

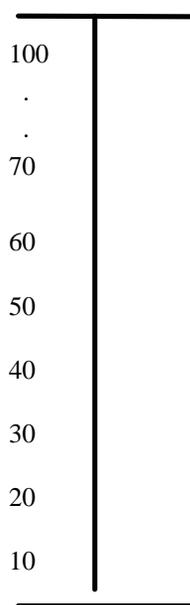
# POVERTY MEASURES

1. The method used in this study to classify individuals as extreme poor, poor, or non-poor is the following: (i) rank individuals according to their level of welfare, as measured by their consumption; (ii) calculate the value of a general poverty line and extreme poverty line; and (iii) identify individuals whose consumption levels are below these lines.

## (I) RANKING INDIVIDUALS

**FIG. 1: POPULATION ORDER BASED IN PER CAPITA CONSUMPTION**

Highest level  
of welfare



Lowest level  
of welfare

To classify individuals as poor and non-poor, they must first be ranked from the lowest to the highest level of welfare. This ranking requires: (a) a definition of welfare; and (b) setting up a measure of this welfare.

2. **Definition of Welfare.** Welfare, or well-being cannot be measured directly, thus consumption was used as an indirect measure of welfare. Consumption is used because it is not subject to the underestimation and biases of an income measure, and because it avoids the subjectivity of measures of unsatisfied basic needs and indicators of human development. See Technical Appendix 1 for details on the establishment of the total consumption as a measure of welfare.

3. This total per-capita consumption variable was used to rank individuals from the lowest to the highest annual per-capita consumption level (welfare). The graph shows major differences in the current per-capita consumption in Panama. In average, the annual per-capital consumption is B\$1,821. However, the richest ten percent of the population

has an average consumption level of B/.6,451 and, at the other end, the poorest ten percent of the population has an annual average per-capita consumption of B/.207.

**FIG. 2: HOW LEVEL OF CONSUMPTION: REPUBLIC OF PANAMA, 1997**

% of population	Level of average annual per-capita consumption (B/. =\$)
100	6,451
90	3,165
80	2,256
70	1,713
60	1,372
50	1,097
40	853
30	646
20	432
10	207

Lowest level of consumption

Source: LSMS 1997

## (II) ESTABLISHING POVERTY LINES

4. Two poverty lines were established for this study: one extreme poverty line and one general poverty line.
5. **Extreme Poverty Line.** The extreme poverty line represents the cost of the minimum caloric requirement recommended for Panama (2280 in average, see Table A1), using the observed consumption basket of the “low income” population. When the consumption level of any individual is below such value, this means that such person is unable to consume the minimum recommended calorie level. That is, even if such person would uses all of his/her consumption in food, the level of the acquired calories still would not be enough to provide the minimum recommended calories.

<b>Table A1 - Panama: Minimum Calorie Requirements: Average by Age and Gender</b>					
Age in Years	Population			Calories/Per-Capita	
	Total	Men	Women	Men	Women
0-1	60,406	30,867	29,539	738	738
1-2	60,737	31,064	29,673	1,100	1,100
2-3	60,906	31,167	29,739	1,300	1,300
3-4	121,739	62,311	59,428	1,500	1,500
5-6	120,797	61,800	58,997	1,750	1,600
7-9	177,660	90,751	86,909	2,000	1,700
10-11	115,271	58,749	56,522	2,200	1,900
12-13	112,285	57,134	55,151	2,350	2,000
14-15	108,994	55,437	53,557	2,650	2,100
16-17	105,704	53,737	51,967	3,000	2,150
18-64	1,528,139	769,357	758,782	3,100	2,100
65 and more	146,048	70,975	75,073	2,300	1,850
<b>Minimum Calorie Requirements: Weighted Average</b>					<b>2,280</b>
Source: <i>Instituto de Nutrición de Centro América y Panamá</i> (INCAP) of the Pan American Health Organization (PAHO). A moderate activity is assumed. <i>Contraloría General de la República</i> . DEC.					
a\ Projections of the population by province, gender, and specific age, by July 1, 1990-2000.					
b\Special Bulletin. Projection of total country population by gender and age cohorts. Years 1990-2000.					

6. The extreme poverty line was calculated as shown below:
- Using the ranking based on total annual per-capita consumption, households with the lowest consumption levels were selected (between the lowest 10% - 40%).
  - On the basis of the food *consumption patterns* of households within the lowest 10% - 40%, the amount of calories supplied by each type of food<sup>1</sup> and the percentage of these calories in the total consumption (in average) was calculated. For example, for this group of households, rice provides more calories than any other type of food (27.2 percent of the calories consumed). Next in importance are vegetable oils and sugar, each of which supplies 9.1 and 8.5 percent of the calories consumed by this group (see Table A2 for consumption patterns of all products).
  - Using the INCAP data, the minimum average calorie requirements of a Panamanian were calculated: 2280 kcal/day (see Table A1).
  - The amount of food required to satisfy the minimum calorie requirements were calculated, keeping the shares (consumption patterns) per type of food for households within the lowest 10% - 40% of consumption. These calls for an

<sup>1</sup> Using the food caloric content reported in “Valor Nutritivo de los alimentos de Centroamérica. Instituto de Nutrición de Centro América y Panamá (INCAP) y la Organización Panameña de la Salud (OPS). Ciudad de Guatemala, Guatemala, 1998”.

adjustment of the current amounts to the amounts required to achieve the recommended calorie level (2280).

