Road Safety of London's Black and Asian Minority Ethnic Groups

A report to the London Road Safety Unit

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Summary

Aims

Our previous study (Edwards *et al*. 2006) demonstrated a relationship between deprivation and risk of road traffic injury in London, with pedestrians in particular, at higher risk of injury in more deprived areas. This study builds on this work to examine the relationship between ethnicity, deprivation and risk of road traffic injury in London.

This study addressed four specific questions –

1) Are there differences in the risk of road traffic injury between different ethnic groups in London?
2) How far can any differences identified between ethnic groups be accounted for by: measurement errors; different levels of exposure; or different levels of deprivation across areas of London?
3) Within ethnic groups, how far does deprivation affect the risk of road traffic injury?
4) Taking into account what we know about differences in risk, possible explanations for differences, what works to reduce risk, and the policy context in London – what are the implications for policy and practice?

To do this, we analysed injuries recorded in STATS19 data between 1996 and 2006. We used census data and GLA population projections to estimate injury rates across ethnic groupings, and the Index of Multiple Deprivation to rank census Super Output Areas in terms of deprivation. Ethnicity was coded by mapping STATS19 categories onto census categories, and deriving three broad groupings called 'White' , 'Black' and 'Asian'. Interviews with policy makers, practitioners, young people and parents were used to provide an overview for the policy context.

Background

There has been limited research on ethnic inequalities in road traffic injury risks in the UK. Although previous studies have identified 'differences', these do not provide any national pattern of which particular communities are at higher risk, and there is little understanding of 'what' about ethnicity might lead to any differences identified.

In London, research on this issue faces similar problems to elsewhere in the country:

- London has many diverse ethnic communities, but data available only allow us to aggregate figures for 'Black', 'Asian' or 'White' which obscure differences between communities;

- It is difficult to calculate accurate rates for each grouping, as the ethnicity of injured road users is classified by the police (through STATS19) using different categories from those used (in the census) to estimate population numbers. If there are large or systematic errors in how individuals are classified by STATS19 or census data, we could under- or over-estimate rates by ethnicity. Further, it is difficult to accurately estimate the size of populations by ethnicity in small areas.

However, there is some evidence that there are ethnic inequalities in injury risks, so it is important that we identify these inequalities as robustly as we can, and that we suggest some possible explanations, in order to inform policy around road safety which might address inequalities where possible.

Are some ethnic groups at higher risk of injury?

Between 1996 and 2006, there were 428,008 casualties recorded in road traffic collisions occurring in London. Of those with ethnicity coded, we classified 262,310 (61.3%) as 'White', 54,348 (12.7%) as 'Black', and 38,858 (9.1%) as 'Asian'. Ethnicity was not coded for 64,233 (15.0%) casualties. Road traffic injury rates per 100,000 population differed by ethnicity. In children and adults, road traffic injury rates were higher in 'Black' groups (305 per 100,000 population in children; 617 in adults) and lower in 'Asian' groups (175 in children and 421 in adults), compared with rates in 'White' groups (234 in children and 479 in adults). 'Black' Londoners have been on average 1.3 times more likely to be injured on the roads than 'White' Londoners (appendix 1).

Between 2001 and 2006, rates of injury for children and adults in all ethnic groups declined for all modes of travel. The rate of decline was similar across the ethnic groups, with one exception: for adult car occupants, 'White' rates declined faster than other groups.

How can we explain these differences between ethnic groups?

Measurement error – Some of the differences may be due to measurement errors. These might include: systematic bias in under-reporting ethnicity of some groups in STATS19, or inaccuracies in mapping STATS19 ethnic categories to census ethnic categories. These could not account for all the differences between 'Black' and other groups, but may explain some of the difference between 'Asian' and 'White' groups.

Exposure – If, on average, road users in different ethnic groups tend to live in more dangerous traffic environments, or have different patterns of transport or leisure activity, they will be more exposed to injury risk. Data on exposure to traffic are limited and we did not identify significant differences in the average amounts of walking across ethnic groups. However, more research could be done to examine, for instance, differences in leisure-related exposure to traffic.

Deprivation – In London, there is a link between ethnicity and area level deprivation: in least deprived deciles of census super output areas, an average 1.5% of the population is 'Black' and 6.6% is 'Asian', compared with an average 23.2% 'Black' and 15.6% 'Asian' in the most deprived deciles. Given that area deprivation is linked to risk of injury, and more 'Black' people, on average, live in the most deprived areas, we would expect more 'Black' people to be injured. However, these area level effects do not explain all the difference.

How far does deprivation affect the risk of road traffic injury within ethnic groupings?

For 'White' and 'Asian' groups, the risk of pedestrian injury was higher for each decile of deprivation (measured by Index of Multiple Deprivation at census super output area level). 'White' children in the most deprived areas were 2.5 times more likely to be injured as pedestrians than those in the least deprived. For 'Asian' children, the injury rates in the most deprived areas were over 4 times higher than for 'Asian' children in least deprived areas. However, for 'Black' children there did not appear to be any relationship between deprivation and risk – the relative risk of being injured was the same across deciles of deprived areas.

This suggests that deprivation does not account for all the differences in injury rates between ethnic groups. It also suggests that deprivation may have different effects in different ethnic groups. For instance, it is possible that lifestyle (and thus exposure to traffic) differs between 'White' or 'Asian' children – depending on where

they live – but that the effect of lifestyle in 'Black' children is independent of area. However, when we examined these relationships by ethnic group for adults injured as pedestrians, we found similar relationships to those in children. That is, for 'Black' adults, the relative risk of injury is also the same across the deciles of deprivation. This would tend to suggest that any explanation for ethnic differences in how deprivation relates to injury risk, such as lifestyle or behavioural differences, would also apply to adults.

It is important to note that the measure of deprivation used in our analysis includes a number of domains that might be better at discriminating levels of deprivation to some ethnic groups than others. It may be possible, then, that it is our measure of deprivation (IMD) that has artificially "flattened out" a real underlying relationship between deprivation and casualty rates for 'Black' children and adults. However, the two domains of IMD which comprise nearly half of the IMD score are 'income' and 'employment' deprivation, neither which are likely to discriminate differentially between 'White', 'Black' or 'Asian' Londoners.

What are the implications for policy and practice?

We have suggested, then, that 'Black' groups in London appear to be at higher risk of road traffic injury, and that at least some of this excess risk is 'real' rather than an artefact of inadequacies in the data available. 'Asian' groups appear to be at lower risk than 'Black' or 'White' groups. We have also suggested that although deprivation levels of a neighbourhood are an important influence on risk, they do not account for all of this risk. In the two most deprived deciles of the population, there are no differences in the injury rates between 'White' and 'Black' Londoners, but in more affluent areas, 'Black' rates are higher, suggesting that increasing area affluence protects 'White', but not 'Black' road users. There are grounds for predicting that exposure to traffic may account for some of the risk differential, but data available have not been able to identify how much.

There are a number of challenges in implementing road safety initiatives in ways that are likely to reduce the observed ethnic inequalities in injury rates:

- Available data are at a crude aggregated level (e.g. 'White', 'Black', 'Asian') that both obscures important differences between groups, and bears little relationship to local communities' own identification of ethnicity;

- Available data are not sufficient to tell us *why* there appears to be an increased rate in those groups identified as 'Black', and a possibly lower rate in those identified as 'Asian'.

Discussions with key stakeholders in London (including local authority road safety staff, community organisations, regional policy makers, young people, parents) raised a number of issues that need to be taken into account:

- Some Black community groups and parents reported a lack of awareness of road danger as an issue that affects them, and there are opportunities of raising interest in the issue;

- Young Black people were concerned about the potential for further stigma – this is another issue where their behaviour is seen as "a problem";

- Given the uncertainties about both why there are ethnic differences, and what would work to reduce them, programmes should be broad enough to meet other goals (e.g. Community engagement) rather than narrowly directed at 'Road Safety';

- Policy should be broadly directed at making London's roads safer to travel around, and neighbourhoods safer to play in, rather than in problematising the behaviour of particular groups.

In general, interventions directed at making the environment safer (e.g. reducing the speed and volume of traffic) will reduce injury risk for the whole population in the longer term, as well as reducing the differences across ethnic groups. However, in the short term, it will be necessary to work with local communities to look at ways of managing existing risks.

Recommendations

The first three recommendations relate to needs for more robust information:

1) Analysis based on STATS19 data and area-level measures has provided a 'broad brush' picture of the relationship between deprivation, ethnicity and road traffic injury, but further research is needed to:

- Understand in detail different patterns of exposure to risk of road traffic injury, particularly for children, and how these relate to deprivation;
- Look at the impact of existing interventions (e.g. 20mph zones) on ethnic inequalities.

2) To monitor trends in the relationship between road traffic injury and ethnicity, the most useful outcome measures are rates of child pedestrian and adult pedestrian casualties

3) Work on improving the completeness of STATS19 data should continue, with monitoring under-reporting and recording of road traffic injuries.

The final two recommendations relate to potential policy implications:

4) The headline findings on ethnic differences in road traffic injury rates could be used to raise awareness of the issue of road safety. There is considerable potential for Local authority road safety teams and Transport for London to work with both statutory partners (e.g. Equality or Diversity teams) and 3rd Sector partners representing BAME communities, to include road safety issues as part of a broader community safety agenda.

5) Although similar rates of decline in road traffic injury rates across ethnic groups suggest that current strategies are, in general, addressing needs across the population, to reduce observed inequalities it will be necessary to reduce injury rates faster in groups identified as 'Black'. However, given the limited knowledge we have of how exposure to risk and other variables interact to put people at higher risk, interventions designed to address ethnic inequalities need to be carefully designed in consultation with local communities in order to:
   - Avoid 'victim blaming';
   - Ensure that Road Safety teams understand the precise risks faced from the perspective of those affected;
   - Ensure that programmes are appropriate and tailored to community needs.

'Local communities' in this context will include neighbourhood communities, but also groups which identify themselves in terms of faith, ethnicity or other communalities (e.g. young people).

Part A: Relationships and Risks

1. Introduction

The London School of Hygiene & Tropical Medicine (LSHTM) recently completed a research project for the London Road Safety Unit (LRSU) entitled *Deprivation and Road Safety in London* that investigated the relationship between road traffic injury and deprivation in London. The results suggest that there are persisting socio-economic inequalities in casualty rates for different road user groups in London, and that differentials are in part associated with minority ethnic status. This raises issues for equality and inclusion in London's road safety strategy.

Internationally, studies have found large disparities in road traffic injury rates by ethnic group (Savitsky *et al*., 2007; Stirbu *et al*., 2006; Braver, 2003; Campos-Outcalt *et al*., 2002; Stevens and Dellinger, 2002; Schiff and Becker, 1996). Evidence in the U.K. is limited, but suggests that injury rates are disproportionately high for some Black and Minority Ethnic (BAME) road user groups (e.g. Lawson and Edwards, 1991; Christie, 1995). While these international and British studies concur that ethnic minorities are at greater risk of road traffic injury, they provide conflicting evidence of who is at risk. In the international studies cited above, ethnic minorities described as 'Hispanic', 'American Indian', 'non-Jewish', and of Turkish, Moroccan, Surinamese, or Antillean/Aruban origin have been found to have higher road traffic injury rates than the native population. Within the UK, both 'Asian' and 'non-White' groups have been found to be at increased risk of injury, depending on the timing and location of the study. This suggests that there is nothing fundamental about belonging to a particular minority ethnic group that causes traffic injury. Rather, perhaps there is something context-specific about belonging to a particular ethnic minority within a particular environment that is associated with high road traffic injury rates.

Why do risks appear to vary between ethnic groups?

The reasons for ethnic differences in road traffic injury are unclear, but are likely to be at least partially explained by the strong association between ethnicity and socio-economic status, particularly in London (Edwards *et al*., 2006; Grayling *et al*., 2002). Other explanations offered for the observed differences in road traffic injury rates by ethnic group include:

Exposure to risk of injury from traffic – There are two components to exposure risk, the time spent on roads and the relative danger (i.e. due to the volume

and speed of traffic) of the roads that are used. Ethnic differences in road traffic injury may be explained by exposure differences if people from minority ethnic groups spend relatively more time as road users, or use roads with higher traffic volumes and traffic speeds.

Risk perception and behaviour – Cultural factors may play a role in ethnic differences in risk perception and risk behaviour (DfT, 2002). For example, it has been suggested that different methods of parental supervision and teaching of road safety skills may contribute to ethnic differences in child road traffic injury risk.

Measurement error – Ethnic differences in road traffic injury may be an artefact of the data due to the inconsistent and differential measurement of ethnicity in different data sources.

It is also important to remember that any associations found between belonging to a particular ethnic group and road traffic injury are merely associations. Although we can assess how far differences are accounted for by socio-economic factors (and, for instance, suggest that these do not account for all of observed differences) we cannot control for all other differences between groups defined through ethnicity. This means that it is not possible to make firm claims about the relationships between being a particular ethnicity and risk of injury, as we do not know whether the variable 'ethnicity' is simply a proxy for some other unmeasured variable. Also, even if it were, it is not possible to know what it is 'about' ethnicity that leads to increased risk.

Despite steady casualty reductions for most road users across London (Tfl, 2004) concerns remain that they have not been shared equally, particularly by minority ethnic groups. In 2007, Transport for London (TfL) commissioned LSHTM to conduct a study of ethnicity and road traffic injury risk, in order to provide an evidence base for recommendations that are applicable specifically to London.

The aims of the study were to: describe the relationship between ethnicity and road traffic injury risk; identify possible mechanisms that may link ethnicity and road traffic injury risk; offer recommendations on monitoring ethnic inequality in road traffic injury risk across London, and on policies to address ethnic inequalities in road traffic injury risk.

In this report we examine the strength of the association between ethnicity and road traffic injury risk for different road user groups in London. Our analysis covers children and adults injured on London's roads as pedestrians, pedal cyclists, powered 2-wheeler riders, and as car occupants.

Using STATS19 data collected by the Metropolitan Police and City Police, we compare the relative risks of road traffic injury to groups of Londoners, using groups constructed using data on age, sex, ethnicity, borough, year and season. Then by linking casualties to the areas in which the collisions occurred, we use data describing area-level deprivation and features of the road network to examine the relationship between ethnicity, deprivation and the road environment.

A model of the links between ethnicity and road traffic injury

The causal pathways linking ethnicity to road traffic injury risk are likely to be complex. In principle, the relative risk of injury on the roads is determined by three variables: the road environment (e.g. speed and volume of traffic; number of junctions, etc.); an individual's exposure to that environment (e.g. how often they are on, or near, roads), and their behaviour when on, or near, the roads (e.g. risk-taking, crossing at controlled crossings, etc.). These three variables are inter-related: behaviour and levels of exposure are, to some extent, a consequence of perceived dangerousness of the road environment.

Ethnicity may impact on injury risk because it is associated with other factors, such as area-level or individual-level deprivation, that are known to be related to road traffic injury risk (Edwards *et al*. 2006). Individual-level deprivation may impact on exposure to risk (e.g. more likely to use public transport, or to make long journeys to work or school). Area-level deprivation is associated with more dangerous road environments. There may also be separate pathways by which ethnicity impacts on road traffic injury risk, if there is something about being in a particular ethnic group that influences exposure, road environment or behaviour directly. For example, if 'White' or 'Black' people are more, or less likely, to use particular modes of transport, or to socialise in public rather than private space, exposure may vary between these groups. These indirect and direct effects of ethnicity are also inter-related, given that cultural differences are shaped by material circumstances.

In this report, we have looked separately at those parts of these causal pathways for which we have empirical data.

2. Methods

Two types of analyses were carried out to investigate the association between ethnicity and road traffic injury risk in London: univariable and multivariable. The univariable analysis describes the distribution of injuries and of injury rates in groups by age, sex and ethnicity ('person'); by borough and Inner/Outer London ('place'); and by year and season ('time'). The multivariable analysis describes the strength of the relationship between injury rates and the individual and area-level factors (e.g. deprivation; speed and volume of traffic).

The multivariable analysis was carried out using small geographical areas known as 'census Lower Super Output Areas' – referred to throughout this report as 'SOAs'. London has 4,765 SOAs contained within 33 boroughs. Each SOA includes an average of 1,500 people and were created by the Office for National Statistics (ONS) using measures of population size, mutual proximity and social homogeneity (similarity), to provide robust small-area statistics for use in analyses that seek to compare areas.

Measures of injury

We were provided with a data file from the London Road Safety Unit containing STATS19 data for all road traffic injury collisions in London between 1996 and 2006. Casualties were identified according to road user group (pedestrian, pedal cyclist, powered 2-wheeler and car occupant). Each casualty was assigned to an SOA based on the Ordnance Survey Grid reference of the location where the collision occurred. Casualties with home address postcodes outside of London were removed from the data set.

Population estimates

More than one source of population estimates were used for our analyses. In the univariable analysis, we used population data from the 2001 census on the number of children (ages 0–14 years) and adults living in London who classed themselves as 'White', 'Black', or 'Asian'. Additionally, for the analysis of the relationship between ethnicity and road traffic injury risk over time, we used the Greater London Authority (GLA) 2006 Round Ethnic Group Population Projections (EGPP) to estimate injury rates in each year from 2001 to 2006.

For multivariable analysis, we estimated the numbers of 'White', 'Black' and 'Asian' children (ages 0–15 years) and adults living in each SOA, so that analysis of

variation in road traffic injury rates could be conducted at the SOA level. These were estimated by multiplying the total numbers of children (ages 0–15 years) and adults living in each SOA (from 2001 census), by the percentages of residents *of all ages* that are 'White', 'Black', or 'Asian' (also from 2001 census). These estimates of SOA-level ethnic group populations were then scaled to ensure that our estimates of ethnic-specific borough populations were equal to those in the census.

Measures of exposure

We used the London Area Transport Survey (LATS 2001) to estimate the amounts of walking, cycling, travel by car or by powered 2-wheelers, for each of the ethnic and age groups. We assessed the evidence for differences in the average amounts of time spent by each ethnic group as a pedestrian, cyclist, etc., and in the total distances of trips made by each mode. The LATS 2001 data were collected using daily travel diaries, kept by the survey participants. Access to the data was provided through Transport for London.

Measures of ethnicity

STATS19 – In London, police officers assign an ethnicity category to each casualty and to drivers or riders. This coding of ethnicity in the STATS19 data is unique to London and police have been including it since 1995. Ethnicity is assigned to one of seven categories: White-skinned European, Dark-skinned European, Afro-Caribbean, Asian, Oriental, Arab, and Unknown.

2001 Census – respondents were asked to classify their ethnicity by selecting from 16 categories.

White:
- British
- Irish
- Other

Black or Black British:
- Caribbean
- African
- Other

Asian or Asian British:
- Indian
- Pakistani
- Bangladeshi
- Other

Chinese or Other:
- Chinese
- Other

Mixed: White and Black
- Caribbean
- African

Mixed: White and Asian

Mixed: Other

LATS 2001 – ethnicity was self-reported in the survey. Respondents were offered a choice of nine categories: White, Black-Caribbean, Black-African, Black-Other, Indian, Pakistani, Bangladeshi, Chinese, and Other.

