

**Gang membership and gang crime in New Zealand: A national study identifying spatial
risk factors**

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Abstract

In this exploratory study we identify the spatial risk factors associated with gang membership and gang crime in New Zealand using social disorganization as a theoretical framework. Gang membership data from the Gang Intelligence Centre and gang crime data from New Zealand Police are included in spatial regression models to identify risk factors. Overall marginal support was found for the use of social disorganization constructs to explain gang membership and gang crime in New Zealand. Higher deprivation and higher diversity were both found to be associated with gang membership and gang crime, respectively. Some similarities and notable differences were observed between our results and the mainly United States (US)-centric results of past spatial gang research. This study allows for a greater understanding of the generalizability of the social disorganization theory to explain gang membership and gang crime in areas with markedly different cultural perspectives and ethnocentricities to the United States.

Keywords: gang membership, gang crime, New Zealand, risk factor, spatial

Gangs in New Zealand are remarkably common. For a country rated as the second most peaceful in the world (Institute for Economics and Peace, 2019), New Zealand is considered to have one of the highest rates of gang activity globally (Gilbert, 2013). There are 6336 individuals on the Gang Intelligence Centre's (GIC) National Gang List (NGL)¹ which equates to roughly 126 gang members per 100,000 population. While the number of gang members in the country fell somewhat in the early 2000s (Gilbert, 2013), the past decade has witnessed a dramatic increase in the annual estimates of gang members (Elers, 2019), mirroring trends in the United States

(US) (National Youth Gang Survey, 2012)². In fact New Zealand police report that the number of gang members has increased by almost 30% from 4975 in 2017, to 6375 in 2019³ driven largely by large-scale recruitment into the two largest gangs in the country - the Mongrel Mob and the Black Power. If consistent with international research (see Pyrooz & Sweeten, 2014), the number of gang members reported by the GIC is, however, most likely under-representative of the true prevalence of gangs in the country.

Gang crime is also increasing. Anecdotal reports suggest a surge in gang violence across New Zealand (Bradley, 2020; Hawkesby, 2020) with the country's Police Minister recently confirming the increase (Graham-McLay, 2020). Of further concern is the fact that gang involvement in crime in New Zealand has become deeper and more sophisticated. A recent parliamentary report notes how gangs have increasingly moved towards cooperation and are now collectively involved in drug importation, cultivation, manufacture, and selling, particularly in methamphetamine (New Zealand Parliament, 2019). In fact, it is estimated that gangs make approximately NZ\$500 million in profit from the methamphetamine trade alone every year (Leask, 2019). International research has shown that gang members in general account for a disproportionate share of crime and violence (see Pyrooz et al., 2015 for an empirical stocktake of research examining the relationship between gang membership and offending). In New Zealand gang members currently fill roughly a third of prison cells (Baird & Hurley, 2018); an increase of more than 20% from a decade ago (Lines-MacKenzie, 2018). Gang members in New Zealand are also more likely to reoffend after release and are twice as likely to reoffend more seriously (Ong, 2015) despite a number of multi-faceted approaches being implemented to address the problem (see New Zealand Parliament, 2019 for a review of the strategies employed since the 1950s).

Despite the growing prevalence of gangs and gang crime in the country research examining its spatial predictors and drivers are sorely lacking. As a result, local researchers are continuously confined to the social conditions - and spatial interpretations - pertinent to US-centric theoretical frameworks when undertaking gang analyses and interpreting findings. This drawback has particular relevance to Māori - the indigenous people of New Zealand- whose philosophy of crime and justice differs considerably from US frameworks (Webb, 2003). The present study explores the distribution of gangs and gang crime in New Zealand, and their predictors, from a spatial perspective. The rest of the paper proceeds as follows. We first provide an overview of the literature on predictors of gang membership, and gang crime, followed by a brief history of gangs in New Zealand to provide context for the study. We then explain the data used for the study and the methods employed before discussing our results and concluding.

Factors associated with gang membership and gang crime

Similar to international studies, factors influencing gang membership in New Zealand span the broad dimensional domains of individual characteristics, family factors, peer groups, schooling, and community conditions (Gilbert, 2013; Howell & Egley, 2005). Research conducted by the New Zealand Ministry of Social Development (2006) found a multitude of risk factors embedded within these domains that could influence individuals to join gangs. These factors included economic deprivation, disorganized parenting practices, parental disengagement, and the provision of gangs to act as a proxy family unit. Financial and material gain, the alleviation of boredom, enhanced status and protection were also found to be significant risk factors as were the excitement associated with crime, adult gang prospecting and a lack of formal education. Of course, these five domains do not operate in isolation with various longitudinal studies suggesting that risks in any of these domains can lead to an increase in the odds of later gang

membership (see Browning & Huizinga, 1999; Browning et al., 1999; Hill et al., 1999). To add complexity, identified risk factors that predict the probability of gang membership most often also predict other antisocial outcomes as well (see also, Esbensen et al., 2009) and individuals who become gang members routinely possess a relatively high number of risk factors prior to gang membership (Decker et al., 2013). It is therefore likely that the accumulation of risk factors within and between these domains is the best way to identify those most likely to become a gang member.

Although less common, a growing body of ecological research on risk prediction for gang membership has identified significant relationships between community factors and gang involvement (Curry & Spergel, 1988; Pyrooz et al., 2010; Rosenfeld et al., 1999). Previous studies have found that gang members are more prevalent in neighborhoods that are disadvantaged (Dupéré et al., 2007; Pyrooz, 2014a) and perceived as unsafe (e.g., lack of resources, high crime, access to drugs) and low in neighborhood attachment/involvement (Glessman et al., 2009; Hill et al., 1999). The presence of gangs in the neighborhood has also found to increase gang involvement (Alleyne & Wood, 2013).

