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What is good about good design? Exploring the link between housing quality and crime.

Rachel Armitage, Michelle Rogerson and Ken Pease.

Abstract:

The design of homes can enhance the quality of life of residents by reducing their vulnerability to crime. Copious research has identified the features of individual properties, their boundaries and development layout, which act as risk and protective factors. This has been to some extent reflected in the England and Wales through regulation, national and local policy, guidance and incentives. Yet many housing developments considered excellent in terms of their design and architecture do not incorporate the design features associated with lower rates of crime. This does not matter if good design is of itself crime reductive. The key question for policy is whether good design creates a crime reductive dynamic (for example by engineering community spirit), or whether good design must be supplemented by features specific to a crime reduction purpose for lower rates of crime to result. HM Government's 2001 statement of housing policy is optimistic that good design will result in safe and secure neighbourhoods, but unclear as to how this link is achieved. This question is here addressed, utilising data from three police forces and over six thousand residential properties. The paper concludes that award-winning housing design (developments accorded BfL status) is neither a necessary nor a sufficient condition for low levels of crime victimisation to result. Award winning design must be supplemented by the incorporation of crime-reductive design for residents to enjoy the quality of life conferred by good design, uncompromised by high crime rates.

Introduction

The emphasis in empirical criminology has over the last three decades shifted somewhat from the search for an understanding of offender characteristics and motivations towards manipulations of the environment which raise the threshold at which latent criminal inclinations are translated into action. The new, place-centred approach is variously badged as situational crime prevention, environmental criminology and crime prevention through environmental design (CPTED).

Housing developments last a long time. Their crime consequences are correspondingly long-lasting and planning and design decisions made now are likely to yield crime harvests (Pease, 1997; Ekblom, 2002) for perhaps half a century. Current policy to provide substantial affordable housing will put in place developments whose design will in part determine long term vulnerability to crime and consequent resident satisfaction. This combination of longevity of crime consequences and urgency of current housing need demands the incorporation of the best possible crime-reductive design in homes about to be built. The policy context does not instil confidence that this will happen. Financial restraints have impacted upon the provision of crime prevention advice, with the number of police Architectural Liaison Officers cut by approximately twenty-five per cent in the period 2009-2011 (from 305 to 230). Current policy changes have also seen the removal of existing Planning Policy Statements and Guidance, to be replaced by a considerably reduced National Planning Policy Framework.

This paper presents findings from perhaps the most ambitious collaborative project of its kind to date, funded by the Home Office, managed by the Commission for Architecture and the Built Environment (CABEⁱ) and carried out by a consortium of researchers led by the Applied Criminology Centre of Huddersfield University.ⁱⁱ The project comprised a detailed review of some seventy policy, guidance and research documents, and in-depth scrutiny of over 6,000 properties across three police forces. The aim was to investigate:

- a) The impact of specific design features of residential housing on crime, and
- b) The link between assessed housing quality and crime.

The former aim, although central to the conclusion and recommendations of this paper, is reported in detail elsewhere (most recently see Armitage, 2011a, 2011b, 2011c; Armitage *et al.*, 2011; Armitage, in press) and only in summary form here. The reader is referred to these sources to underpin the assertion that research reveals a general consistency in the design features which are associated with lower rates of crimeⁱⁱⁱ.

The focus of this paper is to establish the extent to which housing quality is associated with rates of crime. The Government's recently published Housing

Strategy (HM Government, 2011) states that: '*Well-designed homes and neighbourhoods are those that are attractive – reflecting local character and identity while featuring good architecture and landscaping*' (HM Government, 2011, p. 56). The same document asserts that: '*Well thought-through design can also improve the safety and security of homes and neighbourhoods*' (HM Government, 2011, p. 56). Does the first claim naturally entail the second. Is *good design* - which is attractive, reflects local character and features good architecture and landscaping also likely to improve the safety and security of homes? The Government's Building for Life (BfL) award^{iv} is the current standard for what is considered to be *good design* and the findings of this paper are timely given that this standards is to be '*..refreshed*' ready '*for launch next year*' (HM Government, 2011, p. 58). The central question which this paper seeks to answer is whether the Government's measure of *good design* – BfL status, is sufficient to yield housing which is safe and secure and which minimises crime risk, or whether alternative measures of design quality can act as more effective predictors of crime risk. This paper is improvement oriented and is by no means intended as a criticism of the BfL scheme. It is very desirable that people live in well designed neighbourhoods. However, it is also very desirable that people live in low crime areas. If BfL status confers low crime then the desired outcome has been achieved. If complementary design features are necessary to ensure low crime, policy should be adjusted accordingly.

The issue is explored through a detailed analysis of the relationship between housing quality (as assessed against the BfL standard) and crime levels experienced, controlling for socio-demographic variables. The analysis is conducted on two samples, the first comprising thirty-four housing developments representing a set of 'average' private sector homes, the second comparing six flagship exemplars of current design standards with six developments matched as far as possible according to socio-demographic variables, location, age and tenure.