To incorporate data from each source (LATS 2001, STATS19, and 2001 Census) in our analysis, the categories of ethnicity used in each data set were mapped (Table 1). The mapping chosen for the analysis for TfL resulted in four broad ethnic groupings: 'White', 'Black', 'Asian' or 'Other'. Census respondents reporting mixed 'White' and 'Black' identities were included in the 'Black' category because it was assumed that police would more likely identify such identities as Afro-Caribbean. 'Mixed Asian and White' census respondents were assigned to the 'Asian' category.

Table 1: Ethnicity mapping between data sources

TfL study	STATS19	Census 2001	LATS 2001
White	White-skinned European Dark-skinned European	British Irish Other White	White
Black	Afro-Caribbean	Caribbean African Other Black Mixed-White & Black Caribbean Mixed-White & Black African	Black-Caribbean Black-African Black-Other
Asian	Asian	Indian Pakistani Bangladeshi Other Asian Mixed-White & Asian	Indian Pakistani Bangladeshi
Other	Arab Oriental	Other Chinese Mixed-other	Other Chinese

For this report we have focused only on the first three of these ethnic groupings: 'White', 'Black' and 'Asian'. Analyses for individuals in the 'Other minority ethnic group' have not been reported, as sample sizes for this group were relatively small, and interpretation of comparisons of injury rates relative to the larger ethnic groups would be far less reliable. It is also important to note that ethnicity was self-reported in the 2001 Census, but is defined by police officers in STATS19. Therefore, in injury rate calculations the numerator (casualties) and the denominator (population size) may describe two somewhat different populations. This likely reduces the accuracy of ethnic-specific injury rate estimates, and must be borne in mind when comparing road traffic injury rates by ethnic group (see Discussion).

Measures of deprivation

Since deprivation has been found to be highly associated with road traffic injury rates (Edwards *et al*., 2006; Grayling *et al*., 2002), and ethnicity is also associated with deprivation, we included measures of deprivation in the multivariable analysis, to investigate this complex relationship.

Index of Multiple Deprivation

The Index of Multiple Deprivation (IMD) brings together 36 indicators across seven domains of deprivation into an overall score and rank for a geographical area. The index was designed to provide a robust small-area measure of deprivation which encompasses the many different dimensions in which deprivation can be recognized and measured. The seven domains of deprivation are: Income; Employment; Health and disability; Education, skills and training; Barriers to housing and services; Crime; and Environment. The IMD score is an ordered scale where higher IMD scores indicate relatively more deprived areas. For a full description of the IMD domains, see *Deprivation and Road Safety in London* (Edwards *et al*., 2006).

One potential problem of using IMD for this analysis is that an indicator of road traffic accidents involving injury to pedestrians and cyclists (2000-2002) is included in the Environment domain of the IMD. Therefore the IMD score might be partially correlated with pedestrian injury risk, and this could distort the observed relationship between deprivation, ethnicity, and road traffic injury risk. However, the road traffic accident indicator only contributes a total of 2.5% to the overall IMD score. In *Deprivation and Road Safety in London* (Edwards *et al*., 2006), we found no evidence that using the full IMD (including the Environment domain) biased the observed association between deprivation and child pedestrian injury risk. We have therefore used the complete IMD score for the analysis presented in this report.

Deprivation deciles

The values of IMD were obtained for all 4,765 census SOAs in London and were then used to rank SOAs into deciles (tenths) from 1 (least deprived SOAs) to 10 (most deprived SOAs). These tenths of London's SOAs are referred to as 'Deprivation Deciles' throughout this report.

Road network variables

Road network variables were incorporated into the multivariable analysis to take into account variations in the complexity of the road traffic environment between areas. The variables considered included SOA level estimates of the number and density of road junctions (where two or more roads meet), as well as the length and density of A, B, and minor roads and motorways in each SOA, and in adjacent SOAs. At borough level, variables considered were: the number of A, B, and minor roads and motorways; morning traffic speeds of A, B, and minor roads, and motorways; the difference between morning and evening traffic speeds and free-flowing traffic speed; and average traffic flows in 2001. Road densities were calculated by summing the length of roads within each SOA and dividing by the area of the SOA. Similarly, the density of road junctions within each SOA was calculated by summing the number of junctions and dividing by the area of the SOA.

Statistical analysis

To estimate injury rates for the univariable analysis by age, sex, ethnicity and borough, we used the number of casualties in each group as the numerator and the 2001 census population of each group (extrapolated to represent the entire 1996-2006 period) as the denominator. In the analysis of injury rates over time we used population projections from 2001 to 2006 as the denominator.

In multivariable analysis, we investigated the relationship between injury rates and deprivation separately for each of the three ethnic groups ('White', 'Black' and 'Asian'). We used multivariable regression analysis to calculate injury rate ratios, with 95% confidence intervals, comparing ethnic group-specific injury rates in the least deprived areas of London to injury rates in relatively more deprived areas, adjusting for the road environment. The Poisson distribution was used unless there was evidence for 'over-dispersion', when the Negative Binomial distribution was used.[1] Standard errors of estimates from multivariable analysis were adjusted to allow for within-borough correlations in SOA injury rates (so called 'intra-cluster correlation').

[1] It is common to use the statistical distribution called the 'Poisson' distribution when modeling rates in a population. However, this assumes that the average rate (mean rate) over all SOAs is equal to the variance (spread) of rates. If the mean is not equal to the variance in the sample, it is common to use the negative binomial distribution instead.

Road environment variables were selected using both backward and forward stepwise regression to model injury rates in the three ethnic groups.[2] Road environment variables were then chosen to be included in a final adjusted model if there was good evidence (i.e. $p<0.05$) for an association with injury rates in at least two of the models. All analyses were conducted using the Stata Statistical Software (StataCorp, 2005).

[2] In forward stepwise regression, a model is fitted to the data by adding variables one at a time. A variable will remain in the model if its p-value (testing no association with injury rates), is less than 0.2. In backward stepwise regression, a model is initially fitted to all variables, and then variables are excluded if their p-values are greater than 0.2.

3. Results

The STATS19 file contained data on 450,153 casualties from a total of 374,356 road traffic collisions in London between 1996 and 2006. Of these casualties, 22,135 were excluded from the analysis because they reported their home address postcodes were outside London. Of the remaining 428,018 injuries, 363,775 (85%) had been assigned an ethnicity code.

3.1 Person groups

Our initial analysis of the relationship between injury rates and ethnicity was based on ethnicity-specific injury rates for each road user, age, and sex group.

Pedestrians

There was a total of 78,716 people injured as pedestrians in London between 1996 and 2006. Annual pedestrian injury rates within age-sex groups ranged from 29 to 313 per 100,000 people. Pedestrian injury rates appeared highest in 'Black' children and adults of all ages, males and females.

Table 2: Average annual pedestrian injury rates per 100,000 people, 1996-2006

		Ethnic group		
Age group	Sex	'White'	Black	'Asian'
0-4	M	45	95	68
	F	29	52	41
5-9	M	125	235	141
	F	72	135	69
10-14	M	254	313	136
	F	179	255	97
15-24	M	144	164	84
	F	122	148	69
25-34	M	84	124	61
	F	63	84	44
35-44	M	75	97	56
	F	46	62	38
45-54	M	68	106	61
	F	43	69	46
55-64	M	68	102	78
	F	49	82	49
65+	M	85	127	109
	F	68	101	58

Pedal cyclists

A total of 35,925 pedal cycle injuries occurred in London between 1996 and 2006. Annual pedal cycle injury rates within age-sex groups ranged from 0 to 127 per 100,000 people. Pedal cycle injury rates appeared higher in 'White' children and adults than in the other two ethnic groups. The exception was in 'Asian' boys aged 5–9 years, where the cycling injury rate was higher than in 'White' boys.

Table 3: Average annual pedal cycle injury rates per 100,000 people, 1996-2006

		Ethnic group		
Age group	Sex	'White'	'Black'	'Asian'
0-4	M	2	2	1
	F	1	0	0
5-9	M	41	9	56
	F	11	9	3
10-14	M	127	118	51
	F	22	16	4
15-24	M	108	102	32
	F	31	11	4
25-34	M	102	86	19
	F	43	10	3
35-44	M	80	58	14
	F	21	5	1
45-54	M	48	27	8
	F	13	2	1
55-64	M	32	17	8
	F	8	1	0
65+	M	12	9	3
	F	2	0	0

Powered 2-wheeler

There was a total of 63,597 people injured whilst riding powered 2-wheelers in London between 1996 and 2006. Annual powered 2-wheeler injury rates within age-sex groups ranged from 0 to 335 per 100,000 people. Powered 2-wheeler injury rates were highest in 'White' adults, male and female, from age 25 years and older. In 'White' and 'Black' adolescents and young men, the powered 2-wheeler injury rates appeared more similar.

Table 4: Average annual powered 2-wheeler injury rates per 100,000 people, 1996-2006

		Ethnic group		
Age group	Sex	'White'	'Black'	'Asian'
0-4	M	0	0	0
	F	0	0	0
5-9	M	1	0	0
	F	0	0	0
10-14	M	12	14	2
	F	2	1	0
15-24	M	321	335	89
	F	40	13	5
25-34	M	297	171	83
	F	45	10	6
35-44	M	222	106	45
	F	20	4	2
45-54	M	105	32	17
	F	9	2	1
55-64	M	47	4	7
	F	3	1	0
65+	M	8	0	2
	F	1	0	0

Car occupants

A total of 187,398 people were injured as car occupants in London between 1996 and 2006. Annual car injury rates within age-sex groups ranged from 44 to 510 per 100,000 people. Over the age of 25 years, car occupant injury rates appeared highest in 'Black' adults and lowest in 'White' adults.

Table 5: Average annual car injury rates per 100,000 people, 1996-2006

		Ethnic group		
Age group	Sex	'White'	'Black'	'Asian'
0-4	M	48	58	44
	F	47	56	47
5-9	M	69	85	72
	F	86	103	68
10-14	M	69	61	68
	F	94	79	77
15-24	M	423	418	471
	F	401	300	258
25-34	M	244	510	407
	F	272	373	258
35-44	M	207	426	350
	F	219	286	261
45-54	M	160	347	279
	F	184	275	238
55-64	M	134	246	207
	F	134	156	157
65+	M	98	123	112
	F	74	68	75

3.2 Place

Next, our analysis considered the relationship between ethnicity and injury rates across different London boroughs. The City of London was excluded from the analysis as this borough tends to have a large day-time population (tourists and workers) and a small resident population. In this analysis we have linked casualties to boroughs using the SOA of collision location.[3]

Pedestrians

'White' child pedestrian injury rates ranged from 65 per 100,000 in Richmond upon Thames to 197 per 100,000 in Newham. 'Black' child pedestrian injury rates ranged from 99 per 100,000 in Sutton to 227 per 100,000 in Wandsworth. 'Asian' child pedestrian injury rates ranged from 37 per 100,000 in Sutton to 159 per 100,000 in Waltham Forest. Injury rates among 'White', 'Black' and 'Asian' children were higher in Inner London compared to Outer London. The injury rate ratio comparing 'White' children in Inner London to 'White' children in Outer London was 139/105 = 1.32, with a 95% confidence interval[4] of 1.27-1.38. Among 'Black' children the Inner/Outer London rate ratio was 1.19 (1.12-1.26) and among 'Asian' children the rate ratio was 1.21 (1.12-1.31).

'White' adult pedestrian injury rates ranged from 37 per 100,000 in Bexley to 311 per 100,000 in Westminster. 'Black' adult pedestrian injury rates ranged from 37 per 100,000 in Bexley to 314 per 100,000 in Westminster. 'Asian' adult pedestrian injury rates ranged from 27 per 100,000 in Sutton to 179 per 100,000 in Westminster. Similar to the pattern in child pedestrians, adult pedestrian injury rates were higher in Inner London compared to Outer London in all ethnic groups. The pedestrian injury rate ratio comparing 'White' adults in Inner London to 'White' adults in Outer London was 2.21 (2.17-2.26). Among 'Black' adults the ratio was 1.53 (1.46-1.60) and among 'Asian' adults it was 1.58 (1.49-1.67).

[3] This allows the entire STATS19 data set to be used, but assumes that casualties are injured in the borough in which they live. This assumption is valid for pedestrians and cyclists, but less so for other road user groups. However, an analysis of distance from home to collision location (Appendix 3), provides evidence that casualties of all age, ethnicity, and road user groups tend to be injured on average less than 6Km from home, with median distances from home below 4.5Km.

[4] The confidence interval represents the range of values that are likely to contain the true injury rate ratio.

Table 6: Average annual pedestrian injury rates per 100,000 people, 1996-2006

	Children (0–14)			Adults		
Borough	**'White'**	**'Black'**	**'Asian'**	**'White'**	**'Black'**	**'Asian'**
Inner London	139	188	103	119	128	84
Camden	134	187	80	159	176	112
Hackney	139	203	95	99	122	55
Hammersmith and Fulham	109	181	66	96	132	107
Haringey	136	199	94	97	118	71
Islington	153	191	99	129	150	107
Kensington and Chelsea	82	115	41	133	150	102
Lambeth	134	223	89	104	137	104
Lewisham	153	176	75	81	92	70
Newham	197	147	141	85	80	64
Southwark	151	174	76	89	119	69
Tower Hamlets	187	182	89	98	150	70
Wandsworth	106	227	126	64	132	87
Westminster	154	219	96	311†	314†	179†
Outer London	105	159	85	54	84	53
Barking and Dagenham	141	140	105	45	51	38
Barnet	88	165	54	57	72	42
Bexley	100	153	77	37	37	32
Brent	124	199	87	89	97	64
Bromley	89	172	58	41	85	28
Croydon	124	154	67	63	90	43
Ealing	109	182	99	74	119	88
Enfield	113	140	72	59	67	45
Greenwich	161	171	64	63	77	54
Harrow	78	134	67	58	68	37
Havering	96	139	90	40	73	47
Hillingdon	102	136	81	47	94	45
Hounslow	125	155	86	58	100	53
Kingston upon Thames	69	101	47	49	119	38
Merton	101	159	60	51	87	44
Redbridge	85	114	107	51	53	47
Richmond upon Thames	65	144	39	48	99	43
Sutton	84	99	37	41	85	27
Waltham Forest	149	160	159	62	79	73
Greater London	115	175	92	78	109	64

†Adult pedestrian injury rates in Westminster reflect the particularly high number of visitors to this borough.

Pedal cyclists

Pedal cyclist injury rates for 'White' and 'Asian' children were lower in Inner London compared with Outer London (rate ratios were 0.77 (0.71-0.83) for 'White' children and 0.77 (0.62-0.97) for 'Asian' children). There was less evidence for a difference between Inner and Outer London rates for 'Black' children injured as cyclists (rate ratio 0.95, 95%CI 0.83-1.09). Among 'White', 'Black' and 'Asian' adults, pedal cycling injury rates were higher in Inner London compared with Outer London. Rate ratios were 2.88 (2.80-2.96) for 'White' adults, 1.84 (1.68-2.01) for 'Black' adults, and 2.13 (1.86-2.44) for 'Asian' adults.

Table 7: Average annual cycle injury rates per 100,000 people, 1996-2006

	Children (0–14)			Adults		
Borough	**'White'**	**'Black'**	**'Asian'**	**'White'**	**'Black'**	**'Asian'**
Inner London	27	30	11	76	42	16
Camden	21	14	15	97	62	18
Hackney	27	35	10	75	42	17
Hammersmith and Fulham	32	52	4	76	63	28
Haringey	20	24	7	30	21	13
Islington	28	26	12	110	63	35
Kensington and Chelsea	11	47	0	81	75	33
Lambeth	23	31	6	86	45	24
Lewisham	34	27	14	36	23	7
Newham	40	21	16	47	21	11
Southwark	36	26	11	82	36	18
Tower Hamlets	34	28	8	63	67	12
Wandsworth	32	52	11	61	55	16
Westminster	17	31	16	141	99	24
Outer London	36	31	14	27	23	8
Barking and Dagenham	52	26	31	20	8	5
Barnet	25	27	9	18	14	3
Bexley	33	8	19	12	9	7
Brent	27	37	9	38	21	6
Bromley	29	30	4	19	12	4
Croydon	30	31	8	25	21	5
Ealing	32	31	18	40	42	13
Enfield	35	31	12	19	14	5
Greenwich	32	23	11	26	16	11
Harrow	32	56	13	19	19	4
Havering	39	46	24	14	13	10
Hillingdon	55	29	24	28	13	13
Hounslow	51	41	17	54	46	10
Kingston upon Thames	33	30	13	44	33	10
Merton	36	38	14	35	39	9
Redbridge	39	31	15	21	16	6
Richmond upon Thames	32	11	13	47	76	10
Sutton	35	22	4	22	20	5
Waltham Forest	34	26	20	29	30	9
Greater London	33	30	13	45	34	10

Powered 2-wheeler

Powered 2-wheeler injury rates appeared higher for 'White' adults compared with 'Black' or 'Asian' adults in almost all London boroughs. Powered 2-wheeler injury rates in Inner London appeared higher than in Outer London in all ethnic groups: rate ratios comparing Inner with Outer London were 2.20 (2.16-2.24) for 'White' adults, 1.42 (1.34-1.51) for 'Black' adults, and 1.97 (1.82-2.13) for 'Asian' adults.

Table 8: Average annual powered 2-wheeler injury rates per 100,000 people, 1996-2006

	Children (0–14)			Adults		
Borough	**'White'**	**'Black'**	**'Asian'**	**'White'**	**'Black'**	**'Asian'**
Inner London	4	3	1	156	83	45
Camden	4	3	1	176	150	51
Hackney	3	3	0	122	67	46
Hammersmith and Fulham	10	4	0	142	107	90
Haringey	4	4	0	77	55	30
Islington	6	5	0	162	122	72
Kensington and Chelsea	4	2	0	170	142	95
Lambeth	3	3	0	187	88	85
Lewisham	3	1	0	117	61	52
Newham	6	0	1	88	27	20
Southwark	6	3	0	161	66	66
Tower Hamlets	4	7	1	189	122	23
Wandsworth	1	1	0	132	110	72
Westminster	3	2	0	285	220	80
Outer London	2	2	0	71	58	23
Barking and Dagenham	2	0	0	57	27	36
Barnet	2	0	1	70	64	17
Bexley	2	0	0	46	25	15
Brent	1	1	0	104	71	20
Bromley	0	2	0	59	83	38
Croydon	2	2	0	84	70	21
Ealing	3	4	1	93	70	30
Enfield	1	4	0	53	49	23
Greenwich	4	3	0	97	36	17
Harrow	2	2	0	52	48	12
Havering	1	0	0	46	35	25
Hillingdon	3	3	1	61	42	23
Hounslow	3	5	0	110	87	23
Kingston upon Thames	2	10	0	75	74	33
Merton	3	7	0	87	67	30
Redbridge	1	0	1	61	36	16
Richmond upon Thames	2	11	4	85	198	73
Sutton	1	0	0	66	65	28
Waltham Forest	5	1	0	71	44	30
Greater London	3	2	0	103	73	30

Car occupants

Car occupant injury rates for all age and ethnic groups were lower in Inner London compared to Outer London. The injury rate ratio comparing 'White' children in Inner London with 'White' children in Outer London was 0.79 (0.75-0.84); in 'Black' children the ratio was 0.92 (0.84-0.99), and in 'Asian' children it was 0.53 (0.47-0.59). For adult car occupants, ratios comparing injury rates in Inner and Outer London were 0.69 (0.68-0.70) in 'White' adults, 0.88 (0.86-0.90) in 'Black' adults, and 0.74 (0.72-0.77) in 'Asian' adults.

