**Can the contradictory effects of contact be reconciled? A study of the non-additive nature of interpersonal and frontier contact.**

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Currently 308 words over limit (n=2308) for into and conclusion combined. I’m sure we can reduce these with careful edit.

The ability of intergroup contact to reduce prejudice must surely list among the most robust effects in social psychology. Numerous studies have shown that cross-group interpersonal contacts and friendships reduce intergroup conflict, threat and prejudice, and promote trust (Pettigrew & Tropp, 2006; Davies et al., 2011). It is not surprising therefore that contact has been the mainstay of social change interventions promoted by social psychologists (Pettigrew & Tropp, 2011). This work relies on a model of change in which the positive effects of contact with particular outgroup members under specific circumstances is generalized to the outgroup as a whole – and may even improve attitudes towards other outgroups. During the past two decades a great deal of research has provided support for the generalized prejudice reduction model of contact interventions. In particular, we have learned that positive attitudes are more likely to generalize to the outgroup as a whole when intergroup contact occurs under conditions where both ingroup and outgroup identities are kept salient, and that social change interventions should therefore promote category salience rather than decategorization or common ingroup identification (Pettigrew & Tropp, 2011).

However, many question still remain about the ability of contact effects to spread to different situations of intergroup contact. If contact reduces prejudice among a mixed group of friends, will non-prejudiced attitudes also be evident in a conflict situation with outgroup acquaintances at the workplace, with troublesome neighbours, or with strangers in public debate? We don’t fully understand the power of prejudice reduction to generalize across different situations because researchers have primarily focused on positive contact in favourable situations (Dixon, Durrheim & Tredoux, 2005). Contact researchers have long recognised that contact under unfavourable conditions can produce undesirable effects (Allport, 1954), and it is for this reason that they have typically studied the effects of equal status, cooperative and intimate contact. This focus is conveniently operationalized in intergroup friendship, which has been shown to have a range of positive outcomes, including intergroup trust, prejudice and anxiety reduction, and a differentiated view of outgroups (Davies et al., 2011). As a consequence of this focus on friendship and optimal contact “the knowledge gained from past contact research is limited by its primary emphasis on positive features of the contact situation” (Pettigrew & Tropp, 2006, p. 767).

A number of avenues of research have explored the negative effects of intergroup contact, and have raised questions about the merits of contact-based change intervention. The negative effects of contact were thrown it sharp relief by Forbes’ (2004) observation that the conflict hotspots are precisely those parts of the world where “different racial and ethnic groups are in the most frequent contact” (p. 71). A substantial body of research in North America, Europe and South Africa supports the argument that regional diversity can promote intergroup conflict, threat and prejudice, and undermines trust (e.g., Durrheim & Dixon, 2010; Fossett & Kiecolt, 1989; Quilian, 1995; Taylor, 1998). A second body of literature suggests that prejudice reduction produced in contact interventions may not generalize to real world situations of conflict. Although the evidence is not conclusive (Paluck & Green, 2009), there are strong suggestions that the salutatory effects quickly dissipate when individuals return to conflict situations such as in Palestine (Hammack, 2011; Maoz, 2012). Finally, research on white flight and the resegregation of neighborhoods and schools suggests that whites are often prepared to accommodate a small minority of minority members, but will leave once the proportion of minority neighbors passes a tipping point or they imagine large scale future influx of minorities (Crowder, 2000; Charles, 2000; Fairlie & Resch, 2002).

The “paradox” or “contradiction” between the two bodies of evidence is about the effects of contact is intriguing. One literature repeatedly shows that contact reduces prejudice while the other shows that contact produces conflict. This raises interesting questions about how these two countervailing effects are managed in practice. The contradictory effects of contact limits the generalizability of contact theory for as much as the desirable effects of optimal contact may or may not spread to non-optimal contact situations, so too, the undesirable effects of non-optimal contact may infect friendship and other optimal contact. So the question about whether the contradictory effects can be reconciled is an important one for researchers that hope to promote social change.

