

Risk and Vulnerability Assessments: Concepts and Methods

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Outline

■ Concepts

- Risk, poverty and vulnerability
- Why addressing vulnerability
- The risk chain
- Risk management matrix

■ Measuring vulnerability and policy

- Characterizing risks and shocks (Guatemala)
- Consumption smoothing and vulnerability
- Life-cycle approach (Mexico/Argentina)
- Measuring vulnerability (Kenya)

1. Risk, poverty and vulnerability

■ *Risk:*

- uncertain event that may damage people's well-being

■ *Poverty:*

- not having enough now of something valuable

■ *Vulnerability:*

- probability now of not having enough of something valuable in the future

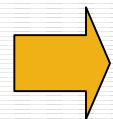
Why do we care (2)?

2. Vulnerability has **intrinsic** value

- *To be well, a person must not only have enough to live a comfortable life today, he must also have good prospects today that he will have enough to tomorrow.*

3. Vulnerability has **instrumental** value

- *In the absence of sufficient means to cope with income shocks ex post, people often engage in risk mitigating strategies ex ante. Such strategies often yield low average returns, trapping people in perpetual poverty. Addressing risk management is an integral part of addressing poverty.*



Need to address poverty and vulnerability **simultaneously**

The risk chain – what determines vulnerability

- Households live in environments characterized by **risks** (e.g. droughts, sickness, price changes, violence/theft).
- Given risks, households allocate endowments to activities generating income. No perfect mapping from income into consumption b/c ex post consumption smoothing (asset depletion, borrowing, formal and informal insurance, migration, de-investment in human capital). The extent to which they can smooth their consumption = **coping capacity**.
- Given risks and in absence of sufficient coping capacity, households reduce **risk exposure** through ex ante income smoothing (income diversification, low risk-low return activities)
- ➔ **risks, risk exposure and coping capacity jointly determine the stochastic nature of people's future consumption and thus their vulnerability to consumption poverty**

Social risk management matrix

Arrangements and strategies	Informal	Market-based	Public
<i>Risk reduction</i>	*migration to less drought prone areas	*food market integration	*disaster prevention infrastructure
<i>Risk mitigation</i>			
-portfolio	*drought resistant varieties; multiple activities	*micro-finance	*research and extension regarding drought resistant varieties
-insurance	*marriage/family	*rainfall and commodity price based insurance	*mandating disaster insurance, certain construction rules
<i>Risk coping</i>	*sale of assets *sending children to work	*consumption credits	*public works

Characterizing Risks and Shocks

- Risk are pervasive, but information on risks and shocks is scarce
- Few datasets with risk and shocks module
 - Ethiopia (1994/95 Survey), almost all households reported suffering from at least one shock over the last 20 years, with 78% reporting harvest failure (Dercon, 2000)
 - Philippines (1998 Survey), 60% of the population was affected by El-Nino shock (drought), and 68% by economic or weather-related shocks in 1998 (Datt & Hoogeveen, 2001)
 - Guatemala (2000 Survey), 53% of the population reported at least one shock during the previous year (Tesliuc & Lindert, 2002)

Why do we care about vulnerability?

1. Poverty \neq vulnerability in theory nor in practice

		<i>Percentage of Households who are:</i>		
		<i>Always poor</i>	<i>Sometimes poor</i>	<i>Never poor</i>
China	1985-1990	6.2	47.8	46.0
Côte d'Ivoire	1987-1988	25.0	22.0	53.0
Ethiopia	1994-1997	24.8	30.1	45.1
India	1976/76-83/84	21.9	65.9	12.4
Indonesia	1997-98	8.6	19.8	71.6
Pakistan	1986-1991	3.0	55.3	41.7
Russia	1992-1993	12.6	30.2	57.2
South Africa	1993-1998	22.7	31.5	45.8
Vietnam	1992/93-97/98	28.7	32.1	39.2
Zimbabwe	1992/93-1995/96	10.6	59.6	29.8

→ Chronic poor could be seen as the very vulnerable, temporary poor as the vulnerable, and the non-poor as non-vulnerable

