# Driven To Excess: A Study of Motor Vehicle Impacts on Three Streets in Bristol UK

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ABSTRACT

Quality of life in cities and towns is of increasing concern to the public, and to policymakers. A major threat to quality of life is the growing volume of motor vehicle traffic, which has increased more than tenfold in the UK since 1950. This growing car dependence is creating an epidemic of deteriorated mental and physical health associated with air and noise pollution, inactivity, road deaths and injuries, and a growing destabilisation of the global climate. Problems related to car dependence have been particularly acute in greater Bristol, UK, where car ownership, vehicle use, and congestion are among the highest in Britain.

The study investigated the specific impacts of traffic on quality of life within a residential area of Bristol through a replication of Donald Appleyard's research into the effect of traffic on neighbourhood social interaction. (Appleyard, 1969) Primary data was collected through observations and a series of interviews with 60 households on three streets with varying levels of traffic in one neighbourhood in north Bristol.

Results confirm that Appleyard's findings are applicable within the United Kingdom, specifically that the number of friends and acquaintances on a residential street, as well as the extent of individuals' 'home territory' tend to decrease as vehicle traffic increases. Other notable outcomes from the research include the finding that the frequency of stationary, street-based recreational activities is reduced as traffic flow increases, and that individuals' perception of the safety of their neighbourhood may be disproportionately influenced by the amount of traffic on their street of residence, especially affecting the degree of independence granted to children. Finally, policy solutions to the issues raised are presented.

**Bio**

Joshua Hart grew up in California, and obtained his BA in psychology at UC Santa Cruz. Between 2000 and 2005 he worked for the Rails-to-Trails Conservancy and the San Francisco Bicycle Coalition. He completed his Transport Planning MSc at UWE Bristol in 2008. His dissertation, *Driven to Excess: Impacts of Motor Vehicle Traffic on Quality of Life in Bristol UK* has been politically influential in the UK and was covered by over 100 media outlets worldwide including the BBC, Guardian, Tehran Times, and the Daily Mail.

# Driven To Excess: Motor Traffic and Quality of Life on Three Streets in Bristol UK

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## INTRODUCTION

The motor vehicle is one of the aspects of the modern world that we take for granted- its' universal presence is so banal that most of us have forgotten- or have never known- the unique quality that public spaces can have when not overwhelmed by cars. The *Driven to Excess* study, carried out in Spring 2008 in Bristol UK, attempted to understand the often significant impacts of motor traffic on individual and community health, and add to the ongoing dialogue about how to improve the quality of people's lives in built up areas.

The study replicated the work of Donald Appleyard, a UC Berkeley planning professor from the UK who led investigations into the effects of car traffic on residential neighbourhoods from the 1960's to the early 1980's. He is best known for his 1969 study showing that people living on streets with heavy traffic have only one third the number of social connections as people living on light traffic streets. Appleyard was a pioneer and a visionary who drew on psychology, sociology and urban planning to contribute to a future where human settlements would once again become places oriented toward the needs of people rather than automobiles. In what was a tragic loss to these efforts, Professor Appleyard was killed in 1982 by a speeding motorist in Athens, Greece.