These questions have been investigated recently in two ways. A handful of studies have used multi-level modelling to investigate how the contradictory effects observed by sociologists studying regional diversity and psychologists studying interpersonal contact operate alongside each other (Christ et al. 2014; Dixon, 2006; Stolle et al., 2008). Stolle et al. (2008) and Dixon (2006) found that the contradictory effects operated simultaneously. White Americans who live in close proximity to African Americans are less trusting and more threatened by their neighbours, but interpersonal friendships in such contexts ameliorated these effects. Although Christ et al. (2014) found that the individual and group level effects operated in the same direction and supported each other, they did not directly measure regional diversity. However, multi-level modelling may not be the best way to investigate contradictory effects of contact because diversity at an aggregate level does not necessary mean the groups are in actual contact: “macrolevel diversity should not be equated with actual intergroup contact” (Christ et al., 2014, p. 4). It is possible to live together apart, adopting practices of segregation that reduce contact to a minimum (Tredoux & Dixon, 2009).

Another recent body of work has separated out the negative from the positive valence of contact, and has sought to determine the distinct predictors and effects of each, and how the two affect each other (Paolini, Harwood & Rubin, 2010; Paolini, Harwood, Rubin, Hunsu, Joyce & Hewstone, 2014; Graf, Paolini & Rubin, 2014; Barlow, Paolini, Pedersen, Hornsey, Radke, Harwood, Rubin & Sibley, 2012). This research explains why sites of contact are so often sites of conflict. As they go about their daily lives, people might have both positive and negative contact experiences. However, valence-salience asymmetry makes negative experiences more powerful than positive experiences for resultant intergroup relations. Negative contact experiences have higher category salience and are thus more easily remembered and likely to generalize to new situations than positive contact experiences. As a consequence, as this research shows, “negative contact is disproportionately influential in worsening intergroup relations more than positive contact is in improving them” (Paolini et al., 2014, p. 11).

The multi-level modeling and contact valence research share an assumption in their attempts to reconcile the contradictory effects of contact. Like other researchers in the field, they treat the diverse effects of contact as being additive, and thus as being of a single kind. To illustrate what we mean by this, consider Pettigrew et al. (2011) claim that “contact’s effects are far greater for majorities than for minorities” (p. 278). They assume that the effects of contact are of a single kind, but differ quantitatively between majorities and minorities. Similarly, although the multi-level models typically don’t measure regional level contact, their methods assume that the effects of these two different indices of contact either operate in the same direction, and can be added to each other, or operate in different directions and can be subtracted one from the other. The same is true of contact valence research. However, in contrast to Pettigrew et al.’s (2011) quantitative distinction between contact effects on minorities and majorities, evidence suggests that the effects of contact are qualitatively different for majorities and minorities. Good quality interpersonal contact strengthens social change orientation and associated variables among majorities, but weakens them among minorities (Dixon et al., 2013).

The present study aims to investigate whether the contradictory effects of contact can be reconciled in this manner, using independent measures of two distinct kinds of contact, namely, interpersonal contact and spatial closeness. To this end we surveyed the experiences and opinions of Indian residents of the formal neighborhood of Northdale regarding interpersonal contact with African residents of neighboring informal settlements. We also surveyed the geographic proximity of participants residence form the nearest informal settlement. Northdale was designated an Indian residential area by apartheid legislation in South Africa but the end of apartheid saw the emergence of informal settlements of African shack dwellers on open land in Northdale and surrounds. The non-optimal and conflictual nature of the contact situation has been poignantly highlighted by ongoing conflict between the formal and informal residents over ‘illegal electricity connections’, crime, and falling house prices. Our research sought to understand how the contradictions are reconciled between the prejudice-arousing threats of physical closeness and the prejudice-reducing effects of positive interpersonal contact. Both the positive and negative effects may want to generalize to new situations but are limited by each other. How then is the psychological condition of contradictory effects managed by people? How does it translate into outcomes? When?

In the light of previous findings of the contradictory effects of group and individual level contact, we hypothesized that physical closeness would be associated with higher levels of prejudice, but that positive interpersonal contact would be associated with lower levels of prejudice. We expected that these prejudice effects would be mediated by the same factors, namely, threat, and empathy.

