9th Grade	0.07	-	0.06	-
10th Grade	0.10	-	0.05	-
12th Grade	0.06	-	0.06	-

*Note* : Averaged across k=40 imputed data sets.

Table 10 presents fit statistics and standard deviations for each of the six mixture models. Models improved fit with each additional class, indicated by larger log likelihood and lower AIC, BIC, and sample size-adjusted BIC estimates. Estimates improved by the greatest margins between the 1-class and 2-class models, and between the 2-class and 3-class models. The 4- through 6-class models do not differentiate greatly by fit, and each produced classes that were not readily interpretable. Fit statistics suggest that the 3-class model is the better fitting model. The 3-class model also has an entropy value of .83, indicating classification sensitivity strong enough to allow the use of the derived classes in subsequent analyses with relatively low measurement error.

The 3-class solution with estimates constrained to be equal across intervention types was compared to a model where these estimates were not constrained, to ensure that the selected

model had an appropriate fit to the data. In comparison to the non-constrained 3-class model, the constrained 3-class model had marginally better overall model fit (e.g. non-constrained model BIC = 45730.36; constrained model BIC = 45626.27). In addition, a likelihood ratio difference test indicated better overall model fit for the constrained model ( $\Delta G^2 = 147.636$ , 17df,  $p < .001$ ), indicating that this model, which assumes definitional equivalence across intervention types, was an overall improvement over a model where these definitions were allowed to vary.

Table 10  
*Latent Profile Analyses Fit Statistics*

Number of Classes	Log Likelihood		AIC		BIC		Adjusted BIC		Entropy
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean
1-Class	-28189.7	118.9	56403.4	237.8	56480.0	237.8	56441.9	237.8	-
2-Class	-20062.6	119.8	40169.2	239.6	40309.8	239.6	40239.9	239.6	0.92
3-Class	-19630.0	116.5	39328.1	233.1	39545.4	233.1	39437.3	233.1	0.83
4-Class	-19404.9	116.6	38901.8	233.2	39195.8	233.2	39049.7	233.2	0.83
5-Class	-19315.5	115.8	38747.0	231.5	39117.7	231.5	38933.4	231.5	0.83
6-Class	-19254.9	117.0	38649.8	234.0	39097.2	234.0	38874.8	234.0	0.71

*Note.* Averaged across k=40 imputed data sets

Table 3 shows the conditional means and probabilities of the study variables for the 3-class model. These three classes were readily interpretable by their estimated means and probabilities. The largest class, with 73.3% of the sample, is a non-affiliated class, which across the five waves has a near-zero probability of having claimed gang membership, and 0.11 or fewer friends in a gang in each wave. The smallest class are “gang members” (7.3%), who have a probability of claiming gang membership ranging between 0.36 and 0.66 across the five waves, and have on average between 1.49 and 2.60 friends in a gang in each of the waves. Last is a middle-class of “gang-associated” respondents (19.4%), who have a consistently low, but non-

zero (0.08 to 0.16) probability of claiming gang membership in any wave, and between 0.61 and 0.95 friends in a gang. Examining class prevalence by intervention condition, control communities have 67.2% non-affiliated, 23.5% gang-associated, and 9.3% gang members. CTC communities had 78.3% non-affiliated, 15.9% gang-associated, and 5.7% gang members.

Table 11  
*Conditional Means and Probabilities from 3-Class Model*

Latent class indicators	Non-Affiliates (73.3%)	Gang Associated (19.4%)	Gang Members (7.3%)
<b>Mean Number of Friends in a Gang</b>			
<i>7th Grade</i>	0.09	0.69	1.71
<i>8th Grade</i>	0.09	0.95	2.60
<i>9th Grade</i>	0.09	0.73	2.33
<i>10th Grade</i>	0.11	0.71	1.96
<i>12th Grade</i>	0.10	0.61	1.49
<b>Probability of Gang Membership</b>			
<i>7th Grade</i>	0.01	0.08	0.36
<i>8th Grade</i>	0.01	0.16	0.66
<i>9th Grade</i>	0.00	0.10	0.56
<i>10th Grade</i>	0.01	0.12	0.52
<i>12th Grade</i>	0.01	0.10	0.43

*Note.* Estimates are based on k=40 imputed datasets.

