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Worry about crime in a cross-national context: a model-supported method of measurement using the European social survey

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Worry about Crime in a Cross-National Context:
A Model-Supported Method of Measurement Using the European Social Survey

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Abstract

This paper examines European Social Survey (ESS) indicators of worry about crime. To scale the measures into a single categorical measure, we use an analytical approach that combines statistical latent class modelling with pragmatic choices for the final classification of the responses. We also undertake an informal examination of the latent class solution in individual countries. Finding the ESS indicators of the frequency and impact of worry to be reasonable cross-national measures of the experience of negative emotions in people's lives, we close the paper with an estimation of levels of worry in 23 countries. The results display a fairly consistent geographical gradient, with the lowest levels of worry about crime mostly in Nordic countries and Western Europe, and the highest in Eastern Europe and Mediterranean countries.

Key words: fear of crime, social indicators, cross-national research, survey design, emotions, latent class models.

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1 Introduction

The streets are unsafe. That is the perception of a significant minority of European citizens, at least according to a series of repeated cross-national surveys (Aromaa and Heiskanen, 2002; Mayhew and van Dijk, 1997; Nieuwbeerta, 2004; European Opinion Research Group, 2003; van Dijk *et al.*, 2007, 2008; van Kesteren *et al.,* 2000; Roberts *et al.,* 2010). People in Southern and Eastern European countries are most likely to feel unsafe in their neighbourhoods, while people in small Northern European countries are most likely to feel safe.[2] This pattern seems to track the heterogeneity of welfare state regimes in jurisdictions across Europe. National differences in subjective safety may have less to do with levels of crime in a person's country and more to do with the level of social security provided by the nation's welfare state (Hummelsheim *et al.,* 2011; Hirtenlehner & Hummelsheim, 2011; cf. Visser *et al.,* 2013).

Over the past couple of decades the literature on fear of crime has grown increasingly interdisciplinary (Ferraro, 1995; Girling *et al.,* 2000; Tulloch, 2003; Gabriel and Greve, 2003; Jackson, 2004; Brunton-Smith, 2011; Bromley & Stacey, 2012; Lorenc *et al.,* 2012; Custers & Van den Bulck, 2012; Kappes *et al.,* 2013; Lane & Fox, 2013; Foster *et al.,* 2013). Studies show how public insecurities about crime manifest themselves in everyday practices and precautionary behaviour (Regnifo & Bolton, 2012; Foster *et al.,* 2012), in feelings of unsafety in the home and streets (Bennett *et al.,* 2007; Semyonov *et al.,* 2012), in perceptions of risk and emotional responses to threat (Jackson, 2009, 2013), and in expressions of neighbourhood breakdown and social instability (Gerber *et al.,* 2010; Hirtenlehner & Farrall, 2013; Vieno *et al.,* 2013). We have seen how fear of crime can have real and lasting effects on individuals and communities, damaging individual health and physical functioning (Stafford *et al.,* 2007; Jackson and Stafford, 2009; cf. Dolan and Peasgood, 2007), eroding social cohesion and trust (Hawdon *et al.,* 2014; Markovitz *et al.,* 2001), shaping the trajectory of neighbourhoods over time (Skogan, 1986), limiting independent child mobility (Foster *et al.,* 2014; Cops, 2013) and encouraging punitive strategies of crime-control and punishment (Garland, 2001; Simon, 2007; Lee, 2007).

Yet, debate continues about the meaning and measurement of fear of crime. While advances in conceptualization and measurement have been made (e.g. Garofalo and Laub, 1978; Ferraro and LaGrange, 1987; Ferraro, 1995; Hough, 1995; Farrall *et al.,* 1997; Gabriel & Greve, 2003; Farrall *et al.,* 2009; Jackson & Gray, 2010; Gray *et al.,* 2011), even the best measures may lack some precision. The significance of fear of crime rests largely on its social problem status, but if studies use measures that do not hone in on concrete emotional experiences that damage well-being, then the evidence base suffers. If measures do not ask people about specific incidences of negative emotional, then the development of a robust empirical literature is held back.

In this paper we assess the scaling properties of some new measures of worry about crime that were designed to avoid some of the limitations of other indicators. Measures of the frequency and negative impact in people's everyday lives were introduced into the main questionnaire of the European Social Survey (ESS) in Round 3 in 2006 (ESS Round 3, 2006; for an overview of the ESS see Jowell *et al.,* 2007). To scale the new measures into a single categorical measure of fear of crime, we use an analytical approach that combines statistical latent class modelling (with local dependencies between some pairs of items even given the latent class) with pragmatic choices for the final classification of the responses. We call this approach a *model-supported method of measurement*. Finding the frequency and impact indicators of worry to be reasonable cross-national indicators of negative emotions about crime-risk in people's lives, our subsequent estimation of levels of worry sheds light on the levels and patterns of worry about crime across 23 countries.

Section 2 presents the new measures and motivates the current approach to operationalizing the fear of crime construct. Section 3 details top-line findings from the ESS for each of the new

[2] For example in the second round of the European Social Survey in 2004 (covering 25 countries), just over 20% of respondents stated they would feel 'unsafe' walking alone after dark in their neighbourhood, and around 6% said they would feel 'very unsafe'. A country comparison showed that the proportion who reported feeling unsafe or very unsafe was less than 15% in Finland, Norway, Denmark, Iceland and Slovenia, but 35% or higher in Ukraine, Estonia, Slovakia, Turkey and the UK.

questions individually. Section 4 develops our categorization and assesses whether the measures scale in consistent and comparable ways in different countries. Section 5 summarizes the levels of this summary measure in all the countries. The final section concludes with some thoughts on our measurement strategy, as well as some future directions of cross-national research on fear of crime.

2 A new approach to measuring worry about crime

2.1 The new measures

In this paper we assess the structure of self-reports of the frequency and impact of worry about crime, drawing upon data from nationally representative probability samples of 23 countries in Round 3 of the ESS. The survey contained four new questions, two each for two types of crime, burglary and violent crime:

1. '*How often, if at all, do you worry about your home being burgled?*', with the response options '*All or most of the time*', '*Some of the time*', '*Just occasionally*' and '*Never*'.
2. (If the answer to the first question was other than 'Never'), '*Does this worry about your home being burgled have…*
    - *...a serious effect on the quality of your life*
    - *...some effect*
    - *...or no real effect on the quality of your life?* '
3. and 4. Two questions with similar wordings, but with 'your home being burgled' replaced by '*becoming a victim of violent crime*'.

The ESS measures were designed partly to avoid weaknesses of common cross-national single indicators, such as 'How safe do you feel walking alone in your neighbourhood after dark?'. Single indicators of felt safety have been criticized for, *inter alia,* failing to mention crime or a specific emotion, referring to a vague geographical area, asking about something which some people may only do rarely (if ever), mixing fears and risk assessments, failing to refer to a specific time period, and conflating the intensity and frequency of feelings (Hale, 1996; Ferraro & Lagrange, 1987).

2.2 The rationale for the new measures

In the light of the aforementioned weaknesses, the ESS measures have three features of interest: (1) they ask respondents about worry rather than fear, (2) they focus on frequency rather than intensity, and (3) they allow a focus on dysfunctional worry that damages quality of life.

First, 'fear' is a strong physical response to an immediate and proximate threat. Clearly this can be a reasonable descriptor of some people's emotions in the presence of immediate and strong signs of danger of crime. But people's emotions about victimization threat often seem to be closer to some kind of rumination about risk in the absence of explicit signs of danger (Warr, 2000; Farrall *et al.*, 2009; Gray *et al.*, 2011). Unlike 'fear', 'worry' captures people's assessment of both proximate and distal threat: one can worry in response to one's immediate situation and one can ruminate about future events that have yet to transpire. According to Berenbaum (2010: 963), worry can be described as repetitive and anxiety-producing thoughts that have three characteristics: '…(1) the repetitive thoughts concern an uncertain future outcome; (2) the uncertain outcome about which the person is thinking is considered undesirable; and (3) the subjective experience of having such thoughts is unpleasant.'