In terms of gang crime, a plethora of studies have analyzed the relationship of various structural covariates with gang crime (focused mainly on gang homicide) at the neighborhood- and city-level (Pyrooz, 2012; Valasik et al., 2017) with a number of factors found to be significant including deprivation (Curry & Spergel, 1988), disadvantage (Kubrin & Wadsworth, 2003), rates of gang membership (Tita & Ridgeway, 2007), population density (Pyrooz, 2012), and population heterogeneity (Mares, 2010), among others. Importantly, the causal pathway through which these, and various other neighborhood level factors increase the risk of both gang crime and gang membership is multifactorial and complex with a number of theories being

espoused to explain this association. One prominent spatial theory that has been commonly used to explain gang membership and gang crime at the neighborhood level is the social disorganization (SD) theory of Shaw and McKay (1942). The SD theory posits that various macro-structural constructs such as poverty and neighborhood instability can explain increases in crime and delinquency experienced in neighborhoods. With particular reference to gangs, the social disorganization perspective argues that spatial risk factors such as poverty creates a breakdown of informal social controls resulting in a social reorganization, of which gangs are a product (Pyrooz et al., 2010). Previous research in the US has found the SD theory to adequately explain the prevalence of gang crime and gang membership in a variety of contexts (see Curry & Spengel, 1988; Mares, 2010; Pyrooz et al., 2010; Tita et al., 2005) although the theoretical linkage between the various social disorganization constructs and gang membership and gang crime has been found to be mediated by both formal and informal social control (Papachristos & Kirk, 2006; Merrin et al., 2015).

While a number of studies have enhanced our understanding of the underlying socio-economic and demographic factors commonly associated with gang membership and gang crime in the US, their generalizability to other contexts is unknown. In fact, we are unaware of any study investigating the spatial correlates of gang membership and gang crime outside the US. Moreover, the above-mentioned studies have most often been limited to a single city in the US or a collection of cities which limits generalizability and comparability. Inconsistencies in data (gang) recording, reporting, and capturing between cities and states may also occur. In contrast, in this study we examine the neighborhood predictors of gang membership and gang crime at a national level and in a setting axiomatically different to the US, namely New Zealand. The main aim of this research is to understand those features of neighborhoods that either facilitate the

formation of gangs or predict gang crime in communities. This is especially important in a New Zealand context given the high rates of gang activity in the country and its growing prevalence.

A brief history of gangs of New Zealand

New Zealand has a long history of gang⁴ activity. A chapter of Hells Angels was established in Auckland in 1960, becoming just the fourth chapter of the group anywhere in the world and the first chapter created outside California (Newbold, 1992). The creation of that initial chapter coupled with growing international migration during the 1960s saw the beginning of a chain reaction in the country leading to the development of numerous local and informal ‘milk bar cowboy’ groups mimicking the lead provided by the Hells Angels. These informal groups slowly transitioned and morphed into outlaw motorcycle gangs which subsequently proliferated throughout the 1960s resulting in the fact that by the end of the decade all of the main urban centres in New Zealand had at least one established gang chapter of some variation.

In the 1970s, gang concerns in New Zealand shifted. First, out of the ‘bodgie’ youth movements, a new type of street gang formed. These street gangs adopted the formal structures and appearance of the Hells Angels; most obviously the backpatch but did not ride motorcycles. Its members were also predominantly made up of Māori rather than whites. The wholesale adoption of backpatches made the gang scene in New Zealand unique as patches meant that the gangs had an obvious and visible presence in the country. Economic restructuring in the 1980s created significant unemployment in New Zealand and Māori were disproportionately affected (Boston et al., 1999; Kelsey, 1993). With the jobs being an important component of maturing out of gang membership during this time (Moore, 1991), the average age of gang membership began to increase (Committee of Inquiry into Violence, 1987) mirroring trends in other parts of the world (Jankowski, 1991; Klein, 1995). As a result the presence of gangs, particularly in lower

socioeconomic neighborhoods and small towns throughout the country, became increasingly permanent.

By the 1990s, gangs had become quasi-community institutions in New Zealand and were deeply embedded in certain neighborhoods, again mirroring trends in the US (see Fagan, 1996; Hagedorn, 2007). Geographical areas, particularly in lower socio-economic neighborhoods, were increasingly defined by different colors; notably the colors red or blue that reflected either the Mongrel Mob or Black Power, respectively. Individuals with affiliations to one gang largely stayed out of the areas of the other. Adding to this mix was a dramatic rise in the 1990s of white supremacist or skinhead gangs, who were responsible for a number of high profile violent incidents including race-related murders (Newbold, 2016). The skinhead gang phenomenon was largely confined to the South Island of the country, where Pakeha (white New Zealanders) are demographically dominant. In the more multicultural urban centres in the North Island such gangs failed to gain traction and were most often reined in by ‘street justice’ (see Gilbert, 2013 for specific examples).