This paper utilises a unique dataset containing details of fifty individual and development level design features of over 6,000 properties, plus an additional twenty architectural design quality features of that same sample of over 6,000 properties, and the judgements made by CABA assessors regarding the design quality of a sample of over 4,000 properties. This is supplemented by police recorded crime data

for the developments and for the surrounding areas. The aim was to establish whether good housing design (as judged by BfL status and CABE Housing Audit scores) is an accurate predictor of subsequent crime levels, whether judgement of design quality (using CABE's own assessment method) is consistent when reviewed by an independent assessor, and whether there are other environmental features of residential housing which are more predictive of vulnerability to crime than conventional design quality measures. The intended outcome is a set of findings which assists in the revision and improvement of existing measures of housing quality (Housing Audits and BfL status) which measures housing quality from a wider perspective, not just based upon architecture, aesthetics and community provision, but also upon the detailed environment factors which influence likely crime risk and thus future quality of life. The extensive dataset is original, the methodology unique and painstaking and the resulting findings and conclusions applied and practitioner focused. The aim is not to attack existing policy and practice within the field of crime prevention through environmental design, but to make the most of the recent and imminent changes to improve quality and to ensure that policy and guidance is evidence based and informed by rigorous, independent research.

Reducing Crime through Design – What Works?

There exists an abundance of literature identifying features of residential housing which act as risk and protective factors. Most recently (and as part of the research project which forms the basis of this paper), Armitage *et al.* (2011) reviewed fifty-seven^v research papers containing evidence relating to what works in design against crime (see Armitage, 2006*b* for a detailed review up to that time). They found general consistency in the results reported. Not only does this suggest that the confusion emphasised by Hillier and Sahbaz (2009), and explored in Armitage (2006*b*), has been overstated, it also confirms that policy makers and practitioners working within the field of crime prevention should now be in a position to provide clear, evidence-based guidance to the communities who, through changes introduced through the Localism Act (2011), will be influencing local policy. As was highlighted above, a detailed review of the evidence is presented elsewhere (Armitage, 2011*a*, 2011*b*, 2011*c*; Armitage *et al.*, 2011; Armitage, in press), however, a brief summary is provided as tables one to six below. It should be noted that the majority of studies in this area have examined the correlation between the

presence or absence of housing attributes and levels of crime, while correlations demonstrate that two variables are closely related they do not necessarily imply causation.

In terms of property type, the research suggests that detached properties, with access to the front and back of the property from either side of the house, are at greater risk of burglary (Winchester and Jackson, 1982; Hillier and Sahbaz, 2009). High risk housing (flats/apartments) appear to be perceived by burglars, planners and police to be at greater risk of crime, however, the research here is conflicting. Newman (1973, 1980) and Newman and Franck (1982) found that the greater the number of storeys within a development, the higher the risk of crime. However, in their study of 101,849 dwellings in a London Borough (UK), Hillier and Sahbaz (2009) found that flats had the least risk of burglary (with detached properties the highest risk). Hillier and Sahbaz (2009) present the mean burglary rate for thirteen property types ranging from very tall blocks to large detached properties and reveal that, in general, the higher the number of sides on which the dwelling is exposed (high rise flats above the ground floor not at all and detached on all four sides), the more vulnerable a property is to burglary. The paper concludes that: '*All classes tend to be safer in flats, but with increasing wealth, the advantage of living in a flat rather than a house increases, as does the disadvantage of living in a house*' (Hillier and Sahbaz, 2009 p. 183).

Properties set at a distance from nearby homes are more vulnerable to victimisation (Winchester and Jackson, 1982), as are those on a corner plot (Taylor and Nee, 1988; Cromwell *et al*, 1991; Groff and La Vigne, 2001; Armitage *et al.*, 2011).

Table One about here

The review of literature found few studies which specifically identified particular designs for accommodating parking within residential areas as being more vulnerable than others. Brown and Altman (1983) studied the environmental features of 306 burgled houses on burgled blocks, non-burgled houses on burgled blocks and non-burgled houses on non-burgled blocks in an attempt to establish which factors were associated with burglary-prone homes. They concluded that properties with a

garage were less vulnerable to burglary than those without garages. Armitage *et al* (2011) found that the only parking variable which significantly impacted upon total crime and upon vehicle crime was the provision of visitor parking – developments which included allocated visitor parking spaces experienced lower crime than those which did not. Although not a statistically significant finding, the research also found that properties with communal parking experienced higher levels of vehicle crime than those with other types of parking provision.

