

## **Micro-Foundations of Fragility: Concepts, Measurement and Application**

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### **HiCN Working Paper 260**

November 2017

*Abstract:*

We explore the micro-foundations of fragility by discussing how to measure the exposure to fragility at the individual level. We focus on two notions that are not covered by existing aggregate, state-centric indicators of fragility. First, different individuals may experience fragility very differently. Second, even though a country as a whole may not be “fragile”, individuals may be exposed to fragility. This differentiation suggests that the experience of fragility varies not just at national levels but also between districts and between individuals. To test this idea, we propose a “Fragility Exposure Index”, which accounts for human security, economic inclusion and social cohesion at the micro-level. We then derive a series of metrics that can be collected in typical household surveys. We test the performance of the Fragility Exposure Index by including a “Fragility Exposure Module” in a household survey in Kenya. Analysis of this data shows that individuals living in rural areas, as well as young and single individuals, exhibit greater exposure to fragility. These findings demonstrate the importance of understanding fragility at the individual level, particularly as it provides the basis to understanding which who would benefit most from pro-stability interventions and to how these interventions perform.

**Keywords:** fragility, individual level, fragility exposure, pro-stability interventions, household survey, Kenya.

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# 1. Introduction and Background

In the last two decades, a growing literature has focused on the negative role of state failure in economic growth and development. While it is strongly assumed and well understood that strong institutions are important, there is no real consensus on their role in fostering economic development (North et al., 2007). The causal relationship between the constituent components of strong states – such as governance, institutions and security – and positive economic performance remains complex to disentangle, particularly at the macro-level. On the one hand, weak institutions are considered a hindrance to economic performance (Acemoglu et al., 2005), while on the other hand, poorly performing economies are prone to ‘fragility’. Such debates have been equally prevalent among practitioners given that “fragile states” face enormous difficulties in achieving the Millennium Development Goals, especially as the designation as “fragile” has often lead to reduced international aid (OECD, 2011).

The precise meaning or definition of what constitutes a “fragile state”, by contrast remains ambiguous. At the root of this issue lies the state-centred approach that is often taken to measuring fragility. Instead, we argue that fragility can be traced to the micro-level by considering how individuals are exposed to its impacts. In turn, we argue that considering the micro-foundations, micro-experiences and micro-perspectives of fragility has significant implications for economic research on fragility and for the design of fragility-sensitive policies and interventions.

In this article, we therefore build a working definition of fragility, focussing on three domains<sup>2</sup>: economic inclusion, social cohesion and human security, which underpins the design of a “fragility module”. Although the terms used in this definition differ slightly from those used in other attempts to empirically understand fragility, the concepts included overlap significantly.<sup>3</sup> Building up from this definition, we generate a list of indicators that are linked to each of the three domains, which were inserted into HORTINLEA, an on-going micro-level panel survey conducted in rural Kenya.<sup>4</sup> Using typical multidimensional indexing techniques, we aggregate the indicators into a single Fragility Exposure Index (FEI) and compare its outcomes across key regional and demographic groupings.

Results from these comparisons show notable variations in exposure to fragility across geographic regions. Individuals living in rural areas are more likely to experience fragility than those in urban areas, whilst young and single households are worse

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<sup>2</sup> We note the existence of several (competing) definitions of fragility. In this article, we therefore do not present our own definition as exhaustive but, rather, as illustrative of the wider concepts discussed. The logic that underpins our index, however, is not sensitive to a particular definition.

<sup>3</sup> See, for example, the Fragile States Index (FSI) (<http://fundforpeace.org/fsi/>)

<sup>4</sup> HORTINLEA is an on-going micro-level panel survey conducted in rural Kenya. See [www.hortinlea.org](http://www.hortinlea.org) for more details.

exposed than others. Under our definition, religious background also plays an important role: Catholics experience fragility worse, compared to Muslims or Protestants.

In a final step, we compare regional aggregates of our FEI with outcomes from the Fragile States Index (FSI). This comparison reveals that the macro-level picture drawn by the FSI is considerably bleaker than that from the FEI. On the one hand, we note that the HORTINLEA sample is representative only of one sub-section of Kenyan, implying the possibility that food producers are less fragile than the national average. Alternatively, the inclusion of informal institutions and networks in the FEI (and their omission in the FSI) may also go some way to explaining this gap, giving the role such institutions may play in mitigating the experience of fragility (Narayan, 2002).

In combination, these outcomes support the idea that fragility manifests itself differently for different individuals, even if such micro-level experiences are not the root cause. It follows that FEIs such as ours are an important and valuable tool in understanding and measuring fragility. Future research should develop similar fragility modules in a range of representative household panel surveys. In the first instance, fully representative surveys would provide a stronger means of comparison between the FEI and national-level measures, as it would preclude group-level effects. Second, inclusion in panel household surveys would allow analysis of the time dynamics of fragility. This would facilitate understanding of the time dynamics of individual experience of fragility and how, for certain groups, it correlates with the evolution of fragility at the national level, whilst also facilitating understanding of policies designed to mitigate fragility.

The rest of this paper is structured as follows: Section 2 provides a concise literature review on current state of fragility indices. Section 3 describes in detail our approach, underscoring the definitions used (3.1), the Fragility Exposure Index (3.2), and the survey module of fragility exposure (3.3). Section 4 presents the results from the case study in Kenya. Section 5 offers conclusions and describes possible future work.

## **2. Status-Quo**

Beginning in the mid-1990s, a large body of literature focussing on the role of state, state collapse and state failure developed (Zartman, 1995; Milliken, 2003; Goldstone et al., 2004; Francois and Sud, 2006; Anderson et al., 2007; Ghani and Lockhart, 2008; Binzel and Brück, 2009). In the wake of this work, the debate on fragility widened – particularly among practitioners – to include countries that emerge from state failure and those that are threatened with future collapse. Different terminologies have been developed to describe this phenomenon: “low income countries under stress” (LICUS) (World Bank, 2005; IEG, 2006); “difficult environments” (Moreno et al., 2004); “fragile states” (USAID, 2005); and “weak states” (Rice, 2005). At the core of these debates, however, is the same combination of state weaknesses. At the same time, despite such

terms being in common use for over a decade, there is still significant debate about their meaning and, in particular, about what characterises countries that are, or are not, classified in such a way (Asian Development Bank, 2006).

