The Various Measures of Low Income in Canada:

Strengths, weaknesses, impacts

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Outline

- Objectives of the workshop
- A Canadian pioneer
- The LICO, LIM and MBM methodologies
- Some comparisons
- Summary and discussions

Objective of workshop

- To illustrate how LICO, LIM and MBM are derived

- To discuss the ideas behind the measures and how do they come together

- To help participants better understand Canada's low income thresholds and statistics, and their strengths, weakness and impacts

In memory of a Canadian pioneer
Herbert Brown Ames (1863-1954)

- Questions about poverty measurement are not new
  - "who are the poor?"
  - "how many are they?"
  - "where are they?"
  - "How to reckon comparative poverty?"
  - "Where is poverty less frequent?"
  - "Do the well-to-do move out?"
  - "Cause of poverty"

Ames: The City below the Hill (1897)

"The City below the Hill" in 1896

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A Canadian pioneer

- *"The City below the Hill"—1 square mile from part of the south western downtown Montreal*

  - *"the home of the craftsman, of the manual wage-earner, of the mechanic and the clerk".*

  - *7671 families, 37652 persons, 25051 adults, 12601 children (6948 school age), 10853 wage earners,11720 home tenders, 2478 lodgers*

  - *Typical family (4.9 persons): 1.41 person worked for wage, 1.53 home tender and 1.64 children; 0.33 lodger*

A Canadian pioneer

- *"It is difficult to determine what shall constitute the low water mark of decent subsistence in our 'city below the hill'".*

- *Information from the Canvassers*
  - *Typical industrial class families lived by $10-$10.25 per week*
  - *1176 families were as "well-to-do" (they had a weekly income above $20 or $1,000 per year)*
  - *888 families lived with $5 or less per week*

  half of average income as the poverty line?

A Canadian pioneer

- ## Ames' reasoning

  - "…*a dollar a day is regarded as the minimum wage for an unskilled laborer*" → $6 per week or $312 per year initially appeared as a reasonable choice

  - But unskilled workers "*cannot count upon regular work throughout the year*" and

  - "*It is an undeniable fact that there are frugal household ... wherein $6.00 per week means independence and comfort*"

  - *Thus "we may safely fix the limit of decent subsistence at $5.00 per week and regard such families as, throughout the year, earn no more than $260.00, as properly to be termed the poor".*

A Canadian pioneer

- ## Poverty rate under Ames' threshold

  11.6%, 888 families out of 7,671, or 4,085 persons out of 37,652

- ## Chief cause of poverty

  - Irregularity of work "*explains much of poverty*" (2/3)
  - Death and disease (1/3)

- ## Ames' recommendations

  - Municipal relief work for the 2/3 able-bodied (winter months)
  - Charity for the 1/3 due to death and disease

Methodology: terminologies

- Definitions to make the presentation consistent
  - *Indicator* – domain in which one measures poverty: income, consumption, wealth, etc
  - *Thresholds/lines* – criteria to identify the poor
  - *Threshold updating*
    - *Revision* – change of method for determining the threshold
    - *Rebase* – changes in threshold to reflect changes in behaviour
    - *Indexing* – changes in threshold to account for inflation
  - *Absolute/relative line*: are the value of the thresholds independent or not of the behaviours/choices/outcomes of society's members
  - *Poverty indexes/statistics*: the aggregated measures of the poor

Methodology of poverty line

- Three approaches
  - Cost of basket approach (usually absolute)
  - Social inclusion approach (usually relative)
  - Subjective approach
- We focus on the methodologies of LICO, LIM and MBM
  - We do not consider the subjective approach
  - MD—more to come from other presenters

Methodology: LICO

- LICO methodology

    one is in low income if he/she spends significantly more of his/her income than the average on food, shelter and clothing

- Rational (Engel's law)
    - Food, shelter and clothing (FSC) are basic necessities of life
    - Families which spent substantially more of its incomes on FSC than average would have little discretionary income left for non-essentials
    - They will likely be living in "straitened circumstances"

Establishment of LICO (1992 base year)

- Step 1: Estimate the regression model

$$\log_{10} FSC_i = \alpha + \beta \log_{10} Inc_i + \delta A + \theta F + \lambda R + \epsilon_i$$

FSC: Food, Shelter and Clothing expenditures of family *i*

Inc: income of family *i*

A: area of resident dummies (rural, urban of different sizes)

F: family size dummies

R: region dummies (Atlantic, Quebec,….)