By the early 2000s, gangs were considered organized crime groups and became increasingly focused on manufacturing and distributing methamphetamine. Overt gang violence and turf warfare generally decreased as it was counterproductive to the enrichment brought about by the drug trade. During this time patched gangs failed to rejuvenate with young members and were most often shrinking in membership (Gilbert, 2013). More recently, however, patched gangs have surged back into vogue with new patched gangs being establishing and numbers in many existing gangs surging (see Elers, 2019). The growth in gang numbers, and the entry of criminally successful Australian gang members into New Zealand since 2015, has upset the balances of power in many areas⁵. For example, new gangs have been involved in violent

territorial disputes in Tauranga and Christchurch (South Island), while in the Hawkes Bay (North Island) old rivalries between the Mongrel Mob and Black Power have been reignited. Currently gang geography in New Zealand is topical with increasing investigations on their growing presence and popularity both in the media (Bradley, 2020; Elers, 2019) and in other scholarly work (Gilbert & Martin, 2019).

The spatial risk factors impacting gang membership and gang crime (both past and present) in New Zealand are largely unknown however anecdotal evidence suggests that gangs have been found to be located in more socially disorganized neighborhoods (Bradley, 2020; Nakhid, 2012). The New Zealand Ministry of Social Development (2006) also noted that the presence of gangs appeared to be related to economic deprivation with gangs more likely to grow in depressed or disorganized communities lacking a sense of pride.

It is within this context that the current study aims to make a contribution. In particular, we aim to identify, for the first time ever, the spatial predictive factors for gang membership and gang crime throughout the country. The study aims to not only demonstrate the applicability of certain elements of well-known environmental criminological theory to contemporary New Zealand, but also reveal important differences in the ecological dynamics of gangs across differing cultural and ethnic contexts.

Methods

Gang membership data

Data on gang members used in this study was obtained from the National Gang List (NGL) of the New Zealand Police. The NGL is maintained by the Gang Intelligence Centre (GIC) and is a list of individuals confirmed to be gang members or associates⁶. The NGL list is updated continuously using various intelligence sources available to New Zealand Police. A multi-step

verification process is used to verify gang membership information. First, when police identify an individual as a possible gang member or associate, they create a notification in the National Intelligence Application (NIA) crime database. The NIA database contains information about crimes reported to and investigated by New Zealand Police, the individuals involved, and information about those individuals such as physical addresses and demographic details. Second, this information is then passed on to the GIC who then seeks information to verify gang membership/association. The information sources used for verification include confirmatory photos or direct reporting to New Zealand Police staff by senior members or presidents of chapters (for example, a president might list the members of his chapter, usually cooperatively to help manage or explain behavior of members, or to assist with prevention of inter-gang conflict). In accordance with the relevant legislation (Prohibition of Insignia Act of 2013), gang association is positively verified by the wearing of gang colors or paraphernalia. Usually this involves a leather vest and gang patch or displaying gang membership via a tattoo. Merely wearing supporter gear is insufficient (for example, t-shirts, beanies, or hats), unless the gang is known to not wear patches. The verification process also includes ensuring accurate demographic information is recorded for each individual, including date of birth, name, and surname.

The NGL data used in this research was accurate as at 22 January 2019 and contained 6336 gang members. The data included the gang members' person identification number to enable cross-referencing with NIA and the name of the gang to which they were affiliated. The 'current primary addresses' (i.e., most recent home address known to New Zealand Police) of gang members were extracted from NIA. Prison addresses were excluded as the research questions were focused on predicting neighborhood gang presence. Where the address was identified as a

prison, a pre-imprisonment address was identified through manual searches in NIA. If there was no pre-imprisonment address available, the gang member was excluded from the analysis. Addresses entered as 'no fixed abode' were also excluded. The final sample included 6097 gang member addresses.

The physical addresses of the 6097 known gang members were subsequently mapped to Census Area Units (CAUs) to provide a count of gang addresses per CAU. CAUs approximate neighborhoods in New Zealand and have residential populations of roughly 3000 to 5000. The gang membership (dependent) variable is expressed as a rate of gang members per 1,000 residential population per CAU. There were a total of 2004 CAUs covering the whole country, but 155 neighborhoods had a low number of residents (<50) and these were excluded in the analysis. Statistics New Zealand prohibits the dissemination of census data in CAUs with low population numbers. No gang members were located in these 155 neighborhoods.

Gang crime data

The data on gang crime used in this study was obtained from the NIA crime database of New Zealand Police. All criminal offenses occurring⁷ between 1 January 2015 and 31 December 2017 (three calendar years), to which the gang members were linked as individuals engaged in criminal behavior were extracted from NIA and used in the analysis. Offender links can only be entered when the police have sufficient evidence to charge or otherwise proceed against an individual (e.g., by way of a written or verbal warning). Given that the data were extracted from a live database, they represent the status of the case as at the time of data extraction; offenses where later information comes to light to identify or confirm an individual engaged in criminal behavior will naturally be absent from the dataset, as would offenses which have not come to the

attention of the police. For the same reasons as for the gang member address data, offenses identified as occurring in prisons were removed.

Several categories of offenses were excluded as offense locations are more reflective of police activity than of the true spatial distribution of offending. For example, illicit drug and weapons offenses are often located at police stations as drugs are found during searches as part of processing individuals taken into custody; public order and traffic offenses, and offenses against justice (e.g. bail breaches) tend to be discovered during proactive police patrols, rather than reported to police by the public. Offenses involving multiple gang members and offenses involving multiple crimes, such as a robbery in conjunction with an assault, are only counted as one offense. Importantly, in our analysis we aggregated all gang crime data. The New Zealand Police typically group any crime committed in the country into four broad categories: dishonesty; drugs and anti-social; property damage; and violence. We used gang crime data from all these categories as our measure of gang crime (excluding the specific crime types described above). As a first empirical attempt to identify spatial risk factors for gangs in general in the country we felt an aggregated gang crime measure would be most appropriate. The final sample included 10,797 gang crime offenses over the three-year study period. The physical addresses of the gang crime offenses were subsequently mapped to CAUs. The gang crime variable is expressed as a rate of gang crime per 1000 residential population per CAU⁸.

