

PD-AAT-498  
45294

A METHODOLOGY FOR ESTIMATING  
FAMILY INCOME IN BOLIVIA

Progress Report

April-May 1986

John Cobb, Jr.

TECHNICAL SUPPORT SERVICES, INC.  
1800 Connecticut Avenue, N.W.  
Washington, D.C. 20009

A METHODOLOGY FOR ESTIMATING FAMILY INCOME IN BOLIVIA

Progress Report for April 19--May 12,1986

	Page
A. Making a Ball-Park Estimate with Available Data	
1. A Brief Look at Median Housing in the 1976 Census	1
2. Available Data: Individual Average Salaries	2
3. A Macroeconomic Approach to Estimating Family Income	4
4. Formula (in Spanish) for Estimating 1980-1984 Median Family Income	6
5. Instructions (in Spanish) for Estimating 1985 Median Family Income	7
6. Results: Family Income in Bolivia 1980-1984	8
7. Family Income in Bolivia (in Spanish)	9
B. Planning a Survey to Estimate 1986 Median Family Income	
1. Strategy and Objectives	10
2. Topics and Subject Matter for Questions	11
3. Analysis Strategy	11
C. Scope of Work for Next Trip	12
Addendum: Memo to Mahlon Barish about Pending Matters	

## A METHODOLOGY FOR ESTIMATING MEDIAN FAMILY INCOME IN BOLIVIA

### A. Making a Ball-Park Estimate with Available Data

#### 1. A Brief Look at Median Housing in the 1976 Census

Although the GOB currently does not produce any estimates of family income distribution--urban, rural or national--the Instituto Nacional de Estadisticas has produced some statistics which may serve to develop a crude estimate of family income--or at least to make an interval estimate: not more than X and not less than Y. This involves making some assumptions, projections and extrapolations which may be unwarranted. Given the current lack of data, the only way to produce a valid and reliable estimate of family income is to go into the field and do enough interviews to produce more direct and up-to-date evidence.

Since the purpose of this analysis is to develop a figure which will be used to develop housing programs, one point of departure is the INE 1976 Census of Housing. It shows:

<u>Viviendas Particulares</u>	No. de Habitantes	Percentage
	4,524,846	100.00%
Casas independientes	1,778,767	39.31%
Departamentos	200,128	4.42%
Habitaciones sueltas en casa de vecindad	595,408	13.16%
Chozas pahuichis	1,914,453	42.31%
Viviendas improvisadas	15,518	0.34%
Locales no destinadas a vivienda	8,767	0.19%
Otras	11,805	0.26%

The simplest interpretation of this 1976 data is that all families living in stand-alone houses and apartments were living in above median housing. Casas de vecindad would seem to have been the median housing at that time. This table shows nothing about income, but housing seems to be ranked from best to worst. However it is certainly possible that in 1976 families living in the lowest cost houses may have had lower incomes than some families living in casas de vecindad. At any rate, these figures give a rough indication of the kind of housing that a 1976 family with median income might have.

The INE ranks housing according to the materials used for roofs, walls, and floors. In a more recent study, it ranked stand-alone houses in La Paz as A,B,C, or D according to the building materials used for roofs, walls and floors. A reasonable assumption is that families in Class D houses in La Paz were living in something like median cost housing.

## 2. Available Data: Individual Average Salaries

Of more immediate interest for constructing a model which will estimate median family income is a set of figures on average wages and salaries which is published by the Ministry of Labor. This statistical series includes yearly estimates of average wages and salaries:

### Average Bolivian Salaries & Wages 1976-1985 and Their Purchasing Power

Year	Average Monthly Salary/Wage in Current Bolivian Pesos (National Mean)	Purchasing Power Index: Salary/CPI with 1970=1 for La Paz	Dollar Equivalent:	
			Banco Central rate of exchange	Annual Average Parallel Rate
1976	2,728	1023	\$136.26	
1977	3,042	1055	\$151.95	
1978	3,371	1059	\$168.38	
1979	3,979	1044	\$162.21	
1980	5,540	987	\$225.85	
1981	6,681	901	\$272.36	\$235.50
1982	14,714	888	\$ 74.96	\$ 98.88
1983	61,089	981	\$122.00	\$ 91.95
1984	501,964	584	\$ 58.48	\$ 62.21
1985	42,419,847	307	\$ 86.16	\$ 61.53

Source: Anuario de Estadísticas de Trabajo in press.  
Cuadros 100 & 110  
(Dollar equivalents added)

Dividing the national mean salary/wage by the INE Consumer Price Index for La Paz to get an index of purchasing power is a questionable procedure. The only justification is that there is no national CPI. The Ministry of Labor in a forthcoming publication (Anuario de Estadísticas del Trabajo) estimates that the average monthly salary in Bolivia in 1985 was 42,419,847. Because of soaring inflation, that figure is difficult to interpret. The La Paz CPI indicates that the average salary had lost over two-thirds of its purchasing power since 1980, and the dollar equivalents show about the same thing.

