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Vulnerability: A View From Different Disciplines

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VULNERABILITY: A VIEW FROM DIFFERENT DISCIPLINES

by

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ABSTRACT

Practitioners from different disciplines use different meanings and concepts of vulnerability, which, in turn, have led to diverse methods of measuring it. This paper presents a selective review of the literature from several disciplines to examine how they define and measure vulnerability. The disciplines include economics, sociology/anthropology, disaster management, environmental science, and health/nutrition. Differences between the disciplines can be explained by their tendency to focus on different components of risk, household responses to risk and welfare outcomes. In general, they focus either on the risks (at one extreme) or the underlying conditions (or outcomes) at the other. Trade-offs exist between simple measurement schemes and rich conceptual understanding.

Key Words: vulnerability, risk, risk management, poverty dynamics.

EXECUTIVE SUMMARY

The recent World Development Report (WDR) 2000/1 highlights the interface between empowerment, security, opportunity - and poverty. This approach to thinking about poverty brings the concepts of risk and its management to the center of the policy dialogue. At the same time, use of the term “vulnerability” has proliferated. This term refers to the relationship between poverty, risk, and efforts to manage risk. Social risk management (SRM) is a new means of looking at poverty, risk, and risk management that has recently been presented in the World Bank’s Social Protection strategy. The SRM perspective addresses how vulnerable households can be helped to better manage risks and become less susceptible to welfare losses.

The World Bank is moving forward in applying conceptual and operational definitions of vulnerability. Practitioners from different disciplines use alternative meanings and concepts of vulnerability, which, in turn, have led to diverse methods of measuring it. Differences in approaches to vulnerability among the disciplines can be explained by their tendency to focus on different components of risk, household responses to risk and welfare outcomes. The objective of this paper is to present a selective review of the literature from several disciplines to examine how they define and measure vulnerability. The disciplines include economics (including the poverty dynamics, asset-based, sustainable livelihoods and food security literatures), sociology/anthropology, disaster management, environmental science, and health/nutrition. As an organizing framework, vulnerability is decomposed into several components: a) the *risk*, or risky events, b) the options for managing risk, or the *risk responses*, and c) the *outcome* in terms of welfare loss.

The focus of most disciplines is either on the risks (at one extreme) or the underlying conditions (or outcomes) at the other. Since each discipline has its own reasons for defining and measuring vulnerability, there is no reason to presume that concepts, measures and methods will be identical across the disciplines. Therefore, lessons learned in one area may not be suitable for all. The differences might justify multidisciplinary cooperation to seek improved and agreed upon definitions and measures of vulnerability.

Vulnerability: A View from Different Disciplines*

1. INTRODUCTION

1.1. *Background*

The recent World Development Report (WDR) 2000/1 (World Bank, 2000) highlights the interface between empowerment, security, opportunity - and poverty. This approach to thinking about poverty brings the concepts of risk and risk management to the center of the policy dialogue. At the same time, use of the term “vulnerability” has proliferated. This term refers to the relationship between poverty, risk, and efforts to manage risk.

“Social risk management” (SRM), is a new means of looking at poverty, risk, and risk management that has recently been presented by the World Bank’s Social Protection Unit (World Bank, 2001). Holzmann and Jorgensen (1999) coined the phrase “social risk management” to refer to the social management of risks - how society manages risks.¹ SRM includes the broad range of formal and informal proactive and reactive risk management strategies by individuals, communities, nations and communities of nations. From a SRM perspective, social protection addresses how vulnerable households can be helped to better manage risks and become less susceptible to welfare losses.

Some general principles related to vulnerability as a concept include the following: a) it is forward-looking and defined as the probability of experiencing a loss in the future relative to some benchmark of welfare, b) a household can be said to be vulnerable to future loss of welfare and this vulnerability is caused by uncertain events, c) the degree of vulnerability depends on the characteristics of the risk and the household’s ability to respond to the risk, d) vulnerability depends on the time horizon, in that a household may be vulnerable to risks over the next month, year, etc. and responses to risk take place over time, and e) that the poor and near-poor tend to be vulnerable because of their limited access to assets (broadly defined) and limited abilities to respond to risk.

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Practitioners from different disciplines use different meanings and concepts of vulnerability, which, in turn, have led to diverse methods of measuring vulnerability. Differences in approaches to vulnerability among the disciplines can be explained by their tendency to focus on different components of risk, household responses to risk and welfare outcomes.

The objective of this paper is to present a selective review the literature¹ from several disciplines to examine how they define and measure vulnerability. The disciplines include economics (including the food security, asset-based, and sustainable livelihoods literatures), sociology/anthropology, disaster management, environmental science, and health/nutrition. It is hoped that this paper will stimulate thinking and discussions about vulnerability, and help lead towards the articulation of clearer definitions and measures.

1.2. Organizing Framework

To better understand the literature, we decompose vulnerability into several components of a *risk chain*: a) the *risk*, or risky events, b) the options for managing risk, or the *risk responses*, and c) the *outcome* in terms of welfare loss. The SRM approach uses this risk/vulnerability decomposition to understand means by which society can manage risk at any part of the chain. The SRM search for optimal vulnerability reduction involves understanding the most efficient means of managing this risk and tradeoffs that exist along the chain. Our focus is on household vulnerability.² The logic then proceeds as follows: households are vulnerable *to* suffering an undesirable outcome, and this vulnerability comes *from* exposure to risk.

Vulnerability begins with a notion of *risk*.³ Risk is characterized by a known or unknown probability distribution of events. These events are themselves characterized by their magnitude (including size and spread), their frequency and duration, and their history – all of which affect vulnerability from the risk. Social actions can reduce risk or exposure to risk. Commodity price stabilization programs, for example, reduce price risk. SRM can also, however, help manage risk at other parts of the risk chain.

Households can *respond to*, or manage, risks in several ways. Households use formal and informal risk management instruments depending on their access to these instruments. Risk management involves *ex ante and ex post* actions. Ex ante actions are taken before a risky event

¹ This is not intended to be a comprehensive of all literature related to vulnerability nor a comprehensive review of any particular discipline's literature. Instead, it provides a panoramic review emphasizing the diversity of approaches to vulnerability.

² The vulnerability of individuals within a household and intra-household dynamics might in fact be critical to understanding household vulnerability.

³ In the literature some authors point out differences between risk and uncertainty, while others argue that they are interchangeable. We assume that they are interchangeable (see Siegel and Alwang, 1999, p.3).

takes place, and ex post management takes place after its realization. Ex ante risk reduction can reduce risk (e.g., eradication of malaria-bearing mosquitos) or lower exposure to risks (e.g., malaria pills, mosquito nets). It is also possible for a household to take ex ante risk mitigation actions that provide for compensation in the case of loss such as purchase of insurance. Risk mitigation includes formal and informal responses to expected losses such as self-insurance (e.g., precautionary savings), building social networks, and formal insurance based on expansion of the risk pool. Ex post risk coping activities are responses that take place after a risky event is realized and involve activities to deal with realized losses such as such as selling assets, removing children from school, migration of selected family members, seeking temporary employment. Some governments provide safety nets, such as public works programs and food aid, that help households cope with risk.

Households often face constraints to adopting efficient risk management practices. These constraints are related to problems of asymmetric information, incomplete or missing financial and insurance markets, cognitive failures in the assessment of risks, the inability of informal mitigation efforts due to covariate risks, and exclusion from social networks (Holzmann and Jorgensen, 1999; 2000). Policy can reduce or eliminate some constraints, but others may require alternative means of risk management because the cost of the policy exceeds its benefits. For a specific household, the set of available risk management options is determined by its assets, broadly defined (see Siegel and Alwang, 1999).

Risk, combined with the household responses, lead to the *outcome*. Thus, the household is said to be *vulnerable from* the risk or *vulnerable to* an outcome. The magnitude, timing and history of risks and risk responses help determine the outcome. A household might be able to mitigate or cope with a risk or set of risks in a given period, but the process can result in limited ability to manage risk in subsequent periods – especially when assets are degraded (see Holzmann and Jorgensen, 1999; 2000; Siegel and Alwang, 1999).

The *outcome* of the risk and risk response process, in terms of welfare loss relative to a given benchmark, is a major interest of social policy. To make the concept vulnerability useful, a socially accepted minimum must be agreed upon for each outcome. For vulnerability to consumption poverty, for example, we might use a poverty line. Vulnerability to malnutrition might be defined in terms of a minimum anthropometric index value. While we can measure losses ex post -- such as welfare lost, levels of consumption below a poverty line, loss of assets and their value, increased malnutrition, suffering from physical violence, etc.-- these are only the static outcomes of a continuous process of risk and response. Vulnerability is the continuous forward-

looking state of expected outcomes. Ex post welfare losses are neither necessary nor sufficient for the existence of vulnerability. Welfare losses, in and of themselves, are not sufficient to identify a household as vulnerable because we associate vulnerability only with those welfare losses that leave a household below a socially defined minimum level.

Working Concept of Household Vulnerability

A household is said to be vulnerable to future loss of welfare below socially accepted norms caused by risky events. The degree of vulnerability depends on the characteristics of the risk and the household's ability to respond to risk. Ability to respond to risk depends on household characteristics – notably their asset-base. The outcome is defined with respect to some benchmark—a socially accepted minimum reference level of welfare (e.g., a poverty line). Measurement of vulnerability will also depend on the time horizon: a household may be vulnerable to risks over the next month, year, etc.

1.3. *Outline of paper*

The concept of vulnerability – how it is defined and measured - is examined for several disciplines, using the above organizing framework. The general economics literature is reviewed first. Attention is then given to specific sub-areas of the economics literature: poverty dynamics, food security, asset-based approaches, and sustainable livelihoods. The sociology and anthropology literatures are summarized together. The disaster management literature is presented next. This strand of literature is eclectic and encompasses disciplines as diverse as social theory and structural engineering. Finally, we examine some of the uses of the term vulnerability in the environmental and health/nutrition literatures. The next section makes some generalizations based on the literature, including a summary of recurring themes. The paper ends with a section of concluding remarks.

2. REVIEW OF LITERATURE

Each discipline reviewed tends to view vulnerability in a slightly different manner. Each uses different outcomes as its primary focus and is concerned with different forms of risk. The economics literature, for instance, focuses on sources of economic risk such as price and weather-related variability. Disaster management literature focuses on risks related to natural disasters. Our review examines risks, responses and outcomes as they are treated by the disciplines. It also attempts to clarify differences in terminology. The ultimate goal is to inform how the disciplines help contribute to an understanding of vulnerability.

2.1. Economics Literature

Relative consensus exists about the meaning and measurement of poverty in the economics literature, but the concept of vulnerability is not as well developed. Much of the mainstream economics literature actually avoids using the term vulnerability (Kanbur and Squire, 1999), but the concept is frequently implicit, particularly in the poverty dynamics literature.

Vulnerability as a concept in the economics literature

The economics literature generally conceptualizes vulnerability as an *outcome* of a process of household *responses to risks*, given a set of underlying conditions. Vulnerable households are those that have moved or are likely to move into a state of poverty or destitution as a result of the cumulative process of risk and response. The outcome (poverty status) is an *ex post* state that is assumed to be the primary concern of policy makers. This conceptualization has led some economists to use measures of variability in outcomes (e.g. income variance, especially downside shocks) as their measure of vulnerability. The focus of much of this literature is on measuring outcomes and identifying indicators of the outcomes. This literature rarely separates risk response into its reduction, mitigation and coping components.