**Method**

**Sample**

We imagined a physical closeness would be experienced by those in the immediate vicinity of the informal settlement as living on or near the frontier, with the threats and possibilities this affords. Accordingly, we subdivided the Northdale population into three strata – immediate neighbours of the Hlalakahle informal settlement, residences in eyeshot of an informal settlement, and the remainder – and we selected a stratified random sample, oversampling households in the two closer strata. We used the last birthday method (O’Rourke & Blair, 1983) to identify individual adult respondents in selected households. The sample consisted of n = 365 self-identified Indian adult South African residents (185 females) whose mean age was 45.43 years (SD = 14.97), ranging from 18 to 84 years. We were unable to contact members of 53 households, who were not at home on 3 occasions. A further 82 eligible people refused to participate in the survey. Together, this gives us a non-response rate of .27. The final sample represents 4.36% of the residential households in Northdale.

**Procedure**

Questionnaires were administered by seven research assistants who were Indian students living in Northdale or surrounding suburbs. They visited selected households, selected individual participants, and administered the questionnaire by asking participants to complete the paper-and-pencil survey themselves. In a small minority of cases where participants were not able to complete questionnaire themselves, the research assistants were instructed to read the questions out aloud while marking participants’ answers in the questionnaire.

**Materials (Colin, please check this closely, making changes to reflect the measure you used)**

The survey consisted of items adapted from measures used in previous research, as well as items designed to capture features specific to the Northdale context. Participants responded on Likert-type scales, with anchors ranging from “strongly disagree” to “strongly agree”, which were reverse scored where necessary. Internal reliability of individual scales was assessed with coefficient omega (Zinbarg, Revelle, Yoval and Li, 2005), or inter-item correlations (for two item scales), and the combined measurement model was assessed as part of the Structural Equation modeling reported later.

*Contact Quantity*. We designed and used two items, which asked respondents to report the amount of contact they had in their day-to-day lives. The inter-item correlation was 0.43

*Contact Quality.* We used three items adapted from Islam and Hewstone’s (1993) Qualitative Aspects of Contact scale (ω = .89): “When I come into contact with people from informal settlements, we generally cooperate well with each other”, “When I come into contact with people from informal settlements, we almost always interact as equals”, and “When I come into contact with people from informal settlements, contact is almost always friendly”.

*Contact Avoidance.* We designed three items to measure the degree to which participants avoided contact with informal settlers (ω = .87): “Do you ever change your routine to avoid contact with informal settlement residents?”, “When walking or driving do you ever go out of your way to avoid areas where you would encounter residents of the informal settlement?”, and “When you are alone do you try to avoid encountering residents of the informal settlement?”.

*Closeness*. We operationalized physical closeness in terms of how close the Indian participants lived to the nearest informal settlement, and their subjective perceptions of closeness and their ability to see, hear and smell their neighbors. We created a composite measure of physical closeness, using the following indicators: (1) Physical closeness, , calculated using Google maps, and scaled to range from 0 to 1; and the visceral experience of closeness indicated by self-reported ability to (2) see, (3) hear, or (4) smell an informal settlement form their house or garden (all coded dichotomously). The summed scale showed satisfactory internal reliability (ω = .79)

*Prejudice*. Prejudice towards people who live in informal settlements was measured by means of a five-item semantic differential scale (Zanna, 1994) on which respondents rated (on 10 point scales) how they felt about members of the outgroup: (1) Negative – Positive, (2) Cold – Warm, (3) Hostile – Friendly, (4) Suspicious – Trusting, (5) Disrespect – Respect. Internal reliability was satisfactory (ω = .81)

*Threat*. We operationalised threat in physical terms, using a 3-item scale adapted from Schmidt et al (1998): (1) I worry about crime committed by informal settlement residents; (2) I worry about being physically attacked by informal settlement residents; (3) I worry about my personal property being damaged by informal settlement residents. The summed scale showed satisfactory internal reliability (ω = .92)

*Empathy*. We used Wang et al.’s (2003) four-item empathic awareness scale: (1) I am aware of how society differentially treats people who live in informal settlements; (2) I recognize that the media often portrays residents of informal settlements negatively, (3) I can see how people who live in informal settlements are systematically oppressed in our society; (4) I am aware of institutional barriers (e.g., restricted access to jobs and healthcare) that discriminate against people who live in informal settlements (ω = .84).