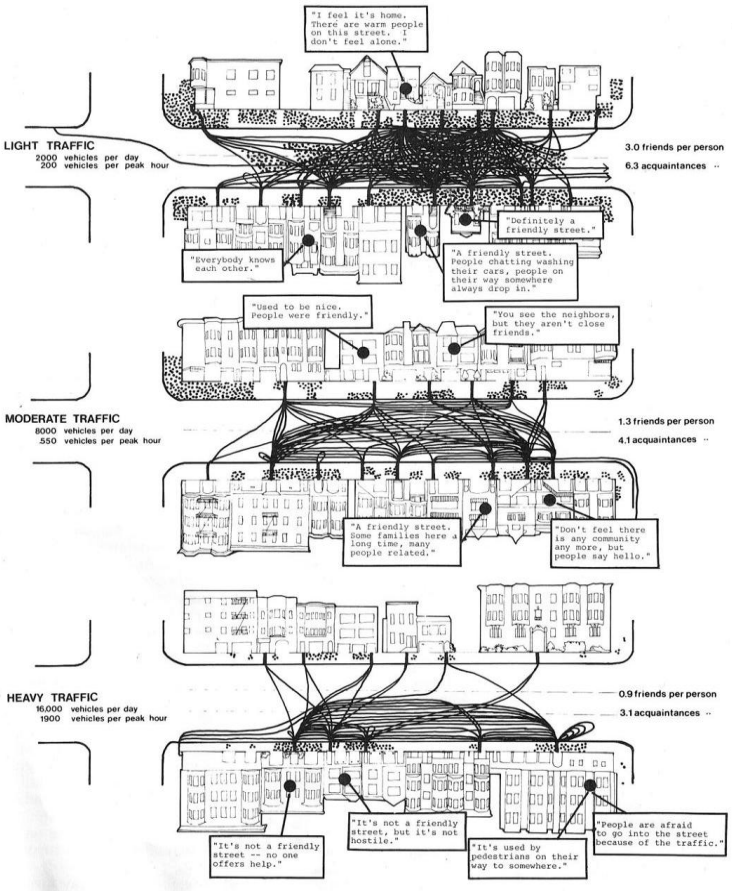


Figure 1: Appleyard's original social diagram- lines represent social connections. Dots are where people are said to gather (Appleyard, 1969)

## LITERATURE REVIEW

### Donald Appleyard's Livable Streets

Following his 1969 study, Appleyard worked with his associate Mark Lintell investigating street design, traffic, and neighbourhood quality of life, work that culminated with the publication of his seminal work *Livable Streets* in 1981. *Livable Streets* revealed the social impacts of traffic in glaring detail through interviews and street observations, demonstrating that casual conversations, children's play, and other street-based social life tends to be suppressed by motor traffic, particularly as volumes increase. Appleyard's findings provided a quantitative case for policymakers to consider the social impacts of current transport policies.

The iconic street diagram produced by Appleyard is included as Figure 1. This diagram visually represents the erosion of social interaction as traffic volumes increase.

### REPLICATIONS OF THE APPLEYARD STUDY

A search of the literature identified three other replications of Appleyard's research:

**Livable Streets, unpublished paper (Patterson et al, 1988):** For a research methods class at the UC Berkeley, a group of graduate students returned to San Francisco to study the same streets as Appleyard. They found similar results- that higher traffic streets led to degraded social networks and abbreviated areas of personal territory.

**Livable Streets Revisited (Bosselmann & MacDonald, 1997):** This study sought to determine the social and environmental impacts of normal heavily trafficked roads compared with boulevards (with local streets on either side). The results confirmed Appleyard's findings that "heavy traffic is associated with a withdrawal from the physical environment." Despite having very heavy levels of traffic (about 45,000 vehicles/ day), the boulevard designed with side streets recorded lower levels of irritation with the negative effects of traffic, showing that boulevard designs can be an effective mitigation of the worst effects of heavy traffic.

**Traffic's Human Toll (Transportation Alternatives, 2006):** This study was undertaken in New York City by the pedestrian, bicycle, and public transit advocacy organisation Transportation Alternatives. The researchers used a corps of volunteers to conduct 600 door-to-door interviews in 4 neighbourhoods over the course of a year. Compared with the initial Appleyard study, they selected streets with significantly lower traffic volumes, with low, medium, and high traffic streets having less than 1,000, 2-3,000, and 5,000 cars per day respectively. Findings echo Appleyard's study that those on heavily trafficked streets hold more negative views of their block, are more often interrupted during sleep, meals, and conversations, and spend significantly less time walking, shopping, and playing with their children.

### IMPACTS OF MOTOR TRAFFIC ON HEALTH AND QUALITY OF LIFE

In recent years, there has been a renewed focus among academics on the human impacts of the relatively rapid motorisation of the past sixty years (see figure 3 below). Research into these impacts falls into 7 inter-related categories: accessibility, noise, air pollution, climate change, traffic danger, physical activity, and social degradation.

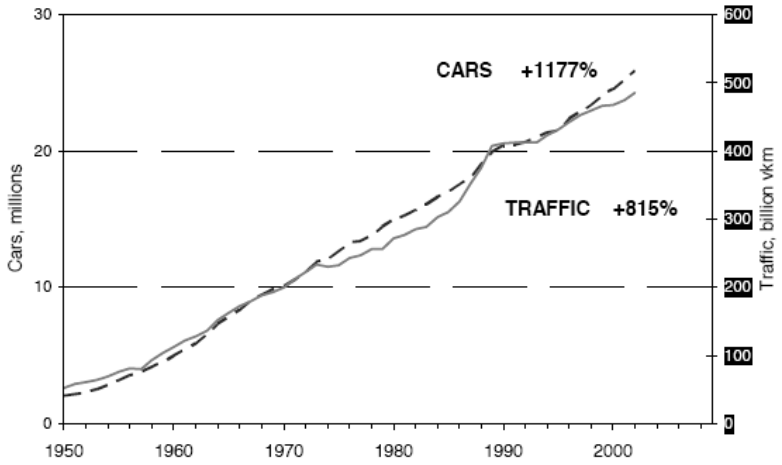


Figure 2: Increase in cars and vehicle km traveled, UK 1950-2002 (Goodwin et al, 2004)