Second, the ESS measures ask about the frequency of worry (e.g. 'how often do you worry…?') rather than intensity (e.g. 'how worried are you …?'). Existing empirical evidence suggests that intensity reports provide a rather undifferentiated picture of people's emotions, and that frequency indicators provide a more precise and targeted focus on the patterning of emotional experience in people's everyday lives. For example, Farrall *et al.* (2009) found that a substantial proportion of British Crime Survey respondents who said they were 'very' or 'fairly' worried also reported that they had *not worried once* over the past twelve months. They showed that actual and recallable moments of worry were rare among those who said they were worried about crime. In fact a good proportion of those individuals who reported some overall intensity of worry could not recall a

single instance when their emotions surfaced.[3] Without information about the frequency with which an individual worries, they argued, it was difficult to tell whether 'very worried' meant that the individual worried on a frequent basis or felt a more diffuse/anxious state of unease and possibility (see also Gray *et al.,* 2011).

Farrall *et al.* (2009) also showed that the frequency measures fielded in the British Crime Survey captured an aspect of worry about crime that was more pressing and more significant in people's lives. Compared to people who said they were worried about future victimization but had not worried recently, those who reported having recently worried also indicated that 'fear of crime' had a stronger impact on their quality of life. The concrete experience of past events of worry was voiced most often by people who lived in poor, disorganized, and risky neighborhoods. Individuals who worried often were relatively frequently victimized; their worries were real and rooted in daily experience; and they resided in places where crime, disorder and attendant social problems were concentrated. By focusing people's attention on past emotional experiences, frequency questions may thus provide more precise self-reports on the more socially and psychologically significant aspects of fear of crime.

Third, the ESS measures focus not just on the past frequency but also on people's beliefs about the impact of worry about crime on their everyday life (cf. Stafford *et al.*, 2007; Jackson and Stafford, 2009). The purpose here is not to make a separate estimate of the impact of worry about crime on people's well-being. It is rather to capture a type of worry that one might call dysfunctional (Gray *et al.,* 2011). For example a recent study (Jackson and Gray, 2010) found that one quarter of the people who said they were worried about crime (according to standard intensity measures) viewed their worry as something akin to a problem-solving activity: they took precautions, these precautions made them feel safer, and neither the precautions nor their worries reduced the quality of their lives. Such worry can be called functional if it stimulates constructive action in this way.

Adding perceived impact of fear of crime to the measurement tool helps to define the particular type of emotional response that people have to the risk of crime. It allows one to distinguish between people who believe that their worry about crime has no impact on their quality of life and those people who believe that their worry about crime does in fact harm their well-being.

3 Top-line findings from Round 3 of the European Social Survey

In summary, by addressing both frequency and impact the ESS has sought to compile a measurement set that may better approximate the everyday (harmful) significance of worry about crime in people's lives. The new measures in the ESS direct the attention of respondents to their recent emotional experience and ask about the impact of worry on people's quality of life. Prompting an (admittedly imprecise) sense of past events of worry, when combined with measures of the negative impact of worry on quality of life, the resulting measures may be more precise indicators of the corrosive experience of worry about crime. If one is interested in fear of crime as a serious social problem, then it seems important to measure both the frequency of worry (to capture the patterning of lived experience) and negative impact (to capture the corrosive effect of such experience), to thus estimate the patterning of negative emotions presenting in their daily life.

In this section we document the weighted and unweighted frequencies for each individual measure. Table 1 shows percentages of the levels of the four survey questions (frequency of worry and impact of worry on quality of life, focusing on burglary and violent crime separately) in the total sample of 43,000 respondents from 23 countries in Round 3 of the ESS.[4] The weighted percentages in the table take into account non-constant sampling probabilities and population sizes of the countries,

[3] In such circumstances 'anxiety' seems the best descriptor. When people say they are worried about falling victim, they are not saying they have worried recently, but rather that they feel some kind of diffuse anxiety about crime. In Hough's (2004: 174) words: 'Leaving aside acute anxiety attacks, anxiety is not comprised of a series of events that can be located in space and time. Rather, it is a rumbling state of unease, often partly submerged, sometimes fully surfacing.' Sacco (2005) might call this 'future-orientated anxiety.' When prompted, they express a sense of psychological proximity to the risk of crime, but they rarely (if ever) find themselves in situations in which they feel a strong sense of threat (Farrall *et al.*, 2009).

[4] Throughout, we use data from Release 3.1 of Round 3 of the ESS (ESS Round 3 2006), downloaded from http://ess.nsd.uib.no/ess/. This includes data from Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Netherlands, Norway, Poland, Portugal, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine and United Kingdom. Data from Latvia and Romania were only available without survey weights, so they have been excluded from the current analysis.

so they can be treated as estimates of the proportions of the response categories among the combined populations of the countries.[5] For completeness, estimated proportions for each of the countries separately are shown in the Appendix.

INSERT TABLE ONE ABOUT HERE

Pooling data from all countries, an estimated 35% of individuals never worried about being burgled, and 41% never worried about becoming a victim of violent crime. The majority of the rest of the population worried 'just occasionally' (37% for burglary, 39% for violent crime) or 'some of the time' (22% for burglary, 17% for violent crime). This leaves small estimated proportions who worried 'all or most of the time' (6% for burglary, 3% for violent crime).

A similar pattern is observed for the impact of worry on quality of life. The majority of those who do worry reported either 'no real effect' (35% of all respondents for burglary, 29% for violent crime) or 'some effect' (24% for burglary, 25% for violent crime). This leaves very small proportions who reported a 'serious effect' (5% for burglary and 4% for violent crime).

Table 2 cross-tabulates the frequency of worry and its impact on people's quality of life. This shows a consistent and unsurprising pattern: the more frequent the worry, the greater the impact on quality of life. Examining associations between the frequency of worry and the impact of worry, we find that of those who worried 'just occasionally' most reported that worry had 'no real effect' (67% for burglary, 61% for violent crime). Of those who worried 'some of the time', the largest proportions reported that worry had 'some effect' (46% for burglary, 59% for violent crime). Of those who worried 'all or most of the time' about burglary, most report that worry had 'some effect' (50%), and of those who worried 'all or most of the time' about violent crime, most reported that worry had a 'serious effect' (50%).

INSERT TABLE TWO ABOUT HERE

4 Modelling and classification of the survey questions

4.1 Analytical strategy

We next examine whether frequency and impact measures can be scaled on one variable – i.e. a measure or 'score' of a person's worry about crime. Such a score would thus indicate the extent to which people experienced frequent worry about crime that decreased their quality of life.

By design, respondents who replied that they never worried about a type of crime were not asked the corresponding question on the effect of worrying on their quality of life. For each such respondent, we assign the value 'no real effect' to the quality of life question, as if they had been asked the question and given this response. After this re-classification, there are 100 possible value combinations of the four questions. Table 3 shows the numbers of respondents with each of these combinations among the 41,664 respondents across all the countries for whom values for all four questions are available (the treatment of responses with some questions missing is discussed in Section 4.5).

INSERT TABLE THREE ABOUT HERE

We will consider scores which are categorical variables, and end up proposing one with six categories (an alternative would be to assign scores as values of a single continuous variable; this turns out not to work well for these data). The act of scoring then consists of classifying each of the 100 cells in Table 3 into one of the categories 1-6 which represent different levels or types of worry about crime. The methodological challenge is how to develop a classification rule to decide which cells to assign to which levels of the scale.

Two somewhat different general approaches to scoring might be considered.[6] The first classifies responses to different levels 'by hand', based on substantive, logical or pragmatic

[5] Here differences between the unweighted and weighted results are fairly large, mainly because countries with large populations tend to have relatively high levels of fear of crime, as will be seen in Section 5.

considerations. We would then typically consider which combinations seem natural in some sense. For example, if the original categories of a variable are ordered, it does not usually make sense to combine non-adjacent categories. Such a procedure can in principle be applied to the survey items in Table 3. However, with four variables and a very large number of possible choices of classification, this is not straightforward.