**Results (Colin, this is the old results section, unedited. I leave the redraft to you my bru! Please note that we are pressed for space in the intro and cocnuson, which together cannon exceed 2000 words. So we need to do as much interpretation of the findings as we can here in the results section – the word length of the methods and results section does not factor into the article length limit. )**

Table 1 reports descriptive statistics, and inter-correlations of variables. It is notable that the sample experienced high levels of threat – a mean of 3.15 on a 4 point scale.

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| Insert Table 1 about here |

Not surprisingly, the closer participants lived to an informal settlement, the more threat they experienced (r=.27, p < .0001, 95% CI = .17;.36). The relationship is well illustrated graphically in Figure 1, which shows the geographic distribution of threat in Northdale.[[1]](#endnote-1) The map exposes the frontier, showing that pockets of threat exist in areas in the immediate proximity to or in eyeshot of the informal settlements. It also shows how the physical geography of Northdale affects the experience of threat. Most notably, the lowest levels of threat are experienced by residents living in the regions geographically separated from the informal settlements by streams.

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There is something disconcerting about this negative consequence of closeness. This is because closeness is also presumably required in order that intergroup contact occur, and we know that the effect of contact on intergroup relations is positive. On the other hand, several researchers have pointed out that contact can have negative effects in certain circumstances, and still others who study intergroup encounter in naturalistic settings have shown that groups often avoid coming into contact with each other (see, for instance, Finchilescu & Tredoux, 2007). We therefore postulated a model that has two routes to prejudice, namely one through physical threat and contact avoidance, which are driven in sequence by closeness, and another through frequent intergroup contact that is positive in quality, and which increases empathy, and in turn, reduces prejudice. This model is shown in Figure x, and we tested it with Structural Equation methods, using the ‘lavaan’ package (Rosseel, 2012) in R (R Core Team, 2014). Although Figure x implicitly makes claims about the pattern of direct and indirect effects between the variables in question (e.g. that the effect of closeness on prejudice is indirect, by driving up threat, which in turn leads to contact avoidance), many of these are the outcome of pruning paths from the model on the basis of modelling results. The figure thus embodies the key theoretical assertions of separate paths to prejudice, as well as some post-hoc refinement.

Standard measures of fit were well within conventionally recommended levels (cf. Kline, 2010; RMSEA = .045 (90% CI for RMSEA .035 to .055), CFI = .97, TLI= .96, SRMR = .06), showing good – but not perfect fit to the data (a minimum function χ2 test showed statistically significant deviation from perfect fit; χ2ML= 281.3, df = 180). Detailed parameters of the structural model are shown in Table x, and figure x shows the paths graphically (and attempts to show the strength of the relationships graphically, in terms of line width)

Of course, part of our model generation has been post-hoc in nature, and could be said to capitalize on chance. As a check on this we conducted an internal cross-validation: we randomly split the dataset into equally sized training and testing sets 100 times, and re-ran the SEM on each set, within each iteration. We averaged differences in the fit statistics over the 100 trials, and computed 90% confidence intervals for the individual fit statistics. The absolute mean difference for each of the fit statistics within iterations was smaller than |.002|, showing good agreement between models fit on random splits of the data. In addition, cutpoints defining 90% confidence intervals were never higher than the conventional limits of good fit suggested in Kline (2010). Of course, a more complete check on the validity of our model would be to replicate it with a different sample, but this is beyond our means at present.

Fit statistics for structural equation models are not always sufficiently diagnostic (Kline, 2010), and so we examined standardized residuals and modification indices too. Approximately 10% of the residuals were larger than notional 95% cut points on a cumulative normal distribution, and four fell outside Bonferroni corrected cut points. Four (of 434) modification indices were larger than 10, the notional cut-off in the MPlus modelling program (Muthén & Muthén, 2011), and none higher than 14. Examination of the few high residuals and modification indices suggested correlated error variances of items across scales, and the need perhaps for further refinement of the scales or measurement model, which we did not attempt here.

To further clarify these results we outline the strength and direction of the paths included in the model (see Table x for a full comparative summary of fit statistics and coefficients).

The model confirms a path that reduces nett prejudice, through high quality (, and frequent contact, with members of the outgroup. This is in line with much other work in the area of contact research. However, we should note that in our model this path did not include empathy as a mediator, unlike the work of others (give refs here).