### **Summary**

The results of these analyses identify three classes of youth with stable patterns of involvement over the five waves. Non-affiliated youth, which represent the majority of respondents in the full sample, are unlikely at any point to have claimed gang membership and have reported very few friends, on average, at any time point. Gang members, are the smallest class of the sample, but are nevertheless substantial. These youth have consistently elevated

probabilities of claiming gang membership across each of the five time points. For example, youth in this class have a 36% chance of claiming gang membership in 7<sup>th</sup> grade and a 66% chance of claiming membership in 8<sup>th</sup> grade. These youth, on average, tend to have more than 1 friend in a gang in each of the five waves. Gang associates are the unique class, often not included in other research and evaluation. These youth have a low probability of claiming gang membership in any of the five waves, but it is important to note that this is a non-zero probability. Additionally, respondents in this class have, on average, less than 1 friend in a gang in any wave. This large class of respondents represents a group of youth who may have some interactions with gangs between grades 7 and 12, distinguishing them from non-affiliated youth, but who are also less likely than gang members to have consistently reported gang membership and multiple friends in a gang. For example, youth included in this class may have claimed gang membership or friends in a gang in one wave, but in none of the other waves.

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**Education**

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PhD – Social Welfare; University of Washington <i>Statistics Concentration in Social Work</i>	2018
MSW – Clinical Practice; Rutgers, The State University of New Jersey	2011
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Research Assistant School of Social Work, University of Washington	2016-Present
Research Assistant, Evidence2Success Social Development Research Group, University of Washington	2014 - 2015
Research Practicum, Seattle Social Development Project Social Development Research Group, University of Washington	2013 - 2014
Research Assistant, Community Youth Development Study Social Development Research Group, University of Washington	2013 - 2014

**Teaching Experience**

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Predocctoral Lecturer, SocW506 – Social Welfare Research and Evaluation	Winter/Spring 2016
Tutor/Consultant, SocW506 – Social Welfare Research and Evaluation	Spring, 2015
Predocctoral Lecturer, SocW505 – Foundations of Social Welfare Research	Winter, 2015
Teaching Practicum, SocWf 390 – Introduction to Social Welfare Research	Autumn, 2014
Tutor, SocW 596 – Statistics for Social Workers	Summer, 2013
Teaching Assistant, SocWf 390 – Introduction to Social Welfare Research	Autumn, 2012

## **Publications and Presentations**

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Jones, T. M., Nurius, P. S., Song, C., & Fleming, C. M. (In Press). Life course pathways from adverse childhood experiences to adult mental health. *Child Abuse and Neglect*.

Nurius, P. S., Fleming, C. M., & Brindle, E. (Under Review) Life course pathways from adverse childhood experiences to adult physical health: A structural equation model. *Journal of Aging and Health*.

Oesterle, S., Hawkins, J. D., Kuklinski, M. R., Fagan, A. A., Fleming, C., Rhew, I. C., Brown, E. C., Abbott, R. D., & Catalano, R. F. (2015). Effects of Communities That Care on males' and females' drug use and delinquency 9 years after baseline in a community-randomized trial. *American Journal of Community Psychology*, 56(3), 217-228.

## **Manuscripts under Review**

Fleming, C. M., Eisenberg, N., Kosterman, R., Catalano, R., Hawkins, J. D., & Haggerty, K., "Assessing risk and protection for diverse adolescent outcomes: Do risk and protective factors for adolescent delinquency and substance use also predict risky sexual behavior?"

Fleming, C. M., Oesterle, S., Hill, K. G., & Catalano, R. "Consequences of Non-Metropolitan Adolescent Gang Association for Young Adults."

Fleming, C. M., & Nurius, P. S. *Incarceration and adversity histories: Modeling life course pathways affecting mental health*.

## **Manuscripts in Preparation**

Fleming, C. M., Herrenkohl, T. I., Kosterman, R., & Lee, J. "Untitled: Longitudinal associations of perceived and objective physical health, depression, and substance use paper"

## **Presentations**

Fleming, C. M., & Nurius, P. S. "Incarceration and adversity histories: Modeling life course pathways affecting mental health." Poster presentation at the Society for Social Work and Research 22nd Annual Conference in Washington, D.C., January 2018.

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Fleming, C. M., Eisenberg, N., Catalano, R. F., Hawkins, J. D., & Haggerty, K. P. "Assessing risk and protection for diverse adolescent outcomes: Do risk and protective factors for adolescent delinquency and substance use also predict risky sexual behavior?" Presentation for the Society for Prevention Research annual conference in Washington, D.C., May 2015.

Oesterle, S., Hawkins, J. D., Kuklinski, M. R., Fleming, C., Rhew, I. Brown, E. C., Fagan, A. A., Abbott, R. D., Catalano, R. F. "Effects of the Communities That Care prevention system on boys' and girls' health-risk behaviors 9 years after baseline in a community-randomized trial. Presentation for the Society for Prevention Research annual conference in Washington, D.C., May 2015.

Oesterle, S., Hawkins, J. D., Kuklinski, M., Fleming, C., Rhew, I. C., Brown, E. C., Abbott, R. D., & Catalano, R. F., "Preventing adolescent delinquency and violence using the Communities That Care prevention system: Findings from a community-randomized trial." Presentation for the SAVIR Annual Conference in New Orleans, LA, March 2015.

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### **Professional Experience**

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