Table Two about here

The literature suggests that surveillance and visibility play a major part in offenders' decision making processes when selecting properties against which to offend. Offenders suggest that properties make a more attractive target where they have less visual access from neighbouring properties (Repetto, 1974), and where they are located within close proximity to a stop sign, traffic lights, a commercial business establishment, a park, church or main road (Cromwell *et al*, 1991). The former is likely to relate to the lack of surveillance from neighbouring residents, the latter could be a consequence of the ease of exit/escape from properties located within these areas or, in the authors' view more likely, that offenders have an increased awareness of properties located close to these busy areas/facilities.

Analysis of prior victimisation also suggests that surveillance and visibility play a key role. Properties with poor visual access to neighbouring properties are more likely to have experienced prior victimisation (Winchester and Jackson, 1982; Brown and Altman, 1983; Armitage, 2006a). Properties located on a main road (Winchester and Jackson, 1982; Groff and La Vigne, 2001; Armitage, 2006a), within close proximity to an exit from a major thoroughfare (Taylor and Gottfredson, 1987) or which are visible from traffic lights (Armitage, 2006a), or from a nearby footpath (Armitage, 2006a; Armitage *et al*, 2011) are also more likely to have experienced a prior burglary.

Table Three about here

Several studies support the notion that neighbourhoods in which residents display signs of territorial behaviour experience (and are judged by offenders to be likely to experience) less crime. Brown and Altman (1983) found that, compared with non-burgled houses, properties which had been burgled had fewer symbolic barriers as well as actual barriers such as fences and locked gates protecting private territory from public access. Brown and Altman also found that burgled properties were less likely to have signs marking the boundary of the property (i.e. the name or number of the house). Brown and Bentley (1993) interviewed seventy-two burglars who were shown pictures of ten residential properties – half burgled, half unburgled. They were asked to rate the properties on a number of risk factors and to judge whether the property had been burgled. Houses showing signs of territorial concern were perceived as being non-burgled. Armitage (2006a) found a statistically significant link between the presence/absence of a real or symbolic barrier at the entrance to an estate and the level of prior victimisation experienced by properties on that development.

Merry's (1981) study into the link between social organisation and crime and disorder in an American housing development which had been built to encompass many of the design features of Newman's defensible space, was less positive. Merry's victimisation survey suggested that there had been eighty-nine burglaries, fifty robberies and purse snatches and ten assaults within the project area. Over half of these robberies reported in the victimisation survey took place in areas which were considered to be architecturally defensible. Merry suggested that the benefits of designing housing estates to maximise defensible space fail to account for the behaviour of residents who may not notice a crime taking place, and if they do, may not be willing to intervene.

Table Four about here

Several studies have suggested that if low-level disorder such as vandalism and litter are not addressed, they can act as a catalyst for more serious crimes. Skogan (1990) refers to this as contagion theory, suggesting that the '*presence of vandalism stimulates more vandalism*' (p.39). Wilson and Kelling's (1982.p.16) broken windows

theory is the more famous precursor of contagion theory. This suggests that an area with existing deterioration such as graffiti and vandalism conveys the impression that a) nobody cares so apprehension is less likely and b) the area is already untidy so one more act will go unnoticed. Taylor and Gottfredson (1987) confirmed that physical incivilities indirectly influence offenders' perception of risk in that they portray a resident's level of care or concern for the area in which they live, thus acting as a sign that residents will not intervene against offending. Cozens *et al* (2001a, 2001b, 2002a, 2002b and 2002c) displayed photographs of two contrasting versions, one being well maintained, the other poorly maintained, of five housing designs – detached, semi-detached, terraced, low-rise flats and high rise flats. Participants were asked to judge each property's vulnerability to burglary. Elderly residents, convicted burglars, planning professionals, police and young adults consistently selected the 'well maintained' option as the safest for all five design types.

In a study of the link between environmental design features and crime within West Yorkshire (UK), Armitage (2006a) found evidence of both brief and long-term desertion to be statistically significantly associated with prior burglary in a sample of 1058 properties.

Table Five about here

Road layout refers to the type of road serving the development on which the property is located (for example, is the road directly in front of the property a through road, a sinuous^{vi} or a linear^{vii} cul-de-sac) as well as the internal network of pathways/footpaths within, and leading out of, the development. Although Hillier and Sahbaz (2009) argue that there are insufficient empirically based studies to form any conclusions regarding the impact of road layout on residential crime, the review of literature suggests otherwise, with many methodologically strong studies presenting clear findings relating to the impact of road layout, connectivity and permeability upon residential crime.

One of the major current debates surrounding designing out crime within residential housing is that of connectivity or through-movement – often referred to as

permeability. The debate centres upon the benefits of facilitating movement within an area weighed against the risks of potentially criminogenic design. For those who advocate increased connectivity, the rationale does not necessarily relate to crime reduction. The primary purpose of designing connected developments is to ensure that people can get from A and B without the need for use of a vehicle (thus reducing carbon emissions and the visibility of the car) and to avoid the need for residents to take unnecessarily lengthy routes. Whilst the cul-de-sac layout is favoured by the majority of criminological literature, urban designers would argue that there are many negative features of this layout. It increases travel distance and therefore reliance upon the motor vehicle, it is an inefficient use of land and it increases the difficulty of ensuring that public transport can travel close to these residential properties. Those who argue that crime is likely to be higher along major vehicular or pedestrian pathways, do so based upon the following mechanisms:

- Properties on developments with high levels of through movement provide ease of entry and escape for potential offenders.
- Properties on developments with high levels of through movement are more likely to be within the activity space, and therefore awareness space, of potential offenders.
- Developments with high levels of through movement offer increased levels of anonymity for potential offenders.