Another possibility would be to rely on a statistical model for the scoring. This involves first specifying a model which includes a latent (unobserved) variable interpreted as a measure of worry about crime. In our analysis this variable is categorical, and the models are known as latent class models. Predicted values of the latent variable can then be assigned as scores to individuals. This is easily done, as a by-product of estimation of the model. However, such scores need not always be entirely satisfactory according to substantive and pragmatic criteria.

Here we employ a combination of these two approaches, which we might term a 'model-supported' method of scoring. We first select and fit a latent class model for the data in Table 3, and derive model-based classifications from it. To obtain the final classifications, we then adjust some of these initial classifications when doing so seems to result in a more satisfactory scoring pattern. The first of these steps is described in Section 4.2, and the second in Section 4.3. Cross-national equivalence and comparability of the classification is considered in Section 4.4, and treatment of incomplete observations in Section 4.5.

4.2 Latent class modelling of reported worry about crime

In a latent class model, the latent variable is categorical with a small number of unordered categories (for overviews, see McCutcheon, 1987; Clogg, 1995; Hagenaars and McCutcheon, 2002). We also examined latent trait models where the latent variable is continuous (with and without assuming it to be normally distributed), but these did not produce well-fitting models with usefully interpretable scores. We will thus focus on latent class models. All of the models were fitted using the software package Latent Gold 4.5.[7]

Let $\boldsymbol{Y}=(F_V, E_V, F_B, E_B)$ denote the vector of the four survey items on worry about crime, where F and E denote questions on frequency of worry and effect on quality of life respectively, and subscripts V and B indicate questions on violent crime and burglary respectively. Let $\boldsymbol{y}=(f_V, e_V, f_B, e_B)$ denote a value of $\boldsymbol{Y}$, i.e. a particular set of responses. The proportions of observations in each cell of Table 3 are simple sample estimates of the probabilities $P(\boldsymbol{Y}=\boldsymbol{y})$ for the 100 observable values of $\boldsymbol{y}$. A latent class model aims to represent these probabilities more parsimoniously by introducing a latent variable X with K categories $1,\ldots,K$, and specifying that

$$P(\boldsymbol{Y}=\boldsymbol{y}) = \sum_{x=1}^{K} P(\boldsymbol{Y}=\boldsymbol{y} \mid X=x) P(X=x) \qquad (1)$$

where $P(X=x)$ are the probabilities of the latent classes, and $P(\boldsymbol{Y}=\boldsymbol{y} \mid X=x)$ are the probabilities of the survey responses given each of the latent classes; we refer to the latter as the measurement probabilities of the items. The responses for different respondents i are assumed to be statistically independent, so the probability of the observed data is given by the product $\Pi_i P(\boldsymbol{Y}_i=\boldsymbol{y}_i)$ where $\boldsymbol{y}_i$ is the observed response for respondent i and each of individual probabilities is given by (1).[8]

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[6] These are also closely related to two interpretations of the nature and meaning of survey measurement in general, the 'pragmatic' and 'representational' (or 'formative' and 'reflective', in a related but distinct dichotomy) interpretations (see e.g. Hand, 2004).

[7] See the manuals of the program (Vermunt and Magidson, 2005a and 2005b) for details of model specification and estimation. One of the useful features of Latent Gold is that it allows model estimation with the estimation algorithm started from multiple randomly selected starting values. This is important for latent class models, including the ones used here, because a single run of the algorithm is not guaranteed to converge to the true maximum likelihood estimates of the parameters. Our final model was estimated using 5,000 starting values.

[8] This is the probability for those respondents for whom all four variables are observed. As discussed in section 4.5, our estimation of the models includes also those respondents for whom some of the responses are missing.

A latent class model is most commonly specified with the additional assumption of conditional independence of items given the classes, i.e. here that $P(\boldsymbol{Y}=\boldsymbol{y} \mid X=x) = P(F_V=f_V \mid X=x)P(E_V=e_V \mid X=x)P(F_B=f_B \mid X=x)P(E_B=e_B \mid X=x)$. This assumption makes for a parsimonious representation and straightforward interpretation of the measurement probabilities. Here, however, we will use the model solely as an aid in classification, so parsimony of the measurement model is less important. We thus consider also models where some pairs of items are allowed to be associated even conditional on the latent class. In particular, let $\boldsymbol{F}=(F_V, F_B)$ and $\boldsymbol{E}=(E_V, E_B)$ be the vectors of the two frequency variables and the two effect variables respectively, and $\boldsymbol{f}=(f_V, f_B)$ and $\boldsymbol{e}=(e_V, e_B)$ specific values of them. Then a measurement model of the form

$$P(\boldsymbol{Y}=\boldsymbol{y} \mid X=x) = P(\boldsymbol{F}=\boldsymbol{f} \mid X=x)P(\boldsymbol{E}=\boldsymbol{e} \mid X=x)$$

is one where the frequency questions are conditionally associated with each other and the effect questions with each other, while all other pairs of items are conditionally independent. This particular specification thus allows for, say, the observed tendency that respondents often choose exactly the same response option for the two identically worded (apart from the type of crime) questions on frequency of worry and, similarly, for the two questions on effect on quality of life. Here this turns out to substantially improve the fit of the model.

Our final model, which we will use as a starting point for classification, has a measurement model of this form, and K=6 latent classes. The measurement probabilities for $\boldsymbol{F}$ are specified by

$$P(\boldsymbol{F}=\boldsymbol{f} \mid X=x) = \frac{\exp[\eta_f(x)]}{\sum_{f^*}\exp[\eta_{f^*}(x)]} \qquad (2)$$

where f^* indexes all 16 possible values of $\boldsymbol{F}$, $\eta_f(x) = \theta_0^{(fV)} + \theta_x^{(fV)} + \theta_0^{(fB)} + \theta_x^{(fB)} + \theta^{(fBfV)}$, and the θ-quantities, for different values of f_V, f_B =1,...,4, and x=1,...,K, are parameters to be estimated. The parameter $\theta^{(fBfV)}$ induces an association for the responses to F_V and F_B, with the special case $\theta^{(fBfV)}=0$ corresponding to conditional independence of F_V and F_B given X. Model (2) is essentially a constrained multinomial logistic model for the combinations of values for $\boldsymbol{F}$, so it treats the categories of F_V and F_B as unordered. The model for $P(\boldsymbol{E}=\boldsymbol{e} \mid X=x)$ is defined analogously.

This model was selected after initial comparisons of a range of different latent class models with different numbers of latent classes. For any given number of classes, we also compared six measurement models, defined by all combinations of two choices. The first of these was defined by assumptions of conditional dependence, either (i) conditional independence, (ii) conditional dependence within $\boldsymbol{F}$ and $\boldsymbol{E}$ as above, or (iii) conditional dependence instead within (F_V,E_V) and within (F_B,E_B), i.e. between the two questions on the same type of crime[9]. The second was between modelling the response levels of the items as unordered (nominal) or ordinal. The unordered model was as shown above, while the ordinal model was specified as an adjacent-category ordinal logit model (see Vermunt and Magidson, 2005a, for details).

Comparisons of the candidate models are shown in Table 4, in the form of the AIC (Akaike, 1973) and BIC (Schwartz, 1978) statistics, for each of which smaller values indicate preferred models (see e.g. Kuha, 2004, for an overview of these statistics). We also considered a number of summary statistics based on residuals calculated from two-way marginal tables of observed and fitted frequencies (as suggested by Bartholomew and Knott, 1999, and Jöreskog and Moustaki, 2001) and standard likelihood ratio tests for pairs of nested models given the same number of latent classes; all of these yielded similar conclusions. The conclusions about the measurement model were clear: for any number of latent classes, all model selection statistics preferred the model which allowed for conditional dependence within the frequency questions ($\boldsymbol{F}$) and within the effect questions ($\boldsymbol{E}$) as specified above, and where the survey items were treated as unordered.[10] The number of latent classes was chosen to be 6, which was judged to give the best balance of model fit, numerical stability of the

[9] We note that the models of type (iii) also capture the feature of the data that the frequency of `Never' for a crime type can only appear together with `No effect' for that crime.