- e) On the basis of such amounts, the cost of food required to satisfy the minimum calorie requirements was determined. This is the cost to meet the minimum calorie requirements, i.e., the value of the extreme poverty line. For Panama in 1997, the extreme poverty line was calculated to be B/.490 per-capita annually.
7. Figure 3 shows the method to calculate the extreme poverty line.
  8. **General Poverty Line.** Total consumption, even among the poorest, almost always includes the consumption of non-food goods and services. Thus, the general poverty line includes an additional amount for the percentage of the **non-food** consumption. For the appropriate percentage, we look at the consumption patterns of the people that are near the extreme poverty line.
  9. To calculate the general poverty line, the value of the extreme poverty line was calculated first, and then the value of the supplementary non-food consumption to be added to the value of the extreme poverty line. This last calculation was as follows:
    - a) Individuals with *total consumption* ( $C_T$ ) levels around (+/-10%) of the extreme poverty line ( $C_T = Z_{pe} = 519$ ) were selected. These individuals are those who, even if they spent their entire resources in food consumption, would hardly meet their minimum calorie requirements.
    - b) The *consumption coefficients* were calculated for this group: that is, the percentage of total consumption allocated to food (in this case, 57.3%) and allocated to non-food products (42.7%).
    - c) To obtain the general poverty line, the value of the extreme poverty line was divided by the percentage of food consumption (57.3%).
  10. Figure 4 shows the method to calculate the general poverty line.

Table A2 - Calculation of Food Consumption Patterns for Extreme Poverty Line									
Item	Calories per Pound	Individuals lowest 10-40%				Calorie % Pattern/day/capita	Calories to obtain 2280 cal./day/person	Average cost per calorie	Annual Cost of 2280 calories
		Average Amount			Calorie %				
		Lb./year/househol	Calories/day/						
			household.	person					
Rice (all)	1634	568.8	2545	530.1	27.2%	619.2	0.000192	43.36	
Vegetable Oil	4013	77.5	852	177.4	9.1%	207.3	0.000216	16.32	
Sugar	1725	167.6	791	164.9	8.5%	192.6	0.000185	12.99	
Grain Corn	1725	143.9	680	141.6	7.3%	165.4	0.000148	8.92	
Bread	1279	109.3	383	79.8	4.1%	93.2	0.000602	20.48	
Flour	1819	67.1	334	69.6	3.6%	81.3	0.000181	5.36	
Beans (frioles)	1559	54.0	230	48.0	2.5%	56.0	0.000329	6.72	
Pasta (Spaghetti)	1684	48.9	225	47.0	2.4%	54.8	0.000330	6.61	
Chicken or Hen	625	131.4	225	46.8	2.4%	54.7	0.001761	35.18	
Cereals & Creams	1643	48.0	216	45.0	2.3%	52.6	0.000542	10.40	
Powder Milk	1618	48.4	214	44.6	2.3%	52.1	0.001622	30.88	
Beef Meat	673	115.6	213	44.4	2.3%	51.8	0.002229	42.20	
Beans (Porotos)	1562	45.7	195	40.7	2.1%	47.5	0.000557	9.67	
Lentils	1544	46.0	194	40.5	2.1%	47.3	0.000422	7.29	
Rine & Green	389	177.4	189	39.4	2.0%	46.0	0.000452	7.60	
Liquid Milk	261	225.8	161	33.6	1.7%	39.3	0.001205	17.29	
Pork Meat	970	48.3	128	26.7	1.4%	31.2	0.001485	16.94	
Processed Corn	699	63.8	122	25.4	1.3%	29.7	0.000614	6.66	
All Peas	1557	27.6	118	24.5	1.3%	28.7	0.000359	3.76	
Butter/Margarine	2916	14.0	112	23.3	1.2%	27.2	0.000437	4.33	
Chicken Eggs	1020	39.6	111	23.1	1.2%	26.9	0.000939	9.24	
Yucca	374	105.9	108	22.6	1.2%	26.4	0.000400	3.86	
Cookies/candies/etc.	2111	18.2	105	21.9	1.1%	25.6	0.000739	6.90	
Evaporated Milk	608	60.0	100	20.8	1.1%	24.3	0.001713	15.20	
Cheese	1209	25.1	83	17.3	0.9%	20.2	0.001695	12.51	
Sausages (ham. etc.)	1004	28.0	77	16.0	0.8%	18.7	0.001892	12.92	
Name	409	60.9	68	14.2	0.7%	16.6	0.000996	6.04	
Sardines & Tuna	591	39.6	64	13.4	0.7%	15.6	0.001457	8.30	
Guineos/banana	299	74.9	61	12.8	0.7%	14.9	0.000910	4.96	
Potatoes	307	71.5	60	12.5	0.6%	14.6	0.001237	6.61	
Fish	296	67.6	55	11.4	0.6%	13.3	0.002877	14.01	
Otoe	414	35.0	40	8.3	0.4%	9.7	0.000972	3.43	
All Soups	1518	9.4	39	8.2	0.4%	9.5	0.001686	5.88	
Tomato Paste &	427	25.8	30	6.3	0.3%	7.4	0.003255	8.74	
Sodas, Drinks.	194	46.6	25	5.2	0.3%	6.0	0.005951	13.10	
Avocados	378	23.5	24	5.1	0.3%	5.9	0.001721	3.72	
Mangos	121	70.5	23	4.9	0.3%	5.7	0.001725	3.58	
Pineapple	139	46.2	18	3.7	0.2%	4.3	0.001710	2.67	
Garlic	608	10.9	18	3.8	0.2%	4.4	0.002017	3.26	
Carrots	168	36.3	17	3.5	0.2%	4.1	0.002394	3.55	
All peppers	162	35.1	16	3.2	0.2%	3.8	0.002665	3.68	
Seafood	165	26.2	12	2.5	0.1%	2.9	0.009858	10.39	
Orange	131	32.4	12	2.4	0.1%	2.8	0.003140	3.25	
Tomatoes	93	39.0	10	2.1	0.1%	2.4	0.005405	4.77	
Apple	209	17.8	10	2.1	0.1%	2.5	0.003615	3.27	
Cabbage	127	27.7	10	2.0	0.1%	2.3	0.003743	3.21	
Pumpkin/Challote	90	35.0	9	1.8	0.1%	2.1	0.003437	2.63	
Lemon	67	43.0	8	1.6	0.1%	1.9	0.003285	2.30	
Sugar Beet	126	18.8	6	1.4	0.1%	1.6	0.004061	2.34	
Lettuce	64	26.1	5	1.0	0.1%	1.1	0.009073	3.69	
Panava	107	17.1	5	1.0	0.1%	1.2	0.010894	4.84	
Cucumber	52	29.5	4	0.9	0.0%	1.0	0.007267	2.72	
Celery	73	16.6	3	0.7	0.0%	0.8	0.008556	2.53	
Whole Onion	100	14.0	4	0.8	0.0%	0.9	0.016747	5.70	
Melon	76	12.5	3	0.5	0.0%	0.6	0.007833	1.80	
Total: Calories				2025		2280			
<b>EXTREME</b>									
Source: ENV 1997									