The review of literature found that the majority of studies, which used a variety of different methodologies, supported the argument that a property located on a development which includes high levels of connectivity and through movement, is more likely to have experienced prior victimisation (Bevis and Nutter, 1977; Rubenstein *et al.*, 1980; Taylor and Gottfredson, 1987; Van der Voordt and Van Wegen, 1990; Poyner and Webb, 1991; Beavon *et al.*, 1994; Mirlees Black *et al.*, 1998; Rengert and Hakim, 1998; Taylor, 2002; Nubani and Wineman, 2005; Yang, 2006; Armitage, 2006a; Armitage *et al.*, 2011). Several additional studies found that being located on a true cul-de-sac (with no pedestrian and vehicular connections) reduced the risk of victimisation (Bevis and Nutter, 1977; Armitage, 2006a; Armitage *et al.*, 2011; Johnson and Bowers, 2010), and that closure of streets resulted in a

reduction in crime levels (Matthews, 1992; Atlas and LeBlanc, 1994; Newman, 1995, 1996; Lasley, 1998; Zavoski *et al.*, 1999; Eck, 2002).

In a review of the evidence relating to the impact of permeability on crime, Taylor (2002) concludes that: '*Neighbourhood permeability is ... one of the community level design features most reliably linked to crime rates, and the connections operate consistently in the same direction across studies: more permeability, more crime*' (Taylor, 2002 p. 419). However, this assertion is not entirely correct as several studies – particularly those conducted in the last decade and using Space Syntax techniques^{viii} – have concluded that increased levels of through movement have a beneficial impact upon crime. Several studies have concluded that crime is concentrated in more isolated and less accessible streets (Rudlin and Falk, 1995; Jones and Fanek, 1997; Hillier and Shu, 1998; Hillier and Shu, 2000 and Shu and Huang, 2003; Hillier, 2004). However, each of these studies uses Space Syntax as a means of calculating integration and connectivity. One explanation for the disparity between these findings is that, although Space Syntax allows a greater number of properties to be analysed (Hillier and Sahbaz looked at 101,849 properties), by the same token this means that presumptions are made about movement and patterns. Where the road layout is physically assessed, fieldworkers can make clearer distinctions regarding road layout, official and unofficial footpaths, and observe the development and how it is used. As Schneider and Kitchen (2007) highlight, space syntax is unable to conduct '*fine-grain analysis*' which accounts for '*types of surveillance, street patterns or local context*' (Schneider and Kitchen, 2007, p. 40). Johnson and Bowers' (2010) analysis at the street segment level is regarded by the writers as definitive because of their use of both manual and GIS means of establishing road networks, and a strong conclusion is reached that permeability is indeed criminogenic.

Table Six about here

Methodology

Police recorded crime data were collected (at property level) for the three year period January 2007 to December 2009 for forty-six developments (a total of 6,284 properties) in three police force areas for the following crime types: burglary, vehicle crime, criminal damage and crimes against the person. Two samples were analysed

and are referred to throughout the paper as the macro and micro samples. The macro sample consisted of thirty-four developments containing a total of 4091 properties. These developments were sampled from those included in the CABE Housing Audits – all developments assessed by CABE for the Housing Audit for the three police force areas. The CABE Housing Audits assess housing estates against the BfL standard, allocating each a score between zero and one hundred to each development. The features assessed as part of the CABE Housing Audits are largely static, such as the design and layout of the scheme, car parking provision, access to public transport and architectural quality. The scores allocated by CABE assessors can be regarded as reflecting judged design quality.

The micro sample comprised 2193 properties across twelve developments. As with the macro sample, it was important to distinguish between judged housing quality for the developments within the sample. For the macro sample, this was measured in two ways. First, the BfL award winning status of the housing developments – with two developments from each of the three police forces selected for their award winning BfL status and matched against similar but non-BfL developments (giving six matched pairs of BfL and non-BfL developments). Second, each of the twelve developments were assessed in the field by an independent and distinguished Professor of Urban Design who provided a quality score that, in line with housing audit scores, ranged between zero and one hundred.