[10] Thus nominal models are preferred even though the response options to each of the questions are clearly ordered in a substantive sense. The ordinal model, which constrains the response probabilities in particular way, does not provide as good a fit as the more flexible nominal model, even after accounting for the relative lack of parsimony of the latter.

estimation (the 7-class model is rather fragile in this respect, and requires a very large number of starting values and iterations for stable results) and the interpretability of the classifications derived from the model. This number of classes is (just) selected as best by BIC, while AIC, which has a smaller penalty for lack of parsimony, prefers a still larger number of classes.

INSERT TABLE FOUR ABOUT HERE

Table 5 shows estimated probabilities of the classes $P(X = x)$, and the measurement probabilities $P(F_V = f_V \mid X = x)$, $P(E_V = e_V \mid X = x)$, $P(F_B = f_B \mid X = x)$ and $P(E_B = e_B \mid X = x)$.[11] An interpretation of the latent classes is derived from the measurement probabilities. For example, respondents who belong to latent class 1 in Table 4 are most likely to respond that they never worry about either burglary or violent crime, and essentially certain to respond that worrying about crime has no effect on their quality of life (or have this response imputed for them following a 'never' response to the frequency question). It seems quite unproblematic to label this the class of unworried individuals. Equally clearly, classes 4-6 consist of respondents who worry about both types of crime, with increasing levels of both frequency and effect of worry from class 4 to class 6. Finally, classes 2 and 3 consist of individuals who are mildly worried about one type of crime, roughly at the same level as those in class 4, but unworried about the other type of crime; the type they do worry about is burglary in class 2 and violent crime in class 3.

INSERT TABLE FIVE ABOUT HERE

The model does not impose any ordering on the latent classes. However, with two exceptions the interpretation of the estimated model fairly clearly allows us to think of the classes as being in order of increasing level of worry about crime, from the entirely unworried to the frequently and deleteriously worried. The exceptions are the two 'single-worry' classes 2 and 3, which are both more worried than class 1 and both less worried than 4, but which cannot easily be ordered relative to each other.

Rather than with the six-class model considered here, it is possible that comparable fit to the data might be obtained with other formulations of a latent class structure, for example with two-level models which specified a hierarchy of a lower-order latent class variable nested within a higher-order one. These approaches are not pursued here, as the six-class structure in Table 5 seems to be a sufficiently interpretable and convenient starting point for the classification exercise described below.

4.3 Classification of worry about crime

Once the latent class model (1) has been estimated, we can use it to address the question of scoring: if we observe particular responses $\boldsymbol{Y}=\boldsymbol{y}$ for an individual, what can we say about which latent class the individual is likely to belong to? This is answered by the conditional probabilities

$$P(X = x \mid \boldsymbol{Y} = \boldsymbol{y}) = \frac{P(\boldsymbol{Y} = \boldsymbol{y} \mid X = x)P(X = x)}{\sum_x P(\boldsymbol{Y} = \boldsymbol{y} \mid X = x)P(X = x)}. \qquad (3)$$

It is conventional to assign a response pattern $\boldsymbol{y}$ to the class x for which the probability (3) is the highest. Here we use these 'modal' classes as a starting point for our final classification of the survey responses.

Table 6 shows our proposed classification of the 100 complete response patterns of the four survey questions into six levels of worry about crime.[12] The interpretation of the classes is as for the latent class model in Table 4, so that class 1 corresponds to those who are not worried about crime or who worry only occasionally and do not believe these worries affect their quality of life (cf. Jackson

[11] For example, $P(F_V = f_V \mid X = x)$ is obtained by summing $P(\boldsymbol{F} = \boldsymbol{f} \mid X = x)$ over all values of $\boldsymbol{f}$ where $F_V=f_V$.

[12] SPSS and Stata code for creating the variable is available from the authors.

& Gray, 2010), class 2 those who worry only about burglary, and class 3 those who worry only about violent crime. Classes 4-6 correspond to increasing frequency and impact of worry about both types of crime. For example, a respondent who answered 'some of the time' or 'some effect' to all four questions is assigned to class 4, while all response patterns assigned to classes 5 or 6 involve at least one response at the most worried level (i.e. worrying 'all or most of time' or 'serious effect on quality of life').

The classifications marked with an asterisk in Table 6 are ones where our proposed classification differs from the class with the highest conditional probability for the latent class model. This is the case for 27 of the 100 cells in the table. The numbers of observations in these cells are mostly small, with a combined total of only 3.2% of the 41,664 complete responses. Thus 97% of these respondents are classified in the same way by both the latent class model and our modified classification rule. Applying the same rule to a different data set could of course give a higher value to this proportion; however, we would perhaps expect it to be relatively low in general, given that most of the response patterns corresponding to these cells are at face value somewhat incoherent.

The most common reason we changed the class predicted by the fitted model was to align partial orderings of the assigned classes and the observed response patterns. As noted above, the measurement probabilities of the model imply an ordering for some but not all of the latent classes, specifically so that class 1 is least worried, and classes 4-6 are in the order of their numbers and each more worried than classes 1-3. Similarly, some but not all pairs of the observed responses (cells in Table 6) also have a logical ordering: for example, where two responses are otherwise the same but one has 'Some of the time' and the other 'All or most of the time' to one frequency question, the latter is unambiguously more worried. The model-predicted classes for such cells, however, are not quite guaranteed to match this ordering, so it was imposed on the final class assignment where necessary. When the classification of a cell was not clear, we also considered the sizes of the conditional probabilities of the classes and the results of models fitted to each of the 23 countries separately (these will be discussed in section 4.4 below). In this, a class was considered firmly established by the latent class model if its conditional probability was close to 1 and all or most of the country-specific models agreed, and open to modification otherwise.

As an illustration, consider the cell in the third row and column of the table, i.e. the one (with 1,693 observations) where respondents stated for both types of crime that they worried 'Just occasionally' and that this had 'Some effect' on their quality of life. The fitted latent class model implies that someone with this response pattern belongs to class 4 with probability 0.99, and 20 of the 23 country-specific models also assign this cell to class 4. There is also no suggestion that any of the 8 logically less worried response patterns should be assigned to classes 5 or 6. Classifying this cell as 4 thus seems unproblematic. As a second example, consider the cell in the second row and column from the bottom, i.e. the respondents who, for both types of crime, worry 'All or most of the time' and state that this has 'Some effect' on their quality of life. The latent class model assigns this to class 5, but with the relatively low conditional probability of 0.68. Also, 13 of the country-specific models assign this pattern to class 6 and only 7 to class 5. Here we have classified this pattern into the most worried class 6. Once this is done, the cell immediately to its right is also logically forced into class 6.

From this classification exercise, only the assigned class for each respondent is carried forward to further analyses, where it will then be treated as an observed variable. This is analogous to what happens when the modal class from a latent class model (i.e. the class which maximizes the probability (3)) is assigned to each respondent. In that case it is also possible to do more, by carrying forward also information about the uncertainty in the modal class assignments. In essence, this provides a way to adjust in subsequent analyses for the misclassification of the true latent classes by the modal classes. For example, Vermunt (2010) and Bakk et al. (2013) describe ways of doing this when the latent class is used as a response or explanatory variable respectively. These methods do not apply to the `model-supported' assignment considered here. Technically, this is because the misclassification probabilities are not well-defined for our assigned classes. Conceptually, it is because the fitted latent class model is treated only as an initial supporting device in deriving this classification, and the final assigned classes are then effectively declared to be the quantities of interest rather than imperfect measures of some true underlying classes. In other words, our assigned classification of worry about crime is more formative than reflective in nature.

4.4 Cross-national comparability of the measures

One of the key methodological challenges in international surveys is the question of cross-national equivalence of measurement. This is the question of whether sets of survey questions measure the same concept and in the same way in all countries. If they do not, similar responses by individuals from different countries need not imply similar levels of the concept being measured. Lack of equivalence can potentially compromise any substantive cross-national comparisons. Yet it is quite plausible, and indeed very likely, in surveys which cover many countries, perhaps because of cultural differences in how a question is understood, or variations in questionnaire translation (for an extensive discussion of this and other issues in cross-national survey design, see Harkness *et al.,* 2003).