The establishment of LICO

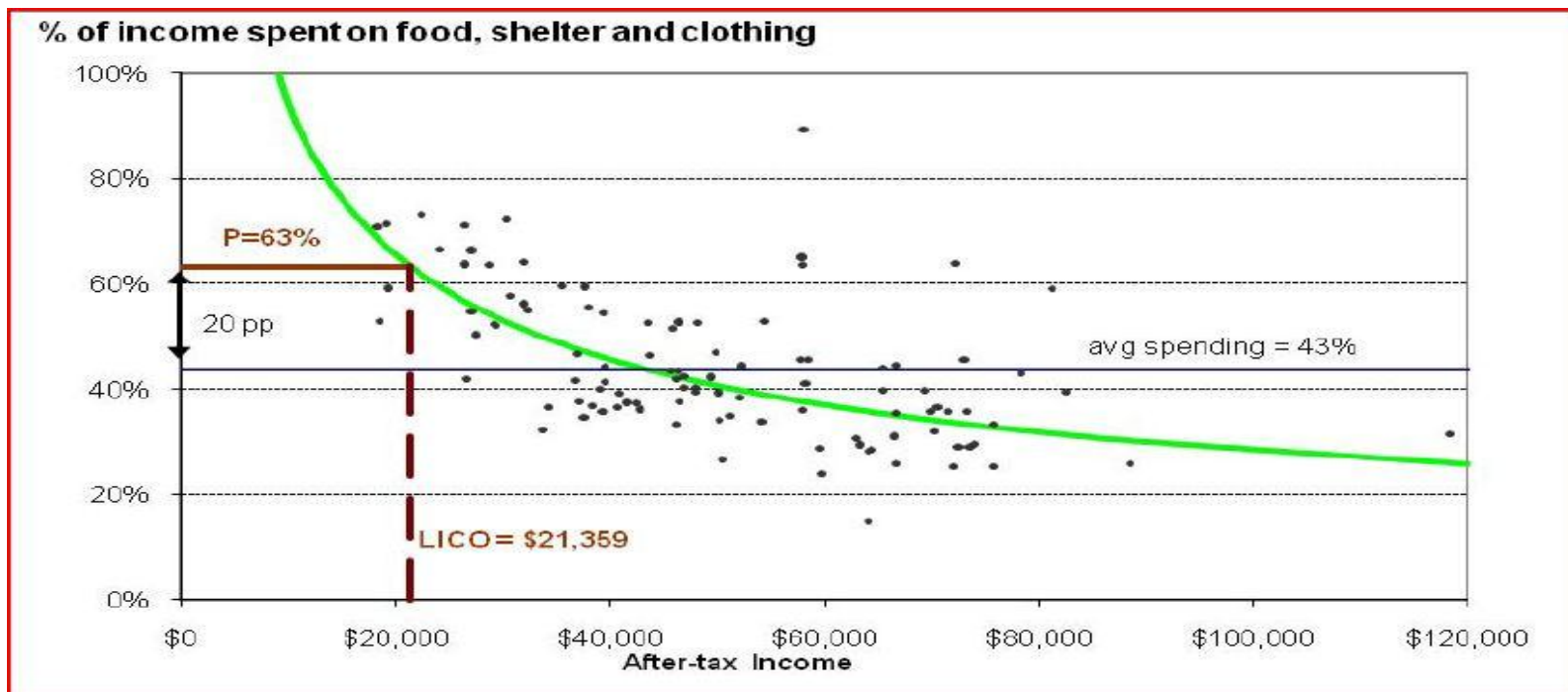- Step 2: Re-arrange the fitted model and define the LICO thresholds for family size *j* lived in area *k*

$$Inc = 10^{(\hat{\alpha}+\hat{\bar{\delta}}A+\hat{\bar{\theta}}F+\hat{\bar{\lambda}}R+\hat{\varepsilon}-\log(FSC/Inc))/(1-\hat{\bar{\beta}})}$$

Assuming: $\hat{\varepsilon}=0\ \left(or\ \log\widetilde{FSC}=\log FSC\right);\ \bar{R}=R;\ \log(FSC/Inc)=\log(\bar{p}+0.2)$

$$LICO_{ik} = 10^{(\hat{\alpha}+\hat{\bar{\delta}}A+\hat{\bar{\theta}}F+\hat{\bar{\lambda}}\bar{R}-\log(\bar{p}+0.2))/(1-\hat{\bar{\beta}})}$$