**Climate Change**
The real threat exists of catastrophic interference in the global climate system if humans continue emitting CO2 and other greenhouse gases at current rates. (Hansen et al, 2008) Future impacts are likely to include melting ice caps and glaciers, rising sea levels, spread of drought, malnutrition, disease, and extreme weather events, many which may appear in a manner that is abrupt or irreversible. (IPCC, 2007)

**Air Pollution**
Motor traffic is the primary cause of poor urban air quality, tending to pollute in areas close to where people live and breathe. (Duhme et al, 1996) Globally, air pollution affects more than 1.5 billion people (Satterthwaite, 1999) and causes over 2.4 million deaths annually. (WHO, 2002)

**Noise**
Noise pollution is a serious (yet frequently overlooked) impact of motorised traffic on health and quality of life. Noise causes annoyance, cognitive performance degradation, sleep deprivation, heart disease, hearing loss, depression and hypertension. (Simpson, 2007) Traffic-related sleep disturbances are also linked with increased child pedestrian casualties. (WHO, 2005)

**Traffic Danger**
Globally, road crashes kill or seriously injure at least 50 million people every year. (WHO, 2004) The UK's share of this annual human toll is about 30,000. (DfT, 2007a) The fear of being killed or injured by a motor vehicle is also one of the primary factors preventing greater use of active travel, particularly among children. Vehicle speed is strongly associated with pedestrian fatality rates in a collision, with a large jump in injuries and fatalities occurring above 20mph.

**Accessibility**
Rising levels of car ownership, expanding road networks and the associated infrastructure have allowed for unprecedented personal mobility. However, expanding *mobility* for car owners has led to a diminishing level of *accessibility* for those lacking access to a car. (Litman, 2003)

**Physical Activity**
The growth of sedentary lifestyles in industrialized countries, fuelled by car-oriented planning practice, has led to a serious public health crisis. This worsening obesity/ inactivity pandemic is

associated with increases in stroke, heart attack, certain cancers, diabetes, and depression. (Sallis et al 2004) In the United States, 70% of the population fails to meet minimum recommended physical activity (USDHHS, 2000), a deficiency that leads to over $77 billion per year in hospital costs. (Pratt et al., 2000)

**Social Degradation**

Healthy social networks are not only crucial to happiness and quality of life- they also defend against multiple forms of mortality: "over the last 20 years more than a dozen large studies have shown that people who are socially disconnected are between 2 and 5 times more likely to die from all causes, compared with matched individuals who have close ties with family, friends, and the community."(Putnam, 2000 as cited by Leyden, 2003)

## RESEARCH SETTING AND METHOD

Bristol, UK was selected as the location for the research as it has some of the highest levels of car ownership, vehicle travel, and congestion of any city in the UK, as well as the associated degradation of environmental quality that is associated with these statistics.

Three residential streets in the north of the city (that were very similar apart from the volume of traffic) were selected for the study. Twenty households on each street were interviewed in person about their street, social ties, and irritation with traffic. Like the original Appleyard study, residents were told that this was a general study about neighbourhood improvement.

**Table 1 Three Bristol streets selected for study**

| Street | Category | Ward | Traffic Volume |
|---|---|---|---|
| Dovercourt Road | LIGHT | Lockleaze | 140 vehicles/ day |
| Filton Avenue | MEDIUM | Horfield/ Lockleaze | 8,420 vehicles/ day |
| Muller Road | HEAVY | Bishopston/ Lockleaze | 21,130 vehicles/ day |

## FINDINGS

Through the process of interviewing 60 separate households, a detailed picture of the dramatic effect of motor vehicle traffic on the quality of daily life emerged. Summaries of life on the three streets will now be presented.

**LIGHT Street (140 vehicles/ day)**


Judging from physical appearance, LIGHT street is very similar to MEDIUM and HEAVY streets. However, from the 20 interviews with residents, it appears to be a much more closely knit community.