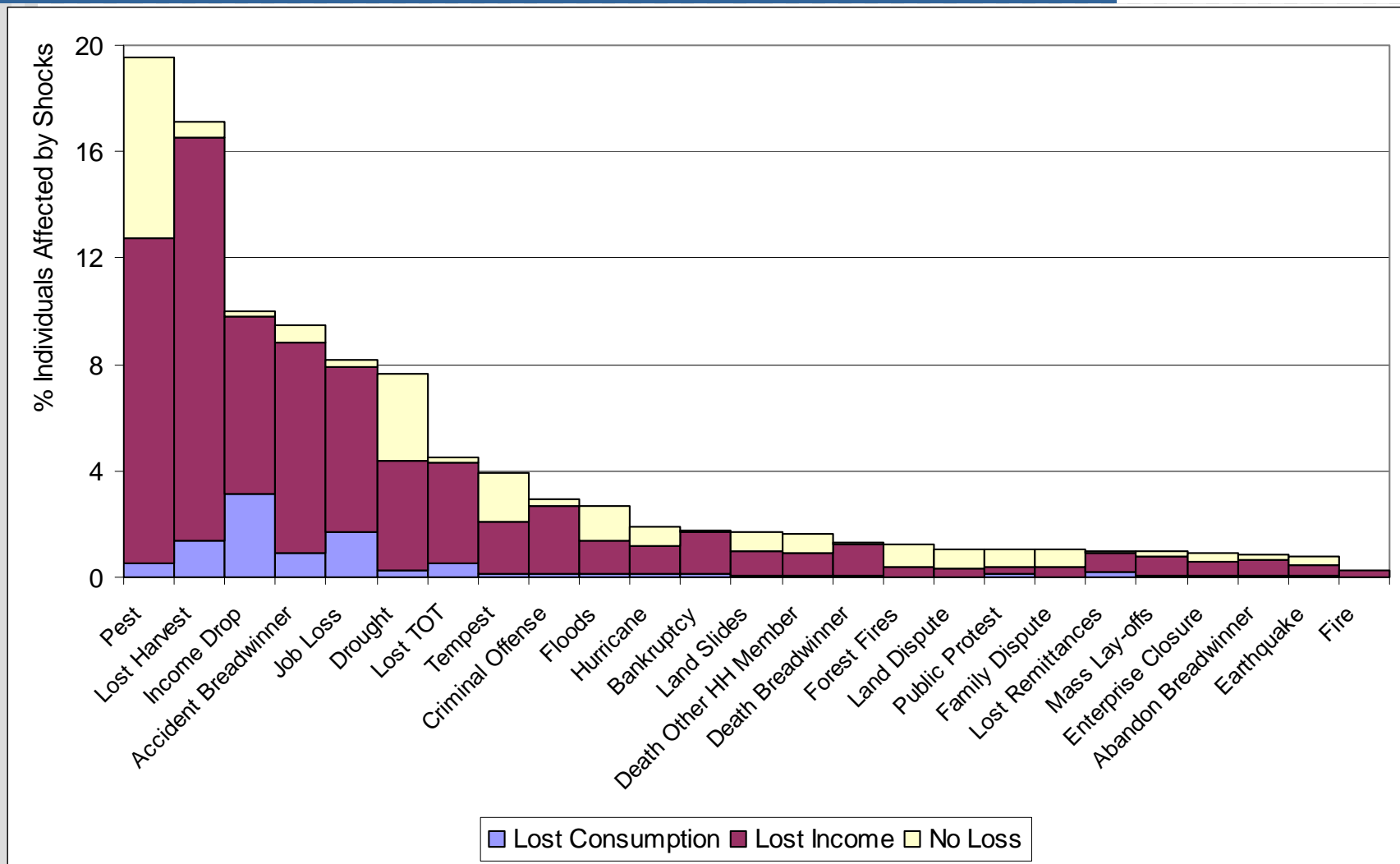
Shocks – Source of Vulnerability

- Understanding vulnerability starts with
 - Type of Shocks
 - Degree of covariance
 - Across space: idiosyncratic versus covariant
 - Across time: repeated/predictable vs. unpredictable shocks
 - Across shocks: bunched vs. “lonely” shocks
 - Severity and Cost
 - Distributional Impact:
 - Who is affected?
 - First-round effect on consumption, income, assets, poverty and inequality

Type of Shocks – useful classifications

Examples of risky events by categories, classified by their degree of correlation			
	Idiosyncratic events	Regional covariant events	Nation-wide and international covariant events
Natural Risks		Rainfall Landslides Volcanic eruptions	Earthquakes Floods Droughts Strong Winds
Health Risks	Illness Injury / Accident Disability		Epidemic Famines
Life-cycle Risks	Birth / Maternity Family break-up Old-age Death		
Social Risks	Crime Domestic violence	Terrorism Gangs	Civil strife War Social upheaval
Economic Risks	Business Failure	Unemployment Harvest failure Resettlement	Output collapse Balance of payments shocks Financial crisis Currency crisis Technology- or trade-induced terms of trade shocks
Political Risks		Ethnic discrimination Gender discrimination Religious discrimination Riots	Political default on social programs Coup d'état
Environmental Risks		Pollution Deforestation	

Incidence of reported shocks, by type, in Guatemala (2000)



Consumption smoothing and vulnerability

- Vulnerability: conditional covariance between changes in consumption and changes in income
- Motivates measures of transient poverty, i.e. the contribution to expected poverty of variability in consumption over time
- Links outcomes of shocks with household risk response strategies

Life-cycle approach

- Identify groups at high risk of poverty, based on observed poverty
- For each age group identify the most likely risks plus “special circumstances groups”, disaggregated by gender/area of residence
- Linked/Complemented with an assessment of the risks (catastrophic / severe or not) and current social risk management interventions
- Simple, powerful method, to identify highly vulnerable groups and their relative size, gaps in the coverage with social risk management instruments, establish priority interventions or corrective measures, costing
- Shortcomings:
 - Suggests that risks within an age group have similar consequences for all people affected
 - The management of risks depends very much on factors other than the age of the person at risk
 - Risks might have consequences for others than the person exposed
 - Works only for idiosyncratic risks