The INE maintains a quarterly statistical series of average salaries and wages based on information from the statistical office of the Ministry of Labor. It was started in September 1983, and the most recent information is for June 1985. It is based on a sample of employers in five cities. It shows that average wages and salaries got into the millions of pesos in the last quarter of 1984, and that the average salary/wage in June 1985 was 27,066,602

I have added the La Paz Consumer price index and dollar equivalents:

Instituto Nacional de Estadisticas  
Unpublished Statistical Series on Quarterly Average  
Salaries/Wages Based on Five Cities

Quarter	Five-City Average Wage/Salary	La Paz CPI	Av. Wage/ CPI	Dollars (Parallel Rate)
Sep 83	28,572	75.098	380	\$ 38.00
Dec 83	62,165	131.613	472	\$ 49.07
Mar 84	100,343	214.869	467	\$ 39.80
Jun 84	278,668	535.769	520	\$ 84.96
Sep 84	384,470	889.889	432	\$ 28.23
Dec 84	2,701,761	2,997.13	901	\$119.86
Mar 85	11,031,872	17,869.7	617	\$ 89.29
Jun 85	27,066,602	48,363.2	560	\$ 58.76
AVERAGE			544	\$ 63.50

The parallel exchange rate was averaged for the month in question. The payrolls used in the sample are the first one for the month in question. Since the conversion to dollars may not be exactly right, I have averaged the dollar equivalents as well as the Purchasing Power Index: Wages/Salaries / CPI.

While none of these figures should be taken as precise estimates, it should be noted that the \$63.50 average above is in the same range as the figures for 1984 and 1985 in the previous table: \$62.21 and \$61.53 respectively.

During the very rapid inflation of 1985, few wage and salary earners increased their earnings at the same rate as their purchasing power decreased. Purchasing power of average wages and salaries seem to have peaked in 1978, and in 1984-85 they are perhaps half of what they were then--if the La Paz CPI is taken as a reliable deflator.

Taking all of this into account it would appear that average monthly salaries and wages in 1984-85 were equivalent to \$60-\$65. This means that annual average earnings have probably been around \$750 a year in 1984-85. In terms of the Earnings/CPI purchasing power index, the average has been in the 500-600 range recently after staying above 1,000 in the 1976-1979 period.

If we want to assume that average earnings are still in this range, (in May 1986) then at a 1,900,000 rate of exchange, average earning would be around 115-120 million pesos bolivianos for one full-time worker.

### 3. A Macroeconomic Approach to Estimating Family Income

The Banco Central publishes annual estimates of the Gross Domestic Product, and these can be combined with information from the Instituto Nacional de Estadística to produce annual estimates of urban and rural family income.

The Banco Central also publishes annual estimates of National Income which are some 5-10% less than the Gross Domestic Product.

The first step is to break the GDP into one amount for rural and another amount for urban GDP. The Banco Central lists GDP figures for agriculture, forestry, hunting etc. together, and these can be summed to produce a GDP figure for agriculture and related rural economic subsectors. If there is a bias, this step probably underestimates rural income and overestimates urban income since it leaves mining and petroleum in the urban sector. For 1984, the total GDP is estimated at 18,233,664 million pesos bolivianos with 12,452,465 coming from the rural sector and the rest allocated to the urban sector under the procedure we are using here.

The next step is to compute the percentage difference between the GDP and National Income. For 1984, National Income was estimated by the Banco Central as 93.8% of the GDP. So we multiply our urban and rural GDP figures by .938 to get figures for total rural and urban income. For 1984, total rural income was 5,673.089 million pesos bolivianos, and total urban income was 12,452,465 millions of pesos bolivianos.

Next the number of households or families in the urban and rural sectors must be estimated. The Instituto Nacional de Estadística has published estimates of both urban and rural population for each year since the 1976 census. The 1976 census also provide the average number of persons per household. They were 4.3 persons per urban household and 3.8 persons per rural household.

Also, the institutional population in hospitals, convents, jails, etc. must be deducted. To do this, we go back to the 1976

census to get a percentage figure for urban and rural institutional populations. The urban institutional population was 2.3% of the total urban population, so we multiply by .973 to get the urban population living in private dwelling units.