Commonalities in definitions of fragility, however, do exist. Typically, definitions are state-centred, perhaps due to the term itself arising in a literature focussing on state collapse (Kahn, 2004; Picciotto et al., 2004; Dibeh, 2008). In turn, characterisations of fragility tend to focus on issues at the state-level, such as legitimacy, effectiveness, capacity to impose the Weberian Monopoly, provision of public goods, etc. Particularly given that some states may exhibit some adverse features but not others, however, it is still unclear how a combination of these adversities, or which combination, adds up to fragility. From this stems a concern that countries defined as fragile may have as little in common with each other as they do with non-fragile states.

Noting such concerns, two measures have been proposed in recent years to define and measure fragility empirically. The FSI

Two measures have been proposed to implement these definitions empirically: the Fragile States Index (FSI) (Fund for Peace, 2009) and the Political Instability Task Force (PITF). FSI is updated annually and is composed of 12 state-level indicators of presumed drivers of fragility – these include: “mounting demographic pressures”; “uneven economic development along group lines” and “progressive deterioration of public services”. These sub-indicators can be grouped in three distinguishable domains: political and military, economic, and social, which themselves are analogues of human security, economic inclusion and social cohesion respectively. The PITF also looks at a variety of societal, demographic, economic, political and environmental factors that might influence the likelihood of state failure (Goldstone et al., 2005). In both cases, however, the included features may be as much an outcome of fragility as they are a cause of it, raising the spectre of endogeneity. Accordingly, in these indices, the strongest predictor of fragility at time  $t$  is usually fragility in  $t-1$ . In turn, there remains a general lack of understanding of the actual mechanisms involved in fragility. How does fragility emerge? What effects does it have on growth and poverty (especially when a lack of growth and poverty contribute to fragility)? How can it be contained or overcome?

In particular, there is a paucity of knowledge on how people actually experience fragility, how it impacts on their lives, how they cope with it and how their lives differ from similar individuals in non-fragile settings. Our FEM and FEI are designed to provide new insight into these gaps, by collecting and aggregating information on how individuals are exposed to various indicators linked to the failures associated with fragility. In turn, in situations where the FEM would be collected in nationally representative household surveys, the subsequent FEI can be aggregated into national

measures of fragility.<sup>5</sup>

### 3. Approach

What is clear from previous efforts to understand fragility is that fragility is complex and stems from the interaction of a range of separate phenomena. In turn, the development of multiple domain indices of fragility is encouraged (OECD, 2015). In typical approaches, the indicators that aim to capture these domains are identified at the state level, however. A number of concerns arise with such macro-level approaches. First, whilst a state as a whole may not be fragile, areas within it could well surpass given thresholds were those geographical areas the unit of analysis. Second, key concepts within these multiple domains may be difficult to measure at the state level, particularly when considering social indicators, which almost inherently take place at the micro-level. Third, a number of endogeneities are likely to be present in these indicators, leading to potential “double-counting” and thus inflating long-term levels of fragility. For example, conflict has a measurable negative impact on economic growth (Miguel et al., 2014). Most indices include measures of both of these indicators, yet in this case, at least some part of poor economic performance is a consequence of fragility, rather than a driver of it.

In this context, we focus on the development of a micro-level multi-indicator index of fragility. We argue that these major concerns do not necessarily arise at the micro-level. First, so long as the surveys used are representative, the unit of analysis can be aggregated to sub-national and national levels, as well as allowing comparison across other social groups. Second, given suitable survey instruments, a range of important individual can be readily collected from individuals. Third, it is possible to differentiate effects between different individuals. This allows, for example, one household to be affected by conflict but to suffer no change in economic situation and another to experience both conflict and worsened economic outcomes, and for the latter to experience “worse” fragility than the former. We therefore develop a multidimensional index of fragility but identify the index at the individual level, using bespoke data collected from a household survey. In effect, this boils the conceptualisation of fragility – even when defined at the state level – down to something that impacts on different groups and different individuals in different ways. This approach, therefore, does not aim to disregard or undermine the significant and important work that has been done at the state level but, rather, to refine these concepts and to project their significance at the individual level.

The benefits of such an approach are manifold. First, it reduces the need to draw artificial distinctions between fragile and nonfragile states, which can be damaging

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<sup>5</sup> *In principle, this notion is the same as recent work on the measurement of conflict and conflict exposure at the individual level (see: Brück et al., 2016; Justino et al., 2016).*

given the diversity of reasons why a state is considered fragile and the spatial variation of fragility within states. Second, by aggregating up from an individual level, we facilitate analysis of differences at individual, group and sub-national levels, as well as across countries. Such an approach not only allows better understanding of the spatial dimensions of fragility, but also about which forms of fragility affect which groups most. More so, it provides better opportunity to understand the feedbacks between fragility and economic development that are not available at the state level. Finally, because such an approach aggregates together a wide diversity of drivers of fragility, it provides the basis of comparison between people, sub-national regions and countries. In turn, a country could score well on some aspects of fragility and poorly on others, allowing better “matching” of fragile states or regions by typology. Such comparisons would provide a better means of comparative research across fragile countries, areas or regions. This is particularly important in understanding the effectiveness of various fragility-reducing interventions, particularly those effective enough to shape individual lives but not large enough to impact at the national level.

### **3.1 Defining Fragility**

There is no single shared definition of fragility – indeed, such a lack of a shared definition is much of the reason why multiple lists of fragile countries exist and why these lists seldom, if ever, fully overlap. In response, we seek a working definition of fragility that builds up from the micro-level. This definition is designed to be illustrative of the general principles of measuring fragility at the micro-level, rather than an exhaustive or definitive definition of the concept.

In line with the state-centric macro-level literature on fragility, we consider fragility in the context of state functions and institutional capacities. Methodologically, an important feature of any definition to be used in the generation of a multidimensional index is that at each domain of the index, and thus each constituent part of the definition itself, can be readily separated. As such, combining this need for separation between the domains with the fundamental bases of traditional definitions of fragility yields three functionings of interest: human security; economic inclusion; and social cohesion. Although we title these domains differently for parsimony, they share a number of key overlaps with those derived from other definitions of fragility (e.g. the FSI)<sup>6</sup> grounding both the definition and the outcomes of this study in the body of literature to date. Fragility, in turn, is effectively defined as the absence of these functions. We further define each sub-component as follows:

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<sup>6</sup> *We do not present this definition as either exhaustive or definitive but as a useful baseline from which to create and analyse a micro-level index of fragility. Due to the nature of the data, however, the approach itself is not sensitive to definitions, as metrics can be included or excluded to match alternative definitions. A future source of research should test how sensitive the index and results are to definitions.*

**Human Security** is, at its very base level, a focus on individual protection but is considered more broadly than simply individuals being protected from physical violence. We therefore consider human security to encompass physical safety, such as exposure to armed actors and experience of violence but also a lack of group- or gender-based discrimination, and equal rights before the law. In turn, this domain has strong links to political institutions, such as an effective local and national justice system; civilian police force; etc.