Table 9: Average annual car occupant injury rates per 100,000 people, 1996-2006

	Children (0–14)			Adults		
Borough	**'White'**	**'Black'**	**'Asian'**	**'White'**	**'Black'**	**'Asian'**
Inner London	57	70	41	172	331	249
Camden	50	39	20	159	349	204
Hackney	57	67	37	185	300	222
Hammersmith and Fulham	23	58	53	113	273	317
Haringey	61	83	61	197	308	256
Islington	39	44	16	135	330	301
Kensington and Chelsea	36	37	51	126	342	310
Lambeth	51	79	47	169	364	328
Lewisham	100	69	75	225	304	285
Newham	94	59	48	279	253	253
Southwark	56	76	40	185	337	266
Tower Hamlets	80	100	31	204	541	194
Wandsworth	37	81	64	118	333	249
Westminster	66	108	31	194	516	291
Outer London	73	77	76	251	378	335
Barking and Dagenham	84	72	105	290	347	567
Barnet	66	79	70	263	497	325
Bexley	65	77	82	199	273	260
Brent	75	84	84	228	354	307
Bromley	68	62	27	233	385	193
Croydon	89	95	57	262	342	207
Ealing	75	52	89	240	452	412
Enfield	78	86	69	319	385	349
Greenwich	94	83	53	256	353	327
Harrow	67	50	67	221	302	212
Havering	89	119	138	311	666	598
Hillingdon	71	84	85	335	562	545
Hounslow	82	96	95	314	542	419
Kingston upon Thames	52	71	44	199	356	225
Merton	59	59	51	171	253	208
Redbridge	88	88	90	303	448	346
Richmond upon Thames	33	67	43	153	434	383
Sutton	62	27	78	207	329	246
Waltham Forest	72	62	65	211	300	348
Greater London	68	73	63	222	351	306

3.3 Time

There were two components to our investigation of injury rates by ethnic group over time: annual changes and seasonal changes.

Injury rates by year

First, we examined the relationship between ethnicity and injury rates among age and road user group from 2001 to 2006. Population data on the number of people in each age and ethnic group were from the GLA 2006 Round Ethnic Group Population Projections. Injury rates shown are casualties per 100,000 people.

Figure 1: Pedestrians

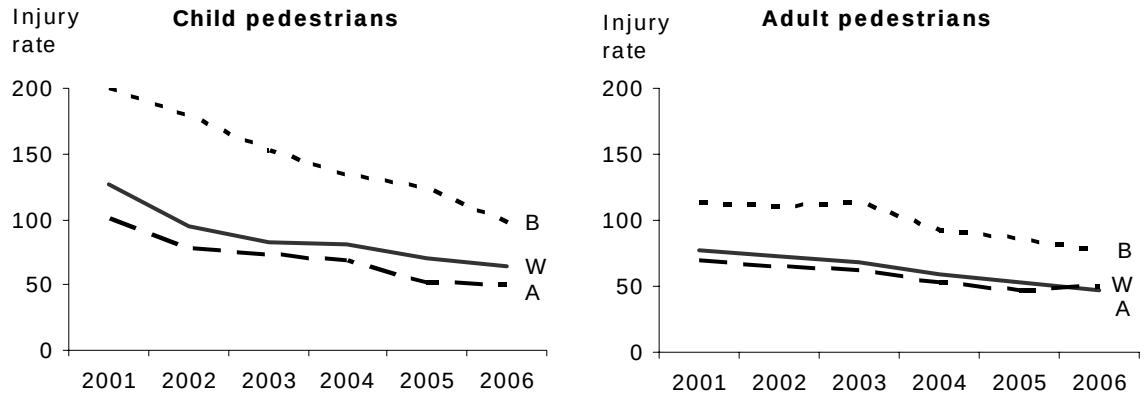
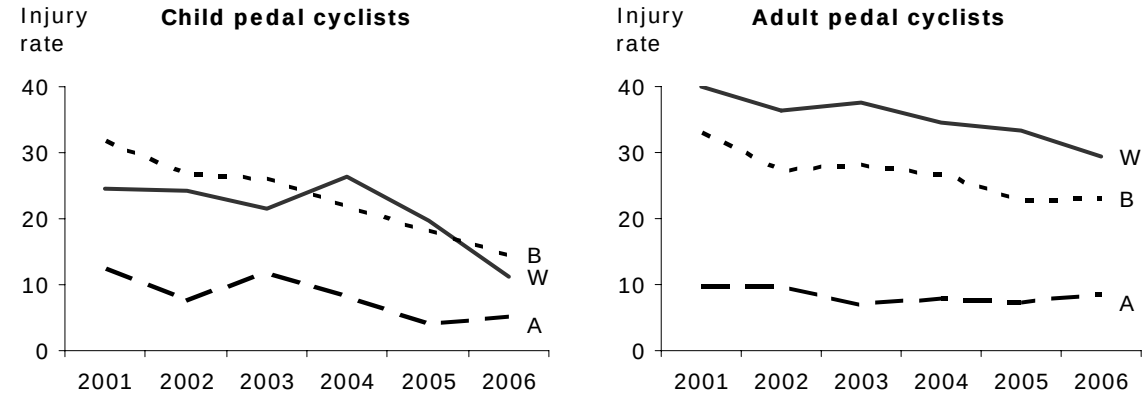


Figure 2: Pedal cyclists

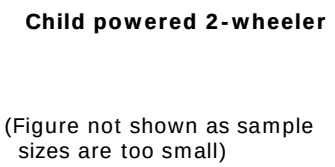


Pedestrian injury rates among children and adults in all three ethnic groups appear to have decreased over time. A formal statistical test (not shown) indicated no evidence for ethnic differences in the rates of decline in either children or adults.

For pedal cyclists, injury rates among 'Black' children steadily declined. In 'White' children, cycling injury rates mostly declined over the time period except for an increase seen in 2004. Similarly, cycling injury rates in 'Asian' children declined over the time period except for a small increase in 2003. Generally, cycling injury

rates appeared to decline among 'White' adults and 'Black' adults over the period. However, cycling injury rates among 'Asian' adults appeared to remain relatively constant. A formal statistical test (not shown) indicated no evidence for ethnic differences in the rates of decline in pedal cycling injury rates for either children or adults.

Figure 3: Powered 2-wheeler



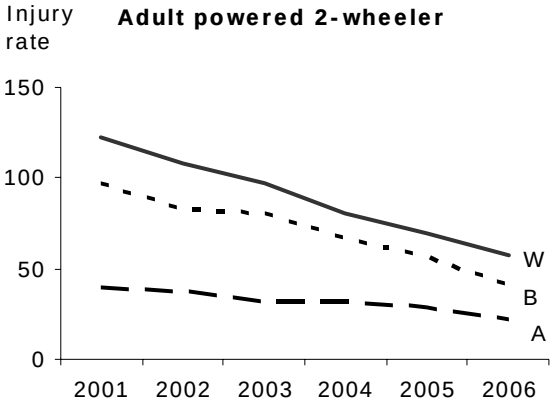
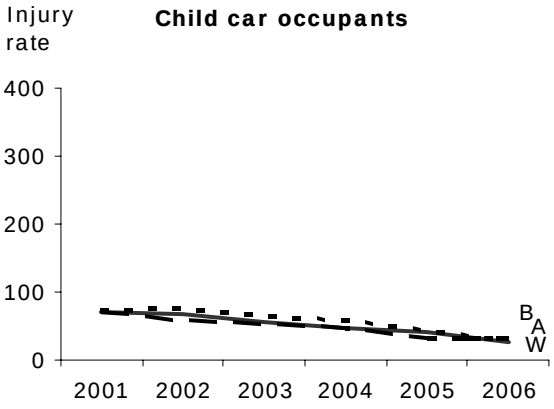
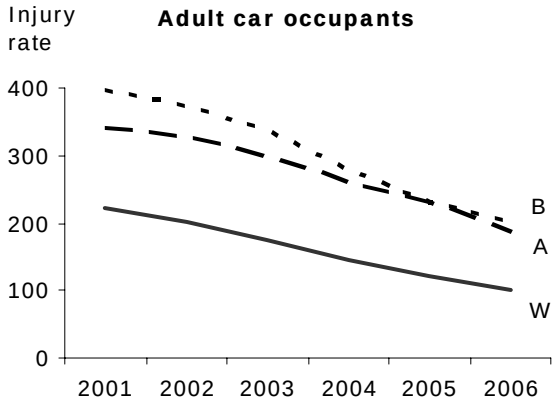


Figure 4: Car occupants





Powered 2-wheeler injury rates have steadily declined among 'White', 'Black' and 'Asian' adults since 2001.

Car occupant injury rates were considerably higher in adults, yet rates have decreased considerably over time in all ethnic groups. A formal statistical test (not shown) indicated no evidence for ethnic differences in the rates of decline in car occupant injury rates in children. However, among adults there was strong evidence that the decline over time in car occupant injury rates was higher in 'White' adults than in either 'Black' or 'Asian' adults (annual reduction for 'White' adults 14.4% versus 10.9% in 'Asian' adults ($p=0.001$) and 13.1% in 'Black' adults ($p=0.013$)).

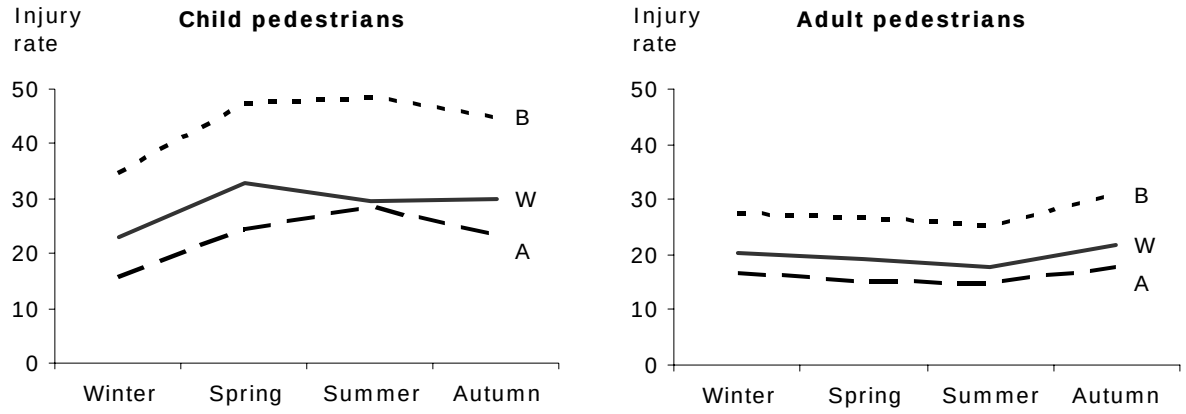
Seasonal analysis

The second component of our analysis of variation in injury rates over time considered seasonal differences. A table showing injury rates by age, ethnic group, road user group and season is included in Appendix 2. The figures below present the average age/ethnicity-specific injury rates per 100,000 people for each season (combining data for the period 1996-2006), for pedestrians and pedal cyclists.

Among children injured as pedestrians, the highest rates occurred in the Summer months (June to August) among 'Black' children and 'Asian' children. However in 'White' children the pedestrian injury rates in the summer months remained similar to that in Spring. A formal statistical test (not shown) provided some evidence that the relationship between season and child pedestrian injury rates differed by ethnicity (p-value testing no association between the interaction of ethnicity and summer months on injury rates was $p=0.085$ for 'Black' children and $p<0.001$ for 'Asian' children).

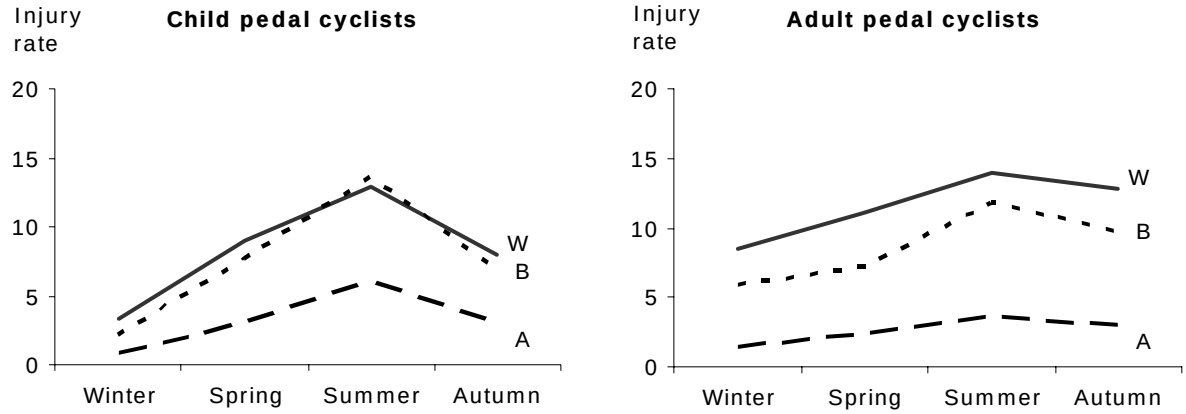
Among adults, pedestrian injury rates in all three ethnic groups appeared higher in the autumn months, and lower in the summer months.

Figure 5: Pedestrians



Pedal cyclist injury rates increased in the summer months in 'White', 'Black' and 'Asian' children. Cycling injury rates appeared higher in 'White' children than in 'Black' children in every season apart for the summer, when they appeared slightly lower. The size of difference in rates in 'Asian' and 'White' children was higher in the summer compared to other seasons. A formal statistical test (not shown) provided some evidence that the relationship between season and child cycling injury rates differed by ethnicity (p-value testing no association between ethnicity and injury rates in the summer was $p=0.002$ for 'Black' children and $p=0.014$ for 'Asian' children).

Figure 6: Pedal cyclists



Among adults, pedal cycling injury rates appeared highest in the summer months in all three ethnic groups. Cycling injury rates in 'White' and 'Black' adults were more similar over the summer months, and were substantially higher than in 'Asian' adults. A formal statistical test (not shown) provided strong evidence that the relationship between season and adult cycling injury rates differed by ethnicity (p-value testing no association between the interaction of ethnicity and summer on injury rates was $p=0.001$ for 'Black' adults and $p<0.001$ for 'Asian' adults).

3.4 Multivariable analysis

The second part of our analysis explored the relationship between ethnicity and road traffic injury, taking account of other variables known to influence risk, namely levels of deprivation and the road environment in areas where people live. In a "multi-variable" analysis, we are able to measure the effect of each explanatory variable (e.g. level of deprivation) on injury rates in each ethnic group, whilst controlling for the effects of other variables (e.g. number of road junctions). For our analysis, each casualty record in STATS19 was linked to the SOA in which the collision occurred.[5]

Child pedestrians

As recommended in *Deprivation and Road Safety in London*, use of SOA of collision instead of SOA of residence of casualties is acceptable for analyses of child pedestrian casualties. This is due to the close proximity of child pedestrian (and cyclist) casualties to their home addresses. We examined whether this assumption

[5] Although the SOA of residence of casualties was available, and arguably preferable, the home address postcodes in the STATS19 data are incomplete, with levels of completeness as low as 11% in some boroughs (see Edwards et al., 2006, Table A1, p62). Linking casualties to their SOA of residence using home address postcode would therefore exclude a large proportion of the total casualties in the STATS19 data.

is true for child pedestrians of all ethnicities. Appendix 3 summarises the distributions of distance from place of residence to site of collision for different age, ethnic, and road user groups. In this analysis we can confirm that 'White', 'Black', and 'Asian' child pedestrians and cyclists do tend to be injured very close to home (median distances from home for 'White', 'Black' and 'Asian' pedestrians are around 600 metres, confirming that they are likely to be injured in the SOA in which they live).

Since child pedestrians are by far the most vulnerable of road user groups, we have chosen to focus our analysis of the relationship between ethnicity, deprivation and road traffic injury using this group. To remain consistent with our report *Deprivation and Road Safety in London* we have used the age group 0–15 years in the analyses by deprivation. A separate analysis of the relationship between ethnicity, deprivation and child cyclist injury rates may be found in Appendix 5. The total numbers of children in each deprivation decile injured as pedestrians between 1996 and 2006 is shown below. It may be seen that in all ethnic groups the numbers of children injured as a pedestrian is higher in more deprived areas of London.

Table 10: Child (0–15 years) pedestrian casualties by ethnic group and deprivation decile (1996–2006)

	Deprivation decile										
	1	2	3	4	5	6	7	8	9	10	Total
'White'	673	885	944	1,097	1,118	1,162	1,260	1,422	1,240	1,414	11,215
'Black'	62	135	180	293	459	539	636	844	943	1,311	5,402
'Asian'	52	90	131	200	259	246	327	362	385	465	2,517

Child pedestrian injury rates per 100,000 'White', 'Black' and 'Asian' children living in each decile are presented in the figure below. For these rates, we estimated the child population by multiplying the total numbers of children and adults living in each SOA (from 2001 census), by the percentages of residents *of all ages* that are 'White', 'Black', or 'Asian' (also from 2001 census). These estimates of SOA-level ethnic group populations were then scaled to ensure that our estimates of ethnic-specific borough populations were equal to those in the census.

For 'White' and 'Asian' children, the rate of pedestrian injury increased for each decile of deprivation. However, for 'Black' children, there did not appear to be any

relationship between deprivation and injury – the rates of pedestrian injury were similar across the deprivation deciles.