In addition to an assessment of design quality, the research team assessed each of the twelve developments in the micro sample against environmental features which previous research had shown to promote or prevent crime using a checklist entitled the Environmental Features Checklist. This checklist included questions relating to thirty-one specific design features of each individual property and nineteen features of the wider development. Although for the purposes of the wider research project, this exercise was conducted for features of the individual property and the wider development, as the CABE Housing Audit design quality variables were only available at the development level, this paper only considers the development level features included in the environmental checklist (the individual level features and their impact upon crime are reported in Armitage *et al.*, 2011). The development level factors included the provision of community facilities, signage and way finding,

real and symbolic barriers, footpaths, car parking provision, communal space, management and maintenance, security measures and surveillance and visibility.

The basis for the selection of the samples is outlined in detail in Armitage *et al* (2011), however, a brief overview is provided here. The macro sample included all properties audited in the CAGE Housing Audits for the three Greater Manchester, West Midlands and Kent police forces. These were selected to allow sufficient geographical spread, and sufficiently numerous BfL developments (for the micro analysis), a large enough sample of properties within those developments, and a sufficient spread of Housing Audit scores. The micro sample included two BfL developments and two non-BfL matched pairs from each of the same three police forces – giving six BfL and six non-BfL developments. The BfL developments were selected to ensure that the sample contained an adequate number of properties, contrasting design types (for example urban, suburban, high and low density) and developments which were not geographically isolated – to allow for the selection of comparator matched pairs.

In summary, the macro sample provided a cross-section of average private sector homes, whereas the micro sample focused upon developments that adhered most closely to contemporary principles of best practice in residential design. These ‘exemplary’ estates were matched with comparator sites according to the following factors: close proximity to the case study area, similar size area, comparable socio-demographic composition and similar range of housing types and density (for example, detached, semi-detached, apartments).

Although the wider project focused upon many research questions relating to the impact of residential design upon crime, the core aim of the present paper is to test for associations between judged housing design quality and levels of the various crime categories – burglary dwelling and non-dwelling, theft of and from motor vehicle, criminal damage, theft from person and assault. Is *good* design (as judged by CAGE Housing Audits, BfL status and a design expert’s assessment) associated with low crime rates?

Results

Housing Quality as a Predictor of Crime

The key analyses presented below concern the relationship between assessed design quality and rates of crime experienced. Is design quality a reliable predictor of crime? For the macro sample, the key association is that between CABE Housing Audit scores and rates of crime. Table seven reveals that the relationship between design quality (as measured by audit scores) and rates of crime is effectively zero, with the exception being vehicle crime, where higher design quality is associated at a statistically significant level with lower rates of crime. Developments that ranked in the top ten for housing quality experienced an average of eight vehicle crimes per 1000 dwellings each year compared to an average of seventeen crimes per 1000 dwellings for developments that ranked in the bottom ten. A similar pattern is not evident for the other crime types analysed.

Table Seven about here

The importance of this table is difficult to overstate. It means that good design and crime-reductive design seem effectively independent of each other (with the exception of vehicle crime). It is possible to argue that this finding could be an artefact of range truncation - that the developments are very similar in respect of either audit scores or rates of crime or both. However, this was not the case and housing audit scores covered a wide range from thirty-three to eighty-two with a mean of sixty-six. As is illustrated in table eight, there was also a considerable range of crime rates across the sample. The rate of police recorded crime in England and Wales in 2009/10^{ix} was 106 crimes per 1000 households. The average annual rate of crime for developments in the macro sample was lower at sixty-five crimes per 1000 households, although this rate reached as high as 233 crimes per 1000 households and as low as twelve crimes per 1000 households.

Table Eight about here

The relationship between housing audit scores and crime rates was not affected by the level of crime in the surrounding area. Two measures of background crime level

were adopted to test this. The first utilised publicly available data on the crime rate in the surrounding police division^x, the second utilised GIS analysis to measure crime rates in a buffer area of 500m surrounding each development. Similarly, the relationship between housing audit scores and crime rates was not affected by the socio-demographic profile of the area in which the development was situated (as identified using the census Output Area Classifications – OACs)^{xi}.

Turning to the micro sample, if good design creates a dynamic which reduces crime, a development selected as an exemplar of current housing standards (one being awarded BfL status) should experience less crime than its comparison site controlled for other variables. Table nine presents relative reported crime rates by common crime type for the six matched pairs. The cell entries represent the number of crimes per household in BfL equivalent developments relative to the number of crimes per household in comparison developments. For example, there was a total of 471 crimes per 1000 households in BfL area one, and 199 crimes per 1000 households in comparison area one, so the 'all crime' cell for pair one is $471/199= 2.4$, indicating 2.4 times as many crimes per household in the BfL development. In short, all cell entries below one indicate the predicted lower crime in BfL developments. All cell entries above one indicate less crime in other developments.