Census data

Nine neighborhood-level variables were created and/or extracted from Statistics New Zealand census data of 2013 to understand the underlying factors associated with gang membership, and gang crime in New Zealand⁹. The variables selected are loosely informed by the social disorganization theory although we emphasize that this study is not an empirical test of this

framework necessarily. Rather the emphasis here is on selecting theoretically specified variables which have been found to be associated with increased gang membership or gang crime elsewhere as well as to test their applicability in a New Zealand context.

All variables were calculated at the CAU level of aggregation and included two measures of neighborhood socio-economic deprivation: NZDep and the percentage unemployed. The former is a composite score calculated by Statistics New Zealand as a means of describing deprivation within an administrative area. The score combines nine variables from the New Zealand census which reflect eight dimensions of deprivation including Access to Transport and Communication Services, Home Characteristics, and Education - the higher the score the higher the deprivation¹⁰. We used raw NZDep scores where higher scores indicate greater deprivation. Deprivation has generally found to be positively associated with gang concentration in a neighborhood (see Katz & Schnebly, 2011; Pyrooz et al., 2010) while the percent unemployed is a universal indicator of neighborhood level affluence previously shown to be associated with gang crime rates internationally (see Bellair & McNulty, 2009; Papachristos & Kirk, 2006).

The percentage of residents who moved home location in the last five years and the percentage of residents who are renting were selected as a measure of residential mobility. While residential mobility has traditionally been associated with increased social disorganization in neighborhoods (see Bernasco & Nieuwbeerta, 2005) researchers note that residential instability may be substantially less influential for crime that stems from the maintenance of social hierarchies, such gang crime (Kubrin & Wadsworth, 2003).

We included three measures of racial/ethnic heterogeneity: first, a Diversity Index (DI; see Meyer & McIntosh, 1992) was calculated as the probability that any two people chosen at random from a given CAU are of different races or ethnicities. It is measured on a scale of 0 to

100, with 0 indicating that a CAU is totally homogeneous and 100 stating a CAU is totally heterogeneous. The greater the DI score, the greater the probability of randomly selecting two people with different ethnic characteristics. The DI is frequently employed in population studies (see Johnson & Lichter, 2010; Tam & Bassett Jr, 2004) and is calculated as:

$$\text{Diversity Index} = 1 - (E^2 + M^2 + A^2 + P^2 + MELAA^2)$$

Where E is the proportion European, M is the proportion Māori, A is the proportion Asian, P is the proportion Pacific people, and MELAA is the proportion MiddleEastern/LatinAmerican/African populations. The value of the index after this initial calculation ranged from 0 (when the neighborhood consists of a single racial group) to .80 when the neighborhood has equal proportion among the five groups. In the final calculation we normalized the index (using .80 as the normalization factor) so that it ranged between 0 and 1. The closer the value is to 1, the more diverse the neighborhood. The DI was then multiplied by 100 in order to deal in whole numbers (ranging from 0 to 100), rather than decimals. Second, a more simplistic measure of heterogeneity was calculated as the percentage of residents that were born outside New Zealand. A third, and final measure was an Index of Concentration at the Extremes (ICE; Massey, 2001) which measures income inequality within neighborhoods. The ICE is calculated using the following formula:

$$[(\text{number of affluent households} - \text{number of poor households}) / \text{total number of households}]$$

Where 'affluent' is defined as households with income above NZ\$100,000 and 'poor' is defined as households below NZ\$30,000 per year. The ICE ranges from a theoretical value of -1 (which represents extreme poverty, namely, that all households are poor) to +1 (which signals extreme affluence, namely, that all households are affluent).

Finally, the percentage male, and the percentage of individuals aged between 15 and 29 years were included as these sub-populations have both found to be targeted by gangs for recruitment both internationally (Decker & Van Winkle, 1996; Windle & Briggs, 2015) and in New Zealand (Ministry of Social Development, 2006). We are unaware of any macro-level studies that have specifically examined the impact that these two socio-demographic variables may have on neighborhood-level rates of gang membership and gang crime. The descriptive statistics for the dependent and independent variables used in the analysis are presented in Table 1.

Table 1: Descriptive statistics

	Min	Mean	Max	SD	Moran's I
<i>Dependent variables</i>					
Gang membership rate (per 1000 population)	0	1.12	39.68	3.18	.196**
Gang crime rate (per 1000 population)	0	6.94	433.33	21.54	.092**
<i>Independent variables</i>					
% Unemployed	0	4.29	17.36	2.35	.336**
NZDep	850	995.07	1350	78.57	.281**
% Resided for less than five years	15.79	47.15	96.51	9.08	.249**
% Renting	0	31.74	95.35	13.29	.247**
Index of Concentration of the Extremes (ICE)	-.44	.08	.85	.18	.403**
Diversity Index (DI)	0	38.13	76.39	16.42	.564**
% Foreign born	0	19.7	68.08	11.38	.746**
% Males	38.94	49.05	71.26	2.75	.138**
% Aged 15-29	3.85	18.49	95.51	7.52	.329**

