

Measuring Household Vulnerability: Conceptual Issues and Illustrative Examples

Luc Christiaensen (World Bank)

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Outline

1. Rationalizing the measurement of vulnerability
2. Conceptualizing vulnerability
3. Quantifying vulnerability
4. Measuring vulnerability
5. Using vulnerability assessments to inform policy

Poverty, vulnerability and risk

- Poverty could be thought of as “not having enough now of something valuable”; it is an ex-post measure of well-being (or the lack thereof)
- Vulnerability could be thought of as “the probability now of not having enough of something valuable in the future; it is an ex-ante measure of well-being
- The presence of risk—the fact that the level of future well-being is uncertain—distinguishes the concept of poverty from the notion of vulnerability

Why worry about vulnerability?

- Vulnerability is an intrinsic aspect of well-being. In evaluating one's well-being, one cannot limit oneself to the person's actual welfare status today, but must also account for his prospects for being well in the future--and being well today does not imply being well tomorrow.
- Understanding vulnerability also important from an instrumental perspective.

Why worry about vulnerability?

- *Permanent damage.* In the absence of effective coping strategies, shocks may permanently damage people's future welfare or this of their children due to permanent loss of physical (distress sale of assets), or human capital (early childhood malnutrition, school drop out)
- Need for forward-looking poverty interventions
- Risk-induced poverty traps. The inability to cope with adverse shocks may lead households to adopt ex-ante risk-mitigating strategies that while offering some stability often also yield low returns, trapping them in perpetual poverty (e.g. portfolio management and technology adoption.)

Why *measure* vulnerability?

Reliable vulnerability measures needed for:

- Diagnostics– tracking the vulnerability situation
- Analytics – to understand the causes vulnerability as well as the effectiveness of interventions aimed at alleviating vulnerability
- Policy purposes – emergency, targeting, monitoring and evaluation

→ If it can't be measured, it does not exist!

2 Conceptualizing vulnerability

“Vulnerability is a measure of the prospect now of your well-being in the future being below a certain socially acceptable norm(s) due to risky events, irrespective of the level of your current well-being.”

“Someone is vulnerable if his vulnerability falls below a certain threshold (either absolute or relative; objectively or subjectively defined).”

➔ Relation between the chronically poor, the transient poor and the rich and the very vulnerable, the vulnerable and the non-vulnerable