Table 1: Managing Social Risk in Mexico: Main Risks Indicators, Size of At-Risk Groups, and Best Practice Policy Responses

Age Group/ Main Risk Indicator	Size of Population at Risk* (Number of Poor Uncovered)		Role for Other Programs/Policies	Role for Social Protection (SP) Policy	
	Urban	Rural		Social Insurance	Social Assistance
0-5 -Malnutrition (0-4) -Access to ECD (0-4) -Preschool enrollment (age 5)	820,000 2,200,000 200,000	990,000 3,000,000 300,000	- Nutrition and educational programs - Publicly provided and/or regulated ECD programs and preschool services	--	- Behavior-conditioned income transfers (PROGRESA) - Targeted ECD and community based pre-schools
6-14 -Primary enrollment -Lower second. enrollment -Child labor -Inactivity	Not at risk 625,000 180,000 160,000	430,000 1,300,000 515,000 Not at risk	- Improve primary school access/quality - Improve secondary school access/quality - Distance learning programs	--	- Behavior-conditioned income transfers (PROGRESA) - Targeted, community-based schooling services
15-24 - Upper second. enrollment -Unemployment - Inactivity	1,000,000 1,100,000 2,000,000	1,200,000 Not at risk 1,600,000	- Improve secondary school access/quality - Improve university access/quality - Community colleges (terminal degrees, professional/semi-skilled qualifications)	--	- Targeted (need based) scholarships, credit facilities, return-to-school (high-school equivalency) incentive programs

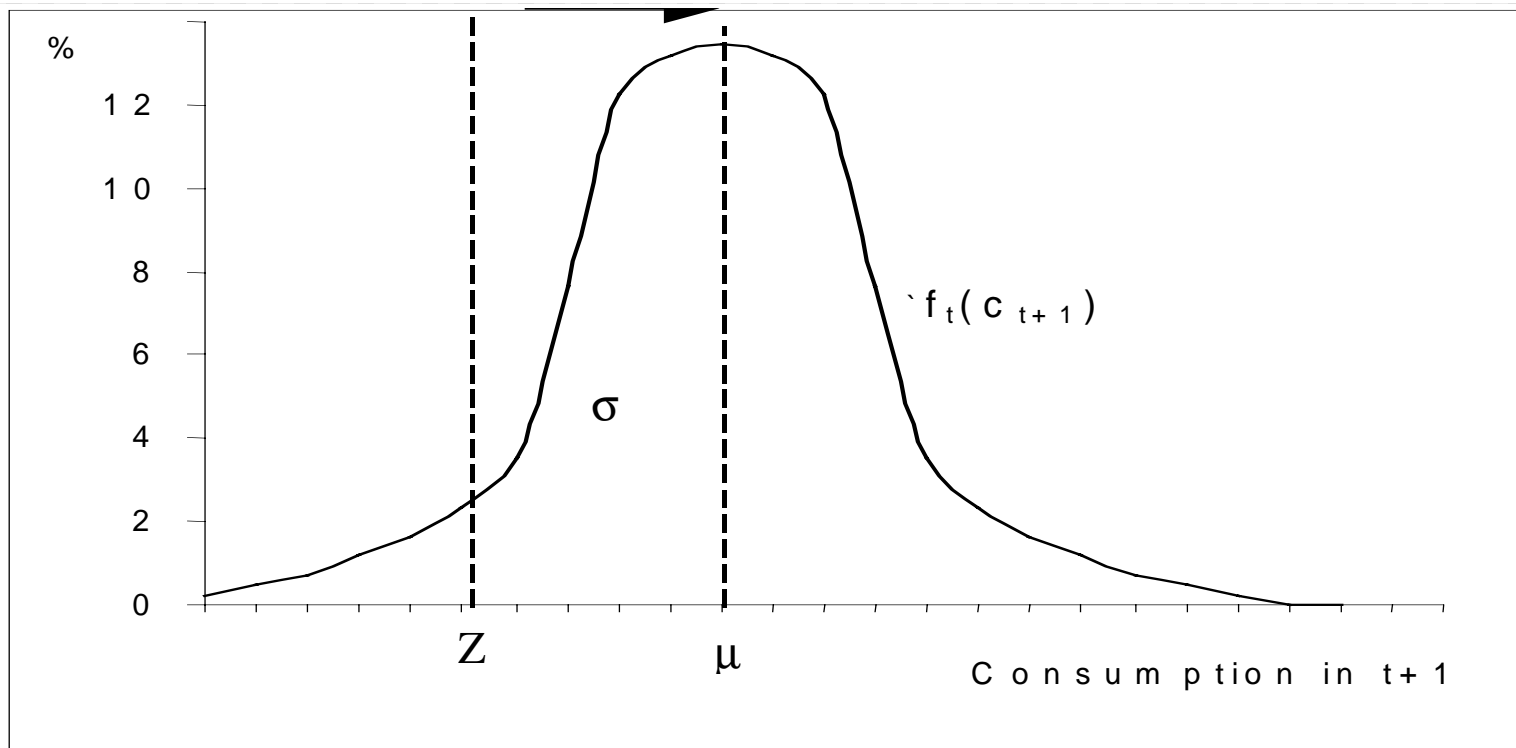
Case-Study prepared by Gillette Hall, based on Hall & Arriegada, 2000