Much of the economics literature concerns itself with finding a metric that is comparable across different outcomes. The reason for this concern is that the ultimate target is to add up the results across the outcomes. Money is a convenient metric as it can be added up. The problem occurs when we consider outcomes such as physical violence, death, health and illness, etc. These outcomes all contribute to welfare losses and households are vulnerable to these losses. However, comparing vulnerability to physical violence with vulnerability to a consumption shortfall is difficult. Therefore, a universal concept of vulnerability (one that aggregated all outcomes) might not be attainable, and instead we might need to settle with measures of vulnerability to different outcomes (vulnerability to measurable welfare loss, crime vulnerability, etc.). A recurring criticism of the economics literature is its use of money metrics and the underlying presumption that all losses can be measured in monetary terms. Vulnerability to non-monetizable shortfalls might indeed be a key policy concern, such as malnutrition or criminal violence.

Economic concepts and measurement of vulnerability

A significant amount of the economics literature has been devoted to the defining and measuring of poverty and its determinants.⁴ The economics literature generally agrees that poverty

⁴ Risk management has also been a key subject of research for financial economists, marketing specialists, and analysis of farm/household-level production decisions by agricultural economists. This literature has strong theoretical and empirical underpinnings.

can be construed in terms of shortfalls in access to services, food insecurity, etc., but economists prefer comparable metric approaches to measurement, and frequently use income or consumption expenditures as the metric. Non money-metric approaches can be found, but usually the indicators are tied back to the concept of poverty using a money-metric baseline (e.g., Glewwe and van der Gaag, 1988). In such approaches, alternative indicators of well-being are examined and usually compared in terms of their ability to identify the poor and possibly quantify poverty. That is, alternative indicators (e.g., landholding size, household headship, distance from markets) are compared in their ability to predict a measurable expected outcome (e.g., falling below a poverty line). The outcome of interest is most often income or consumption expenditures, and the benchmark is an absolute poverty line. A poverty profile is, in fact, a means of recognizing that poverty implies non-monetary shortfalls and informing policy makers by identifying the poor and their characteristics. Recently more attention has been paid by economists to weaknesses inherent in a single-metric approach to measuring poverty. The fact that poverty is a complex concept points to the need for supplementary measures to capture the missing items (e.g. Ravallion, 1996; Coudouel and Hentschel, 2000).

Recently, Coudouel and Hentschel (2000) outlined definitions and measures of vulnerability. They state (p.34): “Vulnerability is a broad concept, encompassing not only income vulnerability but also such risks as those related to health, those resulting from violence, and those resulting from social exclusion – all of which can have dramatic effects on households.” They then state (p.34): “we limit our analysis to vulnerability in income or consumption changes. This aspect of vulnerability, measured in income variability, is only one of the many facets of vulnerability.” They present measures of income vulnerability in terms of its mean and standard deviation (without necessarily weighting negative shocks greater than positive windfalls).⁵

The insistence on use of a common metric in the economics literature improves the empirical tractability of the analysis. However, many types of vulnerability are difficult to compare. Several elements of social concern may simply not be comparable, although economics can provide insights into these areas separately. For instance, we may be concerned with vulnerability to crime or social unrest or to inadequate education. Economics can inform about how to lower vulnerability in each case, but we may need to begin with an identifiable minimum level of each outcome, and vulnerability can be defined as the probability of falling below that level (also the length of time below the level and the degree of shortfall, if quantifiable). The separate vulnerabilities to each outcome would be difficult to aggregate to a single number because of the

⁵ They also note the limitations of using income variability as a proxy for vulnerability.

issue of common metrics and the fact that society may place different weights on failure to achieve different minimum levels.

2.1.a. Poverty Dynamics Literature

A relatively large literature exists on poverty dynamics, recognizing that poverty status is not fixed, but contains a time reference (e.g., Bane and Ellwood, 1986; Jalan and Ravillion, 1998). However, this literature tends to focus on the static *outcome* of vulnerability: ex post movement into (and out of) a state of poverty. The poverty dynamics literature is related to the concept of vulnerability in the sense that poverty is recognized as the *outcome* of a dynamic process. The outcome of the process—poverty—is assumed to be the primary policy focus, and not the process itself. Use of specific benchmarks for outcomes (e.g., a poverty line) and reliance on money-metrics narrows the focus, and makes the analysis more tractable.

Some economists classify poverty as either chronic or transitory. The distinction depends on the time reference. If the household is poor for the entire reference period, it is deemed chronically poor. Alternatively, if, during the period the household moves in and out of poverty, it is said to suffer from transitory poverty.⁶ The reference period usually depends on survey constraints, but can also be conceptual. In this case, poverty is perceived as a dynamic process, depending not only on the period of reference, but the structure of the household and exogenous events. Transitory poverty may be caused either by structural factors (low education, headship, etc.) and lifecycle events (e.g. divorce) or by riskiness, per se. Most economists distinguish between poverty related to risk and non-risk poverty by calling the former *stochastic* poverty (Morduch, 1994). Stochastic poverty occurs when current consumption falls below the poverty line which is also below permanent income.

Stochastic poverty arises because it is not possible to borrow against future income for reasons such as imperfect credit markets (Morduch, 1994). Structural poverty occurs when permanent income is below the poverty line, perhaps due to a shock associated with household structure. The key problem with structural poverty is that because permanent income is below the poverty line, it is not possible to escape current poverty for a sustained period. In the context of structural and stochastic poverty, vulnerability means being vulnerable to risky events in the sense that a bad outcome could move the household below the poverty line (whereby savings or assets or

⁶ Coudouel *et. al.* (2000) define structural vulnerability (associated with chronic poverty) and transitory vulnerability (associated with transitory poverty) and note that one way to address structural vulnerability might be policy reforms (e.g., workplace safety regulations that reduce the risks faced by certain workers).

other claims do not compensate for losses in income), and the household needs to decrease current period consumption in order to survive.

Numerous studies have examined the determinants of households moving into, and out of, poverty. They use panel data sets and define economic poverty in terms of consumption relative to a poverty line. These studies all find transitory poverty to be significant with large portions of the sample moving into and out of poverty over the study period.⁷ They also find that over longer time periods, fewer households appear to be consistently poor (Dercon, 1999).

A recent paper by Pritchett, *et al.* (2000) is an example from the poverty dynamics literature that demonstrates how vulnerability to poverty can be defined and then measured. They define vulnerability as the risk a household will fall into poverty at least once in the next few years. Vulnerability is thus measured as a probability, and households have greater or lesser degrees of vulnerability. They recognize the need to decompose vulnerability into risk and risk response components, but due to data limitations they used proxies for the risks faced by households and their risk responses. Another promising recent paper from the poverty dynamics literature is Mansuri and Healy (2000). Like Pritchett, *et al.* (2000) they define vulnerability as an ex ante and forward-looking probabilistic measure. They make the case that vulnerability can be measured without panel data – that is, cross section data and other time series data might be used to generate a probabilistic forward-looking measure.

Studies of movement in and out of poverty suggest alternative economic definitions of vulnerability *to poverty*. One could define vulnerability as the probability of falling below the poverty threshold over a given period of time. Such a definition incorporates concepts such as risk and response while not losing the analytical rigor of conventional poverty analyses. An enhanced definition could weight this probability by time or expected time spent below the line and depth (or severity) of shortfall below the line. An alternative, suggested by Ravallion (1998) is to decompose chronic and transient poverty accounting for time spent below the poverty line. The vulnerability described by Ravallion (1998), however, does not explicitly account for the stochastic nature of poverty. The logical consequence is the need to measure the *probability* associated with future states to compute *current* vulnerability.

⁷ Examples include: Gaiha and Deolalikar (1998), Jalan and Ravallion (1998), Dercon and Krishnan (1999), Baulch and McCulloch (1998).

2.1.b. *Asset-based approaches*⁸

Vulnerability as a concept in the asset-based literature

The asset-based approach to poverty analysis describes poverty as caused by inadequate access to tangible and intangible assets.⁹ Poverty is implicitly treated as a dynamic state, with vulnerability being associated with the probability of falling below a benchmark level of current period consumption and the loss or degradation of assets. Thus, the *outcome* of risky events, in this literature, is a state where losses create current welfare losses and lower future expected income flows, consumption, and investment (see Reardon and Vosti, 1995; Moser, 1998; Rakodi, 1999). Longer-term effects can be caused by transactions costs associated with the use of assets to manage risk.

A major conceptual focus of this literature is the ability of households to manage risk through enhanced *responses* to risk.¹⁰ Risk management is achieved by allocating assets before and after a negative event. Ex ante, risk management may take the form of risk reduction (e.g., diversifying asset bases or migrating), or investments in risk mitigation (e.g., precautionary savings, purchasing insurance). Ex post risk management may involve risk coping activities (e.g., sales of assets, using underemployed labor). In most cases, some risk coping might be required to complement compensation received through risk mitigation activities.¹¹

The main strength of the asset-base literature is its focus on how household asset portfolios can be used to manage risk. However, the *outcome* is often not analyzed in detail, and the *risks* faced by the households are themselves often implicit. While it is understood that assets are important, the effectiveness of specific assets in reducing vulnerability has not been established empirically. Without such information on risk responses, the outcome state (i.e., vulnerability—to

⁸ Asset-based approaches are not specific to the economics literature. They are based on economics principles and terminology, but multidisciplinary in nature. This literature includes important contributions from sociology/anthropology perspectives (Moser, 1998; Bebbington, 1999), and environmental scientists (e.g., environmental accounting, which is implicit in the Reardon and Vosti (1995) framework). The new literature on asset-based approaches has its genesis in Amartya Sen's entitlement approach. This approach was incorporated into the sociological/anthropological literature by the late 1980s and entitlements were expanded to include social capital and other forms of intangible assets. Asset-based approaches have begun to be reintroduced into the mainstream economics literature, which is increasingly recognizing the importance of social capital to human and social development.

⁹ Tangible assets include land, labor, capital, savings (i.e., natural, human, physical and financial assets). Intangible assets include social, institutional and political relationships, physical and social infrastructure, and location. See Siegel and Alwang, 1999, p.10-12 for details.

¹⁰ As pointed out in the Oxfam Handbook of Development and Relief (Oxfam, 1995, p.931-2): "People's vulnerability also depends on their assets. ... Cashing in these assets during a crisis helps people to survive. The differences in the types and amounts of such assets held by different households and individuals in part explains differences in their vulnerability."

¹¹ Insurance (formal or informal) rarely provides full compensation for risk-related losses.

asset degradation or some form of poverty) can not be accurately measured. Different assets can be used to manage a variety of risks, and specific assets are more effective in managing certain risks than others (e.g., investments in social capital may assist in management of idiosyncratic risk, but may not provide effective management of covariate risk).

Other concepts and measurement issues

In asset-based analyses households with more income- and other welfare-generating assets are considered to be less vulnerable to welfare losses associated with risky events.¹² Investments in assets can reduce vulnerability through two mechanisms: assets can be used to avoid welfare downswings through improved risk management, and investment over time can increase expected income.

Several concepts related to vulnerability are widely used in this literature. *Susceptibility* is the probability that a household will experience a welfare loss from a given event, and is a function of risks faced, the household's assets and its response history. *Resilience* is the household's ability to resist downward pressures and ability to recover from a shock. Resilience depends on, among other things, the effectiveness of the risk response and the capability to respond in the future. *Sensitivity* is the extent to which the household's asset base is prone to depletion following responses to risk.¹³ Both latter concepts are related to the response and outcome of interest. Some households that are not consumption poor might be *investment poor* because their asset base declines over time and they are unable to generate sufficient surpluses to protect, maintain or enhance their assets (Reardon and Vosti, 1995). This concept of investment poverty is forward-looking and dynamic. Relationships between risks and assets are highlighted in the asset-base literature, but despite the close conceptual parallel between assets and vulnerability, the literature has not yet formalized the connection.