A majority (13 out of 20) described the street in positive social terms. "(LIGHT street) is a friendly street- most people know other people," says a 49-year-old woman, and "good communication between houses, togetherness" from a 15-year-old boy. Especially the elderly residents living alone felt supported and cared for the by the tight knit community on the street. A 70-year-old woman who lived alone remarked that, "people on the street have always helped each other in times of illness and difficulty." Another older lady living alone felt lucky to live on such a street where "everyone's kind, thoughtful, helpful, and really lovely to me. When my next door neighbour hasn't seen me for a few days, he knocks just to see if I'm okay….there are more families here- people who stay for a while and put down roots. We share plants and look after each other. There is really a sense of community."

Of course, the street, just like any other, has its problems. Many of the older generation lamented the deterioration of the street's social life, in spite of the fact that most of them still had quite a few friends and acquaintances nearby. A man who had lived on the street for 42 years said that "people don't talk in the street as much as they used to. Everyone here used to know each other. We used to sit on the wall and chat- there would be 4 or 5 of us- those in their 60's would chat with those in their 30's. I haven't seen that since the 1980's." This kind of intergenerational socializing that is essential to healthy communities (Benson, 2002) was often centred around the minding of children who would play in the street, an activity that still occurred, but far less frequently than before. One resident explains why: "when our kids were small, they were always in the street- there were fewer cars then."

Even on one of the quietest streets in Bristol, with only about 140 vehicles per day, the occasional speeding car was enough to create the perception of a potentially dangerous environment, and prevent children from playing in the street. In a knock on effect, this also prevented adults (who would mind their children while they were playing) from socializing in the street. The occasional fast traffic was also the most frequently cited cause of stress. A single mother of a young child said that "a few cars come very quickly and threaten people in the street. I am constantly worried that my 2-year-old will dart out at the wrong time."

All in all though, LIGHT street is a community where people were relatively content with the local environment and their neighbours- a street with a healthy social life, a lower incidence of stress than the other two streets, and a support network that they could rely on during rough times.

**MEDIUM Street (8420 vehicles/ day)**


Filton Ave. is a moderately busy arterial residential road providing access to major employment centres in the north of the city. Many seemed to realize that the traffic was undermining the social life of the street. An elderly couple who'd lived in their house for 48 years, said that MEDIUM street is "not very neighbourly or friendly because you're on a main road."

The oldest inhabitant interviewed on MEDIUM street, a 91 year old man who had been living in the same house for 81 years, when asked to describe his street, said "traffic is really the main thing- life has changed tremendously because of the car. Neighbours don't see each other like they used to, because people get out of their front door, get in the car, and visa versa when they get home." A single woman in her twenties described MEDIUM street as being "busy in terms of the traffic, quite impersonal- part of the busyness means that it doesn't feel much like a community place." One older woman even went as far as to say that "if you were to die here, nobody would know."

One mother on MEDIUM street said that she actively discouraged her children from forming friendships across the street, in order to avoid crossing the busy road on a regular basis- direct evidence that traffic flows can hinder the development of social networks.

Yet despite the bleak reality of a neighbourhood impacted by the noise and fumes of traffic, many of the residents expressed an appreciation of their neighbours and a desire to see a more fully-fledged community develop. A single woman in her 30's said that "we need to be a bit more friendly on this street- it's important to know your neighbours."

HEAVY Street (21,130 vehicles/ day)


The dominant picture of HEAVY street that emerged from the interviews is that of a street where residents largely keep to themselves, and have arranged their lives in such a way as to minimize the primary source of stress on their street, which they identified, more than any other cause, as the heavy vehicular traffic (14 out of 20 households).

Although several residents mentioned their "friendly neighbours" and two residents said that they "swap Christmas presents, and often have meals together," more often than not these friends and/ or acquaintances were located in close proximity to the interviewee's home, and only rarely across the street. More residents expressed negative observations about the street than positive.

A middle-aged man living alone described HEAVY street traffic as a "mountain range, cutting you off from the other side of the road." He describes the street environment almost like a war zone: "The street is hellishly busy….it's a bloody nightmare. The buses and lorries shake the house when they come by. The air pollution can be quite bad out the front, sometimes during rush hour you feel the air getting thicker and thicker." He went on to say that "people have moved out because of the traffic." Over half of those interviewed reported spending more time in the back of the house due to traffic noise

Poor air quality turned out to be a major irritant and source of frustration on the street. A married couple in their late 30's who have been living on the street for 6 years, and have a four year old daughter, seemed at their wit's end: "This street is unfriendly, suspicious, dirty, and not very family friendly. We don't like it, mostly because of the traffic." The father told me that air pollution is a constant irritant. He worries about his little girl: "We're very concerned about her health- she has a constant cough- and we limit the amount of time she spends outside." he said. Remarking that he had cleaned the television the day before, he took a clean white paper towel, wiping it across the screen. He showed it to me and it was black- totally filthy. "We're constantly breathing this in," he said, exasperated.