The correlations between the independent variables shown in Table 2 did not exhibit any surprising relationships, with the highest correlations involving unemployment and the NZDep variables ($r = .81$; p value $< .001$). Rather predictably the percentage of residents that had moved over the last five years exhibited a positive relationship with the other measure of residential mobility, percent renting ($r = .51$; p value $< .001$). These were standard relationships given that recent immigrants were likely to be more mobile and were less likely to own property. Also particularly noteworthy were the positive correlations between the percentage youth and various

Table 2: Correlations for the independent variables

	x1	x2	x3	x4	x5	x6	x7	x8	x9
x1: % Unemployed	1								
x2: NZDep	.81	1							
x3: % Males	-.15	-.12	1						
x4: % Aged 15-29	.40	.25	.03	1					
x5: % Resided for less than five years	.07	-.00	-.07	.59	1				
x6: % Renting	.53	.60	.02	.68	.51	1			
x7: Index of Concentration of the Extremes (ICE)	-.35	-.65	.01	.02	.09	-.32	1		
x8: Diversity Index (DI)	.67	.58	-.16	.48	.25	.58	-.15	1	
x9: % Foreign born	.11	-.13	-.15	.39	.42	.24	.41	.43	1

measures of mobility as well as diversity. Whilst a number of these correlations are high and posed the risk of collinearity, only one of the correlation coefficients were greater than .80 - a common threshold for concern - while all variance inflation factors were below 4.

Estimation

We adopted an exploratory approach in our analysis procedure. As a result no hypotheses were tested per se, rather the aim of the analysis was to broaden our search for spatial risk factors for these two phenomena in the country using a seminal spatial theory of crime (the social disorganization theory) as a framework.

Initially an ordinary least squares regression (OLS) model was fitted to the data. An examination of the model diagnostics indicated a number of violations of the assumptions of OLS regression (see Draper & Smith, 1998). Violations of the assumptions of OLS regression are common when modeling spatial data due to the spatial dependence inherent in the data. For a detailed review of these problems, with particular reference to crime data, see Chainey and Ratcliffe (2005). As a result of these violations another type of regression model that incorporates the spatial element was employed, namely spatial regression. Specifically, we used one popular type of spatial regression model, a spatial lag model. The motivation for the use of a spatial lag model over another type of spatial regression model, the spatial error model, was based on the results of the OLS diagnostics (i.e., Lagrange Multiplier tests) which indicated spatial autocorrelation in the dependent variable. A spatial lag model includes a spatially-lagged dependent variable as a predictor in the model. The general functional form of the spatial lag model is:

$$y = \rho W y + X B + \varepsilon$$

where y represents the number of gang members or gang crimes per 1000 population at risk, W_y is the weighted mean of the local values of y in neighboring areas, p is the parameter, X is the set of motivators, B is a vector of coefficients to be estimated and ε is the error term. Spatial autocorrelation is modeled using second-order rook's movement for suburb adjacency definitions in construction of the weights-standardised w_{ij} matrix. Two separate models were run with one using gang membership rate as the dependent variable and the second model using gang crime as the dependent variable (see Table 3).

Table 3: Results of spatial regression analysis

Variable	Model 1: Gang membership	Model 2: Gang crime
Lag	.265 (.033)**	.456 (.030)**
% Unemployed	.014 (.004)**	ns
NZDep	.002 (.000)**	.002 (.000)**
% Resided for less than five years	ns	.006 (.001)**
% Renting	-.002 (.001)*	ns
Index of Concentration of the Extremes (ICE)	.254 (.040)**	ns
Diversity Index (DI)	.001 (.001)**	.005 (.001)**
% Foreign born	-.005 (.001)**	-.008 (.001)**
% Males	ns	ns
% Aged 15-29	ns	ns
Pseudo R^2	.454	.482

Standard errors in parenthesis

* $p < .05$

** $p < .01$

ns – not significant

Results and discussion

Gang membership

Both measures of socio-economic deprivation were found to be significant predictors of gang membership with an increase in unemployment and deprivation positively associated with the presence of gangs at the neighborhood level. This finding is consistent with past international

literature which has investigated macro-level correlates of gang membership (see Pyrooz et al., 2010; Tita et al., 2005). For example Tita et al. (2005) found that increases in neighborhood disadvantage corresponded to greater probabilities of gang members in Pittsburgh, Pennsylvania while Katz and Schnebly (2011) found that neighborhoods with higher levels of economic deprivation and social disadvantage were found to have higher rates of gang members in Meza, Arizona. The fact that gang membership is higher in more deprived communities to some extent reinforces the stigma that is often attached to gangs in New Zealand. That is, less affluent people are seen to be more attracted to the gang lifestyle than those more affluent (Gilbert, 2013). Empirical evidence investigating the deprivation-gang member relationship in New Zealand has however been sorely lacking with researchers reluctant to speculate on a certain income groups being considered more prone to joining a gang. Whilst this reluctance is understandable, an examination of the differences in gang membership by neighborhood income is critical in order for effective geographically targeted interventions to be successful. The fact that there is an association between gang membership and socio-economic deprivation is particularly problematic given the criminological consequences of gang membership. Movement in and out of gangs not only increases members' risk of being both a victim (Decker & Van Winkle, 1996) and perpetrator of crime (Krohn & Thornberry, 2008) but also impacts other life domains such as educational attainment (Pyrooz, 2014b) and physical and mental wellbeing (Corcoran et al., 2005; Gilman et al., 2014). Residing in a less affluent neighborhood in New Zealand already increases the risk of a range of adverse adult functioning outcomes (Crampton & Salmond, 2000; Pearce & Dorling, 2006). The results of this research suggests that exacerbates this association.