**Economic Inclusion** addresses alleviating extreme poverty and inequality but, again, lacks a single accepted definition. Those definitions that do exist, however, share a number of important overlaps, on which we focus. In that regard, we consider economic inclusion as the provision of opportunity and ability for all people to take an equal share in economic opportunity. That is, that no individuals, or groups, should be excluded from such opportunity. Whilst this can focus on poor personal economic situations and opportunities, it can also include uneven access to public services or the experience of corruption.

**Social Cohesion** is based around an idea that members of communities have the opportunity to cooperate within and across groups. As Chan and Chan (2006) state, this is a situation that facilitates vertical and horizontal interactions and a set of attitudes and norms that include trust, a sense of belonging, and a willingness to participate. In this regard, we consider social cohesion to reflect participation in communities and trust in government and other institutions (both formal and informal).

### 3.2 The Fragility Exposure Index (FEI)

The Fragility Exposure Index (FEI) for individual  $i$  in time  $t$  is then specified as:

$$FEI_{it} = 100 \times Norm(D_{it})$$

$$D_{it} = Norm\left(\sum_{j=1}^N X_{ijt}\right) + Norm\left(\sum_{j=1}^M Y_{ijt}\right) + Norm\left(\sum_{j=1}^O Z_{ijt}\right) \quad (1)$$

where  $X_{ijt}$ ,  $Y_{ijt}$ , and  $Z_{ijt}$  represent the three domains: human security, economic inclusion, and social cohesion, respectively. Each sub-indicator within the following domains is normalised to take a value between 0 and 1 as follows:

$$X_{ijt} = Norm(x_{ijt}) = \frac{x_{ijt} - \min(x_{jt})}{\max(x_{jt}) - \min(x_{jt})}$$

where  $i, j$  and  $t$  denote the individual, sub-indicator, and time period (e.g., year), respectively. This is important to ensure that each sub-indicator within each domain takes the same weight in the final index, as not all variables have similar answer ranges. Hence, for each domain we sum up the total number of the normalised sub-indicators to develop an equally weighted domain index. In the final step, as shown in equation (1), each domain is then also normalised in order to provide equal weights between these domains for the generation of the FEI. Given a lack of strong priors on which are the most important and a lack of bespoke data on those that individuals consider key, we argue that this equally weighted index is the most appropriate method available for this analysis. These equal weights can be augmented to deal with many of the concerns raised in a range of multidimensional indexing literature (Goos and Manning, 2002).

Using Equation (1), we are able to classify individual experiences of or exposure to fragility into one index which has, initially, a value between 0 and 3, where 0 is the least fragile and 3 is the most fragile. However, the normalisation of the index allows us, or other researchers, to transform the values to suit specific analytical needs without jeopardizing the underlying distributions. Here the final FEI takes value of 0 and 100.

### 3.3 The Fragility Exposure Module

We focus our attention on the three domains that derive from our consideration of fragility: human security, economic inclusion and social cohesion. From this stems a requirement to discuss which indicators and metrics accurately reflect these domains and which do so optimally. In reality, given the restricted space in on-going surveys, these desires need to be traded-off against ensuring that the module can easily be inserted in a range of surveys. Similarly, they also need to be traded off with the style of the questions asked and the familiarity of these questions to survey designers, statistical agencies and enumeration teams.

We first reduce our three domains into two distinctive categories: “Experiences” and “Perceptions” of fragility. The former includes indicators that measure actual experiences of fragility at the micro level. These include for example political and community engagement and experiences of insecurity and corruption.<sup>7</sup> While the latter

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<sup>7</sup> It is well worth noting that all existing household surveys collect information on a household's economic situation and their expectations for the future. Similarly, questions about trust in institutions are common in these surveys – including the HORTINLEA data we use in this article. The fragility exposure module, therefore, should be viewed as an extension of existing data collection processes, rather than a separate effort. We note, too, that updating existing answer codes, rather than inserting new questions, may suffice in the creating of a fragility module within on-going surveys.

include indicators capturing: individual fears and satisfaction on a range of security, economic, and social aspects; individual perceptions of the effectiveness of a number formal and informal institutions, and trust in these institutions. In order to generate the questionnaire, we reviewed a range of surveys and garnered an extensive list of potential questions. Subsequently, we reduced this list to include those most directly linked to the key concepts within our definition, whilst also ensuring that these concepts were not ‘double counted’.

With regards to human security, we include measures on satisfaction with personal, neighbourhood and national security; fear of crime, assault, war, ethnic conflict, and police violence. As for economic inclusion and social cohesion, we measure satisfaction with economic and financial situation, education, health, community integration, etc. We regard increases in fear as worsening of the fragility status quo and improved satisfaction as a betterment.

We measure institutional strength through questions that ask about individual perception on the effectiveness of a range of formal and informal institutions. The specifically named institutions include some that are generic – such as central or local government, police, or courts – and others that are context specific, such as tribal elders, religious bodies, etc. In general, we view increasing perceptions of effectiveness as the basis of a lower exposure of fragility. This implies, not only that more effective state institutions correspond to lower levels of fragility but that, in the absence of such effective institutions, more effective informal institutions still mitigate fragility. Trust is measured through a range of questions that ask individuals how much they trust these various formal and informal institutions, as well as their families, their neighbours and their countrymen and assumes that higher trust is a sign of less fragility.

Third, political and community involvement is based on self-reported participation in a range of secular and religious organisations, political parties, and elections. We hypothesise that more participation is a sign of increased community cohesion and of reduced fragility. Experience of corruption is measured through questions that ask how easy it is to obtain assistance from a range of institutions without paying a bribe, while experiences of insecurity is measured through the presence of active criminal groups.