Key dimensions of vulnerability

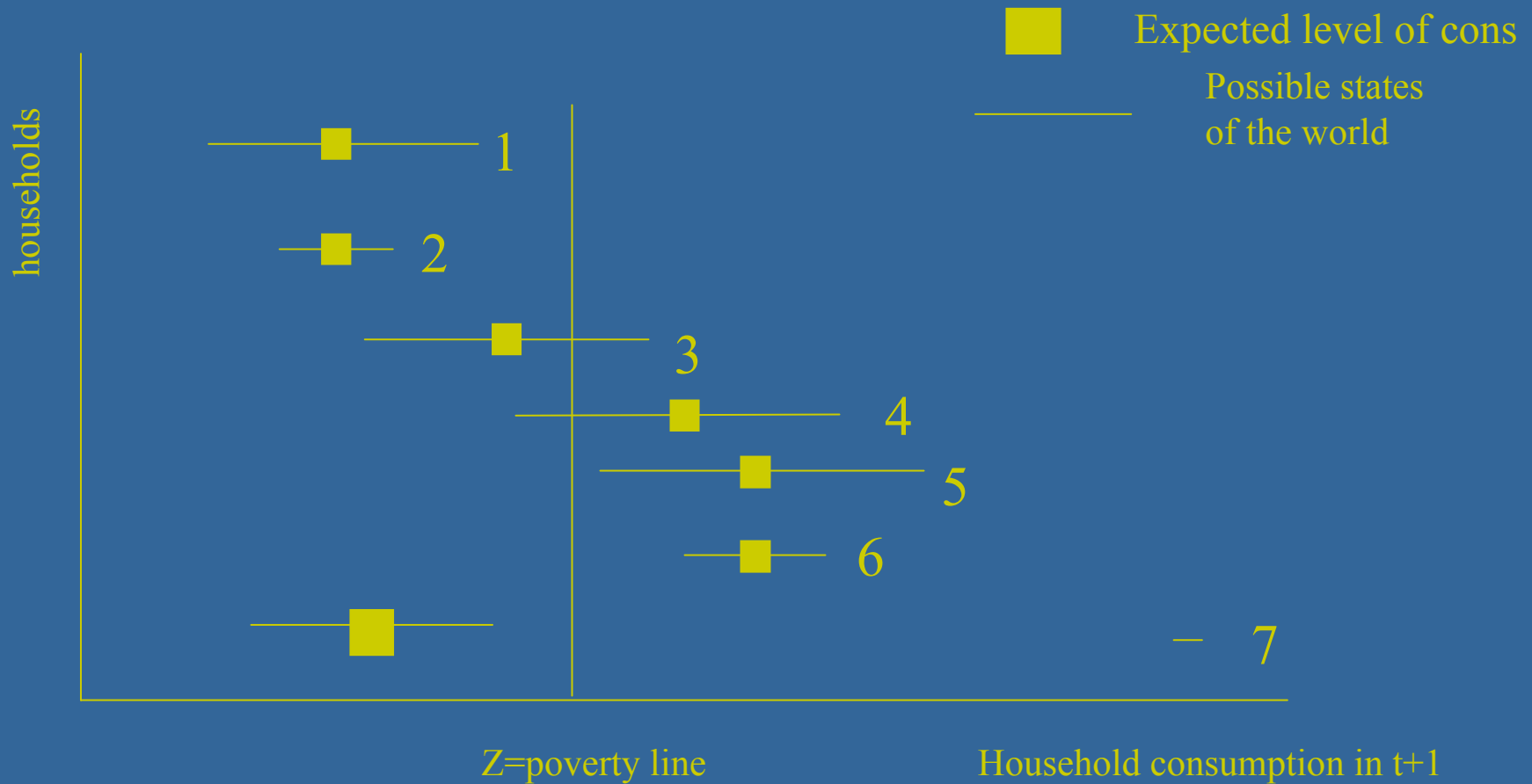
- 1) *outcome oriented*--about one's well-being (either defined as welfare or functionings or ...) not about the means to attain well-being (e.g. income, assets, etc.)
- 2) *forward looking*--about well-being in the future;
- 3) *non-deterministic* view of the future--the future is uncertain with downside risks;
- 4) notion of a *socially accepted norm* (e.g. poverty line) below which your well-being is unacceptably low; By defining loss of well-being in relation to an externally defined threshold (D 4) (as opposed to an internal threshold (i.e. one's current position) this concept of V is distinct from earlier concepts of vulnerability that focused solely on exposure to adverse shocks and ignore ex-post welfare levels;

Choices in quantifying vulnerability

- Time horizon over which future shortfalls are assessed → we take one period ahead.
- Indicator of well-being → consumption or welfare measures based on consumption
- Threshold for consumption → poverty line
- Threshold for vulnerability such that persons whose probability of shortfall exceeds the threshold can be classified as vulnerable
- Estimation of probability distribution $f_t(c_{t+1})$

A Diagrammatic Approach

Households and their prospective levels of consumption



A Diagrammatic Approach

- Assume certain measure of well-being (e.g. cons. and socially accepted minimal norm of this measure (e.g. poverty line z))
- Assume a population with 7 households each with their own expected cons and certain distribution around it.
 - $E(c_1)=E(c_2)<z$, but $\text{Var}(c_1)>\text{Var}(c_2)$;
 - $E(c_3)<z<E(c_4)$, but $\text{Var}(c_3)=\text{Var}(c_4)$;
 - $Z<E(c_4)<E(c_5)$, $\text{Var}(c_4)=\text{Var}(c_5)$, but while c_4 sometimes $<z$, c_5 never $<z$
 - $Z<E(c_5)=E(c_6)$, both c_5 and c_6 never $<z$, but $\text{Var}(c_5)>\text{Var}(c_6)$
 - $E(c_7) <z$, but low probability of high prize (e.g. poor farmer buying a ticket of the state lottery; increasing the prize would push $E(c_7)$ above z)