Table Nine about here

The findings reveal that there is no *overall* difference in rates of crime between BfL equivalent developments and matched developments. Looking more closely at the comparisons, it is clear that for pairs one to three, BfL developments suffer more crimes per head, with twelve of the fifteen comparisons showing this and only three pairs having lower crimes levels experienced at the BfL development. For pairs four to six, the opposite was true, with only four of the fifteen showing higher crime in the BfL pair, and eleven of the fifteen showing that crime was lower in the BfL development. For the thirty cells displayed in table nine, sixteen reveal that the BfL development was experiencing more crime than its matched non-BfL counterpart. For fourteen, the BfL development performed better. This is supported by further analysis of the data which showed that there were no statistically significant relationships between BfL status and crime rates^{xii}. To anticipate a possible

objection, it may be thought that development size is a relevant factor, or may be particularly salient for BfL developments. However, the simple association between development size and total crime was virtually zero, and remained so when controlling for BfL status^{xiii}.

Reliability of Building for Life/Housing Audit Scores

Within the UK, BfL status and CABE Housing Audit scores have been (and still are) viewed as the established predictors of design quality. In addition to ascertaining the extent to which these are useful predictors of crime rate, the research was concerned to establish how reliable these assessments are, and whether the scores or status awarded to a development would be replicated by an independent assessor. The researchers invited an independent design expert to assess all twelve developments in the micro sample against the BfL standard. This provided a unique opportunity to test the consistency/reliability of CABE assessments as well as providing 'new' housing quality scores for the non-BfL comparison developments for which no indicators of housing quality were available prior to this research. The availability of a consistent score for all twelve developments enabled the researchers to check whether the six BfL award winning developments displayed greater housing quality than the developments with which they were paired for comparison. It should be highlighted that this exercise could only be conducted imperfectly as the design expert's extensive knowledge of BfL housing estates throughout the country meant that he was aware of the BfL status of the developments prior to his visits.

Table ten compares the CABE assessments against those of the independent design expert. Developments are categorised into groups above and below the BfL award threshold of seventy per cent (this being the minimum Housing Audit score required to achieve BfL status). Disparity between the scores could have three explanations, the first being that the CABE assessments are not reliable – the likely reasoning being that the questions are too subjective to be replicated. A second explanation could be that the BfL schemes had altered in the time between the CABE and design expert assessments. The third explanation, as is highlighted above, could relate to the design expert's prior knowledge of the developments (and their rates of crime and disorder) – information to which the CABE assessors would not have been privy.

The analysis reveals that the CABE and expert assessment coincided in five out of seven cases for which Housing Audit scores were available^{xiv}. For the two developments where discrepancies emerged, these were a result of the design expert awarding a much lower score (fifty to sixty-nine per cent) than that awarded to the development by the CABE assessor. In these two cases the design expert felt that two of the developments given the status of BfL award winner or equivalent by CABE were not, in his view, at the standard which should be required to achieve accreditation.

When comparing the scores awarded to each of the matched pairs, of the six developments selected for their BfL award winning status, the design expert felt that five exhibited greater design quality than their paired comparison non-BfL development. However, for one pair (pair four above) the non-BfL comparison was judged to have greater design quality than the development awarded BfL status. However, examination of Table Nine shows that although the non-BfL comparison was judged to have greater design quality, it did not have lower crime.

The issue of reliability is important in that, if the CABE design assessments are subjective and/or inconsistent, a more objective measure of design quality could be associated with rates of crime. It will be noted that both the discrepancies occur with lower ratings by the design expert, introducing the possibility (as mentioned above) that schemes had deteriorated between CABE assessments and the later assessments by the design expert.

Table Ten about here

Design Expert Scores as a Predictor of Crime

Having identified that there is some disparity between CABE assessor and design expert score, the analysis turns to whether the design expert's assessment of quality is a more reliable predictor of crime than that of the CABE Housing Audit assessment or BfL status. Table eleven displays the Spearman's rho correlation between design expert score and crime rates per 1000 properties for the five crime types; vehicle crime, burglary, crimes against the person, criminal damage and total

crime. The results reveal that there is only one crime type for which the design expert's assessment of housing quality displays a statistically significant association with crime rates and that is vehicle crime. This is a strongly negative correlation, therefore, higher design expert scores are related to lower levels of vehicle crime.

Table Eleven about here

The findings (as with Housing Audit score) show the lack of association between judged housing quality and crime rate. With the exception of vehicle crime, the correlations shown in Table eleven are all of the expected direction but are weak to moderate and not statistically significant^{xv}. Therefore, vehicle crime aside, the distribution of crime rates across the developments is not predictable from the score allocated by the design expert. It should be noted that the association between the design expert's assessment of quality and crime rates were stronger than those between CABE's own assessment of quality and crime rates in the macro sample (see table six). However, there is the possibility that this could be a consequence of the design expert's awareness of the purpose of the research, and his own specialism in designing out crime.

A More Reliable Predictor of Crime?