Table 1 lists all the sub-indicators used within each domain. Moreover, an example of the augmented questionnaire can be found in Annex A for our work in Kenya.<sup>8</sup>

[TABLE 1 ABOUT HERE]

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<sup>8</sup> *In each survey, these questions will be context specific. This ensures that the institutions we use in our questions, the reference to neighbourhoods and areas, etc. are matched to those that our respondents understand.*

## 4. Case Study: Fragility in Kenya

### 4.1 Country Background and Data

Kenya is an ethnically, culturally, and economically diverse country. Particularly after electoral violence in 2007 and 2008, it has been listed in a number of fragility indices and has frequently been listed in a group of countries at high-risk of fragility. In 2016, for example, FSI rank Kenya in the 20 most fragile states, despite a number of legislative and constitutional reforms in the aftermath of the contested election in 2007.<sup>9</sup> Most notably, these reforms created an ambitious decentralisation process which aimed to transfer importance governance decision-making to sub-national legislatures, giving autonomy to these bodies to address local service requirements (World Bank, 2012). Despite such reforms and impressive economic growth, however, Kenya's underlying fragility classification has not similarly improved. Given such diversities and background, Kenya is an interesting case-study for our purposes, particularly in providing opportunity to understand why apparent improvements in the country have no substantially changed macro-level fragility.

To this end, we collect data in the 2016 wave of HORTINLEA survey collected in rural, peri-urban, and urban areas of Kenya to test the validity of our fragility exposure index. Data collection under the HORTINLEA survey started in September 2014 and continued in 2015 and 2016 in a total of three waves. The FEM was introduced to the survey questionnaire in the latest wave.<sup>10</sup> Even though the main focus of the survey is on agricultural and horticultural production, it contains comprehensive socio-economic information on households and individuals, which augment the reach of the FEM.

Households for the survey were selected using a multistage sampling approach. Given the agricultural nature of the survey, a purposive sampling technique was used to select five counties within rural and peri-urban strata. These are: Kisii and Kakamega (rural), Nakuru and Kiambu (peri-urban), and Nairobi (urban). Selection of sub-counties and divisions is based on information from the respective district agricultural offices. From each division, locations/wards were randomly selected, and households within locations were in turn randomly sample, giving a total sample size  $N = 1000$  households: 700 in rural and peri-urban counties and 300 in Nairobi.<sup>11</sup>

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<sup>9</sup> For the most part, these reforms reduced the power of the president, increased the role of parliament and Kenyan citizens and created an independent judiciary.

<sup>10</sup> The 2016 wave was conducted from September till October 2016 by Humboldt University of Berlin in collaboration with Egerton University and Leibniz University of Hannover. The data collection is funded under the initiative for global food security (GlobE) of the German Federal Ministry of Education and Research and the German Federal Ministry for Economic Cooperation and Development.

<sup>11</sup> It is important to note that HORTINLEA is not nationally representative, but rather, representative of a particular sub-section of Kenyan society. In turn, although our results cannot be fully generalised to the entire population of Kenya, this data still provides the opportunity to test our baseline hypotheses.

## 4.2 Approach

The HORTINLEA survey questionnaire includes a large section on crime and instability in addition to general socio-economic and demographic information, ensuring that the survey already covers a range of key FEM questions. These include: satisfaction in living conditions, personal and neighbourhood security, financial and social standing; fear of crime at home and outside, and fear of war and ethnic conflict; participation in local and central elections, as well as membership in political parties and social groups (e.g., women's groups); trust in a comprehensive list of formal and informal institution (e.g., central government, police, courts, informal village government, etc); perception of power these institutions and their effectiveness in the provision of services; experiences of crime, insecurity (measured via the presence of non-state groups), and corruption. In this regard, the full FEM required only small additions to the survey in question.

In Figure 1, we illustrate the nature of some of this data and the importance of considering fragility at the micro-level. Figure 1 indicates for a selected number of formal and informal institution the mean values of the following four variables: (i) Power; (ii) Effectiveness; (iii) Trust; and (iv) Ease of Services Without Bribes. In all cases, questions are asked on Likert scale running from 1-10, with 1 implying the worst indicators; and 10 the best. We find that religious institutions have a mean value of about 8 for all four variables. In other words, Kenyans perceive religious institutions to be very powerful, effective, trustworthy, and that they can obtain services easily from them without bribes. This static trend also applies for village governments at a mean value of about 6. However, even though Kenyans perceive the central government to be powerful (mean value of about 7), they do not trust it with the same intensity, and are not able to get assistance easily without bribes. The same diminishing trend applies to the police and courts.

[FIGURE 1 ABOUT HERE]

These results provide an important glimpse on the existence of a 'governance gap' for formal institutions in Kenya between the central and local levels. Central, formal institutions are viewed as less able to deliver legitimate services, despite their perceived power. Identifying this gap underscores the importance of using micro-level indicators for measuring fragility and to understand better how different individuals are affected by it. A powerful central government or police force need not necessarily effective in the provision of services to local communities, implying counteracting impacts on fragility. Individuals trust local informal village governing bodies more, and are believe they are more likely to obtain better services from them vis-a-vis the central and county governments. *Ceteris paribus*, such a situation may be viewed as undesirable, yet in the case of weak delivery from the central government, shortfalls can be compensated by an

effective, if informal, form of local governance. In such a case, *ceteris paribus*, effective (informal) local institutions mitigate and reduce experience of fragility. Measures that do not account for such different experiences across people and across branches of government are, therefore, likely to overestimate the experience of fragility.

### 4.3 Results

Based on Equation (1), we construct the FEI using the normalised value of the sub-indicators as listed in Table 1. Following the generation of this index from the underlying data, we first undertake a number of tests on the structure of the data, in order to ensure that our main results hold. First, in order to ensure that all domains are relevant, we conduct a factor analysis. This analysis is designed to ensure that each domain captures something that the others do not. For example, if the economic inclusion domain explained a significant proportion of the underlying variation in the data, it seems possible to suspect that the index really captures poverty, rather than fragility. In such a setting, it would be *a priori* expected that regional, gender or other group-based differences would be found. Our factor analysis shows, first, that the three domains explain something in the order of 60% of the variance in the index; and that each domain contributes approximately equally to this variance (about 20% is explained by economic inclusion; and around 17% by each of the other domains).<sup>12</sup> In Figure 2, we compare the distribution of the three domains. First, we see that Kenyans are more likely to experience fragility via the human security and economic inclusion domains. Human security shows a mean of 0.53 and economic inclusion of 0.56, compared to a value of 0.36 for social cohesion. Perhaps more important, however, is that Figure 2 shows that the medians for each domain are very close to the mean, suggesting relatively clustered data and implying that outliers have weak influence on the wider outcomes.