The model also shows a path that increases nett prejudice, through a chain of variables: the closer Indian residents were to the Black informal settlers, the greater the threat they felt, and the more they avoided contact, leading ultimately to increased prejudice. We tested versions of the model which posited direct effects of closeness on prejudice, and of threat on prejudice, but these were not statistically significant, and/or led to worse model fit, and so we pruned them from the model.

The negative and positive paths to prejudice shown in the model appear to reflect largely, but not completely separate processes. Both had some effect on the other: that is, perceived threat reduced reported quality of contact, and likewise, greater perceived quality of contact reduced contact avoidance.

Missing paths: closeness does not generate contact either in quantity or quality.

We must stress that this interpretation is tentative, as cross-sectional SEM models of the kind we report do not warrant causal conclusions.







**Conclusion**

The contact literature has moved on from asking whether contact reduces prejudice. To form the basis of effective interventions we need to understand how the effects of different kinds of contact operate alongside each other. Following research that has explored contradictory effects of regional diversity and interpersonal contact, and positive and negatively valenced interpersonal contacts, we set out to determine whether contradictory effects of contact can be reconciled. Our research has taught us that this might have been the wrong question. The effects might not be able to be reconciled in the sense that the positive and negative effects and simply be added to each other. According to the wisdom of the prejudice reduction models of social change we might be able to get around the problem of negative contact by orchestrating more positive contact, as suggested by Christ, et al., (2014) and (Graf et al., 2014).

In contrast, our data show that different kinds of contact not only have different valence and outcomes, but they follow different paths to and are differentially related to prejudice.

On the one hand, by living on the boundaries between groups, neighbours that could see, smell, and hear the informal settlement experienced a form of contact we designated ‘frontier contact’. frontier contact, living on the boundaries between groups. We get a glimpse of the social psychological experience of frontier contact from the map depicting the geographic distribution of threat across Northdale (Figure 1). Residents living in the immediate physical proximity or in eyeshot of an informal settlement were more likely to feel threatened by the possibility of crime, physical attack and damage to property. On the other hand, those areas of the neighbourhood that were physically separated from informal settlements by streams were far less to experience such threat.

The results of our modelling showed that interpersonal and frontier contact were empirically distinct, and each established different paths with prejudice. Figure 2 shows that frontier contact was not directly correlated with prejudice, but had a powerful effect on prejudice through the mediating variables of threat and contact avoidance. Staying near to an informal settlement promoted threat and a desire to avoid outgroup contacts, which in turn were associated with increased prejudice. It is unlikely that more residents with higher levels of threat and contact avoidance motives chose to live near informal settlements, giving grounds to believe that the effects are in the causal direction depicted by the model.

In direct contrast to these effects and in line with the expectations of contact theory, good quality interpersonal contact was directly associated with reduced prejudice. This effect was equally strong for residents living in the threat regions near to or far away from the informal settlements. In addition for those living far from informal settlements, the prejudice reduction effect of good quality interpersonal contact was attributable to reduce negative emotions. Surprisingly, the reduced threat and increased empathy associated with good quality contact did not translate into reduced prejudice, either among the either sample living close to or far from an informal settlement.

Together, the results paint a picture of complex contradictory experience of intergroup contact. Frontier contact promotes threat, contact avoidance and prejudice, whereas interpersonal contact reduces prejudice. The contradictory effects operate alongside each other, without one effect generalizing to gradually supersede or take over the other. The residents of Northdale manifested a remarkable ability to partition and compartmentalize rather than generalize the contradictory effects. Living near to an informal settlement prompted fears about crime and attack, and these translated into contact avoidance and increase prejudice. On the other hand, good quality contact with individuals from the informal settlement promoted empathy for the plight of people living in these conditions, and it reduced prejudice. However, these beneficial effects do not eradicate the threat associated with potential criminal activity emanating from the informal settlements.