2.1.c. Sustainable livelihoods literature

The sustainable livelihoods literature is associated with the Institute for Development Studies at the University of Sussex, and draws heavily on the work of Amartya Sen (Scoones,

¹² "Vulnerability, therefore, is closely linked to asset ownership: the more assets people have, the less vulnerable they are; the greater the erosion of assets, the greater the level of insecurity (Moser and Holland, 1997, p. 17)."

¹³ The term "resilience" comes from the ecology literature and is loosely defined as a property that allows a system to absorb and use (even benefit from) change. Where resilience is high, it requires a major disturbance to overcome the limits to qualitative change in a system and allow it to be transformed rapidly into another condition. The property is important, yet there is confusion with respect to its use in the literature. Sinha and Lipton (1999) define resilience as the ability of the poor to escape damage due to poverty (p. 2).

1998).¹⁴ The approach represents an important contribution to the understanding of household vulnerability, but the literature tends to use terms and concepts that are unclear or not widely accepted by other disciplines. In this literature, livelihoods are taken as ways in which people satisfy their needs and earn a living. “A livelihood is a set of flows of income..., should be sufficient to avoid poverty,... implies systems of how rural people make a living and whether their livelihoods are secure or vulnerable over time... (Ahmed and Lipton, 1999, p. 6).”

Vulnerability as a concept in the livelihoods literature

Vulnerability, as it is commonly used in this literature, refers to the probability that livelihood stress will occur - with more stress or a higher probability implying increased vulnerability. Thus, their vulnerability might be denoted “livelihood vulnerability.” This concept is forward looking and an ongoing state. Vulnerability has, in this literature, two sides: an external side of risks, shocks, and stress; and an internal side, which is defenselessness, meaning a lack of means to *mitigate* or *cope* without incurring losses (Chambers, 1989). The sustainable livelihoods literature considers both the *risks* and the *responses*. The *outcome* of interest is loss of livelihood and continued “vulnerability” to subsequent shocks.¹⁵ It is not clear how one would specifically measure this vulnerability as there is little discussion of “a minimum level of livelihood.”

Other strands of this literature (e.g. Davies, 1996) distinguish between “structural vulnerability” and “proximate vulnerability.” Those households that exhibit underlying characteristics that make them vulnerable (such as headship, age, households with old and infirm members—similar to concepts of structural poverty) are called structurally vulnerable. Their vulnerability is independent of the productive capacity of their entitlements in a given season or year; in our framework they face high risks with minimal capability to respond. The sustainable livelihood focus on structural vulnerability addresses risk responses over time.

The concept of structural vulnerability is related to notions of stochastic poverty and chronic poverty as used in the economics literature. Structurally vulnerable households have mean levels of well-being (perhaps measured by consumption) that fall below a cutoff—on average, they are poor—thus they also suffer from chronic poverty. This focus of the livelihoods approach—how can resources be managed in a sustainable manner to increase the mean levels of well-being—is consistent with the notion of vulnerability as a forward-looking state. It also may be contrasted

¹⁴ The sustainable livelihoods approach has been adopted by DFID, UNDP, Oxfam, CARE (see Carney, *et. al.*, 1999, for a comparison of the respective livelihoods approaches.

¹⁵ In DFID’s sustainable livelihoods framework, vulnerability is considered both a “context” (e.g., shocks, trends, seasonality) and a “livelihood outcome.” The term vulnerability describes the risk-response interactions and the outcome (see Carney, *et. al.*, 1999).

with typical poverty analyses, which examine causes and solutions to states, which can be short or long term, below a poverty line.

The condition of proximate vulnerability may change from year to year. Davies (1996) notes that vulnerability is not a steady state, but an evolving process created by cumulative conditions. Thus, short-term responses by households to repeated stimuli can be confused with ongoing transformations of the livelihood system (Davies, 1996, p. 24). These changes affect the classification of risk management strategies: over time, activities that are initially identified as *ex post* coping can become *ex ante* mitigation activities as they are adopted as norms.¹⁶ Also, as environmental shocks become more frequent and “normal” the nature of risk changes. Davies (1996) defines *coping* as a set of short-term responses to unusual food stress; *adaptation* represents coping strategies that have become permanently incorporated into the normal cycle of activities. The livelihoods literature places considerable attention on adaptation as a risk response, but does not systematically identify objectives, technologies and constraints that lead to certain adaptation paths. Thus, it is possible that adaptation can lead to an increased cycle of vulnerability by depleting assets (e.g., removing children from school, cutting trees for fuelwood).

Other concepts and vulnerability measurement

Davies (1996) summarizes livelihood vulnerability as a balance between the *sensitivity* and *resilience* of a livelihood system (see box). While sensitivity might be considered a combination of risk and response, it really relates to an outcome. Resilience, in this context is also an outcome—a component of vulnerability. Resilient systems may have reduced exposure and effective responses to risks, but we observe, *ex post*, the degree to which the system has recovered.

Livelihood resilience: allows a system to absorb and utilize (or even benefit from) change. Where resilience is high, it requires a major disturbance to overcome the limits to change in a system.

Livelihood sensitivity: the degree to which a given system undergoes change due to natural forces, following human interference.

Source: Davies, 1996, p 25

Less vulnerable systems are characterized as low sensitivity/high resilience, while most vulnerable systems are low resilience/high sensitivity (see table 1). Davies (1996) suggests that these concepts be analyzed using an extended entitlements approach, using: i) a balance of sources of, and claims on, entitlements, and ii) mediators of those entitlements (markets, property rights,

¹⁶ For example, adapting to the year-to-year existence of a “hungry season” as opposed to developing alternative risk management strategies to smooth consumption over the year.

etc.). Entitlements are broadly defined to include social and environmental assets (or “claims” on assets based on property, social, political or human rights).

This framework is used to evaluate livelihood vulnerability and how it changes over time. The strength of this approach is its strong conceptual link to reasonable standards about what constitutes vulnerability. The empirical applications examine how variables affecting sensitivity and resilience change over time. There is little discussion of how one would aggregate these changes when some of the indicators showed positive change and others showed negative change. It is also unclear how, since livelihood strategies evolve over time, one would evaluate changes in vulnerability during a period of distinct change (there is no discussion about relative weights of different components of the livelihood system).

Table 1.
Two Dimensions of Vulnerability

		Resilience	
		High	Low
Sensitivity	High	Vulnerable	Very Vulnerable
	Low	Not Vulnerable	Vulnerable

Source: Adapted from Davies, 1996.

Much of the focus of this literature has been on description of livelihood vulnerability and changes to it over time. Little effort has been devoted to empirical “measures” of vulnerability. This literature argues that vulnerability assessments need to focus on livelihood vulnerability, but the assessments and the methods have been population-specific or society-specific. One might use the livelihoods framework to evaluate how a given population’s vulnerability and its sources have changed over time. This information can be essential to policy makers and program directors, but it is unclear how the framework can be applied across populations and comparisons over time when some components show an increase and others show a decrease (since there is no explicit weighting system). Empirical applications of the livelihoods approach to vulnerability using case-studies provide information about conceptualizing and analyzing household vulnerability, but the literature does not provide concrete proposals for indicators and measures.

2.1.d. Food security literature

The livelihoods approach is a generalization of the more established literature on food security. In the food security literature, food production or consumption is the most important component of a livelihood (Maxwell, *et. al.*, 2000). This literature focuses on vulnerability as a

state of “food insecurity.”¹⁷ Food security, in contrast, is attained when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life (World Bank, 1986).¹⁸

Vulnerability, in the food security literature, has been defined as the combined effects of “risk and of the ability of an individual or household to *cope* with those risks and to recover from a shock or deterioration of current status (Maxwell, *et. al.*, 2000, p.9).” This definition explicitly recognizes the risk-response-outcome linkages of vulnerability. Alternatively, Barrett (1999a) takes an outcome-based approach (similar to that in the general economics literature) and defines food insecurity as “the risk of irreversible physical or mental impairment due to insufficient intake of macronutrients or micronutrients (p. 1).” Food insecurity, in this context, is the probability of a negative outcome caused by risks.

Vulnerability as a concept in the food security literature

The outcome (food insecurity) is the main focus of this literature, and much effort has been devoted to identifying and mapping it. Significant effort has been devoted to predicting the outcome based on easily measured indicators. The search for indicators provides lessons about how risk-response-outcome components enter this literature. Mapping exercises typically employ measures such as rainfall patterns, forest cover, soil productivity, etc. to identify spatially vulnerable areas (vulnerable to crop failures and food insecurity). These measures are often collected through remote sensing, and their use signals at least an implicit recognition of the role of risk in determining vulnerability to food stress. Other efforts implicitly focus on the response to risk as indicators of vulnerability. Examples include those examining diversity of income sources, cattle and land ownership, etc. as proxies for food insecurity. Consumption of famine foods, frequency of use of coping strategies, migration, asset sales and others have been used as proxies in this literature and their use represents an implicit recognition of the role of household responses as signals of vulnerability. The food security literature implicitly recognizes different components of vulnerability. However, it generally ignores the specific process by which the components interact to determine overall vulnerability.

Barrett (1999b) and Christiaensen and Boisvert (2000) recently developed conceptual frameworks for food insecurity that considers the entire risk-response-outcome chain. Barrett notes that food security is an *ex ante* concept. *Ex post* outcomes such as inadequate food intake, hunger,

¹⁷ As a “measure” of vulnerability, they suggest the proportion of total household budget devoted to food.

¹⁸ Although this definition contains some vagueness, its widespread acceptance has strengthened the consistency of this literature.

undernutrition may be consequences of food insecurity. One may be food insecure without necessarily experiencing these outcomes. Barrett extends the concept of food security to look beyond outcomes and incorporates intra-household dynamics, the role of assets, how behavior affects exposure and response, the separate role of risk, and the importance of irreversibilities and threshold effects. Barrett’s framework makes the important distinction that food security is a forward-looking concept.

**Table 2:
Framework for Evaluation of Vulnerability Indicators**

	Purpose of Indicator		
	Targeting	Monitoring	Evaluation
Main focus	Costs of collection versus benefits from targeting; often searching for a low-cost alternative	Timeliness; costs of collection	Indicator and means of aggregation
Ancillary concerns	Sensitivity/specificity Correspondence to concept (food insecurity)	Sensitivity/specificity Correspondence to concept (food insecurity)	Extant data collection Frequency of collection versus need to update
Benchmark	Correspondence to outcome of interest. e.g. what exogenous variables are closely associated with “vulnerability?”	Correspondence to outcome of interest. e.g. what variables are closely associated with “vulnerability”	Generally, there is no benchmark. Conceptual underpinnings; theoretical consistency; expert opinion
Unresolved issues (the “holy grail”)	Easy to collect indicators that are closely associated with outcome		“Index” of vulnerability that is widely accepted as absolute, comparable across time and space, and closely associated with concept

Measurement of food insecurity and vulnerability

The food security literature is of special interest because a substantial part of it involves identifying and evaluating indicators for targeting assistance and monitoring food insecurity (see table 2). This empirical focus is motivated by a donor-driven desire to predict famine, identify famine-prone areas, and target households and areas for food relief. The literature has benefited

from a clearly defined policy motivation. However, it usually lacks a benchmark to which indicators can be compared. The problem emerges because although there is an agreed-upon concept of food security, it is impossible to measure it with a single variable. Thus, no specific variable exists to which the indicators can be compared¹⁹. In one sense, this problem is the reverse of the poverty dynamics literature, which has one indicator of outcome and none for the risk-response process.