[FIGURE 2 ABOUT HERE]

In Figure 3, we plot the distribution of the FEI, separating the sub-indicators capturing perceptions of fragility from actual experiences of it. Subsequently, the same approach is applied to each of the respective domains. Figure 3a, therefore, compares the distributions for the entire index, and Figures 3b-3d for human security, economic inclusion and social cohesion, respectively. Figure 3 shows that Kenyan's experience of fragility (mean 47.5) is significantly lower ( $p < 0.001$ ) than their perceptions of it (mean 55.7). This finding holds for the human security and social cohesion domains, but actually reverses for the economic inclusion domain. This, in general, implies that Kenyans experience less fragility than they perceive they do but, as a counterpoint, are also less well-off, economically, than they perceive themselves to be.

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<sup>12</sup> Results from the factor analysis are available from the authors upon request.

[FIGURE 3 ABOUT HERE]

In the next stage, we run comparative analyses by splitting the sample across a range of individual and household characteristics. We split the sample by geographic region, gender, age, marital status and religion. We show the mean differences between the various groups in Table 2 for the whole index and for each domain. For categorical variables, such as region, marital status, age, and religion, we report the significance levels of the average means of the pairwise differences between each category.

First, in terms of regional variations, we find that individuals living in rural counties in Kenya experience significantly more fragility than residents of peri-urban counties. The differences are significant at the 5% level. However, this pattern does not always hold if we examine each county separately. Individuals residing in Kakamega, a rural county, experience higher fragility levels in comparison the rest of the individuals in the sample. In contrast, peri-urban Kiambu residents exhibit lower fragility compared to the rest of the sample. Yet, there are no notable mean differences for Kisii (rural) and Nakuru (peri-urban). Hence, although the differences in fragility exposure between rural and urban areas are significant, the effect is driven mainly by county-specific variations.

Second, younger people (aged 25 and below) experience more fragility in comparison to other age cohorts in the sample. This difference, however, is driven only by the social cohesion domain, implying that older individuals have stronger social networks that help to mitigate the impacts of the other domains. Given the time taken to build up such networks, such a finding seems uncontroversial, yet is still important as it implies younger people may lack the networks to successfully cope with major shocks. Third, there are no notable differences in fragility between men and women, which is mainly driven by the equal means in the human security domain. Men are worse off in the economic domain than women but women, consequently, experience higher fragility than men in the social cohesion domain.

[TABLE 2 ABOUT HERE]

Fourth, in terms of religion, we find no differences in exposure to fragility for Protestants (the largest group) and Muslims (the smallest group). However, Catholics are on average more exposed than any of the other groups in the sample, including individuals who reported having other religious preferences or none. Lastly, monogamous households are less exposed to fragility than single or polygamous households. The differences in exposure to fragility between these groups is very notable and significant at the 1% level and is particularly strong for single individuals, despite no noticeable differences in the economic inclusion domain between the groups.

Next, we compare the findings from our case study to that of the Fragile States Index for

Kenya in 2015. In order to generate a valid comparison, we transform both our index and the FSI to take a value between 0 and 30, where 30 denotes the greatest fragility. Table 3 shows the average fragility for the two indices. The FSI for Kenya has a value of 24.4, while the FEI has a value of 14.6, with the largest differences arising in the social cohesion domain. At face value, this comparison suggests that although Kenya exhibits a high level of fragility, this is less pronounced at the individual level, mostly due to the inclusion of informal institutions in the FEI. We note that our sample is representative, only, for a specific section of Kenyan society, however and that such generalisations could be misleading. At the same time, that the specific section of Kenyan society experiences fragility in a different way than suggested by aggregate measures is still important. On one hand, it implies that informal institutions and other networks at the individual level are an important, but typically omitted, component of fragility. On the other hand, it reinforces the point that some sections of society experience fragility very differently than either society as a whole, or other subsections of that society.

[TABLE 3 ABOUT HERE]

## 5. Conclusions

In this article, we inspect the micro-foundations of fragility. In doing so, we define fragility along the lines of previous work but apply these concepts to how individuals experience manifestations of such fragility. We thereby open up a significantly richer research potential than is provided by state-centric, aggregate, and/or binary measures of fragility that are common in the literature. We generate a so-called Fragility Exposure Index (FEI), which is based on three distinct domains: Human Security, Economic Inclusion, and Social Cohesion. These domains are in turn composed of sub-indicators from a set of variables which can be inserted into standard household or individual surveys if they are not already included. The analysis of this data not only allows us to define if a state is 'fragile' or not but also to consider how different individuals in that state experience fragility.

To test the ideas behind this work, we conduct a trial by developing an FEI based on a fragility exposure module (FEM) into a panel household survey in Kenya in 2016. The results from this analysis demonstrate that individuals in Kenya experience fragility differently depending on their location (rural areas), age group (youth), religion (Catholics), and marital status (singles). Such findings support our assertions that aggregate measures are, often, a blunt instrument in measuring and understanding fragility. Individuals in different locations and of different socio-economic characteristics clearly experience fragility differently.

It is important to note that the findings are based on a limited case study of our fragility

exposure module which uses data from the HORTINLEA survey in Kenya. In this regard, the results we present here should be taken as illustrative of what can be achieved by this approach, rather than as a finished product. Future research should consider inserting the FEM in nationally representative surveys and conducting similar analyses to those presented here. Such work would be doubly beneficial. First, it would provide stronger grounds to make comparisons between micro- and macro-level measures of fragility; and second, it would provide even stronger evidence of the group-based differences we illuminate in this work. Inclusion of the FEM in multiple surveys, therefore, would allow better robustness and validation tests of this index; furthermore, it may allow data reduction analyses to be conducted on the indicators that are most important. Two benefits arise from such analyses. First, it allows inter-region and international comparison of the factors that are most important in determining exposure to fragility. Second, a shorter FEM that captures the essential variation increases the usefulness of the module and the opportunity for its insertion in a greater array of surveys.