These findings help us to think differently about contact-based change interventions. Perhaps the traditional prejudice reduction approaches are at once too optimistic and pessimistic. They hope to eradicate prejudice through generalized effects of positive contact but then offer no hope when real world contact produces negative experiences. The compartmentalization of contradictory contact effects suggests alternative strategies to promote social change. For example, efforts to reduce prejudice through good quality contact interventions in Northdale might be doomed to failure given the nature of the real and immediate threats. Nonetheless, the empathy that these relatively poor and historically oppressed Indian residents have with their even poorer, marginalized and oppressed neighbours is potentially the foundation of solidarity between these groups and the basis for collective action. The question then is how to foster empathy, solidarity and the kind of collective action that would promote genuine social change? (see Dixon et al., in press)

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**Table 1**. Descriptive statistics and inter-correlations of variables

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Mean | SD | ω✝ |  | Threat | Empathy | Prejudice | Contact Quantity | Contact Avoidance | Contact Quality |
| Closeness | 2.26 | 1.32 | 0.79 |  | 0.27\*\* | -0.02 | 0.06 | -0.05 | 0.29\*\* | -0.10 |
| Threat | 3.15 | 0.86 | 0.92 |  |  | 0.04 | 0.27\*\* | -0.22\*\* | 0.49\*\* | -0.30\*\* |
| Empathy | 2.42 | 0.85 | 0.84 |  |  |  | -0.19\* | 0.21\*\* | -0.07 | 0.26\*\* |
| Prejudice | 2.69 | 0.97 | 0.81 |  |  |  |  | -0.35\*\* | 0.27\*\* | -0.37\*\* |
| Contact Quantity | 2.14 | 0.82 | 0.60ⱡ |  |  |  |  |  | -0.22\*\* | 0.40\*\* |
| Contact Avoidance | 1.74 | 1.29 | 0.87 |  |  |  |  |  |  | -0.40\*\* |
| Contact Quality | 2.17 | 0.89 | 0.89 |  |  |  |  |  |  |  |

Note. All measures are scored with range 0 to 4. \* p < .001 \*\* p < .0001

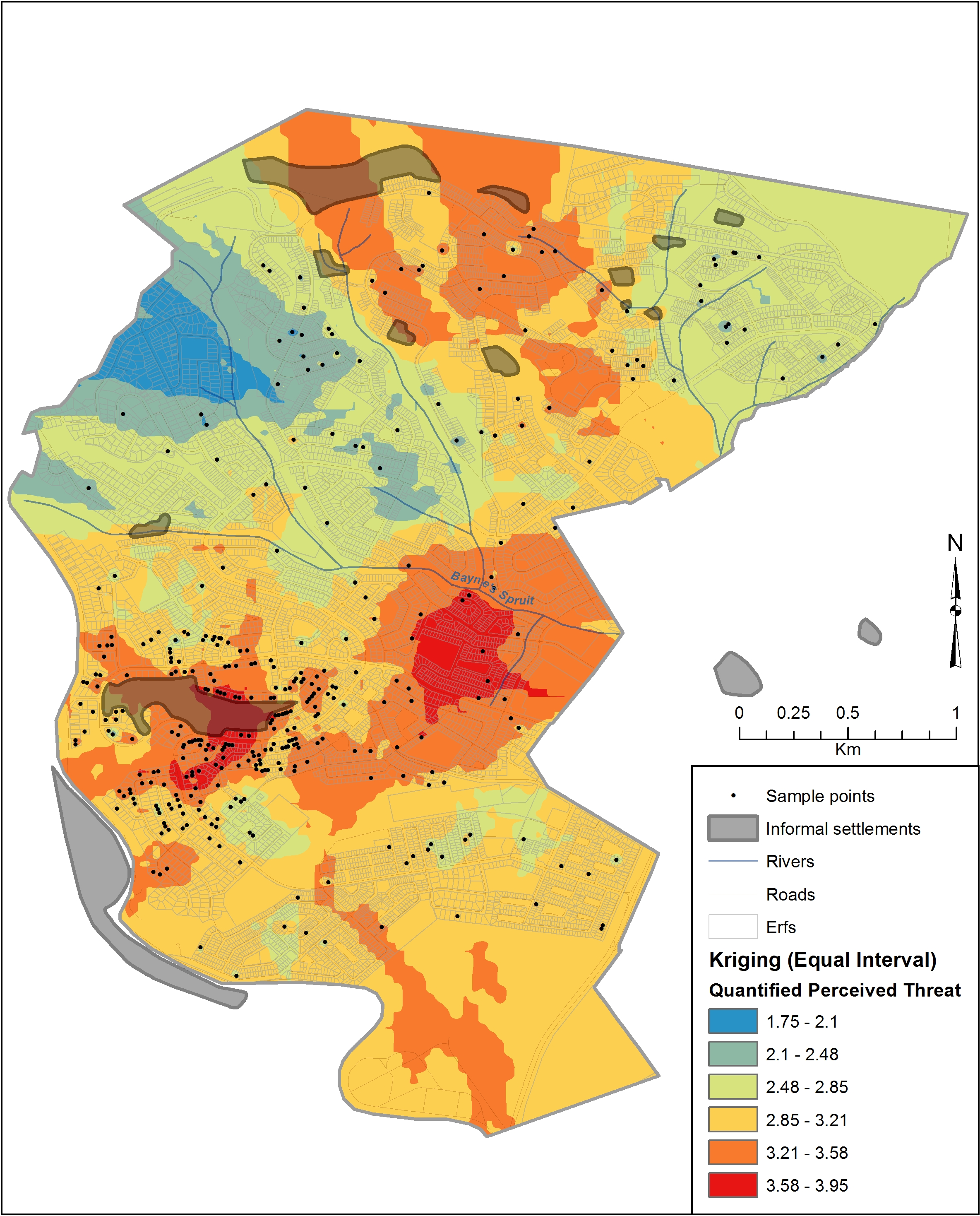
ⱡ This two item scale has inter-item r = 0.43