A diagrammatic approach

- V differs from P by explicitly accounting for a non-deterministic future (D2 and D3)- notions of transient and chronic poverty)
- V-measures differ in their choice of well-being definition (D1) which is ultimately ethically motivated.
- V-measures differ in the way they account of states of the world above the poverty line (i.e. positive shocks)

3 Quantifying vulnerability

Vulnerability as expected poverty (VEP)

→ VEP focuses on the likelihood that well-being will be below the benchmark in the future

Vulnerability as low expected utility (VEU)

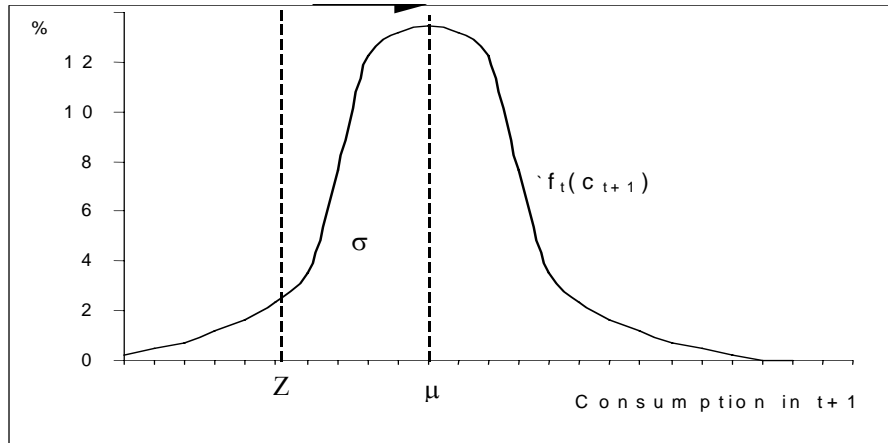
→ VEU focuses on the magnitude of the difference in welfare/utility associated with a certainty equivalent level of welfare (a benchmark) and the household's own expected welfare/utility

Both measures have much in common. They differ in

- 1) Their definition of well-being
- 2) Their treatment of states of the world above the benchmark

Vulnerability as expected poverty

Vulnerability of a person at t is a measure of the prospect of his well-being falling below the benchmark in the future



$$V_{i,t,\gamma} = F(z) = \int_{\underline{c}_{t+1}}^z f(c_{i,t+1}) dc_{t+1}$$

$$V_{t,\gamma} = F(z) \int_{\underline{c}_{t+1}}^z (z - c_{t+1})^\gamma \frac{f(c_{t+1})}{F(z)} dc_{t+1}$$

$\gamma=0$: $V_0 = \text{prob of shortfall}$

$\gamma=1$: $V_1 = \text{prob of shortfall}^*$
conditional expected gap

$\gamma=2$: $V_2 = \text{prob of shortfall}^*$ conditional
expected gap squared

Vulnerability as expected poverty cont.

- While $V_{\gamma=0}$ (V as expected poverty) is intuitively appealing, computationally easier to calculate and also easier to define a “vulnerability line” for (e.g. 50%), it is conceptually flawed, as it would be possible to decrease a population’s vulnerability by shifting risks from the less vulnerable to the more vulnerable. $V_{\gamma=2}$ remedies this problem and should be the preferred measure.
- V_{γ} considers only states of the world below the threshold (focus axiom)
- V_2 has been criticized for implicitly assuming increasing absolute risk aversion (i.e. people get more risk averse as they get wealthier, which seems contrary to empirical evidence).