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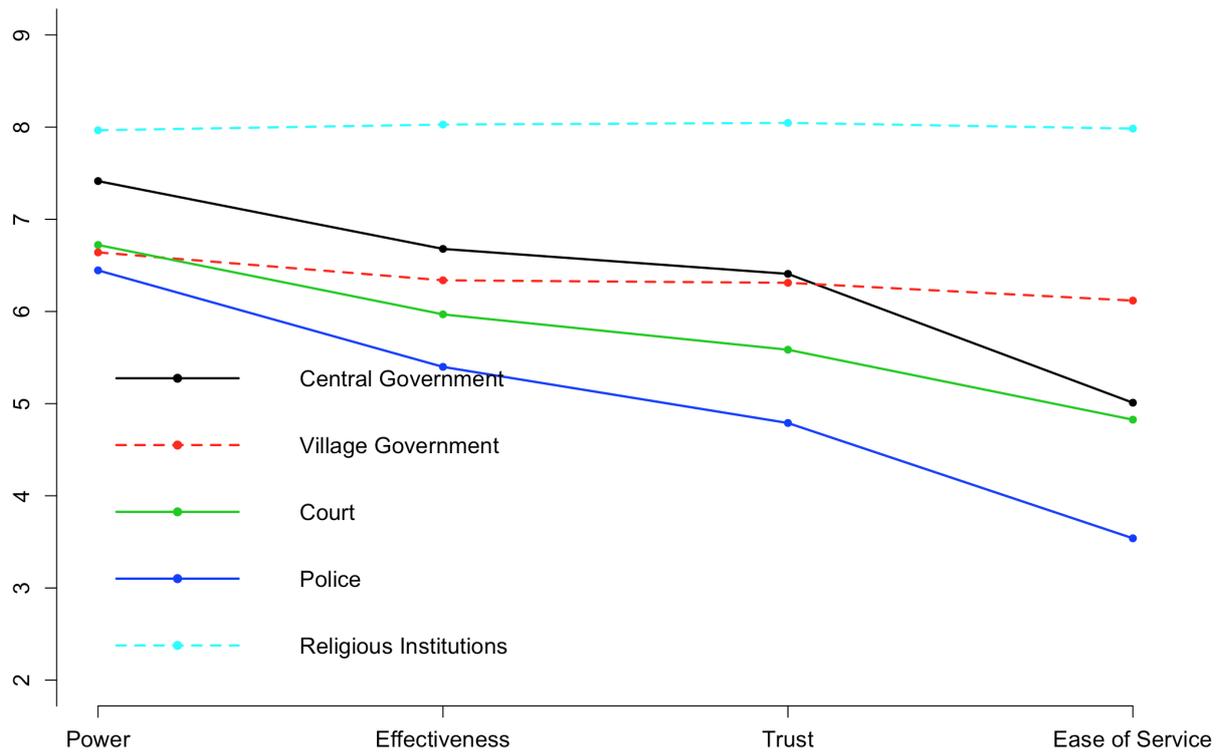
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# Annexes

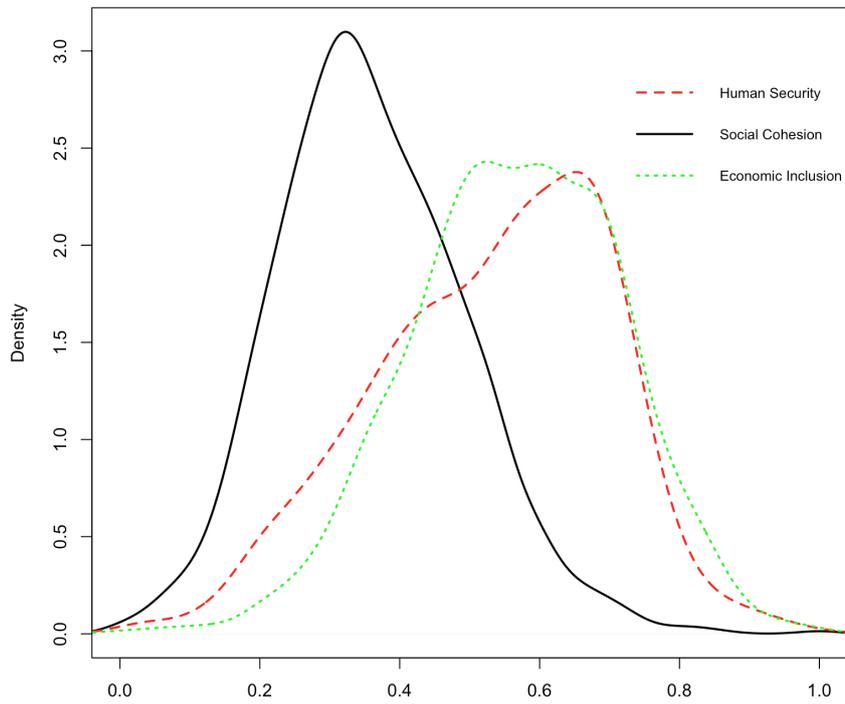
## Annex 1: Tables and Figures

Table 1. Sub-indicators and domains of the Fragility Exposure Index (FEI)		
Domains	Individual Sub-Indicators (Experiences)	Individual Sub-Indicators (Perceptions)
HUMAN SECURITY	<p>Presence of non-state criminal actors in district</p> <p>Previous experiences of theft, sexual assault, physical assault and bribery happened in the last year</p> <p>Preventive measures undertaken to protect against crime</p> <p>Ease of service without bribe from formal institutions (central government, county government, police)</p> <p>Considering leaving due to security</p> <p>Distance 2 police</p>	<p>Fear of crime at home and unsafety in neighbourhood</p> <p>Satisfaction with personal, neighbourhood, and district security</p> <p>Importance of owning personal weapons and reporting family member who committed crime</p> <p>Trust and perception of effectiveness in formal institutions (central government, county government, police, courts)</p> <p>Fear of war, ethnic conflict, religious/ethnic conflict, governmental and local authority misconduct, and police violence and arbitrary controls, crime in village, banditry, Juvenile delinquency, and worry about land conflicts</p>
ECONOMIC INCLUSION	<p>Ease of service without bribe from private sector and NGOs</p>	<p>Satisfaction with financial situation, food security, and living standards</p> <p>Fear of corruption in village, and worry about unemployment, loan</p>