The 1984 urban population was estimated at 2,942,944 persons. If we multiply this by .973 we get 2,9863,485 persons living in urban households (hogares). If we divide this figure by 4.3 persons per household we get 665,927 urban households in Bolivia in 1984.

If we divide total urban income by urban households we get a figure for mean income for an urban household. For 1984, this figure is 17,540,078 million Bolivian pesos per year.

Our final objective is to estimate median family income (or median household income) for each year. Median income is the fiftieth percentile where half of the population is above and half is below the median figure. In national populations, the median is always lower than the mean income because high income families are fewer than lower income families.

I have not been able to find any information about the distribution of urban and rural income for 1984 or any other year. In what may be the least defensible step in the construction of this model, I have made the heroic assumption that median income is about two-thirds of the mean. Therefore, we multiply mean income by .6667. For 1984, median family income is estimated at 11,692,215 per year or 974,351 pesos bolivianos per month. That is the figure that the model is designed to produce.

Gross domestic product figures for 1985 are due to be published by the Banco Central in a few weeks, and after that the model can generate urban and rural median family income for 1985.

The Ministry of Labor estimates in a forthcoming publication that the national mean for wages and salaries in 1984 was 501,964 pesos bolivianos per month. My figure for median family income is almost twice that amount implying that the average family has substantially more monthly income than one average salary.

If we compare the mean wage/salary with mean urban family income, the average family income computed here is almost three times what the Ministry of Labor computes as the mean salary level for 1984. In this interpretation, the model looks as if it may produce an estimate on the high side of a more realistic figure.

#### 4. UNA FORMULA PARA ESTIMAR LOS INGRESOS FAMILIARES MEDIANOS

##### Definiciones

PIB = Producto Interno Bruto  
PIBag= Producto Interno Bruto agropecuario y de otros productos rurales  
PIBurb= Producto Interno Bruto urbano

IN = Ingresos Nacionales  
INag= Ingresos Nacionales agropecuarios y de otros productos rurales  
INurb= Ingresos Nacionales urbanos

POB = Poblacion nacional (proyeccion para cada ano del Instituto Nacional de Estadisticas)  
POBurb = Poblacion urbana (Proyeccion del INE)  
POBrur = Poblacion rural (Proyeccion del INE)

PUPV = Poblacion Urbana en Viviendas Particulares  
PUVC = Poblacion Urbana en Viviendas Colectivas  
PRVP = Poblacion Rural en Viviendas Particulares  
PRVC = Poblacion Rural en Viviendas Colectivas

PromHo = Promedio de personas por hogar  
PromHo Urbano = 4.3 (Censo de INE de 1976)  
PromHo Rural = 3.8 (Censo de INE de 1976)

HoUrb = Numero de Hogares Urbanos  
HoRur = Numero de Hogares Rurales

IPU = Ingresos Promedios Urbanos por Hogar  
IPR = Ingresos Promedios Rurales por Hogar

IMU = Ingresos Medianos Urbanos por Hogar  
IMR = Ingresos Medianos Rurales por Hogar

FORMULAS: Como estimar los IMU y los IPU 1980-1984

PIBurb = PIB - PIBag  
INGurb = IN - INag

PUPV = POBurb - PUVC = POBurb x .973  
PRVP = POBrur - PRVC = POBrur x .987

HoUrb = PUPV / PromHo Urbano  
HoRur = PRVP / PromHo Rural

IPU = INGurb / HoUrb  
IPR = INGrur / HoRur

IMU = IPU x .667  
IMR = IPR x .667

## 5. COMO ESTIMAR INGRESOS FAMILIARES MEDIANO POR EL AÑO 1985

Las cifras que faltan son del Boletín Estadístico del Banco Central.

1. Producto Interno Bruto 1985
2. Ingresos Nacionales Disponible 1985 (en la última página)

Cada uno de los pasos están en mi memorándum (en inglés) del metodología para estimar ingresos familiares medianos.

En el cuadro de PIB por Ramos de Actividad Económicas hay cuatro cifras 1985 debajo del rubro "Agricultura y Caza". Hay que sumar las cuatro cifras 1985 (productos agrícolas, etc) para producir la cifra PIB Rural. Restando PIB Rural del PIB total 1985 da PIB Urbano.

En la última línea de la última página del Boletín está la cifra Ingreso Nacional Bruto Disponible. El INDP es 5-10% menos del PIB. 1. Calcular el porcentaje exacto de diferencia. 2. Restar ese porcentaje de las cifras PIB Urbano y PIB Rural para obtener Ingresos Urbanos y Ingresos Rurales.