Table 4. Federal Social Protection Programs in Mexico

Type of Program	Number of Programs	Budget 2000 (million pesos)	Percent of total Budget	Major Beneficiaries
1. <u>Social Insurance</u>	<u>4</u>	<u>170,539.0</u>	<u>76.1</u>	
—Social Security	3	158,687.0	70.8%	- Formal sector employees
—Negative Income Tax	1	11,760.0	5.2%	- Formal sector employees
2. <u>Sectoral Social Assistance</u>	<u>29</u>	<u>15,861.9</u>	<u>7.1%</u>	
—Education	18	6,622.8	3.0%	- Poor, low educated
—Health	5	4,740.7	2.1%	- Rural poor
—Housing credit	2	3,779.6	1.7%	- Public sector employees
—Other	4	718.8	0.3%	- Various vulnerable groups
3. <u>Income Transfers and Subsidies</u>	<u>7</u>	<u>14,765.2</u>	<u>6.6%</u>	
—Progresa (conditioned income T)	1	9,635.0	4.3%	- Rural poor
—Food Programs	6	5,130.2	2.3%	- Poor
4. <u>Income Generation</u>	<u>54</u>	<u>15,531.8</u>	<u>6.9%</u>	
—Temporary Employment	1	3,997.7	1.8%	- Poor unemployed
—Labor Training	2	1,683.9	0.7%	- Low income
—Rural Development	51	9,850.2	4.4%	- Rural communities
5. <u>Social Infrastructure</u>	<u>5</u>	<u>2,250.1</u>	<u>1.0%</u>	
				-- Communities with low access to basic infrastructure
6. <u>Natural Disaster Protection</u>	<u>1</u>	<u>4,839.9</u>	<u>2.2%</u>	
				-- Communities hit by natural disasters
7. <u>Other</u>	<u>5</u>	<u>202.8</u>	<u>.09%</u>	
TOTAL	105	223,990.7	100%	-- Poor communities

Probability of Being Poor

- Vulnerability is prob. of cons. shortfall in future
- Graphical expression



Choices in measuring vulnerability

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


Key steps to estimate V_γ in practice

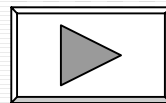
- Determination of a household's prob. distribution of future consumption is the major challenge
- If distribution lognormal → knowledge of mean and variance suffices to know the distribution
- Given each household's ex ante mean and variance we can construct its ex ante distribution of future consumption
- Given each household's ex ante distribution we can estimate each household's probability of future shortfall given a certain poverty line

Key steps to estimate $V\gamma$ in practice (2)

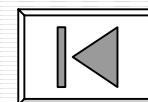
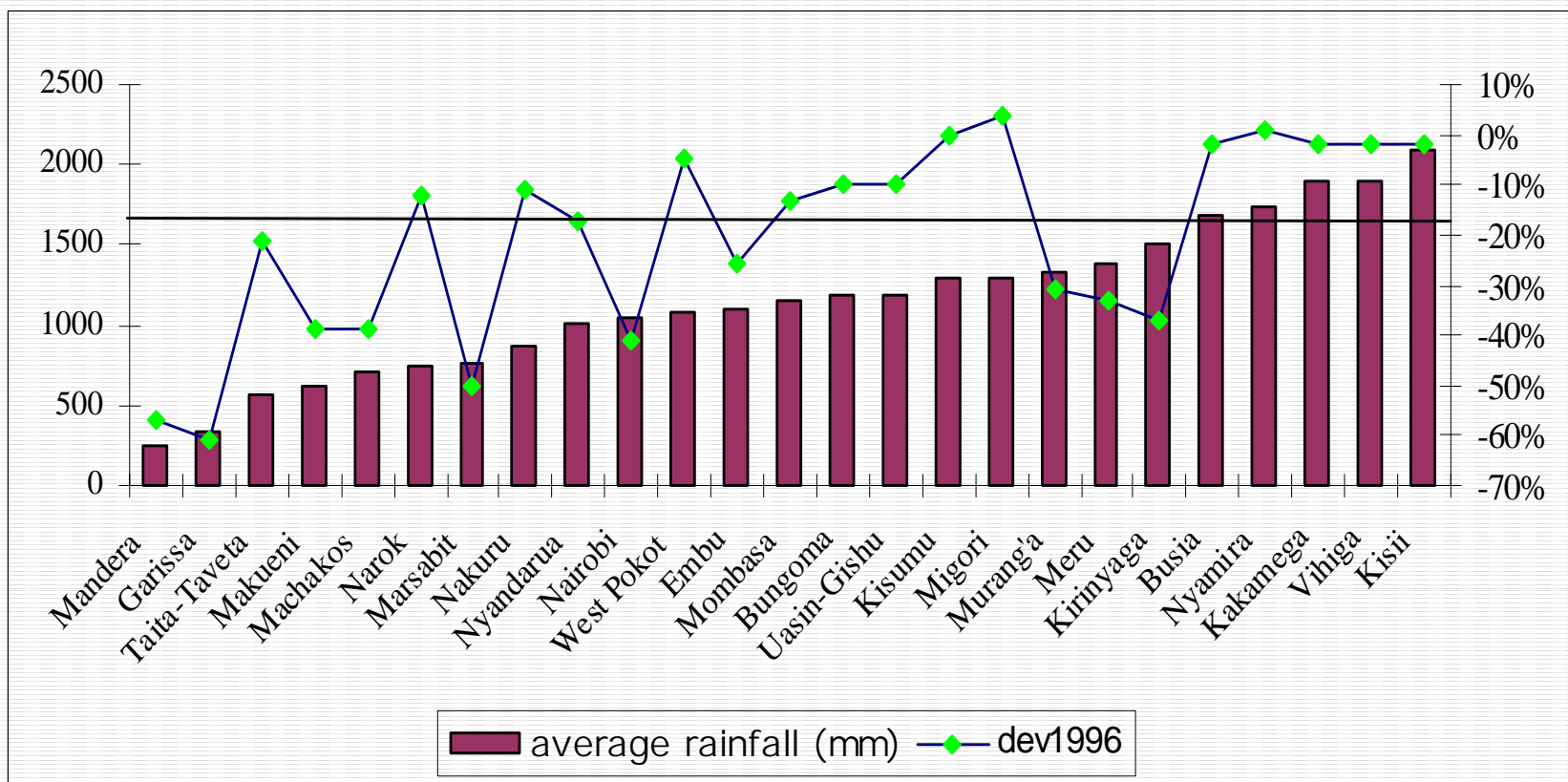
- How to obtain the ex ante mean and variance?
 - We estimate the relationship between the ex ante mean and the ex ante variance of each household's future consumption and its current characteristics, those of its locality and the shocks it experienced during this period
 - Using these estimated coefficients together with household and location characteristics and the occurred shocks we predict the mean and variance of future consumption for each household
 - To do so, at least 2-period panel data needed