Vulnerability as low expected utility

Vulnerability is the difference between the utility derived from some level of certainty-equivalent consumption, z_{CE} at and above which the household the household would not be considered vulnerable and the expected utility of consumption.

$$V_h = U_h(z_{CE}) - EU_h(c_h) \text{ with } c_h \text{ not limited to } c_h < z$$

Or

$$V_h = [U_h(z_{CE}) - U_h(Ec_h)] + [U_h(Ec_h) - EU_h(c_h)]$$

Vulnerability is poverty + risk (Ligon and Schechter)

Vulnerability as low expected utility cont.

- Welfarist approach, explicitly account for individual risk preferences (RP) and theoretical foundation
 - *Practice.* Hard to retrieve individual RP empirically (Just and Pope, 2003) and observed responses to risks often result from other phenomena (e.g. absence of credit or insurance markets) unrelated to risk preferences. Yet, using the same (or similar e.g. CRRA: $u_1(c) = c^{(1-\gamma)/(1-\gamma)}$) RP for all individuals defeats the purpose of welfarist approach.

Vulnerability as low expected utility cont.

■ Ethics. Is it desirable to account for individual RP?

■ Moral Hazard argument.

■ Yet, it is impossible for a person to imagine the effects of big shocks ex ante which have led many governments to install obligatory pension schemes, health insurance, safety laws (seat belts), ex post compensation of flooding victims.

• VEU compensates neg. by pos. states of the world

$$V_h = U_i(z_{CE}) - EU_h(c_h^*) = [U_i(z_{CE}) - EU_h(c_h)] + [EU_h(c_h) - EU_h(c_h^*)] = VEU + PR$$

where $c_h^* = \min(c_h, z)$; PR the pos effect of welfare shocks → since $PR > 0$, VEU underestimates vulnerability measured by expected poverty

→ violation of “focus” axiom in poverty measurement; recall person 7 in diagram → his vulnerability could be reduced by making lottery prize very high

In sum

- While it is clear that we would want to account for differences in shortfall and thus $\gamma > 1$ in VEP, it is not clear that we want to revert to utilitarian approaches (i.e. explicit incorporation of individual RP) to do so. By taking the same value of γ , the benevolent planner also attaches the same value for each shortfall below the benchmark, thereby treating everyone the same.
- Allowing positive to offset negative shocks seems to confuse matters and may lead to intuitively perverse results.
- Most empirical applications so far have taken the expected poverty approach.

4 Estimating vulnerability

- The key challenge in estimating a person's vulnerability is to obtain an estimate of each person's distribution of his future consumption based on his current characteristics and those of his environment as well as the shocks they face.
- The consumption generating process could be modeled as follows:

Estimating vulnerability, cont.

$$C_{ijt+1} = \lambda S_{ijt+1} + \beta S_{jt+1} + \delta X_{ijt} + \gamma Z_{jt} + v_j + u_{ij} + \varepsilon_{htv}$$

C_{itt+1} = consumption of person i in location j at time $t+1$, X_{ijt} and Z_{jt} = observed individual/household and community characteristics respectively

S_{ij} and S_j idiosyncratic (e.g. sickness, death) and covariant shocks respectively

v_i and u_{ij} unobserved time invariant community and ind/hh characteristics

ε_{htv} an error term

$\lambda, \beta, \delta, \gamma$ parameters to estimate

Estimating vulnerability, cont.

- Estimating the stochastic consumption process is data intensive. It requires:
 - ▣ Info on diff. aspects of the hh and its community (cons., income, assets, shocks experienced, coping strategies);
 - ▣ Information on these aspects over time;
 - ▣ Historical information on shocks
- Given data limitations, literature has focused on methodologies using limited information (e.g. pure shock analysis (Tesliuc and Lindert), cross sectional analysis (Chaudhuri), census data (Hoogeveen), pseudo panel (Christiaensen), panel data (Ligon). Examples in other sessions of conf.