The findings presented above suggest that CABE Housing Audit score and BfL status are not associated with crime rates (excepting vehicle crime) at a statistically significant level. The results also reveal that these tools are not reliable in terms of replication, with the design expert judging two of the five developments very differently to the CABE assessors – concluding that they were not of adequate quality to warrant BfL status. Given that the existing measures of design quality are not acting as reliable predictors of low crime rates, and the existence of an extensive body of research relating to the features of residential design which do predict crime risk, is it possible that there could be a more reliable and accurate measure of design quality – which incorporates crime risk, within residential housing?

As was noted above, the research involved the assessment of the 2193 properties located on twelve developments against an environmental features checklist containing thirty-one questions relating to the property and a further nineteen to the

wider development. These questions were based upon existing literature relating to the design features associated with crime risk. Although all fifty factors were pertinent to the research question, due to the CABA Housing Audit scores only being completed to development (as opposed to property level), this analysis of environmental checklist factors against Housing Audit score had to focus solely upon development level factors contained within the checklist (and their association with crime rates). The development level design features included within the environmental checklist are summarised in Table twelve below.

Table Twelve about here

The presence or absence of a design feature was awarded a score, with the scores determined by use of the Burgess Points System described by Armitage (2006a). With this method a score is derived from the difference between the mean rate of crime suffered generally (by the whole sample) and the rate of crime suffered by developments with or without a particular feature.

Table thirteen displays the Spearman's rho correlation between the environmental checklist scores and crime rates per 1000 properties for the five crime types analysed. The correlations between the environmental checklist score and crime rates were strong and statistically significant for vehicle crime and for total crime. Although not statistically significant, the correlations for burglary, criminal damage and crimes against the person were all stronger than those between BfL based indicators of housing quality and crime rates (see table thirteen), suggesting the development of a revised assessment of housing quality should incorporate factors assessed by the environmental features checklist.

Table Thirteen about here

In all three cases the relationship between differently measured housing quality and crime is statistically negative, meaning that a high design score is associated with lower crime (see table fourteen). However, the CABA Housing Audit Score only produces correlations that range from trivial to moderate and the design expert score

produces correlations that range from weak to moderate. In contrast, the correlations produced by the environmental features checklist range from low to substantial.

Table Fourteen about here

It could be argued that the application of these Burgess weights to the environmental checklist produces an unfair comparison with the Building for Life based scores. Our point is that it is clear from current evidence, and from the analysis of the two samples drawn for this research that, of the range of potential housing quality variables, some are far more important in preventing crime than others. Crime protective design needs to prioritise those factors that are most closely related to crime and currently these factors are not represented within the Building for Life standard.

Conclusions

The research project upon which this paper is based covered many areas and focused upon clarifying the association between specific design features of residential housing and crime, and also the link between housing quality and crime. The former has dominated much of the debate within this field and the findings of the review are touched upon within this paper, but only relating to their relevance to the latter – is housing quality, as judged by existing measures, an adequate predictor of crime rates?

Housing policy within England and Wales is undergoing major changes. Most notably the government are aiming to stimulate growth through deregulation and a simplification of the planning process. A greater responsibility is being placed upon communities to make decisions about development within their neighbourhood, and the government believes that communities should be trusted to know what *good design* is. This has many positives, and there is no doubt that communities should have a greater influence on the development within their area, but the extent to which they can be relied upon (unaided) to understand the potential impact which residential design can have upon issues such as crime and disorder, is questionable. The Government's own housing strategy talks about good design and highlights how good design is that which is attractive, featuring good architecture and landscaping

and reflects the local identity and character of a neighbourhood. The same strategy claims that well thought-through design can improve the safety and security of homes and neighbourhoods, yet there is no reference to how this good design will lead to safer neighbourhoods. There is also no reference to the existing literature within this field or to initiatives which have evolved from this evidence base such as the UK's Secured by Design scheme.

The current measure of good design is BfL - an award given to developments which are considered to be exemplars of good design. CABE also conduct more detailed assessments of developments for their Housing Audits which are linked to BfL, both in the principles applied to the assessment, and in the outcome - with only developments scoring seventy per cent or more being eligible for BfL status. Given the recent changes introduced by the Localism Act (2011), which will place decision-making in the hands of communities, it is essential that the guidance and tools available to communities to assist in their decision-making are measuring good design holistically – not just from the perspective of aesthetics and architecture, but also in terms of the impact upon factors such as crime and disorder. The current and imminent changes in policy and practice related to crime prevention through environmental design could lead to pessimistic forecasting. Much of the evidence related to designing out crime from housing had been incorporated into planning policy and guidance documents such as Planning Policy Statement: *Delivering Sustainable Development* (2005), Planning Policy Statement 3: *Housing* (2011), *Safer Places: The Planning System and Crime Prevention* (2004) and *World Class Places* (2009). However, these are to be replaced by a fifty page National Planning Policy Framework. Cuts in police budgets also risk limiting the resources available from police Architectural Liaison Officers in advising communities on local crime problems and how to protect against those risks. Change can be criticised or it can be viewed as an opportunity. The Government's Housing Strategy (2011) talks of how BfL will be refreshed and re-launched in 2012. This, in the view of the authors, provides an ideal opportunity to ensure that this existing measure of good design incorporates the features of crime reductive design^{xvi}.