A major theme of food security research is the search for correlates of “food insecurity.” The general idea is to identify easy-to-collect indicators for targeting and program monitoring. As the concept “food security” is difficult to operationalize, such studies often examine the relationship between proxies, such as child malnutrition, consumption, or even standard measures of poverty, and the proposed “indicators.” Indicator evaluation requires comparison to benchmarks, which are presumed to be accurate measurement of the true concept. However, guidance is available as programs to address food security are usually designed to address a particular element of the problem; the benchmark should depend, thus, on the objectives of the program (Chung, *et. al*, 1997).

A second broad avenue of food security research involves mapping. Vulnerability Mapping Exercises, many of which were conducted under FEWS²⁰, use a number of analytical techniques to examine the degree of correspondence between the indicators and the concept of interest (food security or insecurity). In Vulnerability Mapping Exercises, the typical approach is to construct an index of “vulnerability” and identify geographical areas, social sub-groups, etc. with high levels of vulnerability. Several analytical techniques have been used to create the index, including principal component analysis (Vella and Vichi, 1997; FEWS, 1996), cluster analysis, simple rankings across components of the index (Eilerts, 1994; Keogh, 1997), and arbitrary weights applied to the index elements (Keogh, 1997).

Variables included in such efforts generally represent the components of risk, response and outcome without considering interactions between the components. This failure leads to vagueness about their relationship to the underlying concept, which is the dynamic, forward-looking state of food insecurity (see Barrett, 1999b). However, these studies have made progress toward identifying relationships between variables related to food insecurity.

¹⁹ There is no well-defined benchmark or “gold standard” (see Maxwell, *et al*. 1999). Without a benchmark or “gold standard”, it is difficult to evaluate indicators, since there is nothing to compare them to.

²⁰ The USAID Famine Early Warning System (FEWS) Project for Africa. See USAID’s FEWS Current Vulnerability Assessment Guidance Manual, June 1999.

Several poverty-mapping efforts have been conducted to show the spatial distribution of overlaid variables. These techniques (e.g. Bigman, *et. al.*, forthcoming; Carter and May, 1999) use geographical information systems (GIS) software to overlay environmental data (rainfall patterns, soil types and slopes, ground cover, land use, yield forecasts, etc.), infrastructure data (roads, markets, health and educational facilities, etc.), outcome data (e.g., immunization coverage, health status—usually from administrative data), and household data to create a geo-referenced picture of correlates of vulnerability. The maps provide informative displays and the overlays can be used to produce aggregate “indices” of poverty or vulnerability. The validity of such efforts depends on the aggregation scheme (often, indicators are aggregated through shading; whereby a more opaque region might be construed as more vulnerable), and on the extent of endogenous adjustments to food stress. Information about these adjustments, which include reduced risk, mitigation, and coping, have to come through household surveys and there has not been adequate attention given to incorporating them into mapping exercises.

The food security literature is instructive about how to measure or identify something when the true concept is difficult to measure. Sometimes (e.g. the index approach) arbitrary weights are placed on indicators (e.g., deviations from normal rainfall, degree of income diversity) of the concept. The purpose of such exercises is to come up with a single value that can be compared to a cutoff, and target households or regions whose values fall below the cutoff. Other times, specific weights are eschewed and correlates of the “outcome” are identified. In all cases, the scientists explicitly recognize the difficulty in combining and comparing variables without a common metric.

2.2. *Sociology/Anthropology Literature*

Sociologists have been at the forefront in noting that because poverty is a state resulting from a combination of circumstances, measures such as income or consumption fail to adequately describe the poor. Factors such as capabilities, prospects for earning a living, deprivation and exclusion all help determine poverty status (Moser and Holland, 1998; Bebbington, 1999). Threads of the sociological literature have thus supported use of participatory methods²¹ to identify the poor and, where possible, quantify poverty (e.g. Chambers, 1989; Narayan, *et. al.*, 2000).

Many sociologists have adopted the term “vulnerability” as an alternative means of characterizing the dimensions of poverty not ordinarily captured by money-metric measures. In fact, sociologists often discuss “social vulnerability” as opposed to “economic vulnerability” (e.g., Loughhead and Mittai, 2000). They identify vulnerable groups such as “children at risk”, female-

²¹ Because: i) it is difficult for outsiders to observe and measure many of the dimensions of poverty; and ii) the analysts themselves may not understand the dimensions.

headed households, elderly and disabled, and deal with intra-household relations. This focus is similar to the food security literature that tries to identify vulnerable groups based on broad household characteristics, not specific measures of economic outcomes. Moser and Holland (1998) define vulnerability as “the insecurity of the well-being of individuals, households, or communities in the face of a changing environment (p. 2).” They note that since people move in and out of poverty, the concept of vulnerability (loosely defined) better captures processes of change than static measures. Also, they recognize that vulnerability includes aspects such as “livelihood security” which move beyond typical economic discussions of poverty. Vulnerability analysis will include the threat itself, and also household “resilience,” defined as the ability to exploit opportunities, and resist and recover from negative shocks. This notion of resilience encompasses portions of ex ante and ex post risk responses and recognizes the role of assets (broadly defined) in managing risk.

Sociologists have been the primary intellectual leaders behind extending the definition of assets beyond the physical and financial realms to include social capital and strength of household relations (Putnam, 1993; Moser, 1998). Others use the vulnerability concept to describe conditions resulting from labor market segmentation, which enables the analyst to assess more intangible elements of disadvantage (McIlwaine, 1997). Authors have introduced the importance of linkages between access to and ownership of assets and vulnerability, but the links are conceptual and formal tests are rarely conducted (e.g. Moser, 1998). The search for indicators (usually based on assets or access to them) has helped understand how to conceptualize “vulnerability,” but formal tests of association among risk-response-outcome are difficult since the outcome is not measurable or its components are not comparable using a single metric.

Much of the focus of current sociological efforts to understand vulnerability finds its roots dissatisfaction with common-metric focuses on income or consumption. Common-metric approaches, it is argued, resulted in improper policies and misguided programs. Narayan, *et. al.* (2000) describe the diversity of assets affecting vulnerability and argue that participatory efforts are needed if proper policies are to be formulated. This focus on multiple measures and participatory efforts is implicit, because vulnerability is conceived of as an ongoing state comprised of several components, measurement of one component (e.g., capacity to respond to risk) will not accurately reflect true vulnerability.

Several authors in the “disaster management literature” (described in more detail below) note that individual vulnerability cannot be separated from the concept of “social vulnerability” (e.g., Dilley, 2000; Morrow, 1999). Because of ties between individuals, there is a collective nature

of vulnerability (based on social arrangements). Institutional arrangements count, and measurement is complicated by imperfect information about social ties, social capital and social vulnerability. Social vulnerability is itself a combination of social factors and environmental risk. Note the similarity of these ideas to the economics distinction of the ability of informal ties and social capital to manage idiosyncratic versus covariate risk. Because of the limited strength of informal risk pools, covariate risk is not well managed using informal mechanisms (see Siegel and Alwang, 1999). Weak informal mechanisms can also convert idiosyncratic into covariate risk. This is one of the points of Dilley (2000) and Morrow (1999).

2.3. *Disaster Management Literature*

A large body of literature addresses the relationship between human vulnerability and natural disasters. This literature's common theme is the idea that vulnerability is defined *with respect to natural disasters*, and people, households, communities, etc. are vulnerable to damages from a natural disaster (Kreimer and Arnold, 2000). They focus on risks and refer to them as *hazards*. The degree of vulnerability is determined, in part, by social factors; for instance, the literature on vulnerability to famine discusses vulnerability as a predisposition to famine before the impact of a specific trigger event. Vulnerability is usually defined as an underlying condition, distinguished from the risky events that may trigger the outcome (e.g. Webb, 1993). The literature sometimes fails to be specific about what constitutes loss or damage, and whether it matters to whom the losses or damages accrue.

The disaster management literature is similar to the other disciplines, which usually examine (often implicitly) potential damage to the poor, malnourished, etc. The disaster management literature often includes discussions of poverty only in general terms, using such ideas as "the poor are most vulnerable to natural disasters," rather than presenting concrete evidence to support such claims.²² In the disaster management literature, everyone is vulnerable but some, due to their location choices, etc. are more vulnerable than others.

This literature has, at least since the early 1990s, recognized that the degree of vulnerability of households, communities, regions, etc. includes elements of *risks* and *responsiveness* to risks (Blakie, *et. al.*, 1994). Triggers of natural disasters occur, but household and social systems allow them to become (or prevent them from becoming) disasters through their response. A definition of vulnerability from this literature is "...characteristics of a person or group in terms of their capacity

²² For a recent example: "low-income people and communities are usually the primary victims of natural disasters, in part because they are more likely to be located in areas vulnerable to bad weather or seismic activity (IDB, 2000, p.52)."

to anticipate, cope with, resist, and recover from the impact of a natural disaster (Blakie, *et. al.*, 1994, p. 9).” The literature explicitly recognizes the roles of household assets and access to opportunity (e.g. community and higher-level assets) in determining vulnerability to natural disasters (Vatsa and Krimgold, 2000). The literature also incorporates a time dimension: the extent of a disaster cannot be measured without knowledge of the resilience²³ of the affected groups; this resilience plays out over time.

Most disaster management studies are based on some version of the following relationship²⁴:

$$\text{Vulnerability} = \text{Hazard} - \text{Coping}$$

Hazard is defined as a function of: probability; primacy (shock value based on time elapsed since previous occurrence); predictability (degree of warning available); prevalence (the extent and duration of hazard impacts); and pressure (the intensity of impact). Coping is a function of: perceptions (of risk and potential avenues of action-- the ability to cope is information contingent); possibilities (options ranging from avoidance and insurance, prevention, mitigation, coping); private action (degree to which social capital can be invoked); and public action (e.g., Webb and Harinarayan, 1999; Sharma *et. al.*, 2000).

The disaster management literature usually breaks vulnerability into two components: i) risk mitigation or disaster preparedness, and ii) disaster relief. Risk reduction, mitigation, and some coping activities are usually lumped together into “mitigation activities” and the remaining coping activities are referred to as disaster relief, especially coping resources obtained from sources external to the disaster area. This literature stresses that characteristics of a household are essential determinants of vulnerability because these characteristics affect the “mitigation” and “coping” components of the vulnerability equation. These characteristics include the capacity to anticipate, cope with, resist, and recover from the impact of a natural disaster. Resilience is implicitly contained in the “coping” component of the equation.

The disaster management literature, however, suffers from a lack of precision in language. For instance, Blakie, *et. al.* (1994) define risk as the probability of exposure to events *and* outcomes. Thus, they say a city’s disaster risk is determined by hazard, exposure, vulnerability,

²³ The term resilience (defined previously) is not frequently used in the disaster management literature. The concept is, however, often recognized implicitly. See below.

²⁴ See table 3, below, for an explicit application of this concept.

external context, and emergency response and recovery ability.²⁵ The tautological nature of these definitions—risk determines vulnerability, but vulnerability also determines risk—invites confusion. Imprecise use of terms has affected communication in this branch of literature.

Like the food-security practitioners, the disaster management discipline has devoted considerable effort to techniques for vulnerability mappings. As recently noted by IDB (2000, p.59): “Vulnerability maps would help to evaluate overall risks of natural hazards, assess the probability of different natural hazards in region, and identify the degree of vulnerability of communities located in high risk areas. They could also be used with poverty maps to help prioritize needs and to target assistance in the aftermath of a disaster.”

2.4. *Environmental Literature*

A search of the ecology-based environmental literature reveals that a substantial portion of discussion of vulnerability relates to the vulnerability of species or ecosystems to damage. In the case of species, they are *vulnerable to extinction*; and ecosystems tend to be *vulnerable to irreversible damage*. The key notion is to recognize that this literature defines vulnerability with respect to an outcome, which is based on ecologic-centric concerns as opposed to other approaches that are usually human-centric. This literature focuses on *risks* and *outcomes*.