What determines vulnerability in rural Kenya

- Dependent variable: real 1997 expenditure/adult equiv.
- Risk factors:
 - 1996 rainfall shock; malaria incidence during last 2 wks in 1994 
- Risk exposure (1994)
 - Landholdings, fertilizer use, proxies for income diversification
- Coping capacity (1994)
 - Household size, dependency ratio, gender household headship, adult literacy rate
 - Number of animals
 - Use of electricity
 - Time to food market

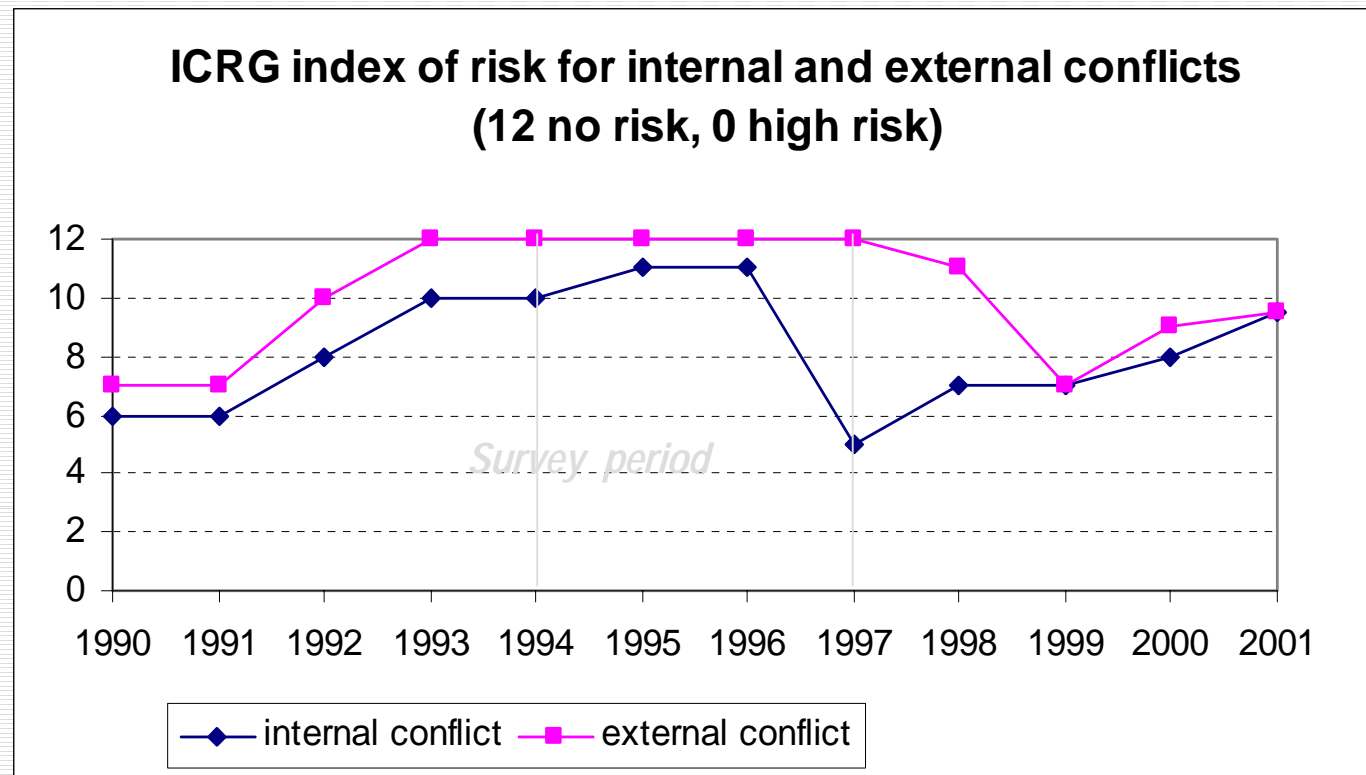


Mean rainfall (1960-90) and deviation from mean (%) in 1996



- Major risk factors

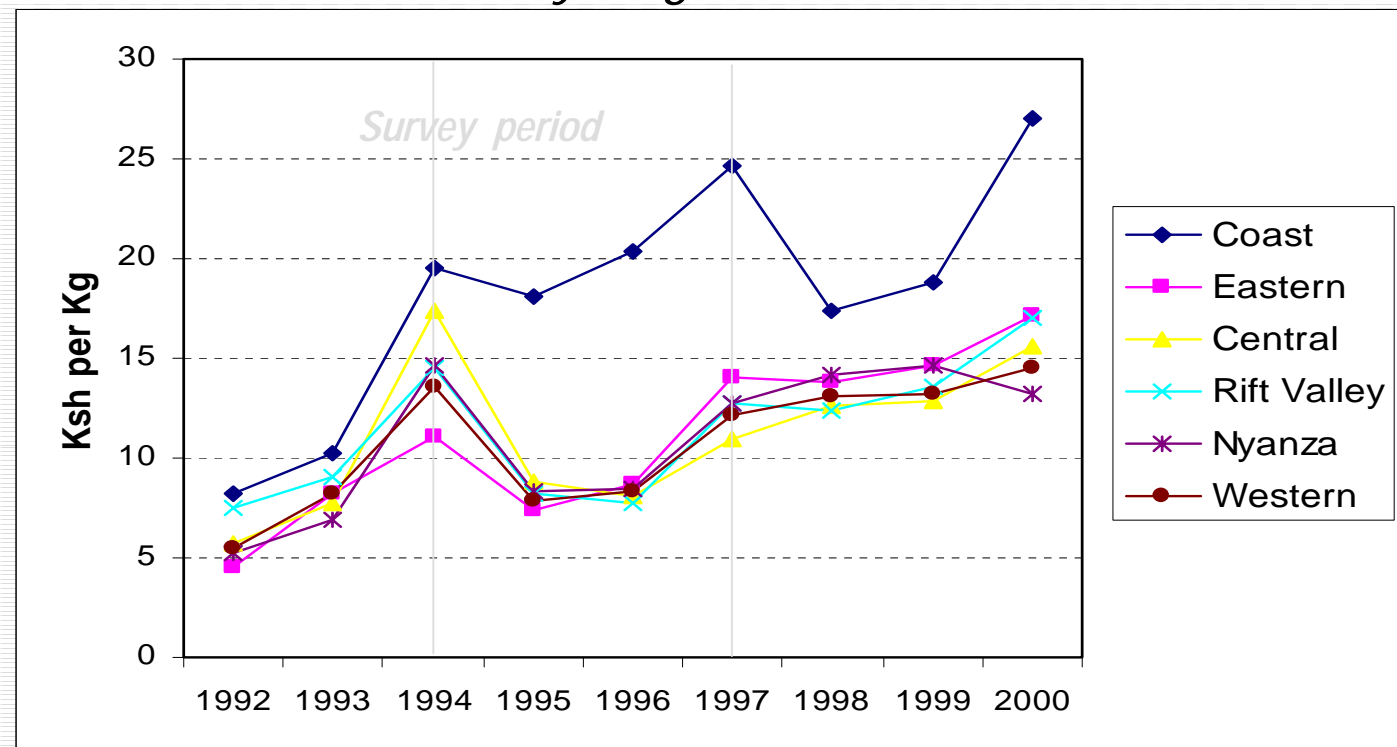
- violence



- Major risk factors, cont. 2

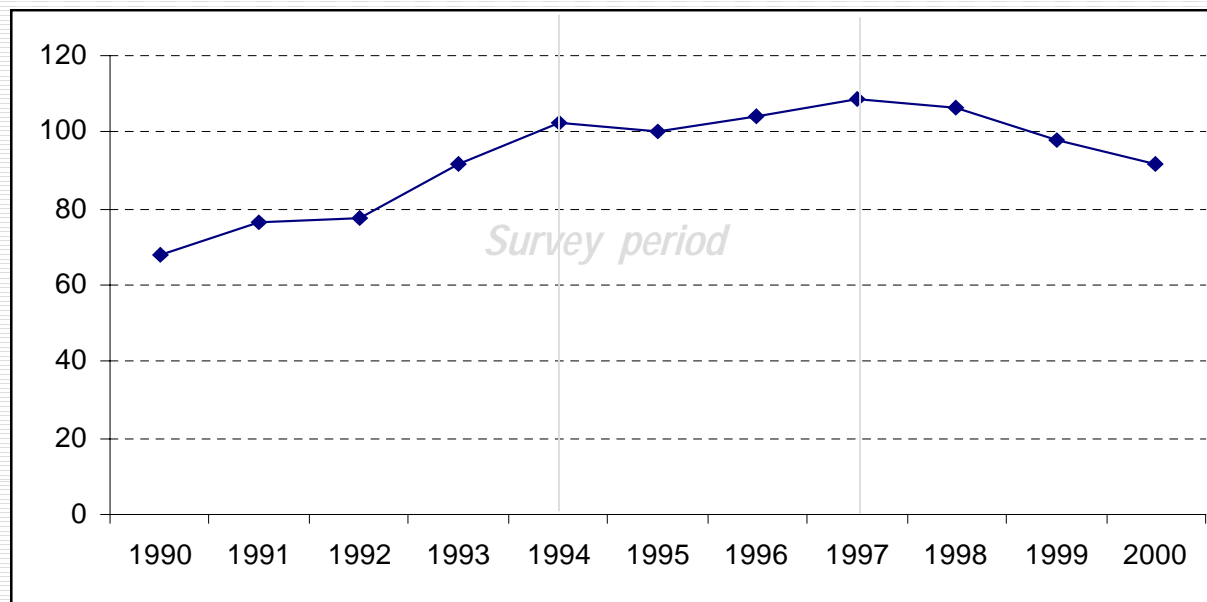
Food prices