This paper presents the findings from a major UK research project – focusing upon the relationship between housing quality and crime. A dataset of fifty individual and

development level design features of over 6,000 properties, twenty architectural features of those same 6,000 properties and a housing audit scores for 4,000 properties were analysed against police recorded crime data for each development and the surrounding areas for the crime categories: total crime, burglary, vehicle crime, crimes against the person and criminal damage. The paper questions the extent to which the existing measure of housing quality can be used as an indicator of crime levels. Do high quality developments experience less crime? The findings suggest that the answer is no. Using CABE's Housing Audit scores, for the thirty-four developments within the macro sample, the findings revealed that, with the exception of vehicle crime, there is no statistically significant association between housing quality and crime. Similarly, when investigating the link between BfL status and crime levels, there is no statistically significant relationship. Developments awarded BfL status do not experience any more or less crime than their non-BfL counterparts, controlling for socio-demographic variables. In terms of the reliability of these measures, the analysis suggests that two developments awarded BfL status by CABE housing assessors were not considered worthy of that status by an independent design expert. This could relate to a deterioration of quality in the intervening period between assessments, or to a difference of opinions regarding the housing quality. For either rationale, the conclusion is the same – that the existing measure of housing quality is not a reliable or durable measure.

Given the concerns regarding the existing measure of housing quality, are there more reliable predictors of crime risk within residential housing? The paper presents two different options. The first utilises the assessment of an independent design expert who, whilst having knowledge of the principles of designing out crime, utilises a BfL based assessment of housing quality. The second uses environmental factors of residential housing known (from previous research) to be associated with crime risk. The results reveal that, whilst the design expert's assessment of housing quality is more strongly associated with crime rates (negatively), there is little difference between that and the existing Housing Audit measure. The measure which incorporated environmental factors did, however, show a strong statistically significant association with crime rates, with developments scoring highly experiencing lower levels of crime.

The focus of this paper is improvement oriented. There has been much debate regarding the influence of residential design upon crime, and some of this has questioned whether the dominance of agendas such as sustainability have undermined the importance of the consideration for security and whether there exists a conflict between the achievement of the two agendas (Armitage and Monchuk, 2009). This paper concludes that the existing measure of good design has no association with crime. Crime is not higher on BfL developments; however, neither does it appear to have a crime reductive impact. The current measure of good design is not accounting for crime risk, and given the abundance of evidence to prove that design can impact upon crime, this appears to be an ideal opportunity to align the two.

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ⁱ From 1 April 2011 CABA became part of the Design Council and operates as Design Council Caba

ⁱⁱ The present paper does not necessarily reflect the views of CABA or the Home Office, though the authors are grateful for the support of both.

ⁱⁱⁱ From a detailed review of 57 research papers.

^{iv} This paper is based upon research conducted upon properties designed and built to the original Building for Life standard, and not that revised in 2012.

^v Although only 57 research papers were found to contain evidence relevant to the impact of design features on crime, the review considered over 70 documents.

^{vi} A Sinuous cul-de-Sac is defined as: Property is located on a road which leads to a dead-end AND is non-linear in geometry so that there is little visibility down the road from the road to which it is connected OR the road is linear in geometry BUT the road to which you turn off to access the cul-de-sac is NOT a through road.

^{vii} A Linear cul-de-Sac is defined as: Property is located on a road which leads to a dead-end AND is linear in geometry so that there is visibility to the end of the cul-de-sac from the road to which you access the cul-de-sac AND the street is one turn off a through road.

^{viii} Space Syntax is a mathematical approach which takes account of the street network and how each street segment connects to other streets at the local and wider area level.

^{ix} BCS Comparator crimes which are broadly comparable with the crime types utilised in this study

^x <http://www.homeoffice.gov.uk/publications/science-research-statistics/research-statistics/crime-research/hosb1011/hosb1011-pfatabs?view=Binary>

^{xi} See www.areaclassifications.org.uk

^{xii} Using Independent samples Mann-Whitney U Test there were no significant relationships at the level of 5%.

^{xiii} For example the correlation between Total Crime and development size was Spearman rho .154 $p > 0.05$, and between domestic burglary and development size was Spearman rho -.028 $p > 0.05$

^{xiv} One of the comparator developments had been included in the CABE level housing audit providing a score for comparison.

^{xv} A larger sample would have increased the potential to obtain statistically significant correlations, however this would be unlikely to alter the practical significance of the findings.

^{xvi} It should be noted that, since this paper was written, Building for Life has been updated – Building for Life 12, and has taken on board many of the comments made in the research upon which this paper was based. There is clear consideration for crime prevention and safety throughout the document and the advice and recommendations take into account the principles discussed here.