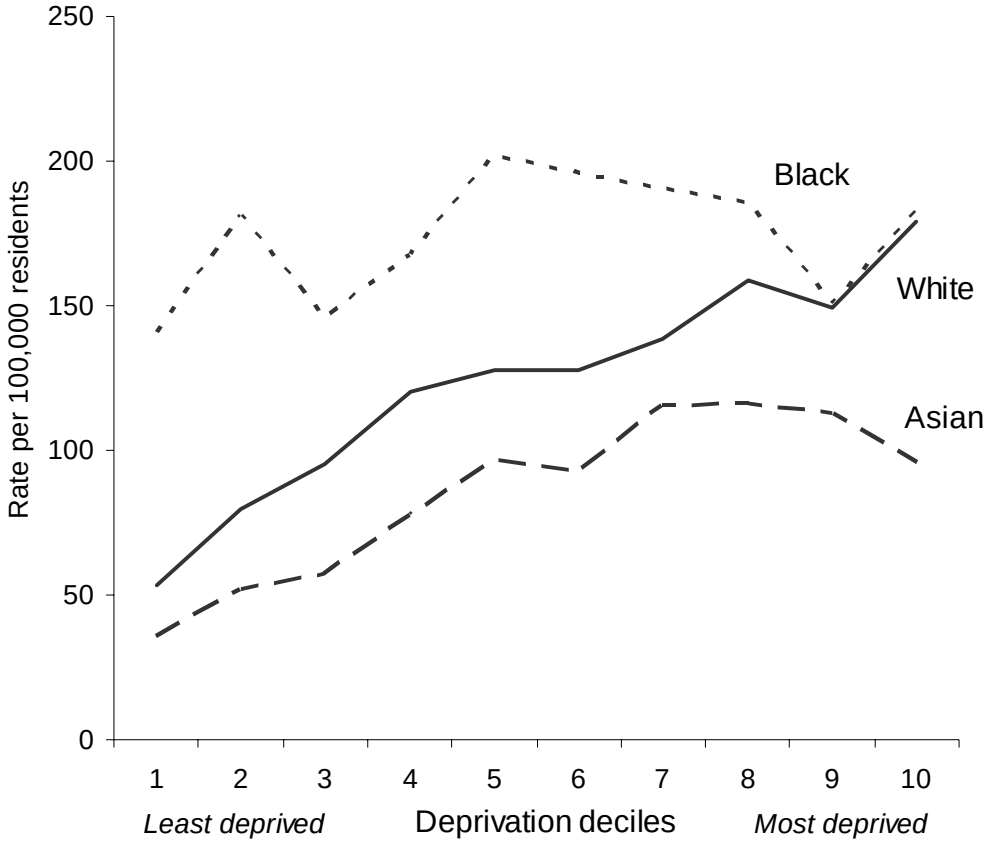


Figure 7: Average annual 'White', 'Black' and 'Asian' child pedestrian injury rates per 100,000 children (0–15), by deprivation decile of residence

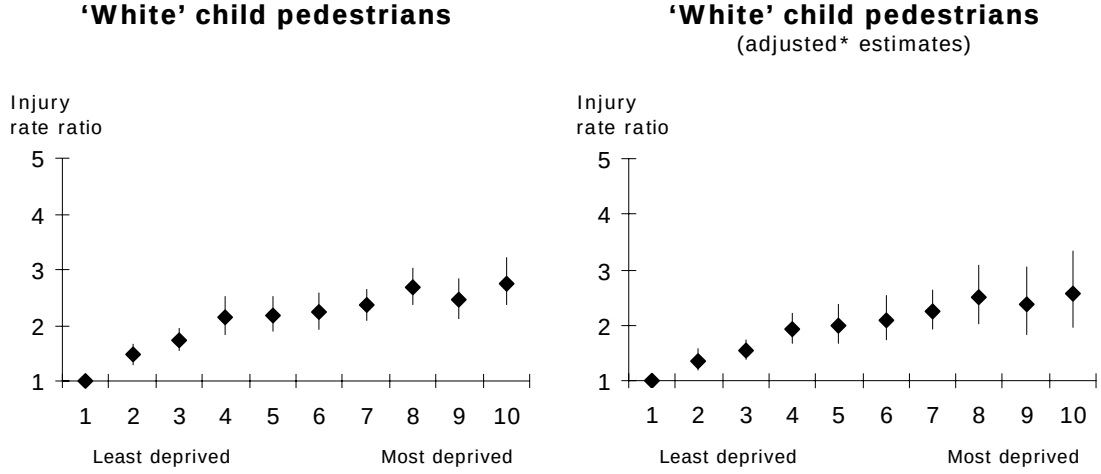
We ran two sets of multivariable models of child pedestrian injury rates. The first model describes child pedestrian injury rates within deprivation deciles for each ethnic group. The second model includes road environment variables to adjust for their effects on child pedestrian injury rates within each deprivation decile. [Note– all models are presented in detail in Appendix 4 of this report.]

'White' child pedestrians

In the figures below, the graph on the left shows the relationship between 'White' child pedestrian injury rates and increasing deprivation. The 'Black' diamonds represent the injury rate ratios, comparing injury rates in each deprivation decile to those in the least deprived decile. The vertical lines running through the 'Black' diamonds represent 95% confidence intervals. Where two confidence intervals overlap, there is not enough evidence to say whether one injury rate is higher than the other. The graph on the right shows the relationship between 'White' child

pedestrian injury rates and deprivation after adjusting for the road environment variables.

Figure 8



*The road environment variables in the adjusted model included the density of junctions, A roads, and B roads in an SOA; the length of minor roads and motorways in an SOA; and borough level estimates of traffic speed and traffic flows. A full list of variables in the adjusted models can be found in Appendix 4.

These figures show a strong positive relationship between deprivation and pedestrian injury rates in the 'White' child population. The injury rate for 'White' child pedestrians in the most deprived decile was more than 2.5 times the injury rate in the least deprived decile. Compared to the least deprived areas, 'White' child pedestrians in all other areas experienced significantly higher injury rates.

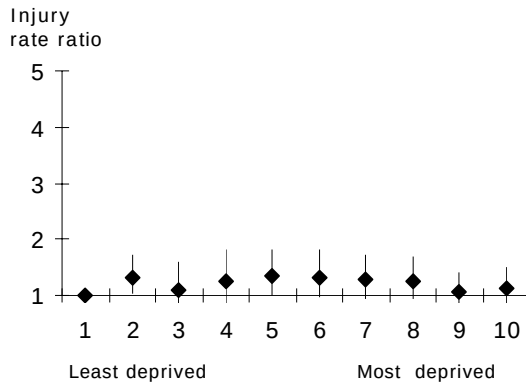
Furthermore, there appears to be 'dose-response' relationship – injury rates increase with increasing area deprivation. Adjusting for the road environment increased the width of confidence intervals (indicating somewhat less certainty about true rate ratios), particularly in the more deprived deciles, however the underlying relationship between 'White' child pedestrian injury and deprivation remained.

'Black' child pedestrians

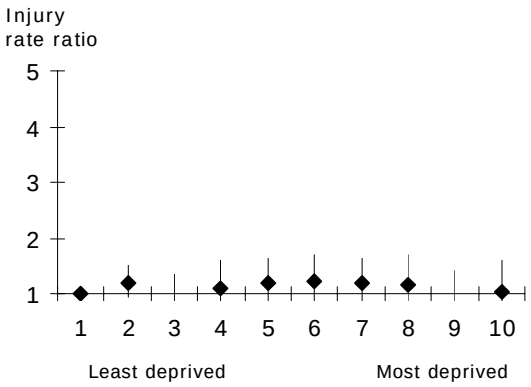
The figures below show 'Black' child pedestrian injury rate ratios by deprivation decile. 'Black' child pedestrian injury rates in the most deprived areas were broadly similar to rates in the least deprived areas. All confidence intervals include the rate ratio of 1.0, indicating no real differences in 'Black' child pedestrian injury rates for any deprivation decile compared with the least deprived. Even after adjusting for the road environment, 'Black' child pedestrian injury rates demonstrated no evidence for a relationship with different levels of deprivation.

Figure 9

'Black' child pedestrians



'Black' child pedestrians
(adjusted estimates)

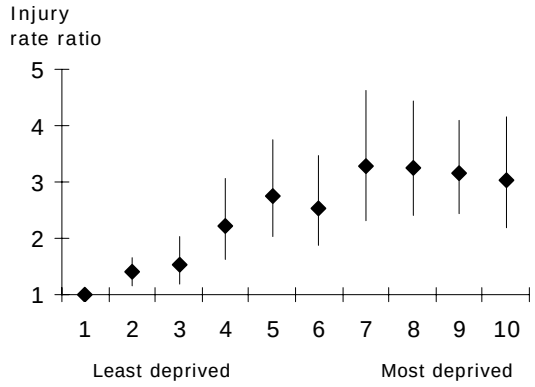


'Asian' child pedestrians

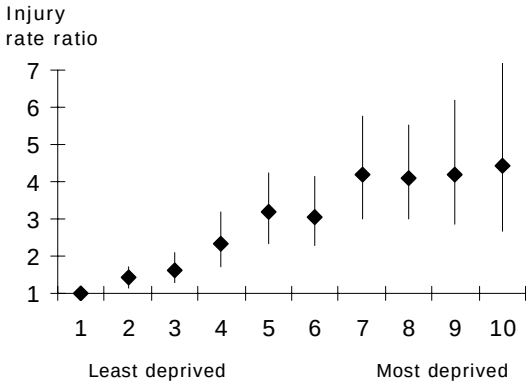
The figures below show 'Asian' child pedestrian injury rate ratios by deprivation decile. The relationship seen between 'Asian' child pedestrian injury rates and deprivation levels is similar to that observed for 'White' children, however the gradient appears steeper.

Figure 10

'Asian' child pedestrians



'Asian' child pedestrians
(adjusted estimates)



Relative to least deprived areas, 'Asian' child pedestrian injury rates increased with increasing deprivation, but then plateau in the most deprived areas. After adjusting for the road environment, the injury rates in the most deprived areas were over 4 times higher than in the least deprived areas. Compared with the rate in the least deprived decile, 'Asian' child pedestrian injury rates were significantly higher in all other deprivation deciles.

These analyses suggest that there are real differences in the relationships between deprivation and child pedestrian injury by ethnic group, and that these remain after controlling for the road environment. In a formal statistical test for interaction between pedestrian injury risk, deprivation and ethnicity (not shown), we found strong statistical evidence that these relationships differ by ethnic group: while the deprivation relationship is similar for 'Asian' and 'White' children, it differs for 'Black' children.

Adult pedestrians

To understand more about these ethnic differences in the relationships between pedestrian injury rates and deprivation, we next examined adult pedestrians. Some caution is required when interpreting these results for adult pedestrian casualties, as the use of SOA of collision instead of SOA of residence in the analysis will be less reliable than for child pedestrian casualties (adults are injured further away from home than are children).

The figures below show the relationship between adult pedestrian injury rates with increasing area deprivation. Again, rate ratios are presented comparing injury rates in tenths of London (according to deprivation) with the rate in the least deprived tenth. The figures presented below show estimates *after adjustment* for the effects of road environment variables.

Figure 11
'White' adults

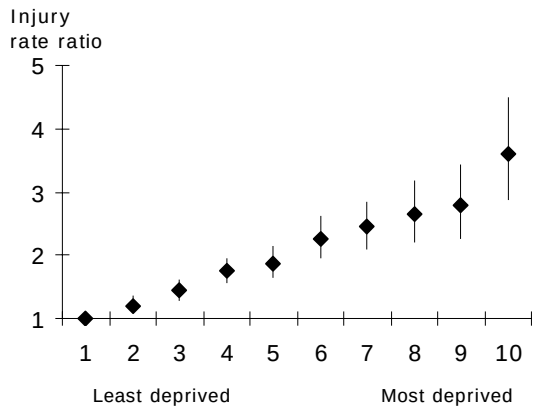
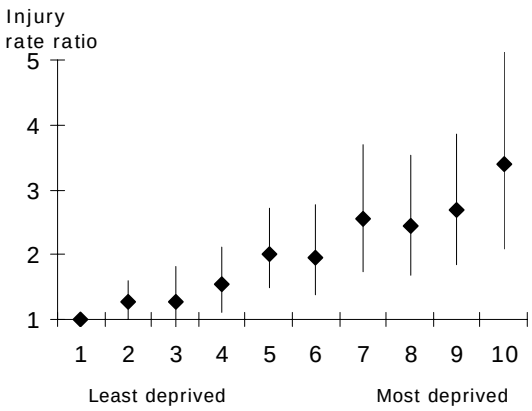
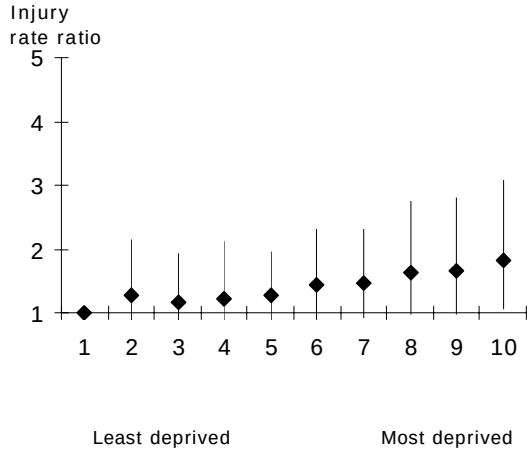


Figure 12
'Asian' adults



A strong positive relationship may be seen between increasing levels of area deprivation and increasing pedestrian injury rates in both 'White' and 'Asian' adults. The injury rate for 'White' and 'Asian' adult pedestrians in the most deprived decile was more than 3 times the injury rate in the least deprived decile.

'Black' adults
Figure 13



There was no good evidence for an equivalent relationship between 'Black' adult pedestrian injury rates and increasing area deprivation.

Only in the tenth most deprived areas of London was there weak evidence that 'Black' adult pedestrian injury rates were higher than in the least deprived tenth.

As with child pedestrians, there is strong evidence for a relationship between increasing deprivation and increasing pedestrian injury rates in both the 'White' and 'Asian' adult population. However, there is very little evidence for any relationship between deprivation and pedestrian injury rates in the 'Black' adult population.

3.5 Exposure to risk (LATS 2001)

Ethnic differences in exposure to traffic as a pedestrian, a cyclist, a car occupant, etc., are a potential explanation for the observed ethnic differences in road traffic injury rates. In *Deprivation and Road Safety in London* an analysis of LATS 2001 data suggested that 'Black' children tend to take a larger percentage of their trips as a pedestrians, compared to 'White' children, and that 'Black' adults take a greater proportion of trips by bus (which includes walking to and from bus stops) compared to 'White' adults. To add to this evidence, for this report our analysis considered two measures of exposure: average daily time spent walking (in minutes) and average daily distance walked (in km). We calculated averages separately for each age, sex, and ethnic group.

The LATS 2001 data include records of daily travel for 67,252 individuals from 29,973 households in London. There was a total 176,447 trips made, comprising a total 360,389 interchanges (parts of trips made by different travel modes). A total of 51,427 trips were made where walking was the only mode of transport used for the entire trip. A further 163,885 interchanges were made by foot.

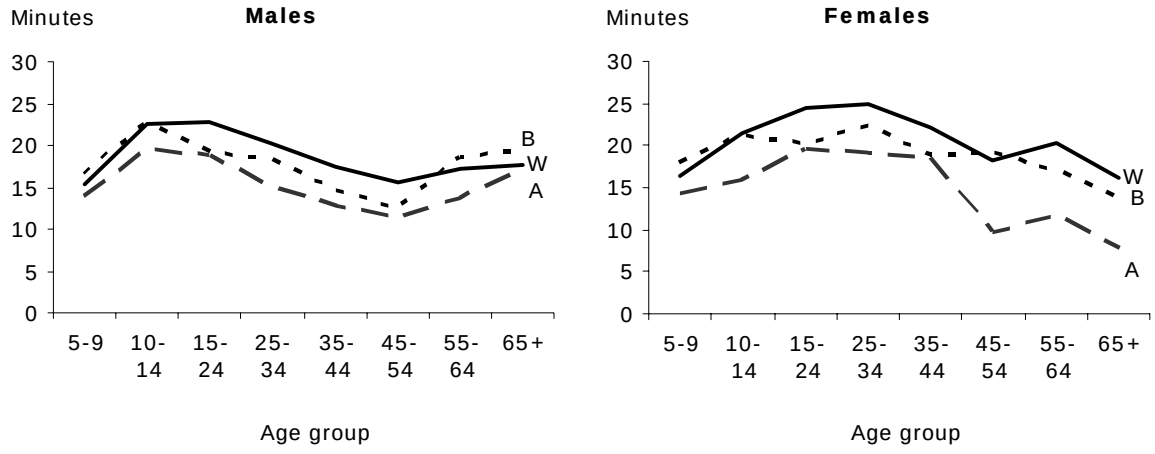
To estimate average times spent walking and average distances walked for the whole of London, LATS data must be weighted to allow for different selection probabilities between age, sex and ethnic groups. The numerators (total numbers

of minutes/Km walked by a particular age-sex-ethnic group) were weighted by interchange-level weights. The denominators (total number of persons in each age-sex-ethnic group) were weighted by person-level weights. All weights used were provided by TfL.

Daily time spent walking

Among children, both male and female, 'Black' and 'White' children appear to walk for a similar amount of time per day. 'Asian' males and females appear to walk slightly less than their 'Black' and 'White' counterparts. For adults up to age 44, 'White' males and females seem to have higher average walking times compared to either 'Black' or 'Asian' males and females.

Figure 14: Average daily time spent walking (minutes)



Daily distances walked

The figures below show average daily distances walked. 'White' male children appear to walk slightly further than 'Black' or 'Asian' male children. However, young 'White' male adults appear to walk considerably further than their 'Black' and 'Asian' counterparts. Older 'Black' males appear to walk further than 'White' or 'Asian' males ages 45 to 64 years old.

Among females, 'Black' girls appear to walk slightly further on average than their 'White' and 'Asian' counterparts. Young 'Black' females 15-24 and 35-44 seem to walk considerably further than 'White' and 'Asian' females of the same ages. Across all ages, 'Asian' females appear to walk shorter distances than either 'White' or 'Black' females.