Rural Market Price for Maize by Region: March, 1992-2000



- Major risk factors, cont. 3

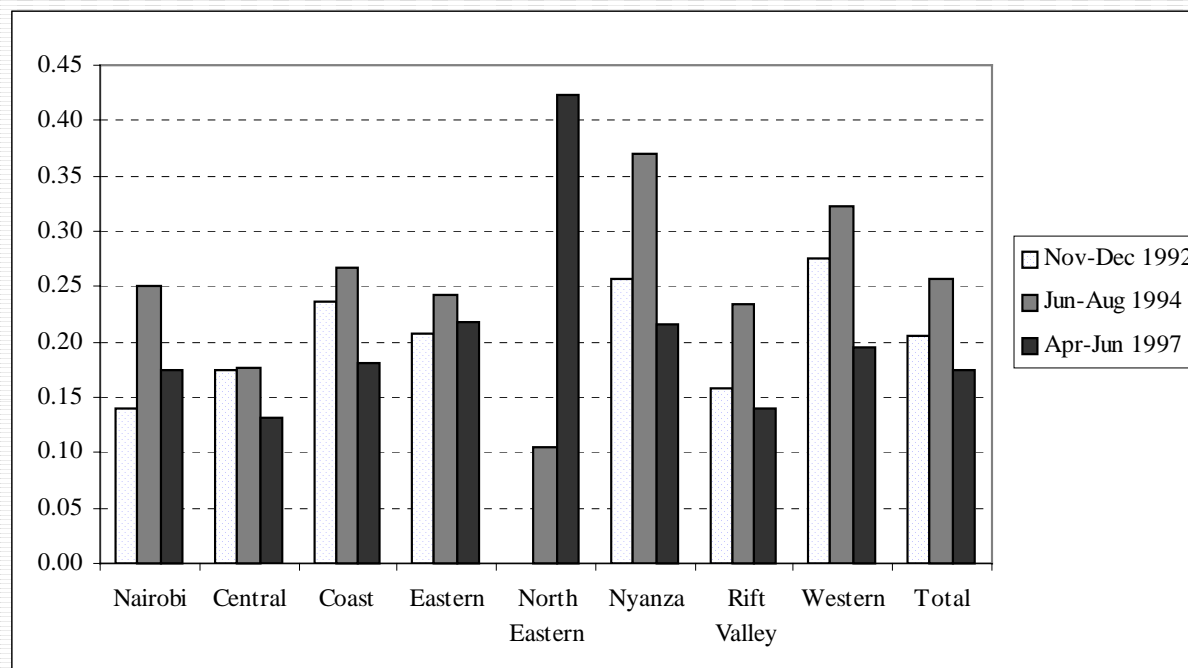
Behavior of Terms of Trade¹⁾ (1995=100) during 1992-2000



¹⁾ Terms of trade index = export price index/import price index

- Major risk factors, cont.6

Percentage of individuals reporting sick during the past two weeks in 1992 and 1994 or the past month in 1997.