Risk assessments and valuation techniques to help provide analytical basis for benefit/cost analyses occupy a major part of this literature. Environmental economists value risk inherent from an activity by focusing on two elements: hazard and exposure. Hazard means the capability of a risky event to cause damage (O’Brien, 2000, p.17). Once the damage is identified, it can be valued using market and non-market valuation techniques. Some environmental economists have been skeptical about the analytical rigor of risk assessments due to scientific uncertainty about risks and relationships between risks and damages, in addition to conceptual problems with non-market valuation techniques, choice of appropriate discount rate, etc. (Tietenberg, 1998; O’Brien, 2000).

More recently, a strand of literature has emerged that combines the livelihoods and environmental literature, and defines vulnerability as exposure of individuals or groups to livelihood stress as a result of environmental change (e.g. Ahmed and Lipton, 1999). Models have been used to make projections with respect to expected negative impacts of global warming and associated climatic and ecological changes such as less rainfall, flooding from rising tides due

²⁵ Hazard—the geological phenomena serving as initiating events; exposure—the size of a city, everything that is subject to the physical demands imposed by the hazard; vulnerability—how easily and how severely physical infrastructure, economy, residents, and socio-political system are affected.

to melting polar ice, etc. (e.g., Dinar *et. al.*, 1998).²⁶ The focus tends to be on risks, with less attention to risk responses.

A recent publication prepared by the World Bank’s Environment Department decomposes two major dimensions of vulnerability: hazard exposure and capacity to cope (see below). High (low) vulnerability households are those faced with the highest (lowest) hazard exposure and have the lowest (highest) capacity to cope. Thus, “even when exposed to the same event, impacts will vary, depending on the entity’s capacity to cope: that is, to withstand and recover from the impact of that event (Sharma, *et. al.*, 2000, p.1).”

Table 3.
Vulnerability: Hazard Exposure and Capacity to Cope

		Capacity to Cope	
		High	Low
Hazard Exposure	High	Low Vulnerability	High Vulnerability
	Low	Very Low Vulnerability	Low Vulnerability

Source: Sharma, *et. al.*, 2000.

2.5. *Health/Nutrition Literature*

Nutritional epidemiologists have been at the forefront of examining properties of indicators, particularly indicators of nutritional status. Efforts to monitor nutritional status with the purpose of early warning for interventions (nutritional surveillance) were a precursor to FEWS (Mason, *et. al.*, 1984). Health and nutritional epidemiologists were concerned with the sensitivity and specificity of indicators of *nutritional status*. In addition, Mason, *et. al.* (1984) place a heavy emphasis on the timeliness of their indicators (with the presumption that because the indicators are being collected to inform action, the information would need to be generated quickly), and balance costs of collection with the value to the decision process. The optimal indicator and its means of collection are dependent on the policy decision being made and the *focus or concern* of the policy, considering costs and timeliness.

In the nutrition literature, vulnerability refers to *nutritional vulnerability*, usually taken as a probability of inadequate food intake needed to live a normal and active life (National Research Council, 1986), or the probability of suffering nutrition-related morbidity or mortality (e.g. Davis, 1996). This outcome focus does not distinguish between risks and responses. Typical indicators of

²⁶ For example, special attention has been placed on potential impacts of global warming on small island economies, which are considered, by definition, to be “vulnerable” to global warming.

nutritional vulnerability are anthropometric indices, chemical analyses, and food intake analyses. Individual measurements are aggregated over populations by presenting proportions “stunted” or “wasted” or malnourished. Nutritional status profiles can be produced much in the way that poverty profiles are. The work related to anthropometrics has looked at the value of anthropometry in indicating both the conceptual issue of malnutrition and the state of vulnerability of people and populations (e.g. Kelly, 1993). A major theme in this literature examines the implications of malnutrition (as indicated by anthropometry) for outcomes such as educational attainment, probability of mortality, adult productivity, etc.

Recent efforts have tried to correlate nutrition and health outcomes with socio-economic status – as measured by a household’s assets (see Gwatkin, *et. al.*, 2000). The difficulty in constructing an asset-index is indicative of difficulties in constructing a measure of vulnerability: “Like consumption of income, an asset index defines disparities in terms that are primarily economic. This is by no means the only way to define inter-group disparities. Other possibilities, not taken into account by the index include gender, education, ethnic background, or other factors associated with social exclusion. Thus this index provides only a partial view of the multi-dimensional concepts of poverty, inequality and inequity (Gwatkin, *et. al.*, 2000).

3. SOME GENERALIZATIONS FROM THE LITERATURE

Each strand of literature and its use of the vulnerability concept can be viewed in relation to the organizing framework (see table 4). Several generalizations are possible:

- The strands of literature tend to be either conceptually strong and empirically weak or conceptually weak and empirically strong. Examples of the first case are the asset based and sustainable livelihoods literature and much of the sociological/anthropological literature. The literature from these disciplines helps demonstrate how different components of vulnerability are related to overall conditions, yet provide only limited empirical applications. Examples of the second are the food security, the nutrition/health, and the poverty dynamics literature. Each of these strands uses sound empirical methods to examine the determinants of outcomes, but are limited in their attention to details of the causal process.
- Parts of the food security, the sociology/anthropology and the sustainable livelihoods literature explicitly treat vulnerability as an ongoing process. Instead of focusing on ex post outcomes, they treat vulnerability as forward-looking. Virtually all the other literature treats the concept and measurement of vulnerability as if deficits below a norm were the

outcome of interest. These strands of literature recognize that vulnerability is a function of risk and risk response, but measure it by looking at a terminal outcome.

- Most disciplines focus on only one or a limited number of sources of risk. For instance, food security studies tend to examine vulnerability to weather-related crop failures, nutrition studies look at risks of declines in food intakes, and the disaster literature focuses on the probabilities and damages associated with specific physical disasters. Aggregate vulnerability depends on a portfolio of risks and related portfolio and risk responses.

Table 4
Vulnerability: How the Literature Treats Risk-Response-Outcome.

Literature	Treatment of		
	Risk	Response	Outcome
Poverty Dynamics	Implicit	Implicit: response clearly determines outcome but specific response mechanisms are rarely identified	Main focus: probability of being poor; transitions in and out of poverty
Asset-based Approaches	Mostly implicit Sometimes includes value of assets at risk	Main focus: but often fails to describe adjustment mechanisms	Not often explicit Sometimes use variability in outcomes as motivation
Sustainable Livelihoods	Sometimes explicit: concept of sensitivity is related to exposure to risky events	Mostly explicit: concept of resilience is related to response Key focus of this literature is household response mechanisms	Literature recognizes that vulnerability is an ongoing and forward-looking process
Food Security	Sometimes explicit: e.g., poor rainfall, price changes Focus on single source of risk	Sometimes explicit	Main focus: probability of not meeting food needs; consequences of inadequate food intake
Disaster Management	Explicit Focus on single source risk	Sometimes explicit, not well delineated	Explicit, but not well delineated Inadequate consideration of welfare consequences of outcomes
Environmental	Usually explicit; identify serious risks and safety thresholds	Implicit: species and ecosystems can respond, but mechanism of response is not made explicit	Explicit focus: species survival, habitat loss, etc. Tends to be forward looking (e.g., sustainability)
Sociology & anthropology	Implicit Usually focus on	Often a key focus of this literature: how	Main focus: outcomes other than “income”

	single source of risk	social and other assets assist household responses to shocks	poverty
Health/Nutrition	Implicit: some recognition of poor health status leading to more nutritional risk	Implicit: some attention to synergies between household production and nutrition outcomes	Main focus: poor anthropometric outcomes or consequences of malnutrition and poor health

The vulnerability literature contains several common themes. Many of these represent important contributions to the understanding of the definition and measurement of vulnerability. However, some of the common themes are really “myths” that can hinder progress in developing definitions and measures. We address each of these ideas separately, in the context of the risk-response-outcome framework. These themes are:

- a) Households are vulnerable to a variety of negative outcomes that can be measured in different ways. Additionally, vulnerability is caused by multiple sources of risk
- b) The poor are more vulnerable
- c) Optimal measures vary depending on the purpose of measurement: targeting, monitoring and evaluation
- d) A meaningful measure of vulnerability requires a benchmark.
- e) Vulnerability is distinguished from poverty in that the latter is a static concept while the former refers to a dynamic condition
- f) A corollary of e) is that panel data are needed to measure vulnerability
- g) Vulnerability and variability are synonymous concepts

a) Households are vulnerable to a variety of negative outcomes that can be measured in different ways. Vulnerability is caused by multiple sources of risk.

This idea is contained in all the literature. First, there are many negative outcomes to which households are vulnerable. For example, nutritionists recognize that current health status, access to public services, environmental conditions, local knowledge and practice, etc., all contribute to nutritional vulnerability (Young and Jaspers, 1995). Likewise, disaster management specialists acknowledge the role of social factors and environmental risk in contributing to vulnerability to natural disasters (e.g. Adger, 1999).

The second component relates to measurement of disparate outcomes and whether to seek a common metric. Economists often recognize that many forms of vulnerability exist, yet they argue that most forms can be valued-- the metric economists prefer is monetary units. One means of

addressing the measurement problems is to value as many of the different forms of vulnerability using a common metric such as money. Poverty measurement has extended its focus to non-market goods and services such as remittances, gifts and transfers, and the consumption value of access to a broadly defined set of assets. Vulnerability to different illnesses could similarly be valued. Other types of vulnerability, such as physical insecurity, are more difficult to value in monetary terms (although avoidance expenditures suggest that they have values). Another means of dealing with measurement problem is to recognize the inherent incomparability of different forms of vulnerability and measure, say, nutritional vulnerability, physical insecurity, vulnerability to poverty, etc. in metrics that make sense for each form of vulnerability.

These issues affect decisions about measuring of vulnerability. Some measurement problems are related to the concept of multiple forms of vulnerability: i) how to condense the dimensions into a single index? ii) how to attain objective measures of many subjective concepts? iii) how to ensure comparability of measure over space and time? Point ii) is a particularly troubling concern. Some “objective” concepts, such as the value (or cost) to the decision maker of constraints and the value of riskiness, can be measured using statistical modeling techniques. Others such as the value of social capital, the value of personal relationships, or the cost of powerlessness are much more difficult to quantify. Different dimensions of vulnerability might be emphasized to different extents depending on the purpose of its measurement.

The third complication is the multiple forms of risk that cause vulnerability. Even vulnerability to poverty comes from a number of risk sources. Recognition of multiple risk sources will facilitate analysis of vulnerability to different outcomes.

Implications of this theme:

- Multiple measures of vulnerability are required. The decision of whether to monetize or not becomes an issue and then whether to collapse the measures into a single indicator. If different metrics are used for the components, then a weighting system needs to be derived. Such a system will suffer from the usual criticisms—mainly the validity of the implied social welfare function.
- The ideal measure or set of measures will depend on the focus of policy or the specific concept one wants to measure (e.g., single-value indicators are preferred for analysis over time and among different groups or countries).