Measurement equivalence can be considered at different levels of strictness (see Johnson, 1998, and Saris and Gallhofer, 2007, for overviews). In the strictest sense, full measurement equivalence holds when the same latent variable model, with the same parameter values, describes the measurement process in all of the countries. In the case of our latent class models, this is the model where the probabilities of the latent classes may vary across countries but the conditional probabilities of all the items given the latent classes are exactly the same in all countries. Parameter estimates for this model are obtained by fitting it for the pooled data for all the countries, with country used as an explanatory variable. Such full measurement equivalence can then also be relaxed within the same modelling framework, by allowing some or all parameters of the measurement models for some of the items to vary across the countries (this is done by including in the measurement model a direct effect of country on an item, and optionally also an interaction between country and latent class). This then also allows equivalence to be examined formally with statistical model selection, by comparing models which do and do not impose the same measurement probabilities in all countries.

This kind of equivalence, operationalized as exact equality of measurement parameters within a joint model is, however, a very strict requirement. When it is applied to a large number of countries in cross-national surveys, evidence so far suggests that it is rarely if ever accepted by standard statistical criteria (see e.g. Kankaras and Moors, 2009; Meuleman *et al.,* 2009; Reeskens and Hooghe, 2008). It is also rejected for our latent class models for the measures of worry about crime among the 23 countries of the ESS data.

A less strict form of measurement equivalence, which we focus on instead, is 'configural' (or 'construct') equivalence. It holds when survey items measure the same construct in all countries, even if with somewhat different measurement probabilities. For a latent class model it is supported if a model with the same number of classes, when fitted separately for each of the countries, fits well for each of them and has measurement probabilities which suggest a similar interpretation for the classes in every country. We examined this by fitting a six-class model, with the same measurement-model specifications as for the overall model, for data from each of the 23 countries separately. The conclusions were broadly similar across the countries, and thus supported the claim of configural equivalence. In other words, although the estimated measurement probabilities were not identical, for most countries the estimated model identified substantively the same classes: one for the unworried, classes of those who worried about burglary or about violent crime only, and three classes which could more or less clearly be ordered according to increasing level of worry.

The main exceptions to the common pattern among the country-specific models were Finland and Switzerland, for which the model identified three 'single-crime' classes (with two for burglary only in Finland, and two for violent crime only in Switzerland). This was mainly due to the fact that the full six-class model, which is necessary and well-estimated for the combined data set of around 43,000 observations, was often somewhat over-parametrized for individual countries, especially for those countries which have the smallest proportions of worried individuals. For any single country, a model with only 4-5 classes was often sufficient, effectively combining (in slightly different ways in different countries) some of the classes of the full model. For both Finland and Switzerland, the best-fitting models in fact had just 4 classes, with classes 1-3 similar to those of the full model, and the fourth combining classes 4-6 of it.

For our model-supported scaling of worry about crime, what matters most is not so much the equivalence of the models themselves, but the consistency of classification of response patterns across countries. We examined this by deriving for each country the modal classes based on a 6-class model fitted to that country's data alone, and comparing these with classes assigned as shown in Table 5. The proportion of respondents for whom these two agreed exactly varied between 67% and 97% in

different countries, and was under 80% in 6 countries and over 90% in 10 of them. This suggests at least reasonable consistency, especially given the slight over-parametrization of country-specific models which implies that the 6-class models may, in essence, draw the boundaries of the classes (especially 4, 5, and 6) at slightly different points in different countries. If we allow for this by counting a difference of no more than 1 class as agreement (and with classes 2 and 3 counted as being one class away from both 1 and 4), the level of agreement is 93% or more in all but three countries; for each of these three, the remaining lack of agreement is because their models classify as class 4 (infrequently worried) also some responses classified as 1 (unworried) in Table 5 – including the typically large-frequency cell in the second row and column of the table.

In summary, the four worry about crime questions appear to work in broadly consistent and comparable ways in different countries. Country-by-country analyses suggest that their measurement models show reasonable configural equivalence across the 23 countries. Furthermore, the class assignments derived from these models are not substantially different from the general classification rule shown in Table 6. While the overall classification schema is not exactly identical to any country-specific classification rule, it appears to represent a reasonable average of all of them, and does not substantively misrepresent the patterns and dimensions of the responses in any country.

INSERT TABLE SIX ABOUT HERE

4.5 Classification of incomplete responses

The classification rule shown in Table 6 can be used when values for all four questions are recorded – but what if they are not? In this section we discuss the treatment of incomplete sets of responses. In the ESS sample there were 1,115 respondents with between 1 and 3 of the responses observed, and only 221 who answered none of the four questions.

The partially missing responses were used in the *estimation* of the latent class model in Table 5. In essence, all of each respondent's answers are included in the likelihood function of the model, even when these answers do not form a full set of four. With this approach, maximum likelihood estimation of the model produces valid estimates under the assumption that the missing data are Missing at Random (MAR, in the sense of Rubin, 1976). This way, all the data from the 42,779 complete or partially incomplete respondents were included in the estimation, and only the 221 individuals with completely missing responses were omitted.

For the purpose of scoring, an incomplete response pattern may correspond to any one of several complete responses, which may be classified into different classes according to the scheme of Table 6. For example, consider a respondent who answered 'just occasionally', 'just occasionally' and 'no effect' to the two questions on frequency and the question on worry about burglary, but did not provide an answer to the question on the effect of worry about violent crime. Depending on what the missing reply would have been if he had answered the question, the complete response pattern of this respondent could be in any one of three cells. One of these would be classified into class 1 according to Table 6, the others into class 2.

To classify such incomplete responses, we propose to use the observed frequencies of complete responses in Table 5 as weights. This means that the assigned class is the one which corresponds to the largest total number of observations among the complete response sets consistent with the incomplete set. In the example above, the possible complete cell which would be classified as 1 has 5026 observations, and the two cells classified into 2 a total of 420 observations between them. Thus a respondent with this incomplete pattern would be classified into class 1. Observations with all four variables missing are left unclassified.

This rule can be motivated as an approximation of how incomplete responses are classified under a latent class model. Suppose that for a respondent a subset $\boldsymbol{Y}_O$ of the four variables in $\boldsymbol{Y}$ is observed and has the value $\boldsymbol{y}_O$, while the remaining variables $\boldsymbol{Y}_M$ are unobserved. The conditional probabilities of latent classes given the observed response are given by $P(X = x \mid \boldsymbol{Y}_O = \boldsymbol{y}_O) = \sum P(X = x \mid \boldsymbol{Y}_O = \boldsymbol{y}_O, \boldsymbol{Y}_M = \boldsymbol{y}_M) P(\boldsymbol{Y}_M = \boldsymbol{y}_M \mid \boldsymbol{Y}_O = \boldsymbol{y}_O)$, where the summation is over all possible values of $\boldsymbol{y}_M$, and the conditional probabilities for $X=x$ inside the summation are given by (3). Under MAR, the conditional probabilities $P(\boldsymbol{Y}_M \mid \boldsymbol{Y}_O = \boldsymbol{y}_O)$ can be estimated by the corresponding proportions in Table 4, so they are proportional to the numbers of observations in the

cells corresponding to possible values of $\boldsymbol{y}_M$. The rule of 'majority voting' by these frequencies then results if, for each $\boldsymbol{Y}=(\boldsymbol{Y}_O=\boldsymbol{y}_O, \boldsymbol{Y}_M=\boldsymbol{y}_M)$, we replace $P(X = x|\boldsymbol{Y}_O = \boldsymbol{y}_O, \boldsymbol{Y}_M = \boldsymbol{y}_M)$ with 1 for the class x assigned for that value of $\boldsymbol{Y}$ in Table 6, and with 0 for other values of x.

5 Using the new composite measure: worry about crime in Europe

Having derived the method of classification as described in the previous section, we then apply it to assign each of the respondents into one of the 6 worry about crime classes. Figure 1 shows the estimated proportions of these classes, for each of the 23 countries and for all the countries together. Also shown are 95% confidence intervals for two proportions, of the least worried class 1, and of the three most worried classes 4-6 combined.