Poverty in Kenya

		1992	1994	1997
Rural	Central	35.9	31.9	31.4
	Coast	43.5	55.6	62.1
	Eastern	42.2	57.8	58.6
	Nyanza	47.4	42.2	63.1
	Rift Valley	51.5	42.9	50.1
	Western	54.8	53.8	58.7
	North	-	58	-
	Eastern	47.9	46.8	52.9
	Total			
Urban	Total	29.3	29	49.2

Vulnerability profile rural Kenya by location

Vulnerability profile of non-pastoral rural communities in 1994

Province (# observations)	Prob. of shortfall (V_0)	Expected gap (V_1)	Cond. expect. gap (V_1/V_0)	Proportion $V_0 > 0.5$
Central (143)	0.14	398	2840	0
Coast (71)	0.43	1902	4423	0.27
Eastern (121)	0.34	1119	3292	0.05
Nyanza (164)	0.50	2100	4200	0.44
Rift Valley (215)	0.33	1231	3730	0.16
Western (94)	0.44	1641	3770	0.27
National	0.35	1350	3857	0.19
# observations	808	808	808	808

- Empirical findings:
determinants of vulnerability, cont.
4

- Risk factors

- Households/communities with a larger **incidence of malaria**, face on average a larger probability of shortfall (lower mean and larger variance);
 - incidence of malaria higher in non-arid areas, though effect of malaria incidence higher in arid areas;
 - similar findings amongst pastoralists (Smith, Barrett and Box, 2001)
- **Rainfall shocks** negatively affect mean consumption, though estimated with great imprecision;
 - when fertilizer is applied in sufficient amounts (proxy for irrigation), negative effect is

- Empirical findings:
determinants of vulnerability, cont.
5

- Risk exposure

- Access to **non-farm employment** greatly enhances mean of future consumption and reduces the variance in both arid and non-arid areas
- Further investigation of non-farm employment in non-arid areas shows:
 - Especially **skilled private sector** workers less vulnerable (higher mean and lower variance)
 - Unskilled private sector workers also higher mean, though also higher variance (less secure income source)
- **Pensions** are variance reducing, though no effect on mean in non-arid zones

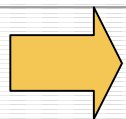
- Empirical findings:
determinants of vulnerability, cont.
5

- Coping capacity

- The larger the **dependency ratio**, the larger a household's vulnerability (lower mean and higher variance of future consumption)
- Possession of **animals** reduces households' vulnerability in arid zones, though not in non-arid zones. Variance reducing effect not significant (market integration)
- **Electricity** access improves average consumption
- **Market accessibility** decreases vulnerability – effect three times larger in arid compared to non-arid zones (higher food prices, lower cash crop prices, less diversification out of riskier low yielding food crops into high return cash crops)

Vulnerability reducing potential of interventions

% change after intervention in average	Expected normalized gap squared (V_2)	
	Non-arid	Arid & semi-arid
All communities $\leq 10\%$ malaria/fever incidence past 2/wks	-44.4	-30.8
All non-arid communities $\geq 5\%$ of adult members as skilled worker in pvt sector and $\geq 10\%$ as unskilled worker; arid & semi arid communities $\geq 25\%$ of income from non-agriculture activities	-7.6	-9.0
All communities total fertilizer use per adult equivalent ≥ 100 Ksh	-3.0	-3.4
All communities $\geq 75\%$ adult members literate	-18.9	-17.2
All communities within 30 minutes from market	-10.5	-19.8



vulnerability can be substantially reduced among rural non-pastoral communities → role of public workfare programs

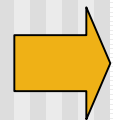
Social Risk Management Framework

Concluding Remarks

- The poor are typically most exposed to diverse risks (natural and man-made)
- The poor have the fewest instruments to deal with these risks

⇒ The poor are the most vulnerable as shocks have strongest welfare consequences

⇒ The high vulnerability makes them risk averse and thus unable or unwilling to engage in higher risk/high return activities



A reduction in vulnerability is thus both an *end* and a *means* of development

Social Risk Management Framework Rationale

- From a backward to a forward looking approach to poverty reduction
- Poverty is not static but dynamic (influenced by shocks and the availability of instruments)
- An ex-post view of poverty does not catch future poor and the effects of risks on current poor

Social Risk Management Framework Central Elements

- Takes account of the multiple **sources of risk** and their **characteristics** (such as idiosyncratic and covariant risk) to address vulnerability
- Operates with multiple **strategies** (prevention, mitigation, coping) and **arrangements** (informal, market-based, public) to deal with risk
- Attempts to match the multiple **suppliers** of risk management instruments (such as households, communities, NGOs, and governments) with key **demand** groups (formal, informal-urban and informal-rural workers)

In summary

⇒ A new approach:

- From ex-post poverty to ex-ante vulnerability considerations;
- From safety-nets to springboards
- From a reactive to proactive approach

⇒ A new definition:

A set of public policies aiming at:

- Helping individuals, households and communities better manage risk
- Providing support to the extreme poor

⇒ A new analytical framework:

- Social Risk Management

In Summary.....

In a specific country context, things to be done...

Social Risk Assessment

Assess current safety net programs and public spending,

Look for interface (or lack of it) between risks, high risk groups, programs, and public spending,

Work towards incorporating risk dimension in public exp.analysis.