As an example of the conflict between dimensions of vulnerability and performance of a measurement scheme, consider the two main social risk management policy concerns. The first-order concern is to use social risk management to avoid risk-related welfare losses. The second-

order concern is to improve inefficient risk-management mechanisms that lead to lost opportunity and long-term outcomes below a feasible frontier. The second concern justifies policies to crowd out inefficient management. Welfare losses below the threshold (the first-order concern) might be no less likely following institution of such a policy, and most measures of vulnerability would show no change.

b) The poor are more vulnerable

This idea is well-accepted and has several underpinnings. First, as the disaster management literature recognizes, the poor are, often because of their location, more exposed to risky events (such as natural disasters) (Sharma, *et. al.*, 2000). Second, the poor have less access to assets that can be used to manage risk through their response (Devereux, 1999; Sharma, *et. al.*, 2000; Blakie, *et. al.*, 1994). Third, if social capital requires time and in-kind investments, the poor are less likely to be able to call on social capital claims for ex post risk management (Serra, 1999; Putnam, 1993; Moser, 1998). Fourth, because the poor tend to be politically disenfranchised they are less likely to receive social services following a disaster, and thus their ability to manage risk is compromised (Narayan, *et. al.*, 2000). Fifth, if vulnerability is defined as vulnerability with respect to an outcome (e.g., vulnerability to increased poverty, as discussed below), then the poor are, *ceteris paribus*, more vulnerable because they are closer to or already below the threshold. Finally, evidence exists that the poor are more likely to bear the brunt of human costs associated with risks (Benson and Clay, 2000).²⁷

Some authors suggest that, due to the close correspondence between the two concepts, poverty should be considered as an appropriate indicator of vulnerability (e.g., Adger, 1999). Others suggest that certain groups, such as the rural poor in many places are less vulnerable than urban non-poor groups because they tend to be geographically isolated from market-related shocks (Glewwe and Hall, 1998). Glewwe and Hall (1998) claim that the poor are not always vulnerable and that vulnerability can be divided into two types. The first vulnerable group is those that are vulnerable to specific shocks, while the second includes as more general notion of vulnerability to changes in socioeconomic conditions (market-induced vulnerability). According to this distinction,

²⁷ Similarly, the WDR 2000/1 states “The risks that poor people face as a result of their circumstances are the cause of their vulnerability.” It adds: “But the deeper cause is the inability to reduce or mitigate risk or cope with shocks—a cause that both draws from and feeds into the causes of other dimensions of poverty (World Bank, 2000, p.36-37).” The first quote equates vulnerability with the underlying condition of poverty, whereas the second quote focuses on poor households’ limited risk management capabilities.

the second group would not include near-subsistence remote households, who may be very poor, but are not affected by exogenous policy shocks or market instability.

Implications of this theme:

- Many of the same factors affecting poverty should be included in a measure of vulnerability. The individual's position with respect to a social standard (e.g., a poverty line) is an important component of many forms of vulnerability; shortfalls below the cutoff are also important, and deviations further below the standard might be weighted more heavily. Factors such as access to assets and the impacts of such access on well-being should be included.
- Dimensions of household welfare that are not easily measured are also important determinants of vulnerability, just as they affect poverty.

Poverty and vulnerability are not synonymous, but are closely related (see below). Many households that are now not poor are certainly vulnerable to falling into poverty. But vulnerability to poverty, using common economic definitions of poverty, is not the only form of vulnerability that exists. Many non-poor are vulnerable to poverty and also to other negative outcomes.

c) Optimal measures depend on the purpose of vulnerability measurement: targeting, monitoring and evaluation

The literature on food security measurement is consistent in showing that the optimal properties of a measure depend on the purposes of measurement. The relative importance of elements such as timeliness, ease of collection, cost-sensitivity-specificity tradeoffs all depend on the purpose of measurement. The clear implication of this theme is that careful consideration of the purpose of measurement must precede decisions about an appropriate measurement scheme.

For example, in some cases, absolute measures (that can be compared across time and space) may be appropriate, while in others, relative measures (that are case-specific) will suffice. Measurement over time for a given society may be possible using a system of relative measures such as frequency of coping strategies, number of meals taken, etc., but comparing across social groups and especially across countries requires an absolute benchmark. The issue then becomes one of whether measurement can be conducted using a comparable metric.

d) An operational measure of vulnerability requires a benchmark

The statement from WDR 2000/1 "Vulnerability affects everyone" is derived from lack of a benchmark. Such a statement is derived from the definition of vulnerability presented (in Box 8.3, p.139 of the WDR) "...vulnerability [is] the resulting possibility of a decline in well-being." Since everyone in the world is vulnerable to declines in well-being, such a definition is not particularly

useful for operational purposes (see Pritchett, *et. al.*, 2000). It is more helpful to think about the possibility of decline in well-being below a benchmark or threshold.

Dercon (1999, p. 6) defines vulnerability as: “vulnerability to fall below a particular minimum consumption level,” and most strands of literature agree that vulnerability is a useful (and measurable) concept only if it is defined as vulnerability to a measurable loss (the *metric*) below a minimum level (the *benchmark*). Without use of a benchmark, the term “vulnerability” becomes too imprecise for practical use.

As an example, in the sustainable livelihoods literature, vulnerability is almost always defined in terms of vulnerability with respect to a minimum level of livelihood. Sinha and Lipton (1999) talk of vulnerability to *basic damage*, or vulnerability to falling below a threshold of poverty, illness, etc. Others (e.g., Davies, 1996) refer to vulnerability to a loss of livelihood, with the often-explicit understanding of a threshold livelihood, a level below which society deems unacceptable. The food security literature refers to vulnerability as a state of high probability that available food will not meet minimums needed for a “normal” life. This literature discusses current status indicators—poverty, hunger, malnutrition, poor health, etc.—and defines vulnerability to be a measure of the probability that one of these negative outcomes (with a presumed threshold) will occur over time (e.g. Maxwell, *et. al.*, 2000). Nutritional vulnerability is defined with respect to minimal nutritional standards. Anthropometric measures are always compared to standards; shortfalls of more than two standard deviations below normal usually indicate malnutrition.

If a benchmark, or a level of well-being below which society deems inappropriate, is employed, then the notion that the poor are generally more “vulnerable” than others increases in plausibility. Vulnerability of the poor results from their closeness to such a threshold; even if they face smaller risks, they are, *ceteris paribus*, more likely to fall below the threshold because of their inability to respond to losses in welfare.

Implications for vulnerability measurement:

- Since vulnerability is defined in terms of potential to fall below socially accepted minimums, measurement should include a cutoff or benchmark.
- Use of benchmark standards for subjective factors or elements that are less measurable needs careful consideration.
- Conflicts between the ability to measure first- and second-order concerns (welfare loss and inefficient risk management techniques) should be investigated. The above argument implicitly assumes that fear of first-order losses results in inefficient risk management. However, measurement of “crowding out bad practices” might be appropriate.

The literature also contains a number of common myths:

e) Poverty is static, vulnerability dynamic

This statement implies some comparability between the two concepts, yet there really is none. A better way of thinking about this is “being in poverty (however defined) is static, vulnerability to the same notion of poverty is dynamic.” Vulnerability to a wide variety of events besides poverty is also dynamic. This distinction is often made in the literature that poverty is static and vulnerability is dynamic,²⁸ but is only of limited use, and is not quite correct. While vulnerability reflects a state that is defined over future events, levels of vulnerability themselves change over time. At a given instant in time a household may be poor and also vulnerable to, for example, increased poverty. At another time, that same household may no longer be poor, but may remain vulnerable to poverty. Or it may become non-poor and non-vulnerable to further poverty (though still vulnerable to loss of income and disutility associated with that: see comments on benchmarks above). Vulnerability is dynamic because it represents an ex ante state that may or may not persist, but it is a condition that implies an outcome in the future after states of nature are realized. A profile of vulnerability, thus, might vary over the lifecycle of the household as attitudes toward risk, potential for bearing and managing risk, and the length of the household planning horizon change. The same is true of poverty. Additionally, the extent of vulnerability depends on resilience or the ability to recover; this resilience is often only revealed by the responses following a risky event.

Poverty also contains a time dimension. People are poor for lengths of time of often-uncertain duration. The economics literature has, for many years, distinguished between chronic and transitory poverty, noting that the determinants of each depend on a number of factors. The data upon which all poverty assessments are built contain a time frame that implies a poverty status over the duration of the recall period or movement in and out of poverty from survey date to survey date. The fact that certain events were not realized during the period in question does not mean that people were not vulnerable to such shocks. It also does not mean that people do not have costs even though the period had no shocks.

Implications for vulnerability measurement:

- Analysts should recognize that an assessment of vulnerability should measure the ex ante probability of change in well-being given environmental and social conditions, and risk

²⁸ See for example WDR 2000/1: “As traditionally defined and measured, poverty is a static concept—a snapshot in time. But insecurity and vulnerability are dynamic—they describe the response to changes over time (World Bank, 2000, Box 3, p.139).”

managing ability of the household. Following realization of events we can assess, ex post, the impact of the event on poverty or other outcomes and the resulting change in current vulnerability to future events.

- The time dimension is crucial as people are vulnerable to outcomes that are realized over a certain period of time.

f) Panel data are necessary and sufficient to measure vulnerability

Panel data sets have been extremely useful, even necessary, in separating chronic from transitory poverty and understanding factors affecting each (Baulch and McCulloch, 1998; Dercon and Krishnan, 1999; Jalan and Ravallion, 1998). They provide evidence about movement in and out of poverty during the reference period and can be used to decompose total poverty into its chronic and transient components. Such measurement often takes the form of ex post assessment; the studies show who moved into and out of poverty given the prevailing conditions during the survey period. They create, to some extent, a static picture of *historical* vulnerability (and, perhaps, a dynamic picture of poverty, but it is only poverty over the reference period). They are less useful in making out-of-sample projections and policy makers are concerned with vulnerability to future shocks. They are interested in *current* and *future* vulnerability. Ex ante prediction or vulnerability assessment using panel data sets requires assumptions about the stationarity of risk management efforts.

The general argument for the need for panel data is that without following households for several years, we will lack the information to quantify the volatility faced by households and their responses to it. This perspective has its roots in the lack of distinction between vulnerability and variability. If these terms are synonymous (and we contend that they are not), then one would need information on variability (a panel is not necessarily needed for this but is helpful) to create a measure (i.e., a dependent variable) of vulnerability. Several problems emerge, however, from reliance on panel data. First, due to costs of data collection, panel data often suffer from small sample sizes, sample mortality, and lack of representativeness. Additionally, panel data sets, particularly in developing countries, tend to be of short duration. These sample-related problems have several implications for vulnerability measurement²⁹.

The sources of risk that individuals face are not likely to be captured completely within the time period of a panel. For instance, if we are interested in vulnerability to hurricane risk and its impact on household decision-making, do we need to ensure that the sample includes a group of hurricane-affected households before we measure their vulnerability to a hurricane? Likewise,

²⁹ See Mansuri and Healy (2000).

would a panel data set have helped Indonesian authorities measure, ex ante, the vulnerability of different social groups in Indonesia to economic disaster?³⁰ Panel data sets are typically analyzed to produce correlates of vulnerability, with outcome variability (e.g., first differences of consumption) or entry into a state (e.g., of poverty) as the dependent variable. These outcomes are normally regressed (using a number of functional forms such as hazard models in the second case) on “determinants” of vulnerability such as household assets, community and location capital, etc. (see Baulch and McCulloch, 1998, for an example). In such cases, the dependent variable should contain outcomes (spells of poverty, losses of income, etc.) that reflect responses to a variety of risk sources, both idiosyncratic and covariate. Without including responses (ex ante and ex post) to the risks, the panel will be of limited use in making out-of-sample predictions. Yet, panels contain numerous observations, many of which may not suffer from a risk outcome, particularly in the case of idiosyncratic risk. In such circumstances, the analysis will suffer from a lack of external validity and will not be useful in making out of sample assessments of vulnerability.