5 Using vulnerability assessments to inform policy

Key policy questions

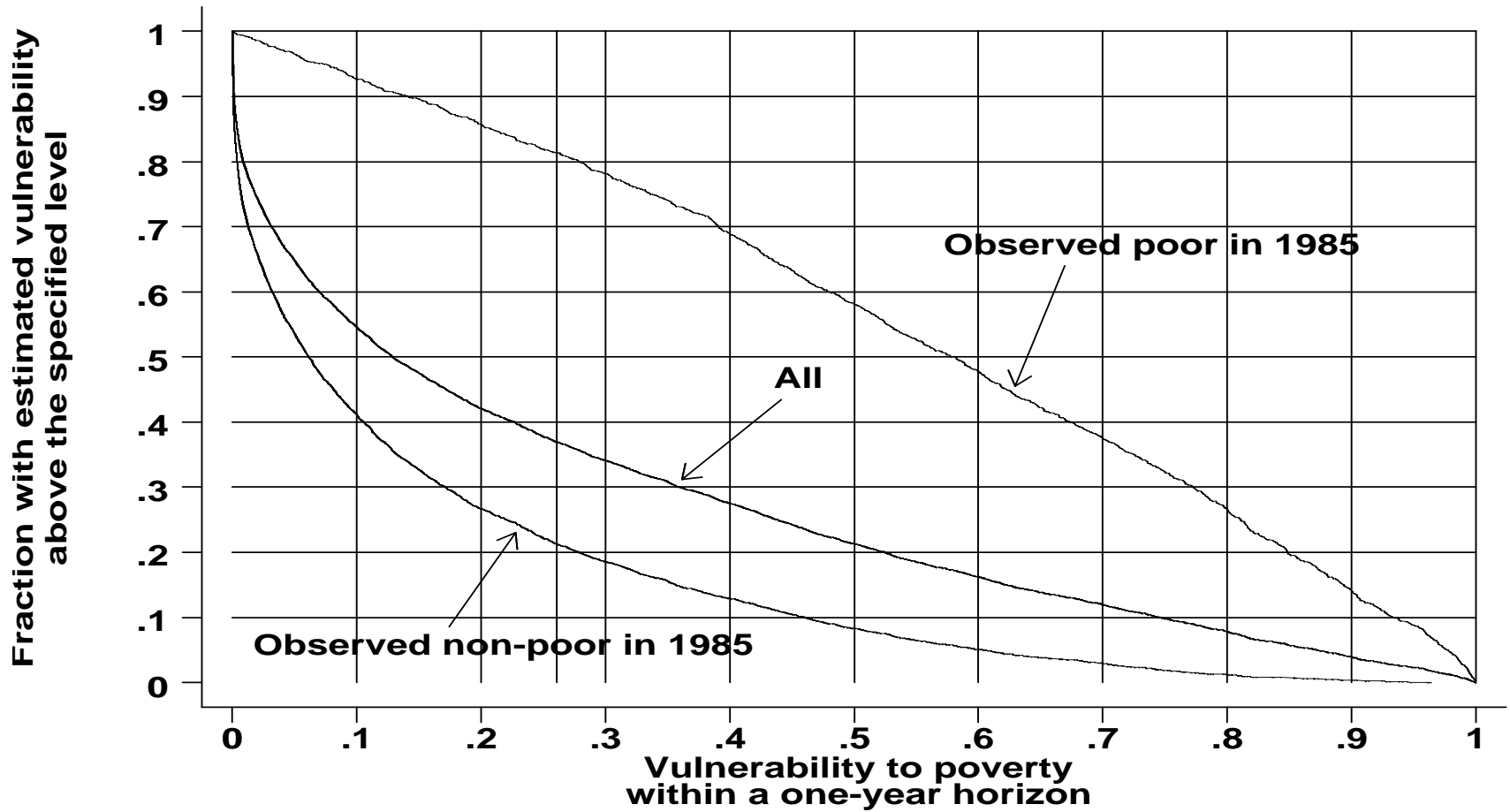
1. How vulnerable is the population?
2. Who are the vulnerable and where are they located?
3. How concentrated is vulnerability within different groups?
4. What are the proximate causes of vulnerability?
5. What are the sources of risk that contribute most to vulnerability?
6. Which types of interventions are most likely to reduce vulnerability?