Figure 15: Average daily distances walked (Km)

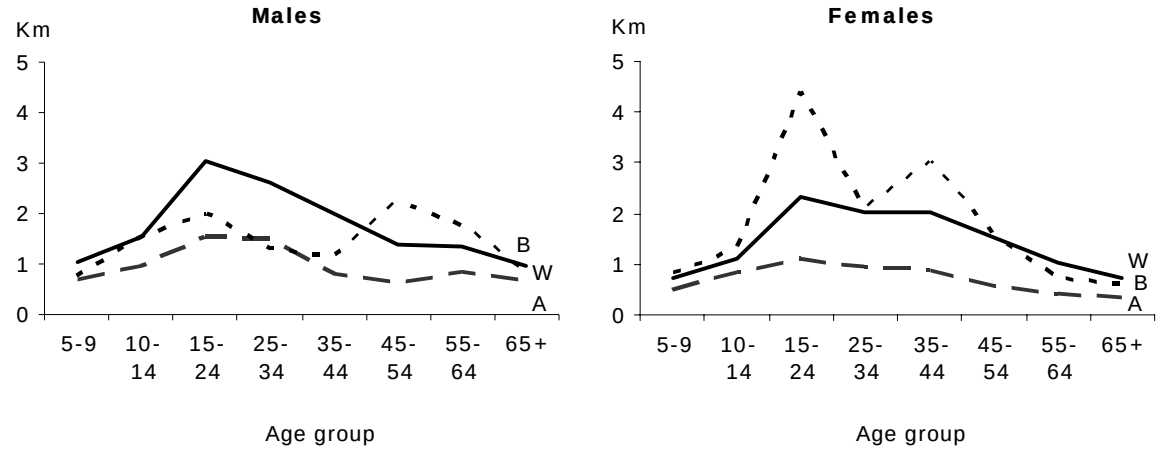


Table 11: Average daily time walking (minutes)

Age group	Sex	'White'	'Black'	'Asian'
5-9	M	15	17	14
	F	16	18	14
10-14	M	22	23	20
	F	22	21	16
15-24	M	23	19	19
	F	25	20	20
25-34	M	20	18	15
	F	25	22	19
35-44	M	17	15	13
	F	22	19	18
45-54	M	16	13	11
	F	18	19	10
55-64	M	17	19	14
	F	20	17	12
65+	M	18	20	17
	F	16	14	8

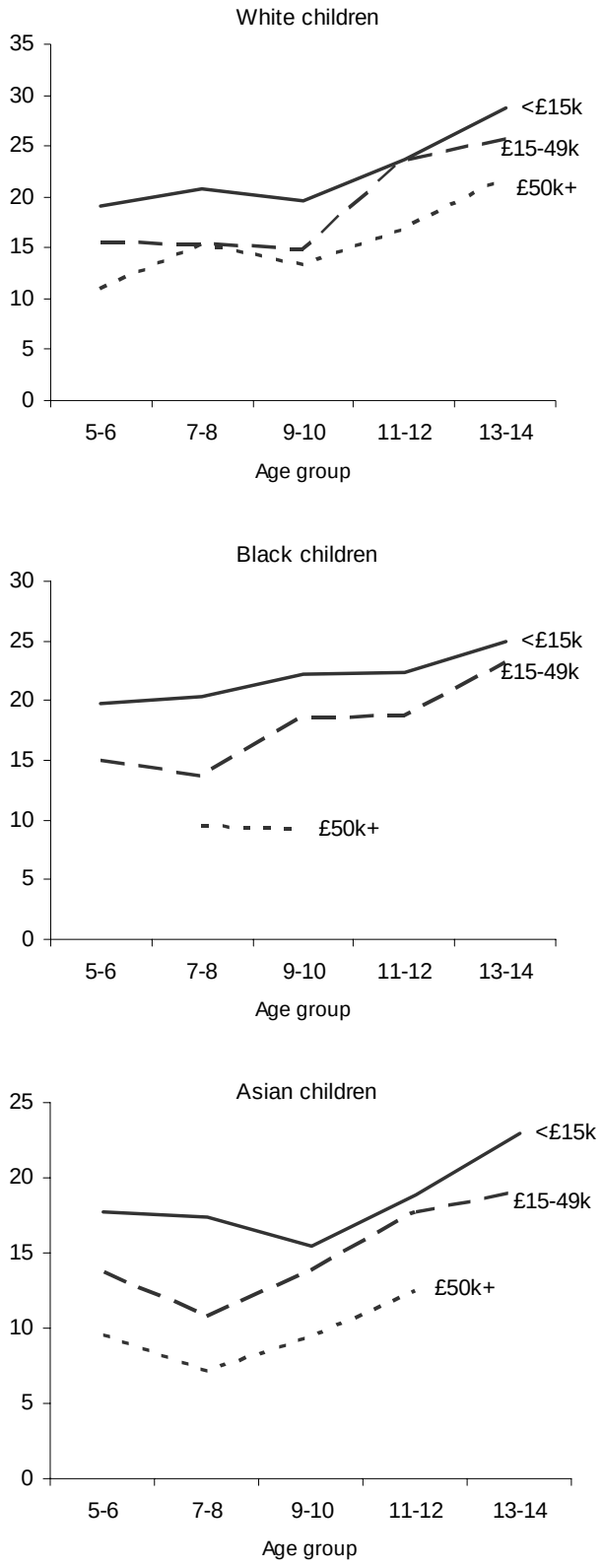
Table 12: Average daily distances walked (Km)

Age group	Sex	'White'	'Black'	'Asian'
5-9	M	1.0	0.8	0.7
	F	0.7	0.8	0.5
10-14	M	1.5	1.5	1.0
	F	1.1	1.3	0.9
15-24	M	3.0	2.0	1.5
	F	2.3	4.4	1.1
25-34	M	2.6	1.3	1.5
	F	2.0	2.1	1.0
35-44	M	2.0	1.2	0.8
	F	2.0	3.0	0.9
45-54	M	1.4	2.2	0.6
	F	1.5	1.6	0.6
55-64	M	1.4	1.8	0.8
	F	1.0	0.7	0.4
65+	M	0.9	0.8	0.6
	F	0.7	0.6	0.4

Daily time spent walking by household income level

To further investigate the relationship between ethnicity and exposure to traffic as pedestrians, we stratified the analysis of time spent walking by household income level (collected during the LATS household survey). We used three household income groups: under £15,000 per year, between £15k and £49k, and £50k or more per year. The minimum income group was based on household incomes below 60% of median income levels in the LATS survey. The figures below show the average amounts of time spent walking by 'White', 'Black' and 'Asian' children in households with these levels of income.

Figure 16



Average daily time spent walking (minutes) by 'White', 'Black' and 'Asian' children in households on three different income levels

It may be seen that for all ethnic groups, the average amount of time spent walking is highest in children from households on lowest incomes, and lowest in children from households on highest incomes. [Note– walking times are not shown in some ages of 'Black' and 'Asian' children in high income households, due to small sample sizes in LATS survey.]

4. Discussion

Principal Findings

This study has examined associations between ethnicity and road traffic injury risk for different road user groups in London. Our analysis has covered children and adults injured as pedestrians, pedal cyclists, powered 2-wheeler riders, and as car occupants. Our principal findings are summarised below:

- *Person groups:* In the 1996-2006 period, 'Black' pedestrians of all age-sex groups appeared to have higher injury rates than their 'White' and 'Asian' counterparts. 'Asian' pedestrians of most age-sex groups appeared to have lower injury rates than 'White' and 'Black' pedestrians. In most age-sex groups, pedal cycle injury rates among the 'White' ethnic group appeared higher than rates among 'Black' and 'Asian' ethnic groups.
- *Place:* Compared to Outer London, Inner London had higher pedestrian injury rates for all age and ethnic groups; higher pedal cycling injury rates among adults of all ethnic groups; higher powered 2-wheeler injury rates among adults of all ethnic groups; and lower car occupant injury rates for adults and children of all ethnic groups.
- *Time:* Casualty rates among children and adults of all three ethnic groups appear to have decreased over time for most road user groups. Car occupant injury rates appear to have decreased more in 'White' adults than in either 'Black' or 'Asian' adults.
- *Season:* There appeared to be seasonal differences in 'White', 'Black', and 'Asian' child pedestrian injury rates. There was also some evidence that the relationship between season and child cycling injury rates differ by ethnicity.
- *Deprivation:* There was strong evidence that the relationship between deprivation and child pedestrian injury rates differs by ethnic group: 'White' and 'Asian' child pedestrian injury rates increase with increasing levels of deprivation, whereas 'Black' child pedestrian injury rates are not related to deprivation levels. Similar results were found for adult pedestrian injury rates.
- *Exposure:* On average, 'Black' and 'White' children walk similar amounts of time each day. 'White' adults aged under 44 years walk longer than 'Black' or 'Asian' adults. Young 'White' men walk further than their 'Black' and 'Asian' counterparts, and young 'Black' women walk further than their 'White' and 'Asian' counterparts. In all ethnic groups the average amount of time spent walking was highest in children from households on lowest incomes, and lowest in children from households on highest incomes.

Before we consider potential underlying mechanisms for these observed differences, we will first consider the methodological issues that have a bearing on our results.

Methodological Issues

Perhaps the most important methodological issue that must be borne in mind when considering the results of part A of this report is that they are based on an 'ecological analysis'. We have analysed SOAs which are small geographical populations of around 1,500 people. Any inferences about the relative risks of road traffic injury for different ethnic groups using different modes of travel and living in different levels of deprivation are based on aggregates of individual data and not the individuals themselves. The results therefore only provide evidence for relationships between ethnicity, deprivation and road injury risk at an ecological (i.e. population) level, and do not necessarily for hold true for all individuals living within those areas.

Are ethnic variations in injury rates an artefact of the data?

Ethnic variations in child pedestrian injury could be an artefact of the data for three possible reasons: (1) bias in the numerator, (2) bias in the denominator, or (3) the population described in the numerator differs from that in the denominator.

Bias in the numerator

In the univariable analysis, the numerator (number of casualties) comes from the STATS19 data. A number of issues could affect the accuracy of STATS19 data in estimating numbers of casualties by ethnic group: under-reporting and under-recording of accidents, reliability of the police-assigned ethnicity codes, and missing data on ethnicity. Estimates of under-reporting of pedestrian injuries in the STATS19 vary based on location, but generally fall between 25-40% (Ward *et al*., 2006). In London, Ward *et al*. (2005, cited in Ward *et al*., 2006) estimate that no more than 70% of casualties are reported to police. Under-recording occurs when collisions are reported but do not appear in the STATS19 data, usually due to clerical errors or latent (i.e. not yet recognised) injuries. Estimates of under-recording in the STATS19 data are around 20% (Ward et al, 2006). If under-reporting and under-recording disproportionately affect different ethnic groups, estimates of ethnic variations in injury rates will be biased.

In the STATS19 data, police are responsible for assigning an ethnicity code to each casualty. Deciding a person's ethnic identity based on their appearance is a difficult

task and some casualties may have selected a different ethnic identity, if asked. These potential classification errors could bias ethnic-specific injury rate estimates. Finally, 15% of casualties in the STATS19 data did not have any information recorded on ethnicity. If casualties from one or more ethnic groups are less likely to have been assigned an ethnicity code in STATS19, then estimates of ethnic-specific injury rates may be biased. We examined the characteristics of the casualties that were missing an ethnicity code and found that coding was less likely to be complete for very young (0 to 5 years) and for older (65 years and over) casualties. Codes were also less likely to be complete for cyclists than for pedestrian casualties. Coding was more complete for seriously injured casualties than for casualties with less severe injuries. Furthermore, the completion of the ethnicity code has fallen each year from around 93% in 1996 to under 80% in 2006.

Bias in the denominator

The univariable analysis used the 2001 census estimate of the population of London to estimate the population at risk for the entire 1996-2006 period. Population estimates from 2001 are likely to underestimate the London population in later years, and overestimate the population in earlier years. If the rate of population growth differs by ethnic group, then this too could introduce bias. The multivariable analysis estimated the numbers of 'White', 'Black', and 'Asian' adults and children in each SOA by multiplying the percentage of persons in each ethnic group *of all ages* to the number of adults and number of children living in each SOA. As the percentages of persons in each ethnic group is likely to vary by age, this method may have introduced error in our estimates of injury rates for each age-ethnic group.

Bias from combining two sources of data

The numerator and denominator in the injury rate calculations may be describing two different populations. First, ethnicity in the STATS19 is police-assigned, while ethnicity in the 2001 census was self-reported. Furthermore, ethnic categories in the STATS19 do not reliably map onto the ethnicity categories used in the 2001 census. For example, not only is it unclear who the STATS19 category 'Arab' is meant to represent, it is also unclear to which census category 'Arab' would be mapped. The numerator in the injury rate analysis represents injuries occurring in London, while the denominator represents the resident population of London. Efforts were made to exclude injuries occurring to non-London residents, however postcode of residence of casualties were missing in many cases. Therefore, the numerator and denominator may depict slightly different populations, again decreasing the accuracy of the injury rate estimates.

Although it is difficult to prove that ethnic variations in injury rates are entirely an artefact of the data, the potential for bias, for the reasons outlined above, must be borne in mind when interpreting the ethnicity-specific estimates of injury rates in this report.

Mechanisms

Assuming that the ethnic differences observed in road traffic injury rates are not entirely artifacts of the data sources used, we now consider the mechanisms that may explain them. In our analysis we considered two mechanisms: exposure and deprivation.

Exposure

Our analysis of ethnic differences in exposure suggests that 'Asian' pedestrians walk less than their 'White' and 'Black' counterparts, which may partially explain the lower pedestrian injury rates in this group. The exposure analysis found little evidence that 'Black' pedestrians walk more than 'White' or 'Asian' pedestrians, suggesting that their higher pedestrian injury rates *cannot* be explained by differences in the time spent walking, or in distances walked.

However, the data used to measure exposure have some notable limitations: First, data from LATS 2001 were collected during school term-time only. Our seasonal analysis of pedestrian injury rates found evidence for ethnic differences in child pedestrian injury rates in the summer months. Since LATS did not collect data in the summer, key exposure differences in these months may have been missed. Secondly, exposure data from 2001 was extrapolated to represent the entire 1996-2006 period. Any potential changes in walking patterns over this time period will have been missed. Finally, not all pedestrians are injured while walking. In an urban American study of injured children, Posner *et al*. (2002) found that one-third of all pedestrian injuries occurred while playing in the road environment. Measures of playing exposure were not available in the LATS data. A UK study examining police data (Sentinella and Keigan, 2006), also found that 'most' fatal injuries to child pedestrians aged 9-15 years occurred when the child was playing.

Deprivation

The hypothesis that deprivation explains ethnic differences in road traffic injury rates is based on the assumption that injury rates increase with increasing deprivation. Deprivation may confound the relationship between ethnicity and

injury found in this report, if children living in more deprived areas have higher pedestrian injury rates, and if more 'Black' children live in deprived areas.

Our multivariable analysis provides strong evidence that the relationship between deprivation and pedestrian injury is modified by ethnicity: 'White' and 'Asian' child pedestrian injury rates increase with deprivation, however, 'Black' child pedestrian injury rates were not found to be related to levels of deprivation. Deprivation cannot therefore fully explain the observed differences in 'Black'-'White' ethnic group injury rates.

It is important to remember that measures of ethnicity in quantitative data are merely proxies of a multi-faceted social construct. Furthermore, the definitions of ethnic groups used in our analysis are imperfect and do not necessarily represent any real communities in London. But our findings do suggest that there are differences in road traffic injury risk by ethnicity, posing a critical question: What is it about the complex construct of ethnicity that could be related to road traffic injury?

5. Recommendations

Following from the analyses presented within *Part A Relationships and Risks*, our recommendations for future research and monitoring the relationship between road traffic injury and ethnicity in London are as follows:

1) Analysis based on STATS19 data and area-level measures has provided a 'broad brush' picture of the relationship between deprivation, ethnicity and road traffic injury, but further research is needed to:

    - Understand in detail different patterns of exposure to risk, particularly for children, and how these relate to deprivation;

    - Look at the impact of existing interventions (e.g. 20mph zones) on ethnic inequalities.

2) To monitor trends in the relationship between road traffic injury and ethnicity, the most useful outcome measures are rates of child pedestrian and adult pedestrian casualties

3) Work on improving the completeness of STATS19 data should continue, with monitoring under-reporting and recording of road traffic injury.

Appendices

Appendix 1

Injury rates by severity

Table 13: Average annual injury rates per 100,000 people, all transportation modes 1996-2006

	Children (0–14)		Adults	
	All injuries (95%CI)	KSI (95%CI)	All injuries (95%CI)	KSI (95%CI)
'White'	234 (231-237)	41 (40-42)	479 (477-481)	72 (71-73)
'Black'	305 (299-312)	53 (50-56)	617 (611-622)	78 (76-80)
'Asian'	175 (170-180)	29 (27-31)	421 (417-426)	49 (48-51)

Table 14: Rate ratios comparing 'Black' and 'Asian' injury rates to 'White' injury rates, 1996-2006

	Children (0–14)		Adults	
	All injuries (95%CI)	KSI (95%CI)	All injuries (95%CI)	KSI (95%CI)
'White'	-	-	-	-
'Black'	1.30 (1.27-1.34)	1.29 (1.22-1.37)	1.29 (1.27-1.30)	1.08 (1.05-1.11)
'Asian'	0.75 (0.72-0.77)	0.72 (0.66-0.78)	0.88 (0.87-0.89)	0.69 (0.67-0.71)

Appendix 2

Injury rates by season

Table 15: Average seasonal injury rates per 100,000 children, 1996-2006

Mode of transport	Season	'White'	'Black'	'Asian'
Pedestrian	Winter	23	35	16
	Spring	33	47	24
	Summer	30	49	29
	Autumn	30	45	23
Pedal cycle	Winter	3	2	1
	Spring	9	8	3
	Summer	13	14	6
	Autumn	8	7	3
Car	Winter	16	17	16
	Spring	17	17	14
	Summer	17	21	18
	Autumn	18	18	15
Powered 2-wheeler	Winter	1	1	0
	Spring	1	1	0
	Summer	1	1	0
	Autumn	1	0	0

Table 16: Average seasonal injury rates per 100,000 adults, 1996-2006

Mode of transport	Season	'White'	'Black'	'Asian'
Pedestrian	Winter	20	28	17
	Spring	19	27	15
	Summer	18	25	15
	Autumn	22	31	18
Pedal cycle	Winter	8	6	1
	Spring	11	7	2
	Summer	14	12	4
	Autumn	13	10	3
Car	Winter	54	84	75
	Spring	55	86	74
	Summer	53	89	75
	Autumn	60	94	83
Powered 2-wheeler	Winter	22	14	7
	Spring	25	17	7
	Summer	27	22	8
	Autumn	30	20	9

Appendix 3

Table 17: Distance from home to site of collision (Km)

Mode of transport	Age Group	Ethnic group	N Records	Mean	SE	Median	5th centile	95th centile
Pedestrian	0-14	'White'	3015	1.38	2.18	0.53	0.04	5.47
		'Black'	257	2.01	3.29	0.58	0.03	8.61
		'Asian'	1834	1.82	2.99	0.63	0.04	7.19
	16+	'White'	9786	3.38	4.72	1.28	0.07	13.76
		'Black'	974	3.72	4.49	2.14	0.08	12.51
		'Asian'	2868	3.56	4.42	1.77	0.10	12.87
Cycle	0-14	'White'	838	0.89	1.47	0.42	0.05	3.17
		'Black'	48	0.69	1.11	0.18	0.03	2.28
		'Asian'	282	1.02	1.56	0.44	0.04	4.35
	16+	'White'	7543	3.73	3.48	2.71	0.31	10.68
		'Black'	446	3.53	3.42	2.53	0.22	10.41
		'Asian'	896	3.27	3.63	1.89	0.24	11.32
Car	0-14	'White'	1981	3.32	4.04	2.05	0.18	10.70
		'Black'	246	3.96	4.01	2.69	0.14	12.56
		'Asian'	938	3.97	4.23	2.60	0.22	12.17
	16+	'White'	34784	4.38	4.84	2.75	0.22	14.11
		'Black'	3993	4.84	4.98	3.29	0.25	14.96
		'Asian'	11394	5.25	5.24	3.58	0.28	15.77
Powered 2-wheeler	0-14	'White'	83	2.85	3.95	1.08	0.16	11.58
		'Black'	8	4.56	3.27	4.45	0.07	9.24
		'Asian'	23	1.77	2.10	1.12	0.11	4.87
	16+	'White'	18016	5.92	5.45	4.23	0.38	17.08
		'Black'	1997	5.85	4.90	4.57	0.45	15.64
		'Asian'	2402	5.26	5.00	3.72	0.31	15.00
All modes	0-14	'White'	6314	2.06	3.14	0.93	0.06	7.97
		'Black'	616	2.84	3.79	1.41	0.05	10.82
		'Asian'	3351	2.42	3.45	1.06	0.06	9.29
	16+	'White'	77020	4.61	5.02	2.89	0.19	15.09
		'Black'	7903	4.89	4.92	3.39	0.22	14.87
		'Asian'	19846	4.84	5.01	3.21	0.21	15.07