La población estimada de Bolivia en 1985 es:

Urbano	3,068,051
Rural	3,361,175

Hay que restar el porcentaje de población en viviendas colectivas.

Si hay dudas, ver mi memorándum en inglés y la hoja con las definiciones y las fórmulas.

6. MEDIAN FAMILY INCOME 1980-1984

	1980	1981	1982	1983	1984
	<u>Bolivian Pesos</u>				
Urban Yearly	90 188	105 446	238 533	729 295	11 692 215
Urban Monthly	7 516	8 787	19 878	60 775	974 351
Rural Yearly	35 172	43 404	97 560	445 692	4 341 792
Rural Monthly	2 931	3 617	8 130	37 141	361 816
	<u>Dollars</u>				
<u>Rate of Exchange</u>	24.51	28.37	148.80	664.40	8 068.57
Urban Yearly	\$3 679.64	\$3 716.81	\$1 603.04	\$1 097.67	\$1 449.11
Urban Monthly	\$306.64	\$309.73	\$133.59	\$91.47	\$120.76
Rural Yearly	\$1 435.01	\$1 529.93	\$655.65	\$670.82	\$538.11
Rural Monthly	\$119.58	\$127.49	\$54.64	\$55.90	\$44.84

Source: Cobb Methodology

Purchasing Power Index of Median Family Income  
(Bolivian Pesos / Consumer Price Index)

Urban Mensual	1340	1186	1200	977	1134
Rural Mensual	523	488	491	597	421

Purchasing Power Index of Average Salaries/Wages (Individual)  
(Individual Average Salary / CPI)

Year	1980	1981	1982	1983	1984
	987	901	888	981	584

Source: Ministry of Labor, Statistics Office

INGRESO MEDIANO POR HOGAR 1980-1984

	1980	1981	1982	1983	1984
	<u>Pesos Bolivianos</u>				
Urbano Anual	90 188	105 446	238 533	729 295	11 692 215
Urbano Mensual	7 516	8 787	19 878	60 775	974 351
Rural Anual	35 172	43 404	97 560	445 692	4 341 792
Rural Mensual	2 931	3 617	8 130	37 141	361 816
	<u>Dolares</u>				
<u>Tipo de Cambio</u>	24.51	28.37	148.80	664.40	8 068.57
Urbano Anual	\$3 679.64	\$3 716.81	\$1 603.04	\$1 097.67	\$1 449.11
Urbano Mensual	\$306.64	\$309.73	\$133.59	\$91.47	\$120.76
Rural Anual	\$1 435.01	\$1 529.93	\$655.65	\$670.82	\$538.11
Rural Mensual	\$119.58	\$127.49	\$54.64	\$55.90	\$44.84

Fuente: Metodologia Cobb

Salvo Error u Omision

Indice del Poder Adquisitivo de Ingresos Medianos por Hogar  
(Pesos Bolivianos / Indice de Precios al Consumidor)

Urbano Mensual	1340	1186	1200	977	1134
Rural Mensual	523	488	491	597	421

Indice del Poder Adquisitivo del Salario Promedio (Individual)  
Formula: Salario Promedio Individual / IPC

Ano	1980	1981	1982	1983	1984
	987	901	888	981	584

Fuente: Ministerio de Trabajo y Desarrollo Laboral

B. Planning a Survey to Estimate  
1986 Median Family Income

1. Strategy and Objectives

After examination of the possibility of doing a separate study of family income, it was decided that the best strategy would be to take advantage of the INE Household Survey (Encuesta Permanente de Hogares) and add questions to it to collect the required information. INE plans to carry out the survey in four cities and is willing to consider the possibility of doing rural interviews in nearby areas.

I left a brief set of specifications with the INE Sample Survey Department with the understanding that further details would be worked out in the last half of June. Below is a copy of the Spanish text that I left with INE. It specifies a set of ideal conditions which will have to be negotiated in detail later. For example the four city sample is not an ideal urban sample, but it will offer a lot better up-to-date information than the 1984 estimates presently available.

ANTEPROYECTO DE ENCUESTA DE INGRESOS FAMILIARES BOLIVIANOS

**META:** Estimar la distribución de ingresos familiares por la población boliviana actual por medio de una encuesta. Estimar el ingreso promedio familiar y también el ingreso mediano familiar.

**POBLACION:** La población de interés es la población total del país menos la población en viviendas colectivas, o sea la población total en viviendas particulares.

**RESULTADOS:** Producir resultados que permita cruzar intervalos de ingresos familiares con características de la vivienda. Relacionar ingresos familiares de varios intervalos con características de la vivienda familiar, tenencia, etc.