Illustrative examples

How poor and vulnerable is the population?

- Estimate vulnerability to poverty at the household-level using 6-years of longitudinal household data from southern China
- Plot distribution of vulnerability, for the sample as a whole, and separately by observed poverty status in 1985

Estimated distribution of vulnerability in southern China, 1985 (Rural Household Survey, 1985-1990)



Illustrative examples...

Who are the vulnerable?

- Compare the characteristics of the poor with those of vulnerable in Indonesia.
- Considerable variation in the fraction of the population that is vulnerable to the fraction that is poor.

Comparing the poverty and vulnerability profiles for Indonesia in December 1998

	Fraction poor	Fraction vulnerable	Vulnerability to poverty ratio
Overall	0.23	0.44	1.92
By location			
East Java& Bali urban	0.08	0.12	1.52
Rest of Indonesia:urban	0.08	0.21	2.59
By education hh head			
No schooling	0.34	0.74	2.18
Secondary	0.07	0.03	0.43
By community characteristics			
Access to transport facilities	0.41	0.61	1.48
Access to clean water	0.29	0.52	1.83

Illustrative examples...

How concentrated is vulnerability within different groups?

- Suppose household deemed vulnerable if more likely than not to be poor at least once during next three years
- Compare the incidence of vulnerability (so defined) to the incidence of poverty within various segments of the population, for instance, in different regions
- Such comparisons suggest useful distinction between ex ante poverty-prevention programs and ex post poverty-alleviation programs

Vulnerability and poverty within regions of southern China (Rural Household Survey, 1985-1990)