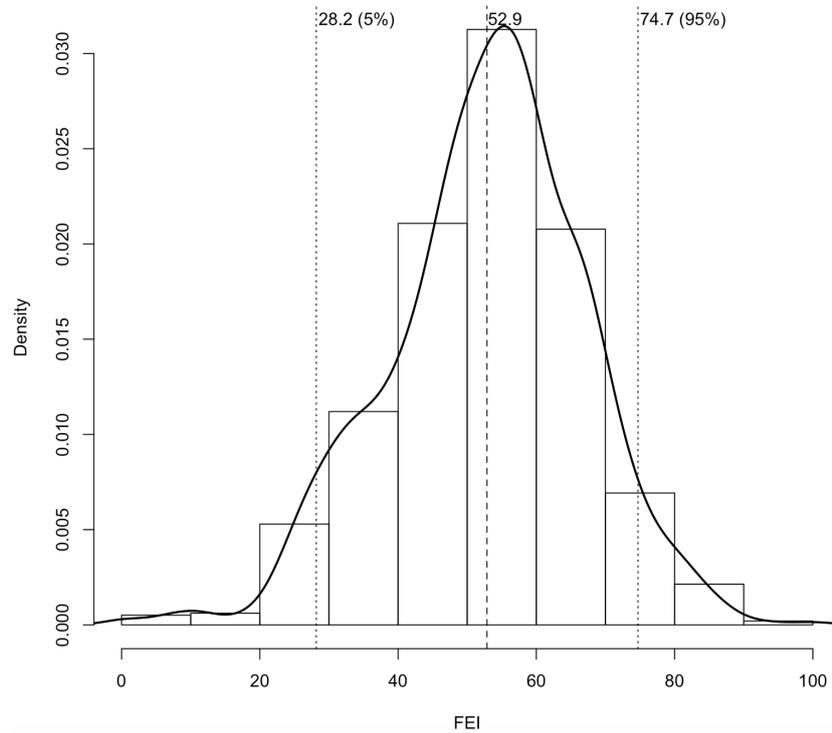
		<p>sharking , and food insecurity in country</p> <p>Trust and perception on effectiveness of privates sector and NGOs</p>
<p>SOCIAL COHESION</p>	<p>Membership of women and youth groups and political parties</p> <p>Registration and participation in previous local and central elections</p> <p>Stealing if stolen from and contact for settling disputes in case of crime</p> <p>Ease of Service without bribe from informal village governments, courts, religious institutions, and traditional institutions.</p>	<p>Satisfaction with leisure time, social equality in village, community integration, and family life.</p> <p>Expectation of registration and participation in future local and central elections</p> <p>Trust and perception on effectiveness of village govns, courts, religious institutions and traditional institutions</p>



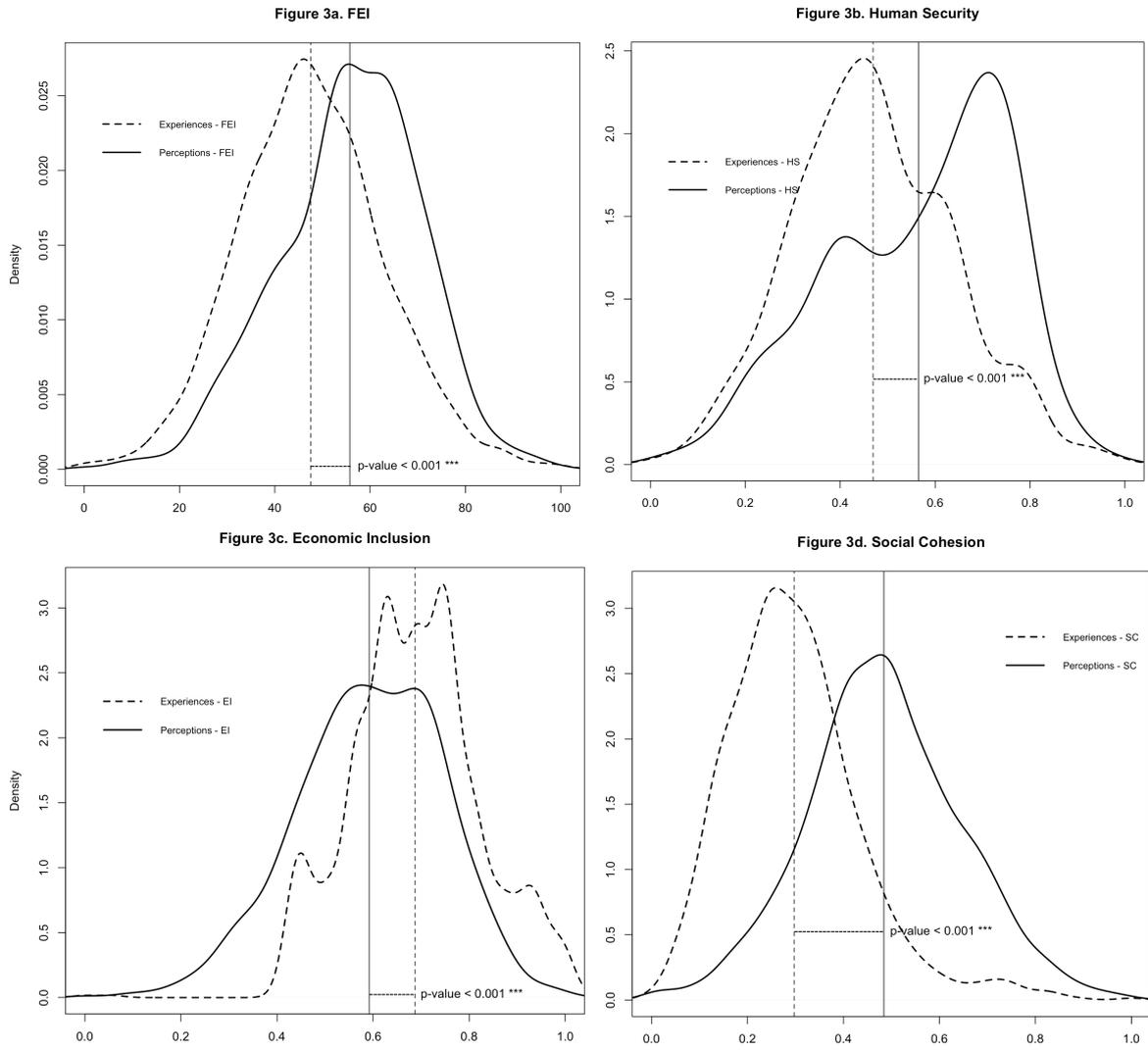
**Figure 1. Governance Gap of Formal Institutions in Kenya**