One of the variables representing residential mobility – percentage of residents that are renting – was significant in the model, but negative. This result suggests that gangs are more

present in neighborhoods with greater residential stability in New Zealand. Whilst surprising, this finding is supported internationally by Katz and Schnebly (2011) and Kubrin and Wadsworth (2003) who also found that neighborhoods with higher residential stability had higher rates of gang members. Researchers argue that may be because high levels of instability may actually decrease reputation-based crime (like gang violence) by inhibiting the development of entrenched social hierarchies. Both income inequality and diversity were found to be positively and significantly related to gang membership in a neighborhood. Neighborhoods with higher income inequality and greater diversity had higher gang membership. Regarding inequality, a study of gang-joining by Barrett and colleagues (2013) found that gang joining among immigrant youth was related to external structure factors such as income inequality and discrimination rather than internal adaptive factors. The researchers concluded that that structural adaptation plays a role in the perpetuation of gangs, particularly in underclass communities. In New Zealand income imbalances widened faster in the 1980s and 1990s than in any other developed nation, with the wealthiest tenth now owning more than half of all wealth in the country (Rashbrooke, 2015). Likewise gangs in New Zealand have also increased in numbers and type since the 1970s (Gilbert, 2013). The results of our research suggest that this growing inequality could, in part, be used to explain the growing gang membership in communities too.

The percentage of foreign-born residents in the neighborhood was negatively associated with gang membership while the Diversity Index was positively associated. Importantly, these two predictors measure different constructs: the Diversity Index provides an indication of the ethnic/racial variation among neighborhood residents without considering their country of birth, while the percentage foreign born provides an indication of differences in citizenship within neighborhoods. From a purely geographical perspective, these results provide the first empirical

indications that the ethnic/racial ‘differentness’ in neighborhoods is relevant to understanding gang membership in New Zealand. From a diversity perspective it could be that increased neighborhood diversity increases social isolation thereby restricting supportive social ties and networks that can protect against gang membership. Previous research has shown how inter-racial trust, trust of neighbors, and even trust of one’s own racial group is lower in more ethnically diverse neighborhoods (see Putnam, 2007).

Explanations for the paradoxical finding of a negative association between the percentage of the neighborhood that is foreign born and gang membership are speculative but it could be related to the demographic composition of New Zealand. Over a quarter of all residents of New Zealand are foreign born (Statistics New Zealand, 2013) with the country ranked 4th among the Organisation for Economic Co-operation and Development (OECD) countries for percent foreign born population (OECD, 2018). In the criminological literature, percent foreign born is most often used as an indicator of racial/ethnic heterogeneity, in turn a proxy for social disorganization and an increased propensity for crime. In a New Zealand context however, this measure may not adequately capture racial/ethnic heterogeneity and could instead measure the degree of social cohesion and collective efficacy commonly found among immigrant communities, particularly in Australasia (see Markus, 2015). These levels of social cohesion and collective efficacy have previously been found to act as protective factors for gang membership international studies (see Papachristos & Kirk, 2006; Tita et al., 2005). Finally, no significant association was found between the percent male and the percent youth, and gang membership. Although somewhat contrary to our expectations, past research has also found age to be unrelated to gang membership (Nuño & Katz, 2019). In his book on gangs in New Zealand Gilbert (2013) highlights that gang members in the country are more often older which does

differ from past literature (Goldstein, 1991; Spergel et al., 1994) although, as previously mentioned, the age-profile of gang members in New Zealand is changing. Indeed, the ‘typical’ gang member profile is now difficult to construct with accuracy, making the task of identification and reporting increasingly complicated and laborious.

Finally, it is important to note that while we did find a number of significant associations between certain central tenets of the social disorganization theory and gang membership (i.e., unemployment ($b = 0.014$, $p < 0.001$) and foreign born ($b = -0.005$, $p < 0.001$)) the magnitude of association was, in most instances, small. For example, an increase of one percent in unemployment will only increase the rate of gang membership rate by 0.014 per 1000 residents. The average gang membership rate is 1.12 per 1000 residents, so an increase of one percent in unemployment increases the average gang membership rate to 1.134. This 0.014 increase in the gang membership rate translates into an increase of only 0.032 gang members based on an average of 2293 people per neighborhood in New Zealand. Similarly, an increase of one percent in foreign born residents will only decrease the rate of gang membership rate by 0.005 per 1000 residents. The average gang membership rate is 1.12 per 1000 residents, so an increase of one percent in foreign born decreases the average gang membership rate to 1.115, translating into a decrease of only 0.011 gang members based on an average of 2293 people per neighborhood.

Gang crime

Only one measure of socio-economic deprivation - NZDep - was found to be a significant predictor of gang crime with an increase in deprivation positively associated with neighborhood-level gang crime. While deprivation has previously been found to be associated with crime in general in New Zealand (see Breetzke, 2020) this is the first time that an empirical link has been identified with gang crime. In past studies using the social disorganization as a guiding

framework, the socioeconomic deprivation measure has generally been the strongest predictor of criminal activity (Andresen, 2006; Freisthler, 2004). While this has most often also been the case with gang crime (Short & Strodbeck, 1965; Valasik et al., 2017), some researchers emphasize the importance of collective efficacy in mediating the structural effects of neighborhood disadvantage on gang crime rates (see Papachristos & Kirk, 2006). That is, if neighbors are able to activate social control, social cohesion, and trust within communities, the impact of concentrated disadvantage measures such as deprivation and unemployment on gang-crime is diminished. An important related issue in this discussion pertains to the reciprocal, and often complex, effects of crime on deprivation (see Cantor & Land, 1985). Indeed, just as deprivation may lead to gang crime, it could be that gang crime may lead to increased deprivation (Gilbert, 2013). The plausible reciprocal effects between deprivation and gang crime illustrate the importance of addressing both these measures in the country.