A divorced, middle-aged man who grew up on HEAVY street, and moved back into the house when his parents died, has noticed a huge increase in traffic. "The air pollution is really very bad- it's annoying when the dirt builds up in the kitchen. There's just always so much dirt, grit, and grime around. I've considered moving out because of this."

Residents on HEAVY street adapted to the impacts of traffic pollution by choosing black curtains and painting their front door black to hide the build up of soot, frequently washing the car, the front of the house, and indoor surfaces, and keeping the front windows shut.

The prevalence of car crashes, and lack of safety was another major area of concern for residents on HEAVY street. According to several residents, crashes on the street are a frequent occurrence. A middle-aged man who has lived on HEAVY street for 27 years, told me that "a cyclist who lives on this block got hit crossing the road, and his leg was broken. A pedestrian was killed crossing at the lights. There have been many deaths and casualties on the road."

Residents attempted to limit the exposure of those deemed to be the most unpredictable and vulnerable groups- young children and pets- to the danger posed by passing traffic. On HEAVY street, most people on the street no longer owned pets, as the emotional pain resulting from one after the other being run over by traffic was too great to bear.

**Social Connections**

Residents were asked to identify the locations of friends, acquaintances, and family members living on their street using an aerial photograph provided. Figure 3 graphically demonstrates the outcome of this exercise, in the format of Appleyard's original social diagram.

**Table 1 Comparison of research findings with original study by Donald Appleyard**

| | LIGHT STREET | | MEDIUM STREET | | HEAVY STREET | |
|---|---|---|---|---|---|---|
| Study | SF | Bristol | SF | Bristol | SF | Bristol |
| Traffic Volume | 2,000 | 140 | 8,000 | 8,420 | 16,000 | 21,130 |
| Avg. # Friends | 3 | 5.35 | 1.3 | 2.45 | 0.9 | 1.15 |
| Avg. # Acquaintances | 6.3 | 6.1 | 4.1 | 3.65 | 3.1 | 2.8 |

Results confirm Appleyard's findings- that heavy traffic makes it less likely that you'll have friends of acquaintances on your street. The average number of friends reported on LIGHT street (5.35) was greater in the Bristol study than in the original San Francisco study (3.0) (see table 4.5). This difference could be attributed to the much lower traffic volume of the LIGHT street selected for this research, compared with Appleyard's study (140 vs. 2,000 vehicles/ day).

What are the mechanisms behind traffic's apparent erosion of social capital? First, activities that lend themselves to social interaction- such as gardening and sitting outside- are especially vulnerable to traffic-related environmental impacts, particularly noise and air pollution. Second, as traffic increases, so does the barrier effect between opposite sides of the street- residents on HEAVY street often had to wait as long as 5 minutes just to cross to the other side. Finally, the threat of being hit and injured or killed by a car in the street environment not only discourages people from spending time there, but those who do may be more likely to be on the defensive, and less inclined to engage in a spontaneous chat with a stranger.