INSERT FIGURE ONE ABOUT HERE

The proportions vary substantially between countries. In the extremes, an estimated 86% of Norwegians but 46% of Bulgarians belong to the least worried class, while the estimated proportion in the three most worried classes is 4% in Norway but 43% in Bulgaria. Moreover, many of these differences are statistically significant, so that for most countries the proportions are significantly above or below the overall European average. On the other hand, the proportions in the two 'single-crime' classes 2 and 3 are fairly constant and do not show an obvious pattern; for example, around 6% of both the Norwegians and the Bulgarians worry *only* about violent crime but not about burglary.

The results display a fairly consistent geographical gradient, with the lowest levels of worry about crime mostly in Nordic countries and Western Europe, and the highest in Eastern Europe and Mediterranean countries. This is consistent with previous research, in particular the work by Hummelsheim *et al.* (2011). Using multi-level modelling to analyse data from Round 2 of the ESS, they found that the strength of welfare-state arrangements – most developed in the small Northern European countries – accounted for most of the national-level variance of feeling unsafe in the streets after dark. In particular, national levels of social expenditure and decommodification of social welfare policy were most important.

6 Conclusion

Questions of risk, insecurity and fear of crime are of significant social concern and political currency not just in Europe, but also in the Americas (Skogan and Maxfield, 1981; Kitchen and Williams, 2010; Dammert and Malone, 2006), Africa (Roberts, 2010), Asia (Zhang *et al*. 2009) and Australasia (Enders and Jennett, 2009). This paper has assessed the first set of cross-national survey measures that focus respondent attention onto the frequency and impact of worry about crime in their daily lives. Our innovation stems from, first the employment of these multiple-item survey measures of worry about crime; second the use of latent class analysis to scale the four measures into a single categorical scale suitable for comparative analysis; and third the subsequent estimation of levels of worry about crime across Europe.

We have used a battery of several questions to measure an underlying (latent) concept and statistical latent variable models to represent measurement. Departing from Ferraro's (1995) measurement set – which asks people how 'afraid' they are – we have built upon recent methodological developments in UK criminology (Gray *et al.*, 2008; Farrall *et al.*, 2009; Jackson and Gray, 2010; Gray *et al.*, 2011). We have conceived of 'fear of crime' as a pattern of emotional experience (i.e. repetitive and anxiety-producing thoughts concerning an uncertain future outcome) that harms well-being and constrains lives.

Filling a gap in the comparative cross-national literature, we have addressed the lack of an empirical investigation of the scaling properties of measurement tools that move beyond existing measures of perceived safety or the intensity of worry or fear. Top-line findings from the four separate indicators of worry about crime indicated that, according to each indicator, between 20-30% of citizens of the 23 European countries studied had some level of (damaging) worry about crime. This proportion worried 'some of the time' or 'all or most of the time' about falling victim of violent crime and about being burgled. This worry had 'some' or 'serious' effect on their quality of life for similar proportions of the respective populations.

The modelling strategy we have employed indicates that the four categorical indicators could be reduced into a single six-category index, suggesting that the frequency and impact of worry correlate fairly strongly. Estimating levels of worry about crime across Europe using the new index, we found that 59% of citizens were unworried, 13% worried occasionally only about burglary or only about violent crime, 20% had some moderate level of worry, 3% a fairly high, and 5% a very high level of worry. There were, however, clear differences in levels of worry between countries. Small Northern European countries had the lowest levels of worry about crime. Southern and Eastern European countries had the highest levels of worry about crime, with countries like Germany, United Kingdom, and the Netherlands in the middle of the tables. The range of the differences was quite dramatic. For example, the proportion of individuals with moderate to very high level of worry was 4% in Norway but 43% in Bulgaria.

Recent years have seen the increasing use of social indicators in the European Union (EU). Complementing economic indicators to track the progress of European Member States, these indicators inform policy development and assessment, particularly in the areas of poverty and social inclusion (e.g. Atkinson *et al*. 2002; Social Protection Committee 2001) and the legitimacy of legal authorities (Jackson *et al.,* 2011). Combining national information with transnational objectives agreed by EU heads of state and governments, social indicators provide valid measurements of different dimensions of human well-being. Fear of crime is one dimension of well-being – an important measure of the health, social justice and well-being of a society. The measures examined in this paper are the first measures to reflect a more fully-specified conceptual definition (worry about crime as an everyday experience that erodes quality of life) that is validated as a cross-national instrument. We thus encourage their use in tracking the health of countries, allowing policy-makers to define the problem, to assess possible solutions, and to evaluate interventions.

We also hope our work on measurement will encourage more cross-national investigation of the fear of crime. Cross-national studies offer the possibility to examine heterogeneity in the prevalence and impact of fear of crime across diverse contexts (e.g. Hummelsheim *et al.,* 2011; Hummelsheim & Hirtenlehner, 2011; Vieno *et al.,* 2013; Hirtenlehner & Farrall, 2013). With a strong foundation based upon valid and reliable cross-national measurement, multi-level analyses can estimate and explain individual-level and national-level variation. Capitalizing on naturally occurring variation across countries and across contexts, such work can move between micro- and macro-levels of analysis, to provide a more compelling assessment of a complex social phenomenon. By locating individuals within their societal context, scholars can thereby examine the psychological and sociological mechanisms that link different levels of this complex and far-reaching social and political phenomenon. We hope the ESS measures and data will help in this regard.

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Tables

Table 1: *Frequencies and proportions of responses to four questions on worry about crime among respondents from 23 European countries.*

	Worry about burglary			**Worry about violent crime**		
	Frequency	Unweighted %	Weighted %*	Frequency	Unweighted %	Weighted %*
	Frequency of worry			Frequency of worry		
Never	16022	38	35	19204	45	41
Just occasionally	14733	35	37	15115	36	39
Some of the time	9327	22	22	6894	16	17
All or most of the time	2489	6	6	1244	3	3
Total	42571	100	100	42457	100	100
(Missing)	(429)			(543)		
	Effect of worry on quality of life			Effect of worry on quality of life		
(Never worry)	16022	38	36	19204	46	41
No real effect	15748	37	35	12845	31	29
Some effect	8752	21	24	8498	20	25
Serious effect	1646	4	5	1533	4	4
Total	42168	100	100	42080	100	100
(Missing)	(832)			(920)		

Data: European Social Survey, Round 3 (2006). Weighted percentages have been calculated using sampling design weights and population size weights. The total number of respondents is 43,000.

Table 2: *Estimated proportions of different effects on quality of life given frequency of worry about crime among combined populations of 23 European countries.*

	Effect of worry on quality of life				
Frequency of worry	*(Never worry)*	*No real effect*	*Some effect*	*Serious effect*	Total
Worry about burglary (n=42168)					
Never	100				100
Just occasionally		67	31	3	100
Some of the time		44	46	9	100
All or most of the time		18	50	33	100
Total	36	35	24	5	100
Worry about violent crime (n=42076)					
Never	100				100
Just occasionally		61	36	3	100
Some of the time		30	59	11	100
All or most of the time		12	38	50	100
Total	41	29	25	4	100

Data: European Social Survey, Round 3 (2006). The estimated proportions have been weighted using sampling weights and population size weights.

Table 3: *Cross-tabulation of frequencies of responses to four questions on worry about crime among respondents from 23 European countries. Data for the 41664 respondents who answered all four questions.*

			Worry about burglary (Frequency / Effect on quality of life)								
Worry about violent crime		*Never*	*Just occasionally*			*Some of the time*			*All or most of the time*		
Frequency	Effect	*None*	*None*	*Some*	*Serious*	*None*	*Some*	*Serious*	*None*	*Some*	*Serious*
Never	*None*	11993	4055	625	56	1352	575	61	137	137	47
Just occasionally	*None*	2542	5026	394	26	1560	472	18	111	121	13
	Some	498	575	1693	46	179	778	70	17	168	35
	Serious	40	10	65	71	10	36	57	1	8	17
Some of the time	*None*	423	541	61	8	942	172	7	106	60	9
	Some	238	368	413	17	347	1772	105	23	407	127
	Serious	48	22	42	40	13	99	223	2	23	96
All or most of the time	*None*	22	11	3	0	23	5	1	49	10	2
	Some	32	29	30	4	32	73	3	23	221	51
	Serious	26	16	20	11	7	49	57	7	58	340

Data: European Social Survey, Round 3 (2006).