Appendix 4

MULTIVARIABLE MODEL: 'WHITE' CHILD PEDESTRIANS

	Unadjusted				Adjusted			
Variable Name	IRR	SE	95% CI	p	IRR	SE	95% CI	p
Deprivation								
IMD decile 2	1.47	0.10	1.29 - 1.68	<0.001	1.36	0.10	1.19 - 1.57	<0.001
IMD decile 3	1.73	0.10	1.54 - 1.95	<0.001	1.55	0.09	1.38 - 1.74	<0.001
IMD decile 4	2.14	0.18	1.81 - 2.52	<0.001	1.94	0.14	1.68 - 2.23	<0.001
IMD decile 5	2.19	0.16	1.90 - 2.53	<0.001	1.98	0.18	1.66 - 2.37	<0.001
IMD decile 6	2.22	0.17	1.92 - 2.57	<0.001	2.10	0.21	1.73 - 2.54	<0.001
IMD decile 7	2.35	0.15	2.08 - 2.66	<0.001	2.25	0.18	1.92 - 2.64	<0.001
IMD decile 8	2.67	0.17	2.36 - 3.03	<0.001	2.50	0.27	2.03 - 3.08	<0.001
IMD decile 9	2.45	0.19	2.10 - 2.85	<0.001	2.38	0.30	1.85 - 3.05	<0.001
IMD decile 10	2.76	0.22	2.36 - 3.23	<0.001	2.55	0.34	1.96 - 3.33	<0.001
Education domain					1.00	0.00	1.00 - 1.01	0.030
Barriers domain					0.98	0.00	0.97 - 0.98	<0.001
Crime domain					1.21	0.04	1.13 - 1.30	<0.001
Percentage of children without GCSEs					1.00	0.00	1.00 - 1.00	0.201
Traffic environment								
Difference between free flowing and morning traffic speeds					1.00	0.00	0.99 - 1.01	0.888
Junction density					0.82	0.02	0.78 - 0.86	<0.001
Density of A roads					1.01	0.00	1.01 - 1.01	<0.001
Density of B roads					1.01	0.00	1.01 - 1.01	<0.001
Density of minor roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.201
Length of minor roads in SOA					1.00	0.00	1.00 - 1.00	0.002
Length of motorways in SOA					1.00	0.00	1.00 - 1.00	0.007
Number of A roads					1.00	0.00	1.00 - 1.00	0.015
Number of road junctions					1.01	0.00	1.01 - 1.02	<0.001
Number of A roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.020
Traffic flow 2001					1.00	0.00	1.00 - 1.00	0.816
Number of adjacent SOAs					1.07	0.01	1.06 - 1.09	<0.001

MULTIVARIABLE MODEL: 'BLACK' CHILD PEDESTRIANS

	Unadjusted				Adjusted			
Variable Name	IRR	SE	95% CI	p	IRR	SE	95% CI	p
Deprivation								
IMD decile 2	1.33	0.18	1.02 - 1.74	0.035	1.19	0.14	0.94 - 1.51	0.148
IMD decile 3	1.09	0.21	0.74 - 1.60	0.668	0.97	0.17	0.69 - 1.36	0.840
IMD decile 4	1.24	0.24	0.85 - 1.82	0.268	1.10	0.21	0.75 - 1.61	0.640
IMD decile 5	1.35	0.21	0.99 - 1.83	0.055	1.20	0.19	0.88 - 1.63	0.246
IMD decile 6	1.33	0.22	0.97 - 1.83	0.078	1.22	0.20	0.88 - 1.69	0.234
IMD decile 7	1.28	0.19	0.95 - 1.72	0.109	1.19	0.19	0.87 - 1.63	0.288
IMD decile 8	1.26	0.19	0.93 - 1.70	0.135	1.16	0.23	0.78 - 1.71	0.460
IMD decile 9	1.06	0.16	0.79 - 1.42	0.697	0.94	0.19	0.63 - 1.41	0.775
IMD decile 10	1.13	0.16	0.85 - 1.50	0.414	1.02	0.23	0.66 - 1.60	0.917
Education domain					0.99	0.00	0.99 - 1.00	0.055
Barriers domain					0.98	0.01	0.97 - 0.99	<0.001
Crime domain					1.38	0.06	1.27 - 1.50	<0.001
Percentage of children without GCSEs					1.00	0.00	1.00 - 1.00	<0.001
Traffic environment								
Difference between free flowing and morning traffic speeds					1.01	0.00	1.00 - 1.02	0.002
Junction density					0.86	0.04	0.78 - 0.95	0.003
Density of A roads					1.01	0.00	1.01 - 1.02	<0.001
Density of B roads					1.01	0.00	1.01 - 1.01	<0.001
Density of minor roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.845
Length of minor roads in SOA					1.00	0.00	1.00 - 1.00	0.670
Length of motorways in SOA					1.00	0.00	1.00 - 1.00	0.039
Number of A roads					1.00	0.00	1.00 - 1.00	<0.001
Number of road junctions					1.01	0.00	1.00 - 1.02	0.001
Number of A roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	<0.001
Traffic flow 2001					1.00	0.00	1.00 - 1.00	<0.001
Number of adjacent SOAs					1.12	0.02	1.09 - 1.15	<0.001

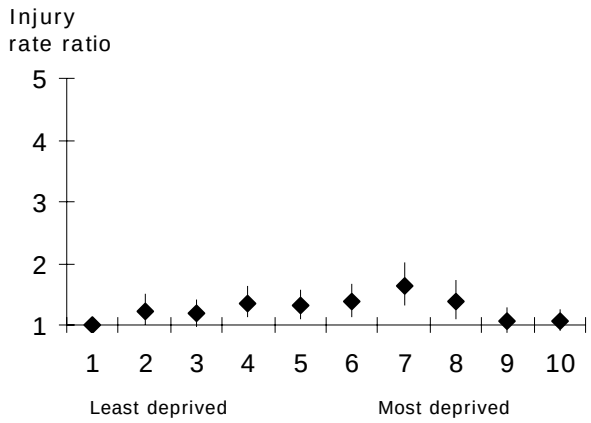
MULTIVARIABLE MODEL: 'ASIAN' CHILD PEDESTRIANS

	Unadjusted				Adjusted			
Variable Name	IRR	SE	95% CI	p	IRR	SE	95% CI	p
Deprivation								
IMD decile 2	1.39	0.13	1.16 - 1.67	<0.001	1.42	0.14	1.16 - 1.73	0.001
IMD decile 3	1.55	0.21	1.18 - 2.03	0.002	1.63	0.21	1.27 - 2.11	<0.001
IMD decile 4	2.23	0.36	1.62 - 3.05	<0.001	2.35	0.36	1.73 - 3.18	<0.001
IMD decile 5	2.75	0.43	2.02 - 3.74	<0.001	3.17	0.48	2.36 - 4.26	<0.001
IMD decile 6	2.54	0.40	1.87 - 3.46	<0.001	3.07	0.47	2.27 - 4.14	<0.001
IMD decile 7	3.28	0.58	2.32 - 4.62	<0.001	4.17	0.69	3.01 - 5.77	<0.001
IMD decile 8	3.26	0.51	2.39 - 4.44	<0.001	4.08	0.63	3.02 - 5.51	<0.001
IMD decile 9	3.17	0.42	2.45 - 4.10	<0.001	4.21	0.82	2.86 - 6.18	<0.001
IMD decile 10	3.02	0.49	2.20 - 4.14	<0.001	4.45	1.15	2.69 - 7.37	<0.001
Education domain					0.98	0.00	0.98 - 0.99	<0.001
Barriers domain					0.98	0.01	0.97 - 0.99	<0.001
Crime domain					1.26	0.07	1.13 - 1.40	<0.001
Percentage of children without GCSEs					1.00	0.00	1.00 - 1.00	0.012
Traffic environment								
Difference between free flowing and morning traffic speeds					0.98	0.01	0.97 - 0.99	0.005
Junction density					0.84	0.03	0.77 - 0.91	<0.001
Density of A roads					1.01	0.00	1.01 - 1.01	<0.001
Density of B roads					1.01	0.00	1.00 - 1.01	<0.001
Density of minor roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.317
Length of minor roads in SOA					1.00	0.00	1.00 - 1.00	0.099
Length of motorways in SOA					1.00	0.00	1.00 - 1.00	0.024
Number of A roads					1.00	0.00	1.00 - 1.00	0.185
Number of road junctions					1.01	0.00	1.01 - 1.02	<0.001
Number of A roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.004
Traffic flow 2001					1.00	0.00	1.00 - 1.00	0.019
Number of adjacent SOAs					1.07	0.02	1.04 - 1.11	<0.001

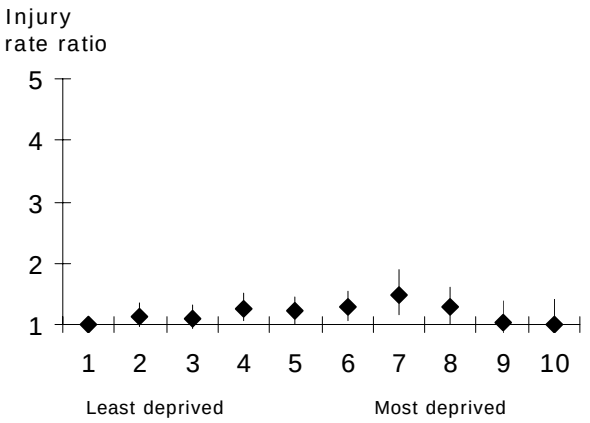
Appendix 5

MULTIVARIABLE MODELS: CHILD PEDAL CYCLISTS

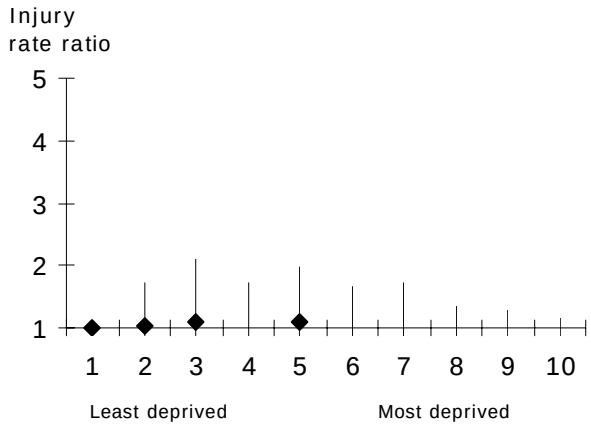
'White'



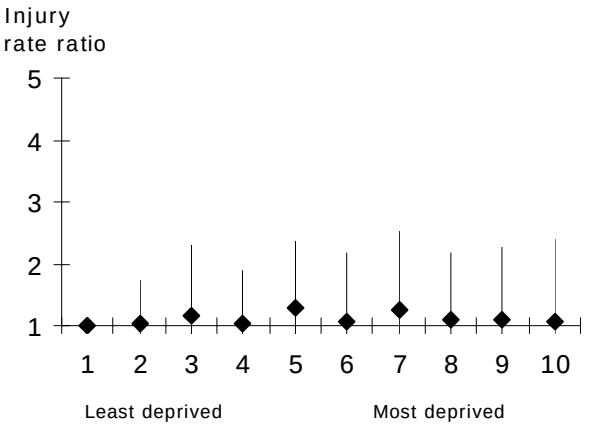
'White' (adjusted estimates)



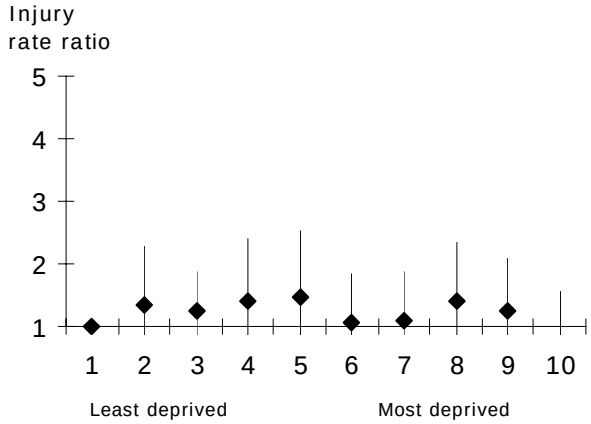
'Black'



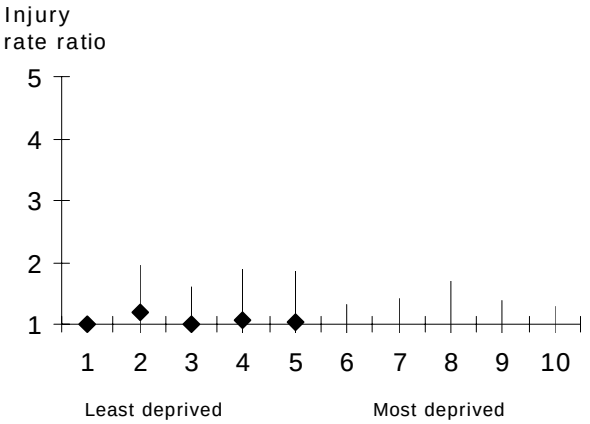
'Black' (adjusted estimates)



'Asian'



'Asian' (adjusted estimates)



There was some evidence that 'White' children living in the moderately deprived areas experienced higher cycling injury rates compared to children in least deprived. There was no evidence for a relationship between 'Black' or 'Asian' child cycling injury rates and deprivation.

MULTIVARIABLE MODEL: 'WHITE' CHILD PEDAL CYCLISTS

	Unadjusted				Adjusted			
Variable Name	IRR	SE	95% CI	p	IRR	SE	95% CI	p
Deprivation								
IMD decile 2	1.22	0.13	0.99 - 1.50	0.059	1.14	0.10	0.95 - 1.35	0.155
IMD decile 3	1.19	0.11	0.98 - 1.43	0.073	1.10	0.10	0.93 - 1.31	0.259
IMD decile 4	1.34	0.13	1.11 - 1.62	0.002	1.26	0.11	1.06 - 1.51	0.010
IMD decile 5	1.32	0.12	1.10 - 1.57	0.002	1.21	0.11	1.01 - 1.46	0.039
IMD decile 6	1.38	0.14	1.13 - 1.68	0.002	1.28	0.12	1.06 - 1.55	0.011
IMD decile 7	1.63	0.18	1.31 - 2.03	<0.001	1.49	0.18	1.17 - 1.88	0.001
IMD decile 8	1.38	0.16	1.11 - 1.73	0.005	1.27	0.15	1.01 - 1.60	0.037
IMD decile 9	1.06	0.11	0.86 - 1.30	0.580	1.04	0.15	0.79 - 1.38	0.763
IMD decile 10	1.07	0.09	0.91 - 1.26	0.435	0.99	0.18	0.70 - 1.42	0.967
Education domain					1.01	0.00	1.00 - 1.02	<0.001
Barriers domain					0.99	0.00	0.98 - 0.99	0.002
Crime domain					1.14	0.04	1.06 - 1.23	0.001
Percentage of children without GCSEs					1.00	0.00	1.00 - 1.00	0.554
Traffic environment								
Speed of A roads in the morning					1.00	0.00	1.00 - 1.01	0.204
Junction density					0.90	0.04	0.82 - 0.99	0.027
Junction density squared					1.01	0.02	0.98 - 1.04	0.553
Density of A roads					1.01	0.00	1.01 - 1.01	<0.001
Number of A roads					1.00	0.00	1.00 - 1.00	0.007
Number of road junctions					1.01	0.00	1.00 - 1.01	<0.001
Number of A roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.001
Number of motorways in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.038
Number of adjacent SOAs					1.05	0.02	1.02 - 1.08	0.002

MULTIVARIABLE MODEL: 'BLACK' CHILD PEDAL CYCLISTS

	Unadjusted					Adjusted				
Variable Name	IRR	SE	95% CI		p	IRR	SE	95% CI		p
Deprivation										
IMD decile 2	1.02	0.27	0.60	1.72	0.947	1.02	0.28	0.60	1.74	0.943
IMD decile 3	1.11	0.36	0.59	2.09	0.749	1.17	0.40	0.60	2.29	0.636
IMD decile 4	0.95	0.29	0.52	1.73	0.864	1.04	0.32	0.57	1.90	0.903
IMD decile 5	1.10	0.33	0.61	1.96	0.752	1.28	0.40	0.69	2.36	0.429
IMD decile 6	0.84	0.29	0.42	1.66	0.612	1.07	0.39	0.52	2.17	0.858
IMD decile 7	0.92	0.30	0.49	1.74	0.802	1.26	0.44	0.63	2.51	0.518
IMD decile 8	0.75	0.23	0.41	1.36	0.341	1.10	0.38	0.56	2.18	0.779
IMD decile 9	0.68	0.22	0.36	1.28	0.234	1.09	0.40	0.53	2.25	0.818
IMD decile 10	0.62	0.20	0.33	1.16	0.131	1.08	0.44	0.48	2.40	0.859
Education domain						0.98	0.01	0.97	0.99	0.001
Barriers domain						0.97	0.01	0.95	0.99	0.001
Crime domain						1.31	0.08	1.16	1.47	<0.001
Percentage of children without GCSEs						1.00	0.00	1.00	1.00	0.928
Traffic environment										
Speed of A roads in the morning						1.00	0.00	0.99	1.01	0.737
Junction density						1.03	0.06	0.92	1.15	0.588
Junction density squared						0.97	0.02	0.94	1.00	0.087
Density of A roads						1.01	0.00	1.00	1.01	<0.001
Number of A roads						1.00	0.00	1.00	1.00	0.365
Number of road junctions						1.01	0.00	1.00	1.01	<0.001
Number of A roads in adjacent SOAs						1.00	0.00	1.00	1.00	0.047
Number of motorways in adjacent SOAs						1.00	0.00	1.00	1.00	0.659
Number of adjacent SOAs						1.08	0.02	1.04	1.13	<0.001