The second problem is that many of the outcomes (e.g., the impacts on the dependent variable of an idiosyncratic shock) are endogenous to other household decisions. This analytical literature recognizes this fact and usually relies on reduced form estimation of changes and duration of outcomes. These are regressed on household human capital investments, location, etc. (e.g., Jalan and Ravallion, 1998; Glewwe and Hall, 1998). However, measurement of vulnerability must include an analysis of vulnerability to specific shocks so that we can then associate a probability measure with the specific shocks. Without producing a structural model³¹ that includes specific shocks, it will be impossible to understand how household vulnerability to such shocks is affected by ownership of and the access to assets, prices, etc. Panel data sets rarely have the richness of detail nor the sample size to estimate structural models of how, for instance, realization of a bad outcome (e.g. illness of a key worker) will affect well-being.

More fundamentally, analytical models of “correlates” of vulnerability using panel data rarely unbundle factors such as exposure to different risks, location, and social structure that should be the focus of vulnerability analysis. While this objection is not specific to panel data as such, the rush to conclude that panel data are needed ignores much of the complexity of measurement.

³⁰ For instance, the prior distribution of an economic policy expert who assessed the risk of economic collapse in Indonesia is probably quite different now than it was in 1995.

³¹ For instance, observed declines in income are due to illness to the household different now than it was in 1995.

³¹ For instance, observed declines in income are due to illness to the household head, which are, in turn endogenous to household decisions about risk management.

There is thus a practical problem of typical panel studies: their limited ability to forecast out of sample “shocks.” For instance, if the period covered by the sample were a period of normal rainfall and fairly stable economic conditions, then movement in and out of poverty (e.g. vulnerability) would largely be due to idiosyncratic shocks. To infer an aggregate level of vulnerability from such a study would be misleading. In contrast, using cross-sectional data and some measure (expert opinion, qualitative methods, etc.) of vulnerability, the “model” that the expert uses could then be imbedded in the measure. It is not clear how experts could capture effects such as access to social capital, remittances, coping ability, or how the household would call on these resources in times of different types of stress.

Implications for vulnerability measurement:

- To measure vulnerability, one needs to identify the potential shocks and sources of risk and predict household responses. Panel data need to be supplemented to measure things such as risk and household responses.
- The measure needs to distinguish between variability and vulnerability and between historical and current vulnerability.

g) Variability and vulnerability are synonymous

The first question to be asked when considering this statement is: “variability of what?”

Authors frequently use evidence about variability in consumption to conclude that vulnerability is high. For example, Dercon (1999) talks about formal insurance instruments and informal risk management arrangements in developing countries and concludes that vulnerability is high, because “despite the existence of these systems, high variability in consumption outcomes remains (p. 5).” Likewise, Glewwe and Hall (1998) use variability in consumption as their implicit measure of vulnerability. Since economists prefer consumption expenditures as measures of well-being, it makes intuitive sense to focus on consumption variability as an indicator of vulnerability. However, as many note, even the poor are able to manage risk through asset allocations, formal and informal insurance, and by smoothing consumption (Alderman and Paxson, 1992; Morduch, 1994; Siegel and Alwang, 1999). Given such possibilities, a focus on consumption variability will understate the true risk and, perhaps, true vulnerability to risk (Morduch, 1994). Such a focus may lead analysts to ignore the adverse consequences of risk management strategies for permanent income or long-term improvements in well-being due to the degradation of household assets and assets at other levels (Siegel and Alwang, 1999). It may be of interest for policymakers to understand the opportunity costs of “reduced consumption variability”. It is important, thus, to recognize that there are at least three consequences of vulnerability: i) the utility costs of welfare

losses and risk aversion (the latter includes the psychic costs of variability); ii) the social costs of movement of people below some threshold; and, iii) the opportunity costs of risk management and resilience.

The second question to consider is: “is historical variability a useful measure of current vulnerability?” This issue is examined in more detail above where we discuss the need for panel data. The conclusion is that historical vulnerability may be a useful measure, but often it is only a weak proxy for ex ante current vulnerability.

Variability, a composite variable that includes probability, frequency, and severity of deviation from the norm, is a crucial dimension of vulnerability. But vulnerability is more than just exposure to risk and more than just variability in consumption: the vulnerability benchmark should be relative to shortfalls below a community-agreed upon minimum level (e.g. a poverty line and positive probability of falling below a poverty line). Variability above such a line may be an individual concern, but is not necessarily relevant for poverty policy.

Implications for vulnerability measurement:

- Measurement of vulnerability should be extended beyond historical variability to include future probabilities, possible management strategies, outcomes and resilience.
- Need to incorporate variability with respect to a benchmark. We are more interested in movement across a threshold, rather than movements up and down.

4. CONCLUDING REMARKS

The recent focus on the relationship between poverty, risk and risk management has enriched dialogue about poverty and vulnerability to it. For example, the Social Protection Unit’s new “social risk management” approach has gained support as a conceptual framework. However, the framework needs further work to refine operational guidelines. In this paper, we emphasize the challenges and attempt to refocus thinking on how different disciplines recognize the relationship between poverty, risk, risk management and vulnerability.

The focus in most disciplines is either on the risks (at one extreme) or the underlying conditions (or outcomes) at the other. What some (e.g., disaster management, environment) call vulnerability (or vulnerability assessment) is really a risk assessment or an assessment of risks. The concept that others (e.g., poverty dynamics, sustainable livelihoods, food security, sociology/anthropology, health/nutrition) call vulnerability is similar to that used in poverty assessments and focus at the other end of the risk chain – at outcomes. They focus on underlying conditions and household inabilities to respond to risks. The search for a single-variable measure

of vulnerability is likely to be futile as each discipline stresses different components of the concept. Numerous empirical constraints have to be overcome to generate measures that explicitly incorporate all the components of vulnerability.

There is definite need to define the purposes of vulnerability measurement. The purpose of measurement influences selection criteria. For example, in some cases, absolute measures (that can be compared across time and space) may be appropriate, while in others, relative measures (that are case-specific) will suffice. Measurement over time for a given society may be possible using a system of relative measures such as frequency of coping strategies, number of meals taken, etc., but comparing across social groups and especially across countries requires an absolute benchmark. The issue then becomes one of whether measurement can be conducted using a comparable metric.

Vulnerability should to be defined with respect to a given risk or risks and to an undesirable outcome. This is the outcome that should be of concern to policy makers. Thus, for example, there is intuitive appeal to defining vulnerability to poverty (e.g., the probability of falling below or further below a poverty line, or the frequency and duration of falling below the poverty line over a given period of time). General consensus exists that societies find levels of living below such poverty lines unacceptable. One might argue that those who spend shorter periods of time below the poverty line are less “deserving” of attention than the chronic poor, but the position with respect to the line is a key concern. Higher weights should be given to potential for longer time or shortfalls farther below the cutoff. The statement that “everyone is vulnerable” is not a useful starting point for indicator/measure selection. The following statement is, however, consistent with our findings: “Everyone faces risks, and some people are vulnerable because of their inability to manage these risks -- due to a lack of assets and other factors.”

Measurement of the forms of vulnerability noted in this paper—vulnerability to poverty, malnutrition, insecurity, etc.— require different tools and different measurement systems. It is unlikely that an aggregate measure (total vulnerability) will ever be attainable. However, a compelling argument could be made to produce “vulnerability accounts” for each form of vulnerability. A plausible outcome is that under certain policy regimes vulnerability to one outcome might decline while that to another increases.

It may be similarly fruitless to aggregate vulnerability to as single outcome across all forms of risk causing the outcome. Vulnerability to poverty comes from price risk, weather risk, health risk, etc. Some of these are covariate, but many are idiosyncratic; measuring and aggregating across all of them presents a difficult challenge.

Based on the objective at hand, measurement should incorporate the different components of vulnerability (risk-response-outcome) identified in the organizing framework. In some cases, measurement of a component is straightforward, but, particularly in the case of risk responses, measurement can be extremely complicated. For example:

- The source, magnitude, duration, etc. of risks needs to be specified and then measured. This risk may be straightforward to measure. For example, for price and weather-induced yield fluctuations, historical data can be used to create a matrix of covariances.
- In cases of infrequent events, such as macroeconomic shocks, high spells of unemployment, political turmoil, etc., the appropriate means of measurement is probably expert opinion. A major limitation of expert opinion is its time and experience dependence.
- Once the universe of risks is identified, individual household's asset portfolios need to be mapped to the source of risk, and options for risk management considered. The value of assets for risk management should be contained in the measure. Assets are critical for measuring and evaluating exposure to risks, risk responses and outcomes.
- The responses to risk are the most difficult component of vulnerability to measure. Ex ante and ex post responses include access to formal and informal insurance and savings, asset sales, temporary employment, reliance on remittances, etc. Household data are clearly required, and behavioral models need to be fitted to such data. However, detailed data on less-frequently used assets and risk responses are difficult to obtain.

Finally, measurement of vulnerability that explicitly includes its risk-response-outcome components will continue to be a difficult undertaking. Since each discipline has its own reasons for defining and measuring vulnerability, there is no reason to presume that concepts, measures and methods will be identical across the disciplines. Lessons learned in one area may not be suitable for all. The differences between disciplines justify greater attempts at multidisciplinary cooperation.

REFERENCES

- Adger, W.N. (1999). "Social Vulnerability to Climate Change and Extremes in Coastal Vietnam." *World Development*. 27(2): 249-269.
- Ahmed, I.I. and M. Lipton (1999). "Impact of Structural Adjustment on Sustainable Rural Livelihoods: A Review of the Literature." *IDS Working Paper 62*. Institute for Development Studies: Sussex.
- Alderman, H. and C.H. Paxson. (1992). "Do the Poor Insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries." PPR Working Paper Series, Working Paper 729. The World Bank: Washington, D.C.
- Bane, M.J. and D. Ellwood (1986). "Slipping Into and Out of Poverty: The Dynamics of Spells." *The Journal of Human Resources* 21(1):1-23.
- Barrett, C. (1999a). "On Vulnerability, Asset Poverty and Subsidiarity." Comments to the Ford/Rockefeller Foundations Seminar Series "Managing Vulnerability and Shocks within the Agro-Food System," New York, May 26, 1999.
- Barrett, C. (1999b). "Food Security and Food Assistance Programs." Chapter for Bruce L. Gardner and Gordon C. Rausser, eds., *Handbook of Agricultural Economics*. Amsterdam: Elsevier Science.
- Baulch, B. and N. McCulloch (1998). "Being Poor and Becoming Poor: Poverty Status and Poverty Transitions in Rural Pakistan." *IDS Working Paper No. 79*. Institute for Development Studies: Sussex.
- Bebbington, A. (1999). "Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty." *World Development*. 27:2021-2034
- Benson, C. and E. J. Clay (2000). "Developing Countries and the Economic Impacts of Natural Disasters." in *Managing Disaster Risk in Emerging Economies*, A. Kreimer and M. Arnold, eds, The World Bank: Washington, D.C.
- Bigman, D., S. Dercon, D. Guillaume and M. Lambotte, (forthcoming). "Community Targeting for Poverty Reduction in Burkina Faso," in D. Bigman and H. Fofack, editors, *Geographical Targeting for Poverty Alleviation: Methodology and Applications*.
- Blackie, P., T. Cannon, I. Davis, B. Wisner (1994). *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. Routledge: New York.
- Breiman, L., J.H. Friedman, R.A. Olshen, and C.J. Stone (1984). *Classification and Regression Trees*. Wadsworth Inc.: Monterey, CA.
- Carney, D., M. Drinkwater, T. Rusinow, K. Neefjes, S. Wanamali, and N. Singh (1999). "Livelihood Approaches Compared: A brief comparison of the livelihoods approaches of DFID, CARE, Oxfam, and UNDP." DFID: London.