**Figure 2a.** Distribution of the Domains of Fragility Exposure Index - Kenya



**Figure 2b.** Distribution of the Fragility Exposure Index - Kenya



**Figure 3.** Differences between experiences and perceptions of the Fragility Exposure Index and its Domains - Kenya

**Table 2.** Variations in exposure to fragility across groups and locations

	<b>FEI</b>	<b>Human Security</b>	<b>Econ Inclusion</b>	<b>Social Cohesion</b>
<b>Gender</b>				
Female	52.96 (14.03)	0.54 (0.17)	0.56 (0.15)	<b>0.37 (0.13)</b>
Male	52.59 (14.24)	0.52 (0.17)	<b>0.59 (0.15)</b>	0.34 (0.13)
p-value	0.721	0.254	0.010**	0.019**
<b>County</b>				
Nairobi	<b>55.84 (13.32)</b>	<b>0.55 (0.16)</b>	<b>0.58 (0.14)</b>	<b>0.40 (0.14)</b>
Kisii	50.71 (14.05)	0.53 (0.18)	0.54 (0.16)	0.33 (0.12)
Kakamega	53.38 (14.46)	0.54 (0.17)	<b>0.58 (0.15)</b>	0.34 (0.13)
Nakuru	52.54 (14.14)	0.54 (0.17)	0.56 (0.16)	0.35 (0.12)
Kiambu	50.63 (14.03)	0.49 (0.17)	0.55 (0.15)	0.36 (0.14)
p-value	<0.001***	0.010**	0.046**	<0.001***
<b>Age Group</b>				
Age <= 25	55.44 (12.84)	0.55 (0.16)	0.53 (0.14)	<b>0.44 (0.13)</b>
25 < Age <= 45	53.27 (14.03)	0.53 (0.17)	0.57 (0.15)	0.37 (0.14)
45 < Age <= 65	52.20 (14.00)	0.53 (0.17)	0.57 (0.15)	0.34 (0.13)
Age > 65	51.47 (15.61)	0.51 (0.17)	0.57 (0.16)	0.34 (0.14)
p - value	0.265	0.634	0.322	<0.001***

**Table 2 – Continued.** Variations in exposure to fragility across groups and locations

	FEI	Human Security	Econ Inclusion	Social Cohesion
<b>Religion</b>				
Protestant	52.59 (13.71)	0.52 (0.17)	0.57 (0.15)	0.36 (0.13)
Catholic	<b>55.25 (13.76)</b>	<b>0.56 (0.16)</b>	0.58 (0.14)	0.38 (0.13)
Muslim	49.09 (13.88)	0.48 (0.18)	0.55 (0.17)	0.33 (0.08)
Other Christian	51.36 (14.95)	0.53 (0.16)	0.54 (0.15)	0.35 (0.14)
Other	<b>55.72 (11.34)</b>	0.46 (0.13)	<b>0.63 (0.08)</b>	<b>0.44 (0.14)</b>
p-value	0.033**	0.032**	0.05*	0.044**
<b>Marital Status</b>				
Single	<b>57.91 (13.95)</b>	<b>0.59 (0.16)</b>	0.58 (0.15)	<b>0.41 (0.14)</b>
Married, Poly	53.32 (15.60)	0.53 (0.18)	0.57 (0.15)	0.37 (0.14)
Married, Mono	52.03 (13.91)	0.53 (0.16)	0.56 (0.15)	0.35 (0.13)
Divorced/ Widowed	53.44 (13.56)	0.53 (0.18)	0.55 (0.14)	0.39 (0.13)
p-value	0.002***	0.008***	0.679	<0.001***

*standard deviation in parentheses.*

<b>Table 3. Comparing micro and macro fragility indices for Kenya</b>			
<b>Fragile States Index (FSI) *</b>			<b>Total</b>
Political and Military Indicators	Economic Indicators	Social Indicators	
8.2	7.7	8.5	24.4 / 30
<b>Fragility Exposure Index (FEI) **</b>			
Human Security Domain	Economic Inclusion Domain	Social Cohesion Domain	
5.3	5.6	3.6	14.5 / 30
<p><i>* The mean of the indicators within each domain from FSI are calculated.</i></p> <p><i>** Our fragility exposure index is transformed to match that of FSI, where each domain is multiplied by ten.</i></p> <p><i>All values for 2016/most recent available.</i></p>			

## Annex 2: Fragility Module Additions – HORTINLEA Survey

PERSONAL SATISFACTION: Please choose the level, which fits to your personal perception!
<b>On a scale of 1 = completely dissatisfied to 10 = completely satisfied, how satisfied are you with ...</b>
...your personal security?
... the security in your neighborhood?
... the security situation in your district?
... you community integration / social integration, supportive interaction with neighbours?
... you social equality in your village / community
... spare time / leisure
... you family life
... your financial situation

How often in the last year have you or anyone in your family:
... Felt unsafe walking in your neighbourhood at night
... Feared crime in your own home

In the previous 12 months, were there any organized groups posing insecurity in your district?	0 = No ; 1 = Yes
On a scale from 1 to 10, how important is it to own a weapon to defend yourself and your family?	
Imagine that a close family member committed a violent crime. On a scale from 1 to 10, how likely would you report him/her to the police?	

Do you belong to a political party?	0 = No 1 = Yes
Did you register to vote in the last national election?	
Did you register to vote in the last local elections?	
Do you think you will register to vote in the next national election?	
Do you think you will register to vote in the next local election?	

Please indicate how much you are afraid of certain phenomena in your village	
...	
banditry	0 = No fear 5 = fear
War	
Religious/ethnic conflict	
Misconduct of govern. authorities	
Misconduct of local authorities	
Police violence	
Arbitrary police control	
Crime	
Corruption	

<b>Type of Institution</b>	How good does [institution] deliver services in Kenya today?	How much do you trust [institution] in Kenya?	How easy can you obtain assistance from [institution] without bribe in Kenya today?
Central Government	1= Very Ineffective to 10 = Very Effective	1= Completely Untrustworthy	1= Extremely difficult to 10 = Extremely Easy
Local/County Government		to	
Police		10 = Completely Trustworthy	
Court			
Religious Institutions			
Traditional Institutions			
NGOs			
Private Sector			
Village government (informal)			