Unlike gang membership, a positive and significant association was found between the percent resided for less than five years and gang crime. This indicates that more mobile neighborhoods are at an increased risk of gang crime. The past twenty years in New Zealand have been characterized by a seemingly inexorable rise in urbanization. Residents have increasingly migrating to urban centres as a result of the greater growth and higher value of services and goods offered in these areas as well as the possibility of higher incomes, and improved health and quality of life. Not only has this trend placed tremendous strain on natural resources, the built environment, and social services in urban areas but this study has indicated how this increased mobility has increased the risk of gang crime. The significance of this measure of residential mobility in this study appeared therefore to once again be a localized reflection of current socio-spatial inequalities. Finally, the strength and direction of association

between the Diversity Index and the percent foreign born and gang crime are consistent with those found with gang membership. In both instances diversity is positively related, and percent foreign born negatively related to measures. Recall that the Diversity Index does not consider residents' country of birth, while the percentage foreign born provides an indication of differences in citizenship within neighborhoods, and that it is expected that greater heterogeneity of ethnic groups increases the difficulty in the maintenance of informal neighborhood social control, thus leading to greater levels of gang crime. In this study however, empirical results point to the opposite. Moreover, in both models the spatial dependence variable was significant which indicates the importance of spatial effects, a consideration often ignored in previous studies of gang membership and gang crime. Overall marginal support was found for the use of social disorganization constructs to explain gang membership and gang crime in New Zealand. The positive association of gang membership and gang crime rate with certain measures of socioeconomic deprivation, and heterogeneity did lend some support for the theory; however there were a number of non-significant and unexpected findings as well.

Again, despite a number of significant findings for gang crime, the effect sizes were minimal. For example, an increase of one percent in the percent residing in a neighborhood for less than five years ($b = 0.006$, $p < 0.001$) will only increase the rate of gang crime by 0.006 per 1000 residents. The average gang crime rate is 6.94 per 1000 residents, so an increase of one percent in the percent residing in a neighborhood for less than five years increases the average gang crime rate to 6.946. The 0.006 increase in the gang crime rate translates into an increase of only 0.014 gang crimes based on an average of 2293 people per neighborhood in New Zealand. Similar small effect sizes were found for the other four significant variables with the notable

exception of the spatial lag variable. The larger effect size for the lag variable does, however, suggest the spatial dependencies that exist and significantly impact gang crime in New Zealand.

Of course our study is not without other limitations, particularly pertaining to the data and methods used. First, the gang data derived from the NGL and NIA databases are continuously updated; the data are therefore a snapshot in time, reflecting police records at that particular point in time and do not indicate any longitudinal trends with respect to spatial risk factors. Second, the data were collected for operational not research purposes and are therefore subject to human error in entering data. However, care is taken with the NGL in particular to ensure records are accurate and up to date. Third, as previously noted, we aggregated gang crime data rather than examine the spatial risk factors for different types of gang crime. We are aware of the dangers of aggregating crime across various types (see Andresen & Linning, 2012), however, we were interested in identifying spatial risk factors in neighborhoods throughout New Zealand in relation to all gang crime and we were also keen to improve the statistical power of the regression models. Moreover, due to the relative sparseness of gang crimes within certain categories (i.e., homicide) we thought it best to aggregate all gang crime. It is possible that the use of aggregate crime rather than specific crime types has masked variation in the geographic distribution of specific crimes and thus of spatial relationships between specific types of gang crime and social disorganization variables. Future research could consider disaggregate gang crime categories if larger datasets permit. Notwithstanding these limitations, the study has a range of theoretical and practical implications.

Theoretical and practical implications

From a theoretical perspective there are a number of implications. First, the empirical evidence suggests that certain socio-demographic factors such as deprivation, and racial/ethnic diversity

are the main spatial drivers of gangs and gang crime in New Zealand. This largely supports the social disorganization theory. The fact that some results of this study are supported by established spatial crime theories is important as it allows relevant role-players that deal with gang suppression and mitigation in New Zealand to prescribe policies accordingly to reduce risk. A number of crime prevention strategies employed commonly worldwide are based on existing crime theory (Akers, 1973; Jeffery, 1971; Wilson & Kelling, 1982), New Zealand could potentially follow suit. Second, the identification of spatial risk factors for gangs and gang crime in New Zealand gives the country and its researchers some measure of credibility internationally. The vast majority of existing research in the geography of gangs and gang crime has been carried out in the US; studies in other parts of the globe are extremely rare. Incorporating the results of this research allows for a greater understanding of the generalizability of international spatial crime theories to areas with markedly different cultural perspectives and ethnocentricities. Finally, it is noticeable that few, if any, previous international studies have identified spatial protective factors for gangs and gang crime and/or factors that drive resilience to the influence of gangs at the neighborhood level. We believe that this is a potential avenue for future research focussing not only on the socio-demographics of the neighborhood but the underlying built environment as well.