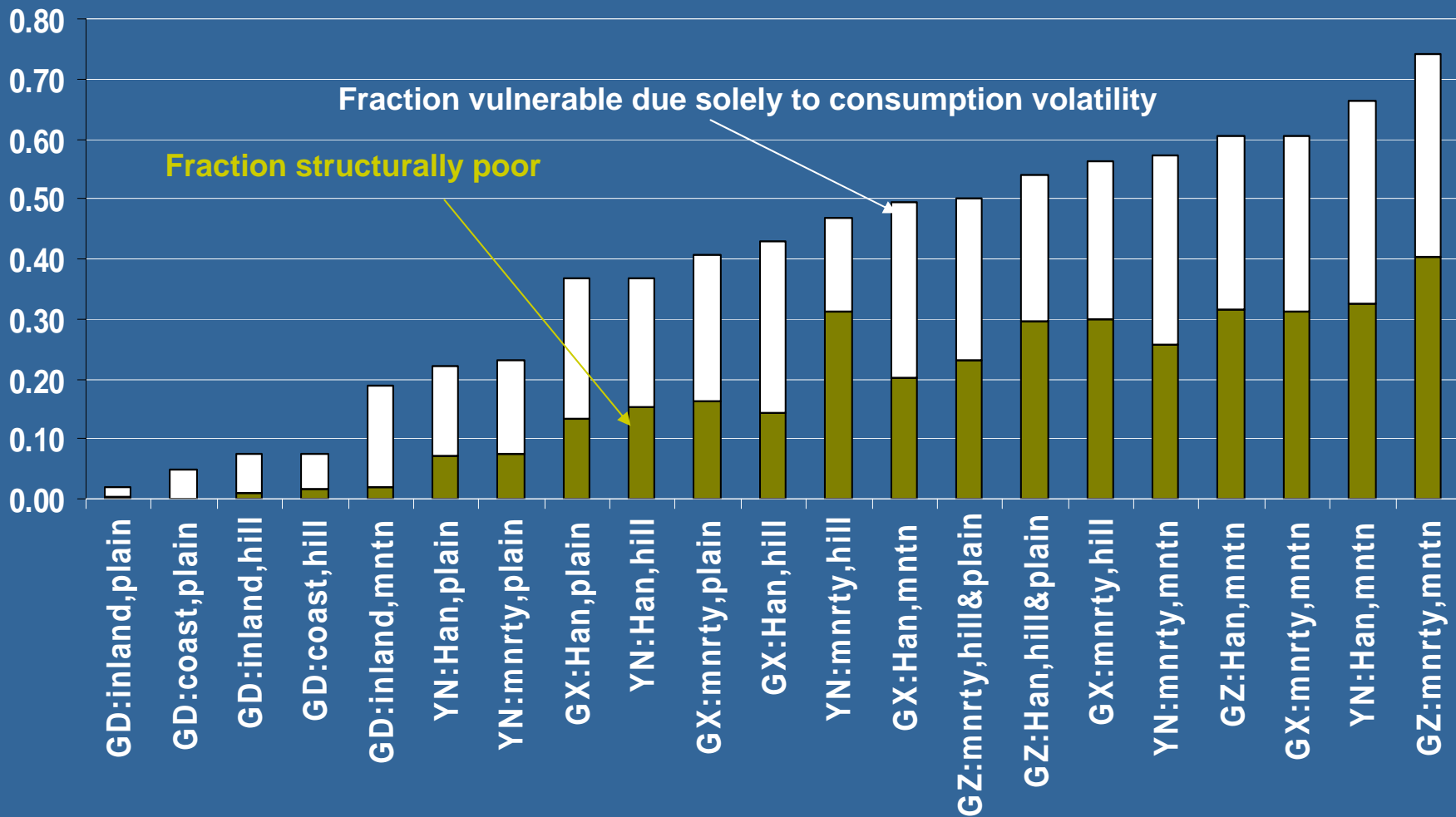
Region	Observed poverty, 1985		Fraction vulnerable to poverty within 3 years		Ratio of vulnerable to poor
	Rank	Rate	Rank	Fraction	
Guandong: inland, plains	01	0.043	01	0.020	0.462
Guandong: coastal, plains	02	0.078	02	0.049	0.625
Yunnan: minority area, plains	03	0.098	7	0.230	2.333
Guandong: inland, hilly	04	0.100	3	0.074	0.745
Yunnan: non-minority, plain	05	0.126	6	0.222	1.756
Guandong: coastal, hilly	06	0.134	4	0.075	0.556
Guangxi, plains, non-minority	11	0.245	8	0.367	1.500
Yunnan: minority area, mountainous	12	0.257	17	0.572	2.232

Illustrative examples...

What are the proximate causes of vulnerability?

- distinguish between those who would not be vulnerable in the absence of consumption volatility and those who are structurally poor
- for the former group, interventions that reduce consumption volatility either by reducing their exposure to risk or by enhancing their ex post coping capacity could be sufficient
- for the latter, risk-reducing interventions alone may be inadequate, and must most likely be accompanied by mean-enhancing interventions

Consumption volatility and structural poverty in southern China, 1985 (Rural Household Survey, 1985-1990)