Table 4: *AIC and BIC model selection statistics for latent class models for four items on worry about crime. For each of AIC and BIC separately, the values have been shifted so that the smallest value - i.e. the model preferred by the statistic - is 0.Columns of the table correspond to different measurement models for a given number of latent classes: `Ordered' and `Unordered' mean that the response levels of each item were treated as ordinal or nominal respectively. `Cond. indep.' means that all items were conditionally independent given latent class; `F-F, E-E' means that there was one conditional dependence between the two items on frequency of worry and one between the two on effect of worry; `V-V, B-B' means that there was one conditional dependence between the two items on violent crime and one between the two on burglary. The model used as the starting point for our classification of worry about crime is highlighted in grey.*

AIC:						
	Ordinal			Nominal		
Number of classes	Cond. indep.	V-V, B-B	F-F, E-E	Cond. indep.	V-V, B-B	F-F, E-E
5	6528	5649	2536	4144	1809	330
6	4890	4206	2075	2579	808	94
7	3370	2874	1474	1289	252	0
BIC						
5	6019	5157	2044	3843	1611	140
6	4423	3756	1626	2373	706	0
7	2947	2468	1068	1178	244	1

Data: European Social Survey, Round 3 (2006), N=42779 respondents who answered at least one of the four questions. Estimates from analysis without using the survey weights.

Table 5: *Estimated response probabilities and (on the first row) probabilities of the latent classes for a 6-class latent class model fitted to data on four questions on worry about crime in the European Social Survey Response probabilities that are 0.40 or greater are highlighted.*

		Latent class					
		'Unworried or the occasional functional worry'	'Burglary only'	'Violence only'	'Infrequent worry'	'Frequent worry'	'Persistent worry'
		1	2	3	4	5	6
	Probability of latent class:	0.55	0.11	0.07	0.21	0.03	0.03
Question	Response						
Violent crime: Frequency of worry	*Never*	0.70	0.60	0.00	0.00	0.00	0.00
	Just occasionally	0.29	0.34	0.53	0.53	0.26	0.12
	Some of the time	0.01	0.06	0.43	0.44	0.57	0.35
	All or most of the time	0.00	0.00	0.04	0.03	0.17	0.52
Effect of worry on quality of life	*No real effect*	1.00	1.00	0.52	0.29	0.02	0.03
	Some effect	0.00	0.00	0.42	0.68	0.88	0.06
	Serious effect	0.00	0.00	0.06	0.03	0.10	0.91
Burglary: Frequency of worry	*Never*	0.60	0.00	0.69	0.00	0.00	0.00
	Just occasionally	0.32	0.40	0.31	0.47	0.02	0.16
	Some of the time	0.08	0.46	0.00	0.48	0.36	0.40
	All or most of the time	0.00	0.14	0.00	0.05	0.62	0.45
Effect of worry on quality of life	*No real effect*	1.00	0.45	1.00	0.38	0.00	0.11
	Some effect	0.00	0.49	0.00	0.59	0.68	0.22
	Serious effect	0.00	0.05	0.00	0.02	0.32	0.66

Estimates from the analysis without using survey weights, using the pooled data on all N=42779 respondents who answered at least one of the four questions.

Table 6: *Proposed classification of responses to four questions on worry about crime into six classes.*

			Worry about burglary (Frequency / Effect on quality of life)								
Worry about violent crime		*Never*	*Just occasionally*			*Some of the time*			*All or most of the time*		
Frequency	Effect	*None*	*None*	*Some*	*Serious*	*None*	*Some*	*Serious*	*None*	*Some*	*Serious*
Never	*None*	1	1	2	2	1	2	2	2	2	2
Just occasionally	*None*	1	1	2	2	1	2	2	2	2	2
	Some	3	3*	4	4	4	4	5	4	5	5
	Serious	3	3	4	6	6	6*	6	6	6*	6*
Some of the time	*None*	3	3	4	5*	4	4	5*	4	5*	5*
	Some	3	3	4	5*	4	4	5	4	5	5
	Serious	3	3	6*	6	6	6	6	6	6	6
All or most of the time	*None*	3	3*	4	6*	4	5*	6*	6*	6*	6*
	Some	3	3*	5*	6*	5*	6*	6*	6*	6*	6*
	Serious	3	3*	6	6	6	6	6	6	6	6

** Assigned class differs from the class with the highest conditional probability according to the latent class model in Table 4.*

Table 7: *Levels of worry about crime based on four new survey questions (assigned as shown in Table 5) against responses to a perceived safety single-indicator measure of fear of crime. The numbers in the table are estimated proportions of categories of the perceived safety question, given the new classes, among combined populations of 23 European countries.*

	Old question: 'How safe do you feel walking alone in this are after dark?'					
Class based on 4 new questions	*Very safe*	*Safe*	*Unsafe*	*Very unsafe*	Total	(Row prop.)*
1 (Unworried or the occasional functional worry)	31	52	14	3	100	(58.7)
2 (Burglary only)	17	53	22	8	100	(6.0)
3 (Violent crime only)	15	46	31	9	100	(7.1)
4 (Infrequent worry)	7	40	44	10	100	(20.0)
5 (Frequent worry)	6	27	43	25	100	(3.1)
6 (Persistent worry)	5	20	39	36	100	(5.1)
Total	22	47	24	7	100	(100)

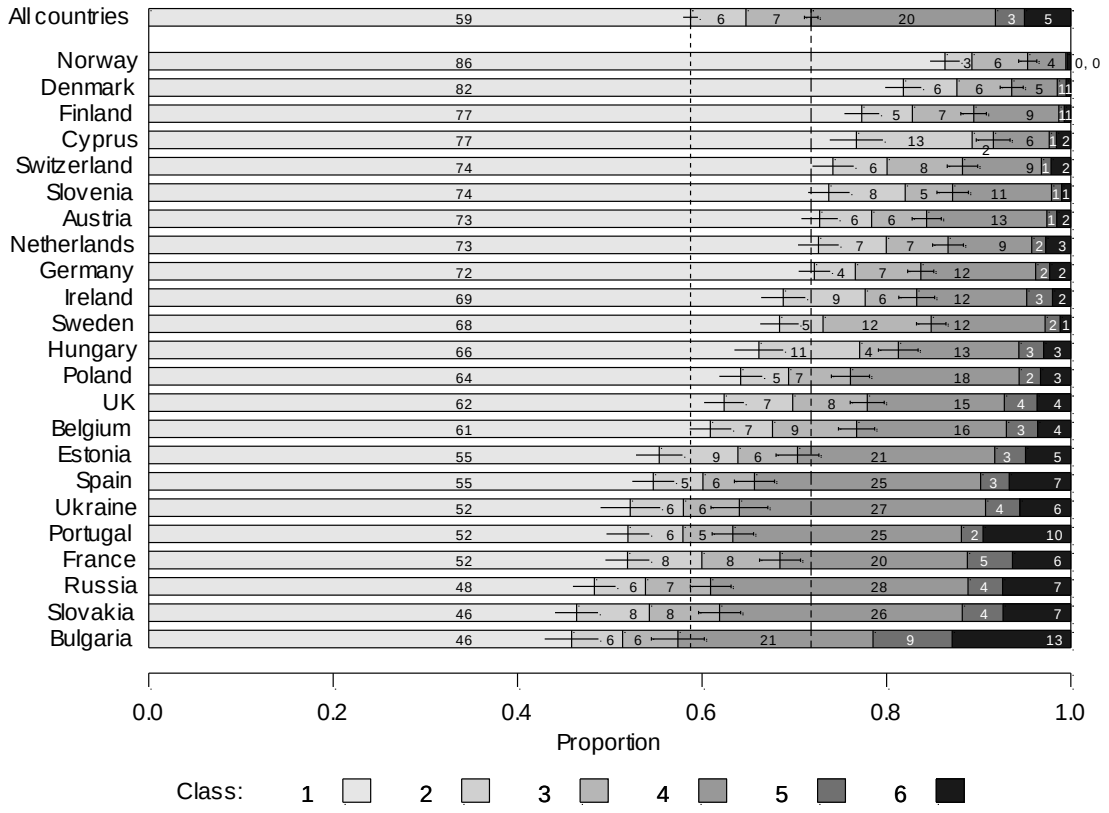
Data: European Social Survey (Round 3, 2006). The proportions have been estimated sampling weights and population size weights. i.e. the estimated proportions of the new classes, as in the 'all countries' bar of Figure 1.