**Community Interaction on Three Bristol Streets**

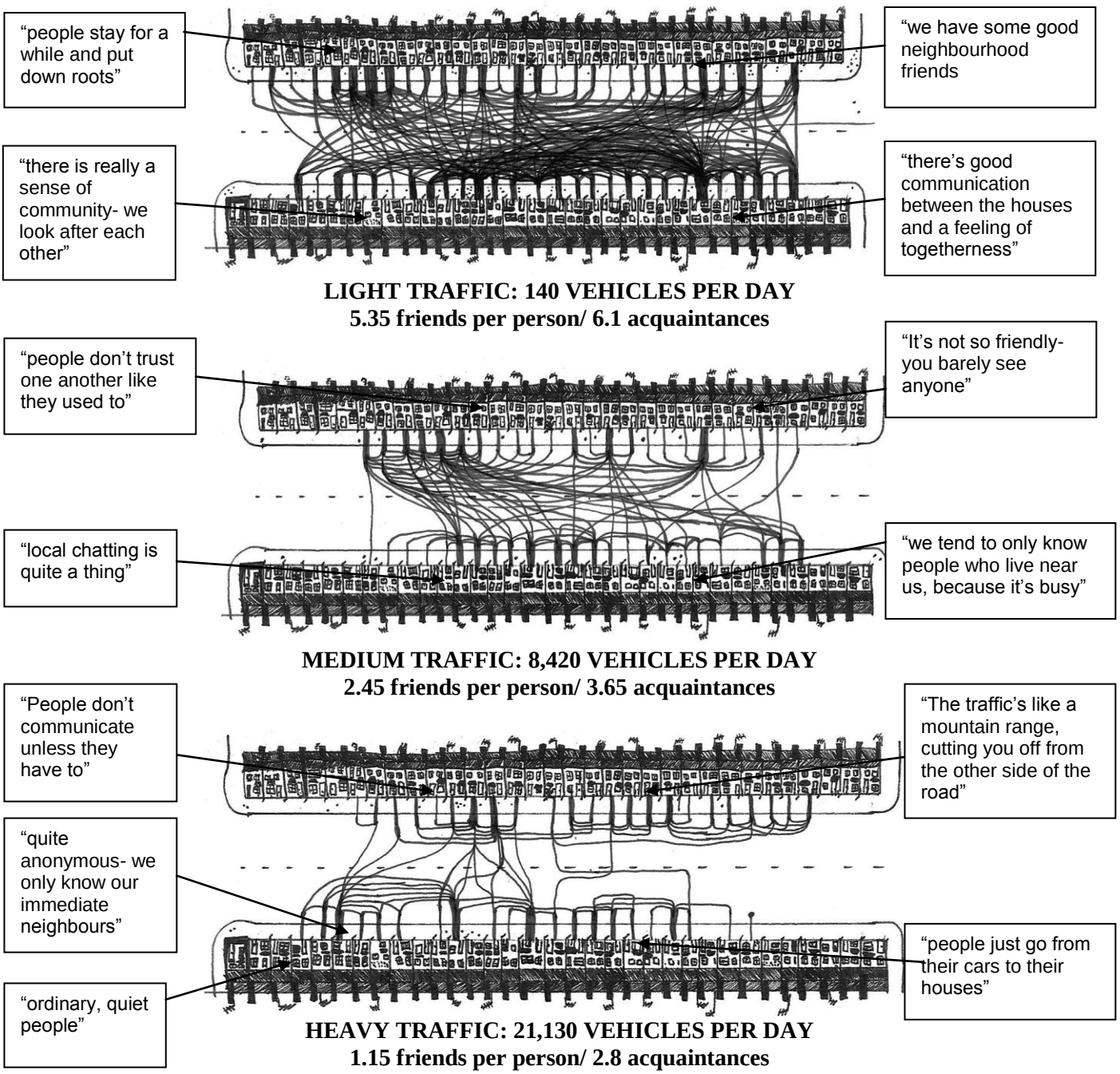


Figure 3 Community interaction on three Bristol streets: lines represent friendships or acquaintances, dots represent where people are said to gather and chat.