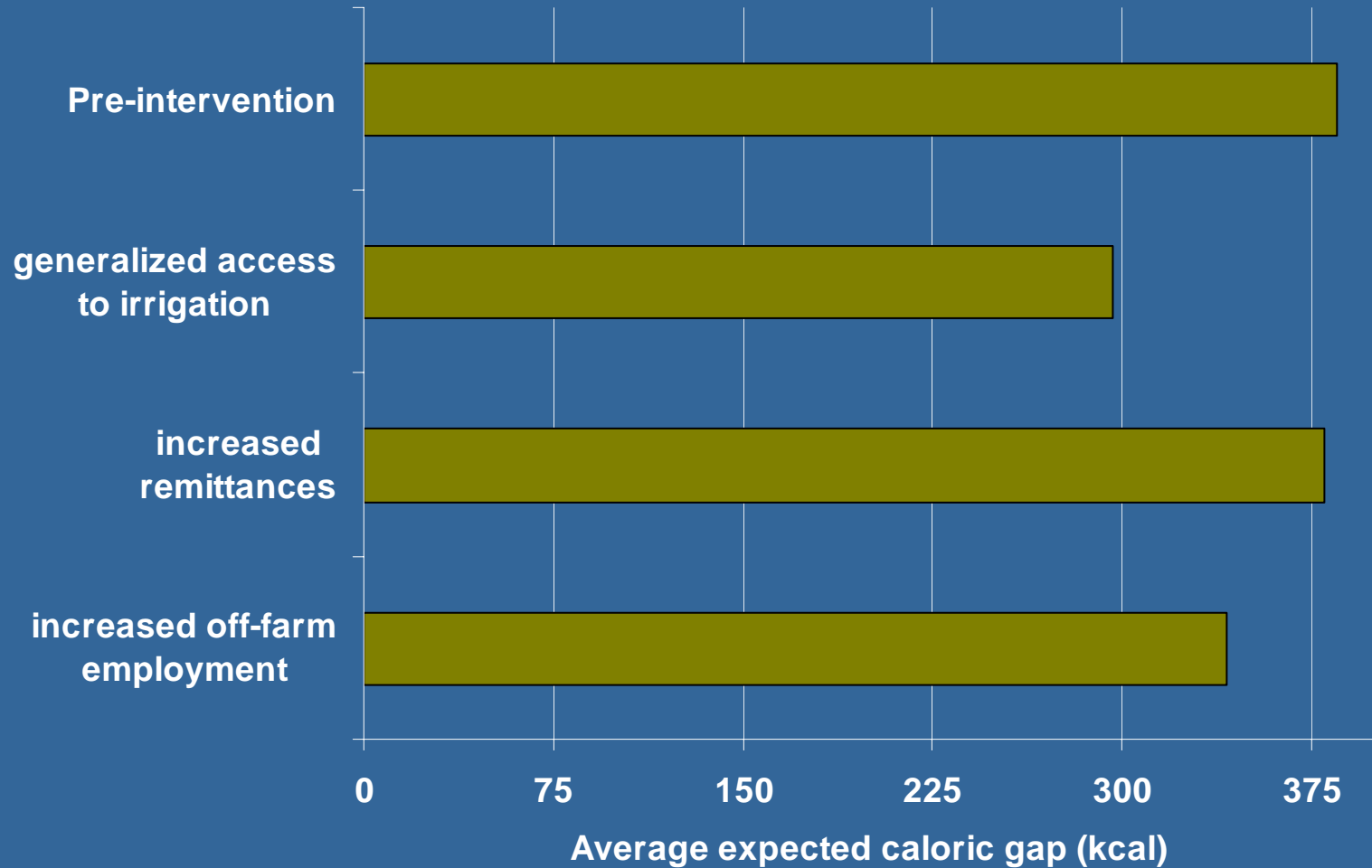


Illustrative examples...

Which types of interventions are most likely to reduce vulnerability?

- Use estimates of the parameters of the underlying data generating process to simulate the impact of various potential interventions

Estimated impact of various potential interventions: Mali



Concluding remarks

- Need for incorporation of risk and vulnerability in poverty assessment is well understood;
- Conceptualization of measuring vulnerability has much advanced; key remaining issues are related to the role of
 1. positive shocks;
 2. risk preferences in quantifying vulnerability.
- Precise identification of the stochastic consumption process is data demanding and challenging. Data on household and community characteristics over time as well as historical info on shocks seem necessary. Nonetheless, promising approaches (both qualitative and quantitative) are underway.
- V measures permit answering important policy questions.

References

- Chaudhuri, Shubham, 2003, *Assessing vulnerability to poverty: concepts, empirical methods and illustrative examples.*
- Christiaensen, Luc, 2000, *Measuring vulnerability and Food Security: Case Evidence from Mali, Chapter 2, Unpublished Ph.D. dissertation, Cornell University*
- Ethan Ligon and Laura Schechter, 2002, *Measuring Vulnerability, WIDER Discussion Paper 2002/86.*