**MUESTRA:** Usar una muestra representativa de la población nacional o urbana nacional de un tamaño que permita niveles de confianza y errores standard razonables: quizás de 1500 a 2000 hogares en todos los departamentos. Usar muestra aleatoria con marco muestral que incluye todos los departamentos.

Escojer con cuidado una secuencia de preguntas que empiece con temas fáciles de contestar (tenencia, tipo de vivienda) y deje hasta el final las preguntas más delicadas de ingresos familiares. Preguntar sobre todos los ingresos de la familia pero sin promedios de las fuentes de ingresos.

Investigar la posibilidad de construir un índice de calidad de vivienda con datos de materiales de construcción, servicios de agua, electricidad, etc. con el objetivo de cruzar el índice con intervalos de ingresos familiares.

## 2. Topics and Subject Matter for Questions

I left a set of topics with INE to give them a general idea of what USAID will want to add to the Household Survey. The two areas covered in the list in Spanish below are family income and housing characteristics. I have told the survey people at INE that I would like to make the early questions simple and easy to answer questions about the house, number of family members, etc. and leave for near the end of the interview the more delicate questions about family income.

TEMAS: Materiales de pisos, paredes, y techo.  
Tipo de vivienda--casa independiente, habitacion suelta, departamento, etc.  
Tenencia--propia, alquilada, etc.  
Numero de personas de 10 anos o mas.  
Numero de personas con trabajo (tiempo completo o parcial)  
Numero de personas con salarios.  
Jefe de familia: tiene mas que una fuente de ingresos?  
Ingresos totales de la familia el mes pasado.

## 3. Analysis Strategy

Since INE has been candid in saying that their surveys are done with out-of-date sample frames, I want to have an analysis strategy which will strengthen the results. The analysis strategy that I have in mind is to cross-tabulate income data with housing characteristics. Then for a given set of housing characteristics, an income range will be available.

By analyzing the various income ranges found for various housing characteristics, it should be possible to come up with a good estimate of mean and median family income as well as family income distribution.

INE uses the Hogar or Household as its unit of analysis, and since this allows comparisons with previous data, I think it is best to keep this definition standard. The results, then, will be in terms of household income, but for the vast majority of households this will be the same as a family.

### C. SCOPE OF WORK FOR JOHN COBB

Return in June for 3rd & 4th week of an eight week assignment. Tentative Dates: June 14 - June 30 with last day in Washington, D.C for final drafting of trip report.

Work with Instituto Nacional de Estadisticas, Departamento de Encuestas y Muestreo. Since a major objective of the trip will be to plan additional questions to work into the next INE Survey of Households, this is the department the consultant should work with most closely. INE will be asked to modify some of the characteristics of the survey, and details will be negotiated in June. This department is responsible for the survey and INE has offered desk space. Counterpart will be Freddy Carranza, acting head of the department.

Trip objectives: Work with INE personnel in questionnaire development to add questions on family income and housing characteristics.

Assist in negotiating with INE on sample characteristics and general survey design of interest in making the best possible estimate of family/household income.

Use macroeconomic model developed in last trip to make projections for first half of 1986.

MEMORANDUM

RE: Pending matters as of May 10, 1986

To: Mahlon Barash, Private Sector Advisor

From: John Cobb, USL/TSS Consultant

There are two items which should be coming to you from the INE Depto. de Encuestas:

1. An estimate of the extra data processing costs involved in doing some extra tables from the 1984 Household Survey and the 1985 Rent Survey. Depending on the figure you can either tell them to go ahead and produce the statistical tables, or to hold up until I get back.
2. An estimate of the extra costs involved in adding some questions to the 1986 Household Survey. Also, an estimate of the extra costs involved in adding to the four cities which they plan to include in their sample: adding other departmental capitals and possibly four rural areas near the four cities now scheduled.

Freddy Carranza should be bringing these figures in during the next week or so. If this seems worth pursuing, you should probably ask Carranza to introduce you to the Director Executive of INE (who has his office in another building).

Ask Bob Boni to ask Eduardo in Planificacion at CACEN to compute a 1985 median family income figure as soon as the next Boletin Estadistico of the Banco Central comes out. They use figures from the publication all the time. It is from the Depto. de Estudios Economicos (ninth floor).

Aside from May 15-18, I expect to be in the Washington area until I come back. Bob Boni has the Technical Support Services address and telephone number, and you can reach me through Frank Senold there. My home phone is [REDACTED] [REDACTED]

The middle of June seems like a good time to continue with INE. However, if the situation changes, I could come earlier in June. After the end of June, I would not have any time free until the first of August.

Thanks very much for all of your help.