MULTIVARIABLE MODEL: 'ASIAN' CHILD PEDAL CYCLISTS

	Unadjusted				Adjusted			
Variable Name	IRR	SE	95% CI	p	IRR	SE	95% CI	p
Deprivation								
IMD decile 2	1.35	0.36	0.80 - 2.29	0.264	1.19	0.31	0.72 - 1.97	0.502
IMD decile 3	1.24	0.26	0.82 - 1.86	0.307	1.00	0.24	0.63 - 1.60	0.987
IMD decile 4	1.40	0.39	0.81 - 2.41	0.226	1.05	0.31	0.59 - 1.89	0.859
IMD decile 5	1.47	0.41	0.86 - 2.53	0.162	1.03	0.31	0.57 - 1.87	0.929
IMD decile 6	1.05	0.30	0.59 - 1.85	0.872	0.67	0.23	0.34 - 1.30	0.235
IMD decile 7	1.08	0.30	0.63 - 1.88	0.773	0.66	0.26	0.31 - 1.41	0.285
IMD decile 8	1.41	0.36	0.85 - 2.34	0.180	0.80	0.31	0.38 - 1.70	0.562
IMD decile 9	1.25	0.33	0.75 - 2.08	0.399	0.68	0.25	0.33 - 1.39	0.287
IMD decile 10	0.89	0.25	0.51 - 1.55	0.681	0.41	0.24	0.13 - 1.29	0.126
Education domain					1.01	0.01	0.99 - 1.03	0.328
Barriers domain					1.00	0.01	0.98 - 1.02	0.951
Crime domain					1.26	0.12	1.04 - 1.54	0.017
Percentage of children without GCSEs					1.00	0.00	1.00 - 1.00	0.225
Traffic environment								
Speed of A roads in the morning					1.00	0.00	0.99 - 1.01	0.730
Junction density					0.85	0.05	0.75 - 0.96	0.006
Junction density squared					1.04	0.02	0.99 - 1.08	0.139
Density of A roads					1.01	0.00	1.00 - 1.01	0.003
Number of A roads					1.00	0.00	1.00 - 1.01	0.426
Number of road junctions					1.00	0.00	1.00 - 1.01	0.318
Number of A roads in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.115
Number of motorways in adjacent SOAs					1.00	0.00	1.00 - 1.00	0.926
Number of adjacent SOAs					1.08	0.03	1.02 - 1.15	0.005

Part B: Policy and Practice

1. Aims

The analysis of road traffic injury data in Part A has provided a detailed picture of how risk of injury, ethnicity and deprivation may be related statistically. As we have noted, though, the identification of statistical relationships cannot explain why or how ethnicity is related to injury risk, or what the policy implications of addressing the issue might be. The aims of this part of the report are to put the findings of Part A in policy context, and to use the knowledge of key stakeholders to suggest possible mechanisms that could be explored in future research.

Specifically, the aims of this part of the project were to:

- Use existing data on borough professionals' views, and additional interviews with key stakeholders, to describe the current context in which policies to address ethnicity are developed;

- undertake qualitative pilot work to identify potential research questions in this area, and generate exploratory hypotheses for future studies.

2. Introduction

Given the difficulties in identifying possible mechanisms that link ethnicity and injury risk, qualitative work is an important element in unpacking exactly how environments, socio-economic conditions and ethnic identity might interact to shape exposure to, and behaviour in, road environments. It also has a role to play in understanding the relationships between 'ethnicity' as measured in routine data sets and 'ethnicity' as it is understood as a description of a community or an individual. Finally, qualitative research can help identify suggestions for further research.

Assuming that the relationship between ethnicity and injury risk is not purely artefactual, it could be explained by a number of factors, such as road environments, relative deprivation, different levels of exposure to risk, or different behaviours in particular environments. Explaining why 'Black' children in particular seem to be at higher risk in London will require a local understanding of how these factors inter-relate. One issue, for instance, is the apparently puzzling finding that in an earlier study in Birmingham (Lawson and Edwards 1991) young 'Asian'

pedestrians were at higher risk of injury compared with 'White' and 'Black' children, whereas in London it appears that young 'Black' pedestrians are at higher risk than either 'Asian' or 'White' children. Clearly there is nothing inherent about being categorised as 'White', 'Black' or 'Asian' that puts one at higher risk, but there may be something specific about being categorised in that way in particular places that is associated with risk.

As Karlsen and Nazroo (2002) argue, ethnic identity (i.e. how we choose to define ourselves or others) may be less important to health outcomes than ethnicity as structure (i.e. those social factors that we have less control over at an individual level, such as experiences of racial discrimination or the ways in which ethnicity may be related to housing availability or employment opportunities). These are likely to be variable across the country – what it means to be, say, Afro-Caribbean in an Inner-London borough might be different to what it means in Birmingham. For instance, different patterns of housing stock might mean that 'being Black' in Birmingham has very different implications in terms of where you live and your exposure to road danger compared with 'being White' or 'being Asian' than it might in London.

So, although there are probably no direct effects of ethnicity on road traffic injury risk, the interplay of ethnicity and environment does have a number of implications for risk exposure. Some relate to structural factors, such as where people from different ethnic communities are likely to live within London, which affects variables such as how much traffic there is, whether there are safe places for children to play, and what choices are available for transport. Some relate to the how ethnic identity might shape behaviour. Here, identifying yourself within one group might have implications for kinds of leisure activity undertaken, or transport mode choices. A systematic investigation of these factors is outside the frame of a small-scale project. However, discussions with some key stakeholders did generate some suggestions for further research on potential mechanisms operating in London which might link particular ethnic identities and experiences with injury risk, and describe the context within which policies will be developed.

3. Methods

Three sources of data were drawn on for this part of the project:

- Analysis of existing data set on key stakeholders in London. For the previous project on deprivation and road safety (Edwards *et al*. 2006), we interviewed 40 borough professionals and other stakeholders in London and reviewed 32 borough Road Safety Plans. We revisited this data to address specifically: what boroughs are currently doing to address possible links with ethnicity; what data they need; and what challenges they see.
- Further interviews with selected stakeholders. Seven community organisation and London-wide agency representatives were interviewed to identify how, if at all, the 'problem' of ethnicity and road traffic injury has been framed in London, and canvass their views on potential interventions and further research needed. The aims of these interviews were to identify the relative importance of road safety to key groups, and to identify potential policy and practice implications.
- Pilot work with young people and parents. A small opportunistic sample of seven young people and three parents (from different ethnic groups) were interviewed to explore their views on the links between their exposure to risk, behaviour and 'ethnicity' as both a structural factor and identity. The aim was not to include a representative sample of participants, but rather to explore the feasibility of using interview data to shed light on possible differences in exposure and behaviour, and to begin to unpack some of the problems with the indicators for ethnicity identified above. Interviews had three aims:
    - To generate some pilot data on travel patterns for work, school and leisure and identify how theses patterns might relate to risk exposure;
    - To get a range of views on why there might be differences between London's ethnic groups;
    - To gather views on possible strategies for addressing inequalities in road traffic injury.

Approval for the interview study was granted by the LSHTM Ethics Committee. Those quoted in this report gave consent to be interviewed and to be quoted anonymously. Some details and geographical identifiers have been changed or removed to maintain confidentiality.

4. Findings

This section summarises the views of the stakeholders included in the study. These are an essential context for considering how policies should address inequalities in injury, as they illustrate current awareness of the issue and the ways in which the relationships between ethnicity and risk are understood.

4.1 How important is the issue of road safety to Black and Minority Ethnic (BAME) communities in London?

For most community organisations, parents and young people, there was low awareness of road safety as a priority issue in general, and little awareness that it was an issue that might be of specific concern to London's BAME communities. Some considered road traffic injury in general as an 'inevitable' risk, and therefore not an issue that would be tied to social inequalities:

"Accidents are just part of life, aren't they?" (Community organisation)

"I would go as far as to say that in the past you'd see road casualties being just an acceptable hazard that people would seek to live with and I think that would go across all communities". (Policy maker)

Even if road traffic injury was considered to be potentially the result of social factors, rather than something that 'just happened', it was felt to be a relatively low priority compared with more pressing issues such as gun and knife crime. It was also not, in general, seen as a specifically 'Black' or ethnic minority issue, and not one that they had experienced community demands about:

"I was quite shocked to be told that it was an issue specific to the black community" (Community Organisation)

"I wouldn't say that I'm aware that there was any major drive from the community around this, partially because I think the community was probably not aware that this was an issue, it was not aware that there was an inequality". (Policy maker)

This comment does suggest that if there was more awareness of both the relationship between ethnicity and road traffic injury risk, and the number of injuries on London's roads, it might become an issue for communities to mobilise

around, and there was a considerable amount of willingness to raise awareness and consult with communities through working with bodies such as Transport for London. However, some did note that 'working with communities' would be a challenge on this issue, given the difficulties of identifying exactly which communities are at high risk, and the low levels of understanding of how and why there is an over-representation of some groups in road injuries:

"There are so many different cultures and countries, so identifying the exact people to work with is a daunting task" (Policy maker)

This reflected the views of road safety professionals, who were also concerned about using the relatively crude data from STATS19 as a basis for developing interventions. We turn now to the views of road safety professionals. If road traffic injury was a low priority for BAME groups in London, ethnicity was a relatively low priority for borough professionals.

4.2 Ethnicity and road traffic injury: the perspective of London boroughs

Road Safety Plans

One indicator of the relative priority of ethnicity for road safety teams is how far it is addressed in the borough Road Safety Plans (RSPs). However, as we found for deprivation in general (Edwards *et al*. 2006: 90), RSPs focused largely on the broader targets they had been given for reducing the numbers of casualties, rather than on issues that might be important, but with no specific targets. A few reports did discuss ethnicity in terms of the diversity of the population, but of the 32 RSPs we had available only a minority addressed the implications of ethnicity for road traffic injury:

- 5 reported specific casualty numbers by STATS19 ethnic groups, with 3 of these reporting changes over time. One of these made a commitment to reducing numbers for ethnic minorities.
- 3 did not report figures, but made reference specifically to the added risk for 'Black' pedestrians, either in their Borough or as reported by TfL. One of these recommended more research on the issue.
- 4 reported that they had carried out an Equality Impact Assessment, although 1 one these boroughs explicitly reported that there were no issues to do with Race Equality that arose from road safety

These low overall rates of coverage do not necessarily indicate a lack of interest in addressing ethnic inequalities. However, in a field where there are already a number of policy priorities, they do suggest that boroughs will inevitably concentrate resources (or at least public statements) on those issues that are the subject of specific targets.

Views of professionals

Our previous study on deprivation and road safety in London discussed the range of ways in which road safety teams addressed ethnicity in their work, noting that, given the comparatively weak evidence at the time that there were ethnic inequalities in injury risk, 'ethnicity' was largely seen as an issue to be taken into account when delivering road safety interventions, rather than an issue of inequalities that should be addressed through prioritising resource allocation (Edwards *et al*. 2006:100-104). In summary, borough road safety professionals reported that:

- Given that each borough had a unique mix of settled and more recently-arrived communities, crude findings on 'ethnic' differences might not be useful at the local level;
- Too little was known about why ethnicity might be linked to injury risk to 'target' interventions effectively;
- Work with local ethnic minority communities relied on good links with community groups.

Here, we revisit the views of road safety professionals to address three particular areas that have implications for addressing ethnic differences in injury rates: the problems of insufficient evidence; different perspectives on how to address ethnic differences and developing good community links.

1) The evidence base.

At the time of the original interviews (early 2006), there was little robust data about the statistical relationships between measures of ethnicity and road traffic injury in London available to borough professionals. Some participants in the study had seen presentations at the Pan-London Road Safety Forum suggesting that 'Black' Londoners were over-represented in the injury data, and others were aware from local studies that there may be some over-representation, but given that there was no certainty about the relationship, much of the discussion about potential inequalities was around the needs for data and, more importantly for practitioners, needs for information about what they could do to address the problem, if there was one. Further, there was no detailed evidence to suggest

whether 'ethnic' differences were 'real', or an artefact of either data collection methods (see Part A of this report) or simply reflected the different levels of deprivation across London's population.

In the absence of any reliable data, professionals had to draw on personal knowledge and observation, which was limited, as this practitioner noted:

"It [ethnicity] isn't given in the normal statistics… we really just don't know, the only way we can get it is by feel, when you're going to places .. but you go to another area, and it might be completely the opposite, so it's quite difficult to establish" (Interview 13)

The key challenge from the perspective of borough level practitioners was the lack of relevance of London-level data to their locality. At a borough level, there are too few injuries (particularly serious injuries) to analyse by particular ethnic groups to identify where there might be over-representation, but at the London level, data are inevitably aggregated to crude 'Black', 'Asian' and 'White' groups derived from STATS19 which do not relate to the specific communities defined by ethnicity, religion, or other communalities. The specific needs, say, of recently-arrived people from central Africa may well be different from those of the Somali community and those of well-established Afro-Caribbean groups. Individuals from these groups are all likely to be defined as 'Black' in terms of STATS19, but the risks they face are likely to be varied, resulting from very different exposure to traffic risks, travel patterns and risk behaviours. As one officer, who was knowledgeable about the data suggesting an over-representation of 'Black' children in the injury statistics, noted:

"It starts getting complicated of course because it is different for different ethnic mixes – you've got different groupings" (Interview 11)

A further problem noted with reliance on STATS19 data for our knowledge about ethnic differences was that, as one road safety officer put it, "that only tells us about the visible minorities". This officer was concerned about the potential high rate of injuries among a large local Jewish community, which was unlikely to be identified through London-level data derived from STATS19.

Even if professionals were aware of the issue, and considered it one they would prioritise in their borough, a more pressing lack of evidence was that of what would

be effective in addressing inequalities. Similar issues were raised in terms of addressing deprivation: simply knowing that there are inequalities does not help, given the problems of 'targeting' resources (see Edwards et al 2006) and the lack of evidence on what works to reduce inequalities. These 'evidence gaps' were more profound for ethnicity than deprivation. For deprivation, which was measured at area level, and had a step-wise relationship with injury risk, at least particular geographical areas could be prioritised in terms of their relative deprivation (for instance in terms of Index of Multiple Deprivation score) for engineering solutions such as 20mph zones. 'Ethnicity' is a rather different measure, given that it is an attribute of individuals (as measured in STATS19), and the only way of 'targeting' areas is to identify which ones have the highest proportion of 'Black' residents.

2) Different perspectives on addressing ethnicity

The views of borough professionals ranged from those (largely in Inner London) who were concerned about the potential risk differences across ethnic groups but unsure what they could do, to those (largely in Outer London boroughs) who did not consider this to be an issue of relevance to their borough. Some did not see it as a productive strategy to frame the issue of one as 'ethnicity', given the weaknesses of the data available (see above) and the lack of knowledge about how to address it. There was also the issue of priorities: given the multiple policy goals they were asked to address, it was difficult to focus on ethnicity, especially as there were few community demands for this to be at the top of the agenda. As one noted, partner organisations such as the police and local BAME groups focused on the high priority issues of gun and knife crime, and within their road safety teams, the focus was on meeting the Mayor's targets for reducing overall rates of injury (see Edwards *et al*. 2006)

For most, an approach of what we described (Edwards *et al*. 2006) as 'tailoring' was seen as most appropriate. Rather than 'targeting' particular communities, this involved the careful tailoring of interventions such as educational programmes to the needs of the recipients, and their particular needs. That would include cultural needs associated with ethnicity, but also needs related to age, disability, or other differences across local communities. One described this as 'tweaking' (Interview 9) to the needs of particular audiences.

One area of agreement was the move away from translating educational materials into other languages, because it was seen as not cost-effective with so many local

languages, and often unnecessary, as the main beneficiaries of educational materials (children) had good English skills:

"We have spent thousands doing that, it just isn't worthwhile" (Interview 3)

Although specific materials might be translated for newly-arrived communities, or to publicise consultation events, in general, translation of promotional materials was not seen as a productive method of addressing the diverse needs of local ethnic minority communities within the borough.

3) Developing community links

Given the importance of detailed local knowledge to 'tailoring' interventions, good and sustainable links with local communities were needed. For long settled communities, this was relatively unproblematic, as many had local councillors and officers working for the boroughs who could help identify needs and appropriately meet them. Many of the examples of work with local communities mentioned in the study arose from officers who were from local ethnic minority communities taking the lead on this issue. Well-established communities with their own organisations also had a route for asking for particular services. Examples included an Islamic school which has requested help with road safety and a Bengali women's groups which had requested road safety officers provide some information for them. Some borough staff noted that such requests were the only route to providing tailored information:

"We would do it on request .. we have been asked to do something on Turkish radio" (Interview 14)

If providing tailored help relied on receiving specific requests, the challenge was clearly in working with more recently-arrived communities, or those without organisational resources and knowledge needed to liaise with statutory authorities. This was recognised as a challenge for involvement in consultations as well, with the borough often having good links with those organisations it traditionally worked with (Schools, neighbourhood groups, religious organisations) but having more difficulty with less visible or more transient communities, or those reluctant to deal with statutory authorities.

4.3 Accounting for ethnic inequalities

Our previous report (Edwards *et al*. 2006: 103) noted that when road safety professionals were asked for potential explanations for ethnic differences, they were offered tentatively. Not surprisingly, given the lack of good published evidence in the area, those that did suggest possible explanations noted that these were speculative, and based on common-sense or personal observation, rather than any robust evidence. Similarly, when the community leaders and other stakeholders interviewed in this study were asked for their views on why some groups might be more at risk, they were drawing on personal experience, and often aware that this experience was filtered through stereotypical assumptions about the behaviour of both their own (given experience can only ever be partial) and other communities. These provisional explanations were offered and are reported here, then, as opinions, which do generate potential avenues to explore in future research, but should not be read as 'evidence' about the possible explanations of the relationships described in Part A of this report.

Structural accounts

For some, the key reasons for differences probably lay in the structural differences between communities in London, particularly around deprivation, which was seen to influence the dangers of the road environment and access to alternatives to playing on the street for young people:

"in the poorer deprived areas of London you'll find that a lot of the roads don't actually have … this middle part, the island" (community organisation 10)

"in some poor boroughs there isn't a lot of options and activities for young people. Most schools have got rid of their parks and sports centres, so many young people in deprived areas don't have any social activities to get on with, so most of them are just, if you like, hanging out on the road sides because they haven't literally got anything to do. So that's another practical problem really because there isn't a place for them to go and socialise" (Community organisation 10)

Knowledge

In the previous study, road safety professionals raised lack of knowledge about road layouts and crossing types as one potential issue that might make some recently-arrived communities more at risk on London's roads:

"There are so many different kinds of crossings… It's confusing for anybody, lets alone someone who has not been used to that … so [we have] a talk which introduces them to the road network and introduces different types of crossing" (Interview 12)

This was a view echoed in discussions with community leaders and policy makers in this study, but not by the young people and parents interviewed, who saw themselves as knowledgeable about safety. Currently, the data are not detailed enough to identify how much of the excess injuries in the 'Black' group are accounted for by recently-arrived individuals.