### (III) POVERTY MEASURES

11. The poverty indices used in this study are three special cases of additively separable measures of Foster, Greer and Thorbecke (1994). The general poverty measure is:

$$P_a = \sum_{i=1}^q \frac{\left(\frac{1-y_i}{Z}\right)^\alpha}{n} \quad [\text{Eq. 1}]$$

where:

$y_i$  = estimated consumption of the  $i$ th person in a population of size  $n$

$Z$  = poverty line

$q$  = number of persons whose  $y_i$  is below poverty line  $Z$  and;

$\alpha$  = is a non-negative parameter that reflects the measure's aversion to poverty

12. **Head Count:** The first case is that where  $\alpha = 0$ . This is the Head Count measure (H) and, as can be seen from Eq. 1 it is simply  $q/n$  or the proportion of the population below the poverty line. In short, the Head Count index provides information on the incidence of poverty. It says nothing about the depth or severity of poverty and treats as equal any two populations where the proportion of the population living in poverty is the same.

13. **Poverty Gap:** To determine the depth of poverty, a second case of poverty measures is used called the Poverty Gap index (PG). This index is the case where  $\alpha = 1$  (in Eq. 1). The index is the aggregate poverty deficit of the poor relative to the poverty line.

14. **FGT  $P_2$ :** The third case of the poverty measure is that where  $\alpha = 2$ . This measure, often called the Foster-Greer-Thorbecke  $P_2$  measure (FGT  $P_2$ ), identifies the severity of poverty and demonstrates the relative inequalities among the poor. It is distributionally sensitive and, essentially, weights the average poverty gaps by the population at each level.

15. Ravallion (1992<sup>2</sup>) presents a good example to illustrate the differences between this index and the previous two. For example, it is possible for two populations to have the same head count and poverty gap measures but have very different distributions of levels of poverty. Ravallion (1992) presents the example of two populations A and B where A is made up of four individuals with consumption 1, 2, 3, 4 and B is made up of four individuals with consumption 2, 2, 2, 4. If the poverty line equals three, the head count for both populations is 75 percent, the poverty gap measure is 25 percent. But the FGT  $P_2$  measure is 14 in population A and eight in population B which demonstrates that

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<sup>2</sup> Ravallion, Martin, "Poverty Comparisons: A Guide to Concepts and Methods", World Bank LSMS working Paper No.88, 1992.

the poorest person in Population A has half the expenditures of the poorest person in Population B.