- Carter, M. and J. May. (1999). "Poverty, Livelihood and Class in Rural South Africa." *World Development*. 27:1-20.
- Chambers, R. (1989). "Editorial Introduction: Vulnerability, Coping, and Policy." *IDS Bulletin*, 20(2): 1-7.
- Christiaensen, L. and R. N. Boisvert (2000). "On Measuring Household Food Vulnerability: Case Evidence from Northern Mali." Working Paper WP 2000-05, Department of Agricultural, Resource and Managerial Economics, Cornell University, Ithaca, NY.
- Chung, K., L. Haddad, J. Ramakrishna, and F. Riely (1997). *Identifying the Food Insecure: The Application of Mixed-Method Approaches in India*. Washington: International Food Policy Research Institute.
- Coudouel, A., K. Ezemenari, M. Grosh, and L. Sherburne-Benz (2000)." Preliminary Draft for A Sourcebook on Poverty Reduction Strategies. The World Bank: Washington, D.C. April.
- Coudouel, A. and J. Hentschel (2000). "Poverty Data and Measurement." Preliminary Draft for A Sourcebook on Poverty Reduction Strategies. The World Bank: Washington, D.C. April.
- Davies, S. (1993). "Are Coping Strategies a Cop-Out." *IDS Bulletin* 24(4): 60-72.
- Davies, S. (1996) *Adaptable Livelihoods. Coping with Food Insecurity in the Malian Sahel*. New York: St. Martin's Press.
- Davis, A.P. (1996). "Targeting the Vulnerable in Emergency Situations: Who is Vulnerable?" *Lancet* 348(9031): 868-871.
- Dercon, S. (1999). "Income Risk, Coping Strategies and Safety Nets," mimeo prepared for the 2000/1 World Development Report. Katholieke Universiteit Leuven.
- Dercon, S. and P. Krishnan (1999). "In Sickness and in Health: Risk-sharing within Households in Ethiopia." *Journal of Political Economy*.
- Dercon, S. and P. Krishnan (1996). "Income Portfolios in Rural Ethiopia and Tanzania." *Journal of Development Studies*, 32(6):850-875.
- Devereux, S (1999). "Making Less Last Longer: Informal Safety Nets in Malawi." *IDS Discussion Paper* 373. Institute for Development Studies: Sussex.
- Dilley, M. (2000). "Climate, Change, and Disasters," in Kreimer, A. and M. Arnold, eds *Managing Disaster Risk in Emerging Economies*. The World Bank: Washington, D.C.
- Dinar, A., R. Mendelsohn, R. Evenson, *et. al.* (1998). "Measuring the Impact of Climate Change on Indian Agriculture." World Bank Technical Paper #402. The World Bank: Washington, D.C.
- Eilerts, G. (1994). "An Assessment of Vulnerability in Zimbabwe's Communal Lands." Harare: USAID/FEWS mimeo, 42 pp.

Freeman, P. (2000). "Infrastructure, Natural Disasters, and Poverty," Chapter 5 in Kreimer, A. and M. Arnold, eds *Managing Disaster Risk in Emerging Economies*.

Ghaiha, R. and A. Deolalikar (1993). "Persistent, Expected and Innate Poverty: Estimates for Semi-arid Rural South India 1975-1984." *Cambridge Journal of Economics* 17:409-421

Glewwe, P. and J. van der Gaag (1988). "Confronting Poverty in Developing Countries: Definitions, Information and Policies." *Living Standards Measurement Study Working Paper 48*. The World Bank: Washington, D.C.

Glewwe, P. and G. Hall (1998). "Are Some Groups More Vulnerable to Macroeconomic Shocks than Others? Hypothesis Tests Based on Panel Data from Peru." *Journal of Development Economics*. Vol. 56, pp 181-206.

Gwatkin, D.R., S. Rustein, K. Johnson, R. Pande, and A. Wagstaff (2000) . "Socio-Economic Differences in Health, Nutrition, and Population in Morocco." The World Bank: Washington D.C. See www.worldbank.org/hnp

Holzmann, R. and S. Jorgensen (1999). "Social Protection as Social Risk Management: Conceptual Underpinnings for Social Protection Sector Strategy Paper." Social Protection Discussion Paper No. 9904. The World Bank: Washington, D.C. see www.worldbank.org/sp

Holzmann, R. and S. Jorgensen (2000). "Social Risk Management: A Conceptual Framework for Social Protection and Beyond." Social Protection Discussion Paper No. 0006. The World Bank: Washington, D.C. see www.worldbank.org/sp

Inter-American Development Bank (2000). *Social Protection for Equity and Growth*. Inter-American Development Bank. Washington, D.C. Johns Hopkins Press: Baltimore.

Jalan, J. and M. Ravallion (1998). "Transient Poverty in Postreform China." *Journal of Comparative Economics*. Vol 26, pp. 338-357.

Kanbur, R. and L. Squire (1999). "The Evolution of Thinking About Poverty: Exploring the Interactions." <http://www.worldbank.org/poverty/wdrpoverty/evolut.htm>

Kelly, M. (1993). "Operational Value of Anthropometric Surveillance in Famine Early Warning and Relief." *Disasters* 17(1): 48-55.

Keogh, E. (1997). "Geographical Targeting of Districts in Zimbabwe," Harare: Social Development Fund, Government of Zimbabwe.

Kreimer, A. and M. Arnold, eds. (2000). *Managing Disaster Risk in Emerging Economies*. The World Bank: Washington, D.C.

Loughhead, S. and O. Mittai (2000). "Urban Poverty and Vulnerability in India: A Social Perspective." Paper presented at the Urban Forum: Urban Poverty Reduction in the 21st Century, Sponsored by the World Bank, April 3-5, 2000. Chantilly, Virginia.

- Mansuri, G. and A. Healy (2000). "Assessing Vulnerability: An Ex ante Measure and its Application Using Data from Rural Pakistan." Development Research Group, The World Bank: Washington, D.C. *mimeo*.
- Mason, J. B., J.P. Habicht, H. Tabatabai, and V. Valverde (1984). *Nutritional Surveillance*. Geneva: World Health Organization Press.
- Maxwell, D. (1999). "Programmes in Chronically Vulnerable Areas: Challenges and Lessons Learned." *Disasters* 23(4):373-384.
- Maxwell, D., C. Ahaideke, C. Levin, M. Armar-Klimesu, S. Zakariah, and G.M. Lamptey (1999). "Alternative Food-Security Indicators: Revisiting the Frequency and Severity of Coping Strategies." *Food Policy* 24: 411-429.
- Maxwell, D., C. Levin, M. Armar-Klimesu, M. Ruel, S. Morris, and C. Ahaideke (2000). *Urban Livelihoods and Food and Nutrition Security in Greater Accra, Ghana*. Research Report 112. International Food Policy Research Institute (IFPI): Washington, D.C..
- McIlwaine, C. (1997). "Vulnerable or Poor? A study of Ethnic and Gender Disadvantage among Afro-Caribbeans in Limon Costa Rica." *European Journal of Development Research* 9(2): 35-61.
- Morduch, J. (1994). "Poverty and Vulnerability." *American Economic Review* 84(2):221-225
- Morrow, B.H. (1999) "Identifying and Mapping Community Vulnerability." *Disasters* 23(1):1-18.
- Moser, C. (1998). "The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies." *World Development*. 26(1): 1-19.
- Moser, C. and J. Holland (1997). "Household Responses to Poverty and Vulnerability. Volume 4: Confronting Crisis in Cawama, Lusaka, Zambia." Urban Management Programme, Report No. 24. The World Bank: Washington, D.C.
- Narayan, D., R. Patel, K. Schafft, A. Rademacher and S. Koch-Schulte (2000). *Voices of the Poor: Can Anyone Hear Us?* Published by Oxford University Press for The World Bank.
- National Research Council (1986). *Nutrient Adequacy: Assessment Using Food Consumption Surveys*. Washington: National Academy Press.
- O'Brien, M. (2000). *Making Better Environmental Decisions: An Alternative to Risk Assessment*. MIT Press: Cambridge.
- Oxfam (1995). *The OXFAM Handbook of Development and Relief*. Oxfam Publications: Oxford.
- Pan American Health Organization (1998). *Natural Disaster Mitigation in Drinking Water and Sewerage Systems: Guidelines for Vulnerability Analysis*. Washington, D.C.
- Pritchitt, L., A. Suryahadi, and S. Sumarto. 2000. "Quantifying Vulnerability to Poverty: A Proposed Measure, Applied to Indonesia." Policy Research Working Paper #2437. The World Bank: Washington, D.C.

- Putnam, R. D. (1993). *Making Democracy Work: Civic Tradition in Modern Italy*. Princeton: Princeton University Press.
- Rakodi, C. (1999). "A Capital Assets Framework for Analyzing Household Livelihood Strategies." *Development Policy Review*. 17(3):315-342.
- Ravallion, M. (1996). "Issues in Measuring and Modeling Poverty", *World Bank Policy Research Working Paper 1615*. The World Bank: Washington, D.C.
- Ravallion, M. (1998). "Expected Poverty Under Risk-Induced Welfare Variability." *Economic Journal*, March: 1173-1183.
- Reardon, T. and S. Vosti. (1995) "Links Between Rural Poverty and the Environment in Developing Countries: Asset Categories and Investment Poverty." *World Development* 23(9): 1495-1506.
- Scoones, I. (1998) "Sustainable Rural Livelihoods: A Framework for Analysis." *IDS Working Paper No. 72*. Institute for Development Studies: Sussex.
- Serra, R (1999) "Putnam in India: Is Social Capital a Meaningful and Measurable Concept at the Indian State Level?" *IDS Working Paper No. 92*. Institute for Development Studies: Sussex.
- Sharma, M., I. Burton, M. vanAalst, M. Dilley, and G. Acharya (2000). "Reducing Vulnerability to Environmental Variability: Background Paper for the Bank's Environmental Strategy," The World Bank: Washington, D.C. *mimeo*,
- Siegel, P. and J. Alwang (1999). "An Asset-Based Approach to Social Risk Management: A Conceptual Framework." Social Protection Discussion Paper No. 9926. The World Bank: Washington, D.C. see www.worldbank.org/sp
- Sinha, S. and M. Lipton (2000). "Undesirable Fluctuations, Risk and Poverty: A Review," University of Sussex. *mimeo*
- Tietenberg, T. (1998) *Environmental Economics and Policy*. 2nd Edition. Addison-Wesley: Reading, MA.
- Vatsa, K. (2000). "Notes on Vulnerability." Department of Engineering Management, George Washington University, Washington D.C. September. *mimeo*.
- Vatsa, K. and F. Krimgold (2000). "Financing Disaster Mitigation for the Poor." in *Managing Disaster Risk in Emerging Economies*, A. Kreimer and M. Arnold, eds, The World Bank: Washington, D.C.
- Vella, V. and M. Vichi (1997). "Classification of Poverty in South Africa Using Cluster Analysis," The World Bank: Washington, D.C. *mimeo*
- Webb, P. (1993). "Coping with Drought and Food Insecurity in Ethiopia." *Disasters* 17(1):33-47.

Webb, P. and A. Harinarayan (1999). "A Measure of Uncertainty: The Nature of Vulnerability and its Relationship to Malnutrition." *Disasters* 23(4): 292-305.

Williams, C.A., M.L. Smith and P.C. Young (1995). *Risk Management and Insurance*. 7th Edition. McGraw-Hill, Inc.: New York.

World Bank (1986). *Poverty and Hunger: Issues and Options for Food Security in Developing Countries*. Washington D.C.

World Bank (2000). *World Development Report 2000/1:Attacking Poverty*. Washington, D.C.

World Bank (2001). *Social Protection Sector Strategy: From Safety Net to Springboard*. Washington, D.C.

Young, H. and S. Jaspars (1995). "Nutritional Assessments, Food Security and Famine." *Disasters*. 19(1): 26-36.