Culture

In general, respondents were circumspect about attributing cultural differences as explanations of risk differences, given that comments about cultural difference drawing on 'common-sense' knowledge are often based on racist stereotyping about others' behaviour. There were a few comments that could be attributed to these kinds of stereotypes in the data:

"a lot of people who are Gujarati speakers, their whole attitude to life is different, they undervalue life"

"some of the Afro-Caribbean kids have no self-discipline when they are crossing the road"

"in that community you get a lot more of children looking after children"

In general, professionals, community leaders and policy makers did not refer to cultural differences. However, there were a few comments that suggested that *exposure* to risk might be a result of differences in transport choices that might be tied to aspects of an ethnically-defined identity. One example were the comments reflecting on the relatively low rates of cycling in ethnic minority communities, which did suggest the different meaning cycling as a mode of transport might have across different groups:

"It is sometimes that people at the lower end of the economic spectrum sometimes think that actually things like cycling is indicative of your status. So basically it's people can't afford to drive that actually will cycle … and as it happens, the black community, broadly speaking, is the poorest section of the community … I can

recall even walking, for example, and having people from my community saying 'Why are you walking?'" (Community organisation)

"Ethnic minorities feel that perhaps that [cycling] may be perceived that that's their only method of transport, you see.. people feel they have choices and the ethnic minorities maybe feel 'well, people might perceive that's my only choice" (Community organisation)

Young people and parents were more likely to draw on cultural differences in offering explanations for different rates of injury. Parents referred to local differences in, for instance, whether children were accompanied on their way to school, or in the different leisure activities that were typical of different ethnically based peer groups ("the Afro-Caribbean boys are more likely to be on their bikes in the park" (Parent); "I think the white kids aren't out on the streets so much" (Parent)).

Not perhaps surprisingly, few young people discussed their own culturally-specific risk-taking behaviour, but they did identify cultures that might put others at risk, which were on occasion linked to particular ethnic 'styles'. This ['White'] boy for instance, discusses how, despite having similar leisure activities, there was a certain 'Black' style at his school may be linked to road traffic injury:

"the style they like to follow is, is about appearing cool and part of that is never rushing or never kind of moving out of the way for anyone else… it's something about the image that means that they don't, you know, they feel almost the traffic should stop for them, rather than they should stop for the traffic. (YP15)

One ['Black'] girl suggests a mix of structural and cultural reasons that might protect 'Asian' young people from injury:

"The Asian kids are more in their houses, because of their religion, and black and white kids are out in the street more – the Asian kids, 'cos there aren't that many of them, they might be worried about people being racist and not want to go out, so they stay in" (YP12)

The view that young 'Asian' people may be less likely to be exposed on the street to risk is echoed by this ['Asian'] girl reflecting on her peers:

"It's because Indian girls have a really strict upbringing. If we do anything wrong we get punished for it, so it's like we're not going to get injured. I'm allowed out by myself, but I see Indian girls are really less out by themselves unless they're like eighteen or something" (YP14)

However, in general, parents, young people and professionals stressed the 'sameness' of behaviour, particularly that of young people in road environments, saying they found it hard to believe that there were 'ethnic' differences that might explain different risk outcomes. One young man suggested that the problem was more likely to be the difficulty in identifying a suitable denominator: his account of why 'Black' children might have more injuries was that:

"In this area, there are like loads and loads of black kids, so of course there's going to be more of us knocked over" (YP11)

4.4 Young people's transport choices: convenience, safety and socialising

The seven young people included in this study were of course not representative of the population of London, but their accounts of experiences travelling and socialising do suggest some differences across peer groups that might be productive to explore further in research as potential explanations for differential exposure to risk.

First, it is important to note that for the young people interviewed in this study, road safety was not a high priority. All were well aware of road safety advice (such as advice to wear cycle helmets, to cross roads in a safe way), and could talk knowledgably about road safety advice they had received. However, their accounts of travel and socialising suggested that other dangers were more significant, and other priorities more pressing. Other priorities could include getting to school on time (a challenge in many parts of London, where many made long journeys to school, and where bus services might be unreliable):

" It [bus number] takes longer, then I'd be late for school and get detention" (YP13)

"Sometimes I have to run across Padstock Road in the mornings 'cos I see the bus coming and you have to get on it" (YP 11)

"Sometimes I'm in a hurry, and sometime I'm on [local high street known for fast moving traffic with few crossing places] I'll just stand in the middle of the road and make the cars stop" (YP12)

Similarly, following what planners call 'lines of desire' could reduce the chance of road safety advice being followed. These are the favoured routes that we choose to navigate roadways because they are the most obvious, even if less 'safe'. As this young man notes, engineering solutions need to take these 'lines of desire' into account to make streets safer, and this would require a knowledge of how local people actually move around the road environment:

"there are some, some obvious places where if you looked at a map you might not think we don't need to put a crossing there, but when you're actually there it's very obvious that they need a crossing. It's like that road I was talking about at the end of the street, if you looked at it doesn't look a particularly busy road, but a lot of people who will use it to skip a bit of Rowbridge Hill, and it's the only way you can actually get from here in the direction of North End … " (YP15)

More significant dangers were primarily those of other young people. Postcode, school and small neighbourhood allegiances were widely referred to even by these young people, who did not report belonging to specific gangs. Coming across those from other schools or postcodes when alone was potentially dangerous, with a risk of being assaulted, or mugged:

"You always see fights like kids from different schools or the same school, the kids on the top of the bus, there's always fights breaking out – someone gives a look, or says something" (YP 12)

"I wouldn't go to [neighbouring locality] – there's all different bandanas and gangs, and they'd know we weren't from there, so we'd get beaten up probably" (YP11)

Asked about their main concerns in terms of keeping themselves safe, violent crime was the main issue:

"Guns and knives, there's been so much shooting. I don't even know if my friends is carrying [weapons]. Even the parents don't know if their kids, like they're carrying guns or not" (YP11)

"It's the gun crime and gangs and all the shootings and stabbings" (YP12)

In choosing 'safe' routes around London, then, the accounts of all the young people we talked to suggested that road traffic injury was a less pressing concern than other dangers, and one that was sometimes traded against other goals (such as getting to school on time).

Peers were an important part of travel choices. Not surprisingly, young people preferred to travel to school with friends, and would alter journeys to meet up or socialise at the bus stops. Peer opinions were also a factor in risk behaviours such as wearing cycle helmets. One had stopped cycling because his mother had banned it unless he wore a helmet. Another said:

" Like none of your friends wear one, so you'd feel odd, different. Some do, this one girl, but she's not my friend. No one does, not our friends" (YP12)

Knowledge is unlikely to be a key factor in explaining differences in risk across ethnic groups, given that all the young people in this study knew (for instance) about safe places to cross roads, and that cycle helmets protect you, and there was no suggestion that this knowledge was differentially distributed across London's ethnic groups (although it may apply to those more recently arrived). However, there was little direct relationship between knowledge and behaviour, and how this knowledge gets put into practice might be different. Patterns of risk exposure associated with socialising were also determined by peer group norms. This small group of three 'Black', two 'White and two 'Asian' young people is obviously not representative of London's population, and indeed the young people interviewed said mostly the ethnic groups they were familiar with did 'the same things' in their leisure time. There were, though, indications of differences in patterns of socialising. For the two 'White'[6] young people included, socialising was focused on

[6] Young people were asked to describe their own ethnicity using the census categories. For those who did not tick one of the 'White' choices, this was a difficult task: the categories simply did not reflect the ways in which they understood their own identities. Several comments made whilst attempting to choose a category illustrate this:
'What should I tick? My Dad is like from Africa, but he went there from India, and my mum is Indian and now we all live in England'
[to friend] 'Why are you ticking Black, not mixed? Your dad is English, isn't he?'
'But he doesn't live with us, so that doesn't count, does it?'
'My mum is [Caribbean] and my dad is from [European background], so I'm Caribbean, but I'm English as well'

visiting each others' houses, and mainly being indoors, watching videos or playing computer games:

"You know, we'd, we'd hang out at their houses some of the time, but I'd often meet up with a few friends and we'd kind of criss-cross between houses, so, you know, we just, we just kind of go where our mood takes us" (YP15)

[where do you go when you meet up with friends?]"Go round her house, listen to music, go to the cinema, or we just hang out here [own house] in my bedroom" (YP16)

Two of the 'Black' children talked about being outdoors, on the streets outside friends' houses, in the playground or park. When asked specifically why outside rather than inside, one girl explained:

"'Cos your house might be messy or something, and you can just be outside, sitting on the wall and chatting or riding your bike or playing football with your friends" (YP12)

Clearly this is not 'evidence' of different patterns of socialising and exposure, but it does reflect an element of exposure that travel data does not necessarily pick up, that of simply 'hanging out' rather than travelling, which might be more likely to put some people at risk of road traffic injury.

All young people reported similar strategies for maximising convenience, opportunities for socialising and safety when travelling around London. These included drawing on detailed knowledge of local bus routes, safer places to cross roads and avoiding known dangers (often adjacent neighbourhoods, which were perceived as more dangerous in terms of the potential for trouble from other young people than more distant neighbourhoods). There were a number of specific strategies reported for minimising risk, including choosing transport modes for particular times of day, and avoiding the more 'dangerous' parts of the bus if alone:

"there are some areas I'd rather walk through in the morning than walk through kind of mid-afternoon when there's lots of people about that I might run into." (YP15)

"If I'm on my own I sit downstairs on the bus, I don't look, I don't make no comments and you don't involve yourself" (YP12)

There were, then, indicators that transport mode choices might be influenced by ethnicity, both directly in terms of the structural constraints that arose from where you lived, but also in terms of 'identity' in that choices of transport clearly had symbolic meanings that might be shaped by one's own ethnic identity, as well as how peers and the wider community might react to particular choices.

4.5 Addressing inequalities

The challenges faced by borough professionals in addressing ethnicity in road safety work were discussed above. For community organisations, if road traffic injury was to be on their agenda, it was most productively done as part of a broader concern with 'community safety'. One issue mentioned by several was the need to provide more alternatives to the street as a space for young people to socialise, as this addressed the problems of gang culture that were perceived as a high priority in many parts of London, but would also possible reduce road injuries:

"We've actually been lobbying our current borough here, [borough], and saying they should be doing more for young people in terms of activity centres, community centres, youth centres and that's a big challenge that we actually face, just trying to get young people off the street into something a bit more" (Community organisation)

Policy makers felt that if there was solid evidence of ethnic differences in injury rates, then this was clearly an issue of inequalities, and targeting (in terms of putting more resources into some communities) would be appropriate:

"we have to continue to educate and to work towards reducing the amount of casualties that we have across the board, but I do think there is a role for identifying and taking, where appropriate, target of action to maximise the impact" (Policy maker)

However, there were concerns that this would have to be sensitively, and without victim blaming those communities that were at high risk:

"So, this has to be done sensitively, not just because other people might actually think it's not a good idea, but actually there is a sense that people feel that they are being scapegoated again." (Policy maker)

This was a view also given by borough professionals, who were concerned that, particularly if educational interventions were designed on the basis of stereotypical assumptions about 'cultural differences', they could be merely 'victim-blaming' and counter-productive. Young people also noted the danger of targeting young, 'Black', boys in particular. After hearing an explanation of why the study was happening, one said:

"Why are you saying Black people? Why is it always us black kids that is the problem?" (YP11)

Policy makers suggested that one danger was that these sensitivities could become an excuse not to act:

"Some [practitioners] have said that 'Well, we don't want to look like we've stigmatised [some communities]' It's rubbish … but that's what their fear is" (Policy maker)

5. Discussion

This part of the report summarised the views of some key stakeholders in London (children, road safety professionals, policy makers, community organisations). Taken with the data presented in Part A, which described the statistical risks associated with being 'Black', 'Asian' or 'White', they suggest that there are a number of issues around ethnicity and road traffic injury that could be addressed by both Transport for London and the London boroughs. However, decisions about what, if anything, could be done, depend as well on political values, around both competing priorities and the costs and benefits of focusing on ethnicity. There are two key questions that arise from this description of the policy context of London's road safety programmes:

1) Should road traffic injury be addressed as an 'ethnic' issue?

We have confirmed that there are ethnic differences, at a crude level, in the risk of being injured on London's roads, which are not accounted for purely by differences in deprivation across London's ethnic communities (see Part A of this report). Given the evidence that for 'Black' groups, there is a higher risk, there is clearly an issue of potential inequality here, but a number of costs and benefits associated with describing road traffic injury as an 'ethnic' issue.

One benefit is the scope, and willingness from community organisations, to raise awareness across the BAME communities of road safety, given the evidence that this is an issue that affects them disproportionately. Similarly, flagging road safety as an issue of 'ethnicity' would provide leverage, and possibly further resources, for road safety teams to work with communities that may be rather marginalised in planning and consultations.

However, there are also some disadvantages. First, several participants in this study noted the potential for 'victim blaming' those at highest risk ('Black' boys), and framing this as 'their problem'. Demands for action need to come from communities, rather than be imposed on them by those with little understanding of the complex mix of factors that might put them at risk. Second, if road traffic injury is to be framed as an 'ethnic' issue, there is problem of *how* to address it, given that, as we have argued, there is unlikely to be any direct link between ethnicity and risk. Rather, the link is between what being defined as a particular ethnicity means specifically in London.

2) How should ethnicity be addressed?

If road safety is to be addressed as an ethnic issue, policy organisations suggested that it might be appropriate to 'target' resources or services at particular groups. There are two problems here: First, is knowing which communities to target, given the widespread recognition that STATS19 categories are not that useful in identifying the high risk groups. The crude categories of 'Black', 'Asian' and 'White' will each contain a range of groups identified by communalities (for instance) of religion, ethnic identity or nationality. The data are not detailed enough to identify which of these groups are at relatively high risk. Data derived from STATS19 are unlikely to be able to provide this level of detail, and more detailed local research is unlikely to be drawing on large enough data sets to identify significant differences between groups. It may be impossible to accurately identify those 'communities' that are at high risk.

Second, even if such groups could be identified statistically, and then identified as 'real' communities, it is difficult to know *what* would be targeted at them. More education, for instance, is unlikely to helpful, given the lack of evidence that there are any knowledge differences between ethnic groups in London. Targeting behaviour is also problematic. If it is, for instance, the behaviour of 'Black' children that is different – in that they are found more likely to be out on the street than other groups – do we really want interventions that reduce the amount of their active transport, when other policies are encouraging walking, cycling and outdoor activity? More generally, we need to think carefully about what the goals of policies are. If they are aimed at removing young people from danger, do we really want to discourage young people from public space, and from active leisure activities?

In terms engineering solutions, there is good evidence that these reduce injury rates (see Part B1, Edwards *et al*. 2006). It is, though, difficult to see how these would be targeted at particular ethnic groups, except by prioritising those geographic areas with higher proportions of 'Black' residents for traffic calming measures. Reducing speed and volume makes London's roads safer for everyone, whatever their behaviour. In the longer term, this would also even out any differentials between ethnic groups based on exposure differences. However, as a relatively 'upstream' intervention, which does not obviously 'target' ethnic communities, this may be politically difficult to frame as an intervention designed to address ethnic inequalities.

A possible solution

There are, then, advantages in using the evidence on differences between the ethnic 'groups' derived from STATS19 data for awareness raising. There was considerable support from those 3rd sector organisations that represent BAME groups, for using the data that 'Black' people are at relatively higher risk, to mobilise BAME community organisations around road safety, as part of broader community safety programmes. There was concern about low awareness of road safety, compared with problems such as crime and gang culture, and the data on higher rates within the 'Black' community are both a useful resource for BAME groups wanting to advocate for community safety programmes, and a way of generating interest in road safety among those groups.

The data are also potentially useful for borough professionals, as a route for engaging with communities, particularly those that have been traditionally marginalised from consultation and planning processes. However, 'targeting' particular communities is problematic. Instead, these data could be seen as an opportunity to mobilise and engage multiple local communities, and taking into account their priorities for safety, such that programmes can be carefully tailored to local needs.

6. Conclusion

Policy

There is currently low awareness of road safety as an issue that affects London's ethnic minority communities, and some scope for raising awareness in collaboration with community organisations. There are several challenges to addressing road safety as an 'ethnicity' issue, particularly the difficulties in identifying precisely which communities are at higher risk, and why. Explanations are likely to be specific to London's diverse areas, and relate to the specific mix of environmental, social and behavioural factors that affect ethnic communities in those areas. The most productive strategies available for professionals who are concerned about addressing inequalities, will require sustained links with local community organisations, both to design appropriate programmes for needs identified, and to avoid implementing inappropriate programmes based on inadequate understanding of why some people are at higher risk. To be effective, there is good evidence that programmes should be designed primarily to make road environments safer (see Edwards *et al*. 2006, Part B1).

Further research

The limitations of STATS19 data for deriving anything other than broad brush pictures of the issue have been noted. However, this broad picture is a useful one for highlighting differences, and attempts to improve data recording should continue for monitoring purposes. These are the best data available for examining ethnic differences, given the low rates of completion of ethnic coding on other data sources such as hospital admission records. It is unlikely, though, that further analysis of STATS19 data will generate more useful understanding of the relationships between ethnicity and road traffic injury risk, and further research on the particular links between ethnicity and road traffic injury risk will require primary data generation.

The views of those participating in this study suggest several areas that could be investigated further, including detailed work with young people on strategies for keeping themselves safe on transport in London. The young people in this study were knowledgeable about road safety, and insightful about the potential for solutions such as better location of road crossings. Research with communities

(including the more recently arrived), young people and local communities identified as potentially at high risk by borough professionals, might be productive in identifying both road safety issues from the perspective of vulnerable road users, and possible solutions.

Recommendations

1) The headline findings on ethnic differences in road traffic injury rates could be used to raise awareness of the issue of road safety. There is considerable potential for Local authority road safety teams and Transport for London to work with both statutory partners (e.g. Equality or Diversity teams) and 3rd Sector partners representing BAME communities to include road safety issues as part of a broader community safety agenda.

2) Although similar rates of decline in road traffic injury rates across ethnic groups suggest that current strategies are, in general, addressing needs across the population, to reduce observed inequalities it will be necessary to reduce injury rates faster in groups identified as 'Black'. However, given the limited knowledge we have of how exposure to risk and other variables interact to put people at higher risk, interventions designed to address ethnic inequalities need to be carefully designed in consultation with local communities in order to:

- Avoid 'victim blaming';
- Ensure that Road Safety teams understand the precise risks faced from the perspective of those affected;
- Ensure that programmes are appropriate and tailored to community needs.

'Local communities' in this context will include neighbourhood communities, but also groups which identify themselves in terms of faith, ethnicity or other communalities (e.g. young people).

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