From a practical perspective the identification of spatial risk factors for gangs and gang crime in New Zealand can assist in the prescribing of policies that work to address this problem. Reactively, the focus of gang policy in New Zealand should be on detecting and managing risk. This includes the identification of so-called ‘high-risk’ neighborhoods; that is, neighborhoods which contain the most gang crime; as well as neighborhoods from which the greatest number of gang members emanate. Operationally, policing agencies could implement interventions in

neighborhoods which not only exhibit the ‘most gang crime’ or where the ‘most gang members live’ but where the *risk* of gang crime occurring or gang members residing is high. From a proactive and primary crime prevention perspective, policy makers, intervention developers, funders, researchers, and other interested role-players can direct much needed early intervention programmes and strategies to neighborhoods of greatest concern. Again, these interventions would be geographically-targeted; and efforts would focus on high-risk locations (which are largely known) and focus on addressing spatial risk factors for gangs and gang crime (which are also largely known) in order for gang activity in general to be measurably reduced. A number of similar strategic interventions have been undertaken, particularly in the US, to tackle gang-based violence with some success, notably the Boston Gun Project in the late 1990s (see Braga et al., 2001). Part of the project, colloquially known as the ‘pulling lever’ strategy, involved deterring violent behavior by gang offenders by reaching out directly to gangs, and indicating that violence would no longer be tolerated, and that law enforcement agencies would ‘pull every lever’ legally available if violence occurred (Kennedy, 1998).

Conclusion

In their review of the current state of gang research Decker et al. (2013) highlight a number of ways in which macro-level gang research can ‘move forward’. Among those identified were to increasingly apply macro-level theory – such as the social disorganization theory - to patterns of gang activity as well as the need for researchers to identify macro-level correlates of gang activity in contexts outside the US. In this exploratory research we have taken up this challenge and advanced current understanding of gang activity in a number of ways. First, this study has highlighted a number of spatial risk factors for gang membership and gang crime in New Zealand. While this may be considered a rather trivial finding to international gang scholars, the

fact that this study is the first of its kind in the country, and indeed the Pacific region as a whole, makes it highly significant and meaningful. Second, we have examined both gang membership and gang crime in a context outside the US and identified a number of similarities and differences from past work. A number of unique macro-level correlates for both gang membership and gang crime were identified which provide vital insight into this growing concern in the country. Third, we have investigated these phenomenon at a national level. To our knowledge this is the first ever study to do so. This is important as results from a national study can allow policy-makers to devise large-scale uniform interventions aimed at preventing, intervening, and suppressing gang activity in the country. Finally, the results of research provide academic credibility to the range of existing gang research that have identified a number of variables that increase the risk of gang activity. It is anticipated that the results of this study can pave the way for further research examining how various neighborhood-level demographic and socio-economic indicators predict (or prevent) gang behaviors and activity in the future.

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Notes

1. The National Gang List (NGL) is a list of individuals confirmed to be gang members or associates by New Zealand Police. These individuals are referred to herein for convenience purposes as gang members, although level of membership (e.g., patched, 'prospects') varies. The number reported here is accurate as of 22 January 2019.
2. Gaining accurate estimates of the number of gang members throughout the United States (US) is problematic as the Department of Justice ended funding for the only validated national data source on gang activity in the country, the National Youth Gang Survey, in 2012. However trends from this archived database and other anecdotal evidence (see Axelrod, 2015; Ladd, 2018) suggests an increase in gang numbers throughout the US.
3. The reported increase in gang members during this time period may also be the result of a change in reporting and recording practices employed by the GIC
4. A New Zealand Adult Gang or Youth Gang is an organization, association, or group with a common name, one or more common identifiers, and whose members or associates either individually or collectively promote, encourage, or engage in criminal activity that is driver by a desire for profit and/or to create an atmosphere of fear and intimidation, all of which are enabled by virtue of membership in the gang.
5. The deportation of gang members from Australia to New Zealand from 2015 under new anti-biker gangs laws introduced in Australia have acted as a catalyst and exciter for gang activity in the country.
6. We are aware of the numerous problems inherent in compiling gang databases (outlined by Densley & Pyrooz, 2020), however the data available to us is the most spatially

replete database with which to conduct analysis and draw inferences. The process described is accurate as at the date of data extraction.

7. Where offenses were entered as occurring over a time range, due to the specific offense time/date not being known, the 'start date' was used.
8. The use of residential population as the denominator to determine the gang crime rate in this study could be brought into question. Other denominators may be more appropriate for certain crime categories. For example, a more appropriate denominator for vehicular theft could be the number of vehicles per CAU. Given we aggregate a range of crime types, however, using denominators specific to crime types was not feasible. The use of residential population as a denominator also enables comparison with other studies which use residential population based rates.
9. The most recent census in New Zealand was held in 2018 however the accuracy and reliability of the results of this census is open to debate (see Smith, 2018). This is largely due to the failure of the 'digital first' strategy adopted by Statistics New Zealand in which the organization attempted to undertake the census almost exclusively online.
10. The New Zealand Index of Deprivation comprises of nine weighted demographic measures of material deprivation. These include (1) people with no access to a telephone or (2) motor vehicle, (3) people with no qualifications, (4) people living in a single parent family, (5) people not living in own home, (6) people living in households below an equalized bedroom occupancy threshold, (7) people receiving a means-tested benefit, (8) people unemployed and (9) people with equalized income below an income threshold.