**Home Territory on Three Bristol Streets**

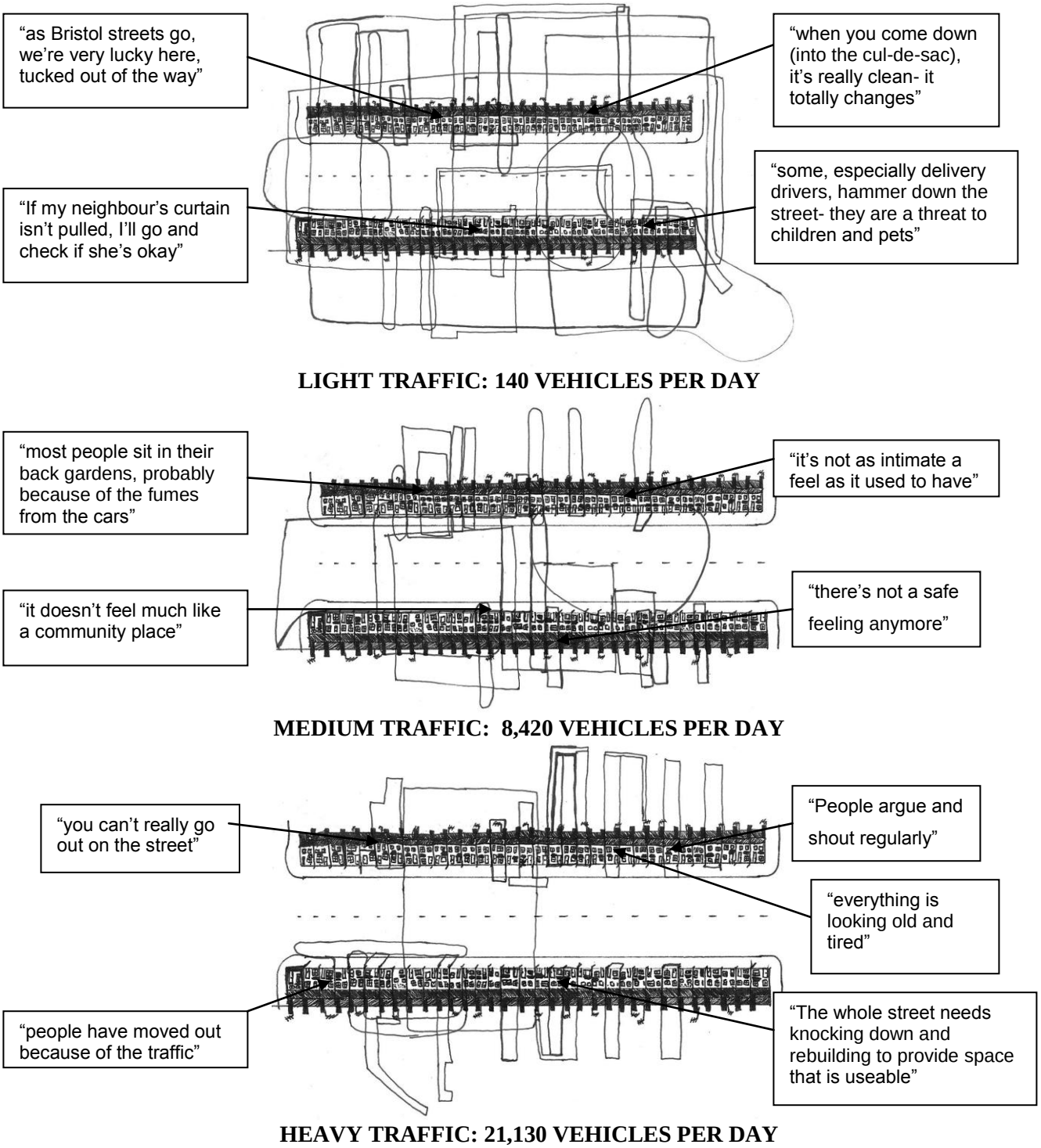


Figure 4 Residents were asked to draw their home territory (the area over which they felt a sense of personal responsibility or stewardship).

**Home Territory**
Next, on the same aerial photograph, residents were asked to draw their 'home territory.' Home territory was defined as the "area over which you feel you have a sense of personal responsibility or stewardship." (Appleyard, 1981) Results confirmed Appleyard's findings. Single diagrams of each street showing the results from all 20 residents are included as figure 4.

## DISCUSSION OF RESULTS

This study has confirmed the primary findings of Appleyard's original research- that higher levels of automobile traffic have a considerable negative impact on the social and physical environment. Put into context with the large body of subsequent research that has documented the severity of these impacts, a bleak picture emerges of a growing deterioration of the quality of life in our cities and towns, particularly along major roads.

If the increase in car traffic isn't simply the inevitable, yet mundane annoyance of modern life it seems to be on the surface, but is in fact a social and ecological crisis of deepening proportions, it is the responsibility of all of us, but especially our political leaders, to set ourselves on a new trajectory toward a sustainable future. If we fail, we will have created a world of "mutual detriment and significant loss where everybody suffers." (Whitelegg, 1997)

## POLICY RECOMMENDATIONS

We must address the traffic crisis not by simply adapting to ever increasing traffic volumes, but by seeking major reductions in traffic across the board. Significantly reducing the number of cars in the industrialised world may seem like a utopian dream divorced from reality, but it's important to remember when the automobile was introduced in the late 19th century, "many argued that it posed a danger and a nuisance, and as such should be denied the use of the public streets." (Southworth & Ben-Joseph, 1997)

This section will examine how new policies and thinking can restore civility to public places, currently under siege from heavy motor traffic.

**Transport Policy and Changing Travel Behaviour**
Motorised traffic has continued to grow, fuelled partially by new and widened roads, despite evidence that expansion doesn't just accommodate existing motorised travel demand, but induces new demand, above what would have been expected without the additional capacity. (SACTRA, 1999) Policies must be enacted that ensure a shift of public investment from prioritising the car to a coordinated plan to provide quality, accessible networks that favour cyclists, pedestrians, and public transport users, especially the key linkages between these modes.