✝ Omega is an ostensibly better measure of scale reliability than Alpha (Zinbarg, Revelle, Yovel & Li, 2005)

Table x Fit statistics and unstandardized regression weights for a Structural Equation model showing positive and negative routes to prejudice.

|  |  |  |
| --- | --- | --- |
| Fit statistics | Value | |
| *χ2ML* | 276.42 | |
| df | 179 | |
| CFI | .97 | |
| TLI | .96 | |
| RMSEA | .045 | |
| 90% CI RMSEA | .035; .055 | |
| SRMR | .06 | |
| AIC | 2261.61 | |
| N | 273 | |
|  | *b (s.e.)* | *p<* |
| Contact quantity 🡨 Contact quality | .65 (.11) | .001 |
| Contact quality 🡨 Threat | -.36 (.08) | .001 |
| Threat 🡨 Closeness | .70 (.15) | .001 |
| Empathy 🡨 Contact quality | .23 (.05) | .001 |
| Contact avoidance 🡨 Threat | .67 (.10) | .001 |
| Contact avoidance 🡨 Contact quality | -.38 (.08) | .001 |
| Prejudice 🡨 Contact quantity | -.30 (.10) | .001 |
| Prejudice 🡨 Contact avoidance | .17 (.07) | .001 |
| Prejudice 🡨 Contact quality | -.24 (.10) | .001 |
|  |  |  |
| Paths excluded from model (n.s. paths) |  |  |
| Contact quality 🡨 Closeness | -.02 (.17) | .889 |
| Prejudice 🡨 Empathy | -.10 (.11) | .344 |
|  |  |  |

**Figure 1.** Experiences of threat in Northdale.



-.38\*

.23\*

-.36\*\*

.65\*

0.67\*

.70\* \*\*

-.30\*

0.17✝

RMSEA = 0.045 sRMR=.06 cfi = .97 nnfi = .96

LR χ2 = 276.42, df = 179   
\* p < .001 ✝ p < .02 🟀p < .03

-.24🟀

**Figure x**. Structural Equation model showing positive and negative paths to intergroup prejudice.

Dark and light shading show the negative and positive paths, respectively. Line width represents strength of path coefficient. All variables are on a common scale.

1. The analysis was undertaken in ArcInfo 10.2 using an Ordinary Kriging interpolation with a spherical algorithm utilizing a spatially variable search window of 12 data points. In essence this means that for closely clustered points the spatial extent of overlapping points is smaller than those further apart but the standard interpolation utilizes the 12 closest points around each pixel to create the surface. Raster resolution is 10 metres.

   The scientific explanation of Kriging is as follows: Unlike plain Inverse distance weighting which assumes the influence of a point diminishes away from the point at a constant rate, Kriging factors in distance and direction when calculating spatial correlation. It statistically examines the data, then fits a modelled variogram and using this variogram it creates a surface. It is most appropriate where there are spatial correlations or relationships between points particularly distance and direction, such as modelling wetlands based on water depth or soil type. [↑](#endnote-ref-1)