Figures

Figure 1: *Estimated proportions of levels of worry about crime based on four new survey questions (assigned as shown in Table 5) in each of 23 European countries, and overall proportions for the combined populations of these countries. The two vertical lines represent overall proportions for class 1 and for classes 4-6 combined, and the short horizontal lines show the 95 % confidence intervals for these proportions in each country.*

[graphic on next page]

Data: European Social Survey (Round 3, 2006). Country-level proportions have been estimated using sampling weights, and the overall proportions using both sampling weights and population size weights.


All countries
59 6 7 20 3 5
Norway
86 3 6 4 0, 0
Denmark
82 6 6 5 1 1
Finland
77 5 7 9 1 1
Cyprus
77 13 2 6 1 2
Switzerland
74 6 8 9 1 2
Slovenia
74 8 5 11 1 1
Austria
73 6 6 13 1 2
Netherlands
73 7 7 9 2 3
Germany
72 4 7 12 2 2
Ireland
69 9 6 12 3 2
Sweden
68 5 12 12 2 1
Hungary
66 11 4 13 3 3
Poland
64 5 7 18 2 3
UK
62 7 8 15 4 4
Belgium
61 7 9 16 3 4
Estonia
55 9 6 21 3 5
Spain
55 5 6 25 3 7
Ukraine
52 6 6 27 4 6
Portugal
52 6 5 25 2 10
France
52 8 8 20 5 6
Russia
48 6 7 28 4 7
Slovakia
46 8 8 26 4 7
Bulgaria
46 6 6 21 9 13
0.0
0.2
0.4
0.6
0.8
1.0
Proportion
Class: 1 2 3 4 5 6

Appendix

Tables A1 and A2 break down the frequency and impact of worry about crime for the individual countries. The countries are rank ordered according to the combination of 'some of the time' and 'all or most of the time' (for frequency) or the combination of 'some effect' or 'serious effect' (for impact). Countries with low levels are at the top. Starting with frequency, we find Norway, Denmark, Hungary, Poland and Slovenia with relatively low levels of insecurity, followed by Austria, Switzerland and Finland. At the other end of the table with relatively high levels of insecurity, we find Portugal, Estonia, Belgium, Slovakia, Spain, Bulgaria and France. Moving to impact, the pattern of small Northern European countries with the lowest levels of fear of crime is strengthened: Norway, Denmark, Sweden, Finland, Austria, Slovenia and Ireland. At the other end, the pattern of Southern and Eastern European countries with the highest levels of fear is also strengthened: Estonia, Ukraine, France, Portugal, Russian Federation, Bulgaria and Slovakia. In the middle (for both frequency and impact) we find the United Kingdom, the Netherlands and Germany.

Table A1: *Estimated proportions of levels of how often individuals in 23 European countries worry about violent crime and burglary.*

Frequency of worry about violent crime						Frequency of worry about burglary					
	Never	Just occasionally	Some of the time	All or most of the time	Total		Never	Just occasionally	Some of the time	All or most of the time	Total
Norway	58	38	4	0	100	Norway	55	39	5	1	100
Slovenia	54	40	5	1	100	Poland	40	46	9	4	100
Cyprus	79	14	5	1	100	Slovenia	40	46	11	2	100
Denmark	56	37	7	1	100	Denmark	45	38	14	4	100
Hungary	58	34	7	2	100	Hungary	42	38	14	6	100
Poland	40	50	7	3	100	Switzerland	51	29	18	2	100
Austria	53	34	13	1	100	Germany	47	32	19	2	100
Switzerland	55	31	12	1	100	Austria	46	33	19	3	100
Finland	39	47	14	1	100	Ukraine	36	42	15	6	100
Ukraine	39	46	12	3	100	Russian Federation	29	48	16	7	100
Netherlands	57	28	14	1	100	Finland	31	43	24	1	100
Germany	51	33	14	1	100	Cyprus	52	22	22	4	100
Ireland	50	33	14	2	100	Netherlands	46	27	23	4	100
Russian Federation	32	50	15	3	100	Sweden	35	37	26	2	100
Sweden	39	39	20	2	100	Ireland	35	34	23	7	100
United Kingdom	41	36	19	4	100	United Kingdom	28	37	25	10	100
Estonia	41	35	21	3	100	Portugal	39	25	27	8	100
Belgium	42	30	24	3	100	Estonia	29	35	29	7	100
Portugal	47	24	22	7	100	Belgium	33	29	30	8	100
France	35	33	28	4	100	Slovakia	28	33	33	6	100
Spain	39	28	26	6	100	Spain	35	25	31	9	100
Slovakia	33	34	31	3	100	Bulgaria	26	29	23	21	100
Bulgaria	31	32	24	13	100	France	26	27	38	9	100

Data: European Social Survey (Round 3, 2006). Country-level proportions have been estimated using sampling weights. Countries are ordered according to the total of 'some of the time' and 'all or most of the time'.

Table A2: *Estimated proportions of levels of the effect that worrying about violent crime and burglary has on individuals' quality of life in 23 European countries.*

Impact on quality of life of worry about violent crime						Impact on quality of life of worry about burglary					
	Never worry	Worry, no real effect on quality of life	Worry, some effect on quality of life	Worry, serious effect on quality of life	Total		Never worry	Worry, no real effect on quality of life	Worry, some effect on quality of life	Worry, serious effect on quality of life	Total
Norway	58	33	9	0	100	Norway	55	39	6	1	100
Denmark	56	36	8	1	100	Denmark	45	46	9	1	100
Finland	39	53	7	1	100	Sweden	35	53	11	1	100
Slovenia	55	29	15	1	100	Finland	31	57	10	1	100
Sweden	39	44	16	1	100	Austria	46	36	17	1	100
Ireland	51	33	15	1	100	Slovenia	41	40	17	1	100
Cyprus	80	11	7	2	100	Ireland	36	44	18	2	100
Austria	54	30	15	2	100	Cyprus	52	30	17	2	100
United Kingdom	41	37	20	2	100	Switzerland	52	35	12	2	100
Switzerland	56	30	12	2	100	United Kingdom	28	51	19	2	100
Poland	40	30	27	2	100	Germany	47	36	14	2	100
Germany	52	30	15	3	100	Poland	41	32	25	3	100
Hungary	58	20	19	3	100	Netherlands	46	39	12	3	100
Belgium	42	40	15	3	100	Belgium	33	47	17	3	100
Netherlands	58	29	10	3	100	Spain	35	35	26	4	100
Spain	39	32	25	4	100	Hungary	42	30	23	5	100
Estonia	41	29	25	5	100	Estonia	30	38	26	6	100
France	35	38	23	5	100	Ukraine	37	23	34	7	100
Ukraine	40	19	34	6	100	France	26	44	22	7	100
Russian Federation	33	22	38	7	100	Portugal	40	22	31	8	100
Portugal	47	15	30	7	100	Russian Federation	30	26	35	9	100
Slovakia	33	30	29	8	100	Bulgaria	28	27	36	9	100
Bulgaria	33	24	33	9	100	Slovakia	29	32	30	9	100

Data: European Social Survey (Round 3, 2006). Country-level proportions have been estimated using sampling weights. Countries are ordered according to the total of 'some effect' and 'serious effect