**Information Provision**
If any attempt at reforming transport policy is to be successful on the broad scale necessary, it is crucial to inform the general public not only about bus timetables and cycle networks, but also the truth about the impacts of car use, a truth that is not widely known at present. (Steg and Gifford, 2005) Though they are likely to be fiercely resisted by entrenched interests in the auto and oil industries, government funded public awareness campaigns should begin to discourage driving just as they do smoking.

Provision of information can only go so far, however. The real prize is to make car-free transport appeal to people's concern with their self-image. Studies have found that driving behaviour is far more influenced by social norms, emotions, and vanity than actual need, despite what people say. (Steg, 2005)

**Parking Policy**
Enacting policies that affect the price and availability of vehicle storage can be more effective than public transport provision at managing levels of traffic in an urbanised area. (DfT, 2001)

One example of how to make big changes in travel behaviour is to gradually constrain the parking supply, as Copenhagen has done in its city centre, a plan that avoided the kind of disruption to accessibility that could have triggered a political backlash. Since 1962, the city has reduced the amount of parking in the area by 2-3% per year, while investing in the quality of public spaces, and boosting public transport provision. Over the past several decades, this policy has effectively improved urban livability and widened travel choices, yet the reduction in parking was hardly noticed, as it happened so gradually. (CABE, 2002)

**Street Design**
It is fitting that a large part of the solution can be found where the impact of car traffic is often the worst, but also where that traffic begins every day- along the residential street. A transformation of residential neighbourhoods themselves- from polluted, dangerous thoroughfares to quality environments directly outside one's front door can- in and of itself- encourage walking and cycling, and discourage driving. (Killingsworth et al, 2003)

A number of theorists have placed the blame for our hostile streets on a planning code that fails to distinguish between the highly predictable world of the highway, and the urban places where people live, work, and play. (CABE, 2002) They have argued for a new design "language" where public space is shared. The development of *woonerven* or home zones as they are known in the UK is one example of this shared space philosophy. Although it is counterintuitive, by actually decreasing the degree of *perceived* safety, it is possible to influence the degree of care that road users exercise when in conflict with each other, and increase the degree of *actual* safety. (Hamilton-Baillie, 2004)

In the right circumstances, shared space principles can tame traffic, but will likely do little to reduce it. Enter the concept of "filtered permeability," (Melia, 2007), where bicyclists and pedestrians retain full access to the street network, while cars are restricted by bollards at certain junctions. The concept can effectively design a non-motorised advantage into the built environment.

**Legal Measures**
Since 2006, local authorities in the UK have had the ability to declare a 20mph default speed limit on built up roads. (DfT, 2006) Lower speed limits as well as strict liability laws for drivers have successfully been adopted in Netherlands and Scandinavian countries. (Whitelegg, 2007) These laws have done much to make cycling and walking safer, more attractive options.

Table 1 Risk of pedestrian fatality in a vehicle collision by vehicle speed (IIHS 2000)

| Vehicle Speed | Risk of Pedestrian Fatality |
|---|---|
| 20 mph | 5% |
| 30 mph | 45% |
| 40mph | 85% |

Planning codes should be strengthened to ensure that new developments are well served by public transport, cycling and walking routes so that a car is not a daily necessity. (Barton, 2003)

Employment centres should be located within the existing urban fabric and in close proximity to public transport stops or stations. These types of compact land uses are associated with lower levels of car use, and improved air quality. (Frank et al, 2000)

**Final Word**

*"Like the smoker, we cannot know for certain what course our dependency might take…. yet we know that to do nothing about our dependency equates to taking a risk with the health of society. We also know that to do too little too late could result in sealing our fate."*

*-Glenn Lyons (2003)*

This study provides a small snapshot of the social and environmental impacts of vehicle traffic on three streets in one neighbourhood in Bristol UK. But of course the presence of vehicle traffic is a nearly universal aspect of modern life, especially in the industrialised countries, but increasingly in the developing world as well, which is motorising faster than the industrialised countries ever did, often without awareness of, or attempts to mitigate the worst of the repercussions of this policy. The current situation is bad enough. The bigger threat is what's to come if transport policy continues on its current trajectory: significant additional traffic being added to streets that are already suffering from the effects of existing vehicle numbers- with all that that entails for environmental quality, health and safety, loss of community, and stability of our climate. We cannot drive blindly into this future.

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