The establishment of LICO

- Fitted values and average spending on FSC

(4 person families living in city center with population of 30,000 to 99,999)

Establishment of LICO (1992 base year)

- Step 3. Calculate LICOs for families of different living in different areas

Family size	Rural area	Urban area by population size			
		Under 30,000	30,000 to 99,999	100,000 - 499,999	500,000+
1 person	8,848	10,126	11,296	11,439	13,526
2 persons	10,769	12,325	13,749	13,922	16,462
3 persons	13,410	15,346	17,120	17,336	20,499
4 persons	16,729	19,146	21,359	21,628	25,574
5 persons	19,050	21,802	24,322	24,628	29,121
6 persons	21,127	24,179	26,974	27,313	32,296
7 or more	23,204	26,556	29,625	29,998	35,471

LICO methodology: What's in FSC

- Food
  - Food purchased from stores
  - Board paid to other private households
  - Food purchased from restaurants, etc
- Shelter
  - Principal accommodation
  - Other accommodation
- Clothing
  - Women's, men's, girl's, boy's, infant's wears
  - Clothing materials, notions and services

LICO methodology: What's not in FSC

- Inclusions and exclusions
  - Inclusions
    - Expenditures on owned/rented vacation homes, jewelry, dressmaking and tailoring, clothing storage, dry cleaning
  - Exclusions
    - Household operation: detergent and soap, Paper towels, Facial and bathroom tissue Paper, plastic and foil household supplies; telephone, postal; appliances, furniture, textiles (bedding, towels)

- Should we re-define necessities over time?
  - Transportation
  - Health and personal care item

Classification of income

```
Market income
    Earnings
        Wages,salaries and commission
        Self-employment income
            Farm
            Non-farm
    Investment income
    Retirement pensions
    Other income
(plus) Government transfers
    Child tax benefits
        Child tax benefits
        Universal child care benefit
    Canada Pension Plan/Quebec Pension Plan benefits
    Old Age Security and Guaranteed Income Supplement/Spouse's Allowance
    Employment Insurance benefits
    Social assistance
    Workers' compensation
    GST/HST Credit
    Provincial/territorial tax credits
    Other government transfers
(equals) Total Income
(minus) Income tax
(equals) After-tax Income
```

LICO methodology: income

- **After-tax income: some exclusions**
  - In-kind income is excluded
  - Investment income can be negative
  - Self-employment income can be negative
  - Realized capital gains are excluded
    (but taxes paid on capital gains are deducted from income)
  - EI & C/QPP contributions are not taken into consideration (not considered as taxes, not deducted from total income)

The history of LICO

- Revision and rebase
  - The **first set** of LICOs was introduced by Podoluk in 1968
    - Estimate P, proportion of income spent on FSC by all families
    - Add 20 percentage points to P to implement the "well-above average" parameter ($P = 50\%$ in 1961)
    - Obtain a sample of families that spent *(P+20)% or more of their incomes* FSC
    - Find the maximum income of families of size 1, 2, 3, 4 and 5 or more living in urban centers (1961 $): **1,500, 2,500, 3,000, 3,500, 4,000**

  - Revision in 1973 for 1969 (followed the regression approach and extended to 35 thresholds)
  - Rebase in 1982 for 1978
  - Rebase in 1988 for 1986—after-tax LICOs were first produced
 - Most recent rebase in 1993 for 1992

LICOs in non-base years: indexing

- The Current (2009) after-tax LICOs $= (1992\ LICOs) * \dfrac{CPI_{2009}}{CPI_{1992}}$

Family size	Rural area	Urban area by population size			
		Under 30,000	30,000 to 99,999	100,000 - 499,999	500,000 or more
1 person	12,050	13,791	15,384	15,579	18,421
2 persons	14,666	16,785	18,725	18,960	22,420
3 persons	18,263	20,900	23,316	23,610	27,918
4 persons	22,783	26,075	29,089	29,455	34,829
5 persons	25,944	29,692	33,124	33,541	39,660
6 persons	28,773	32,929	36,736	37,198	43,984
7 or more	31,602	36,167	40,346	40,854	48,308

Difference between rebasing and indexing

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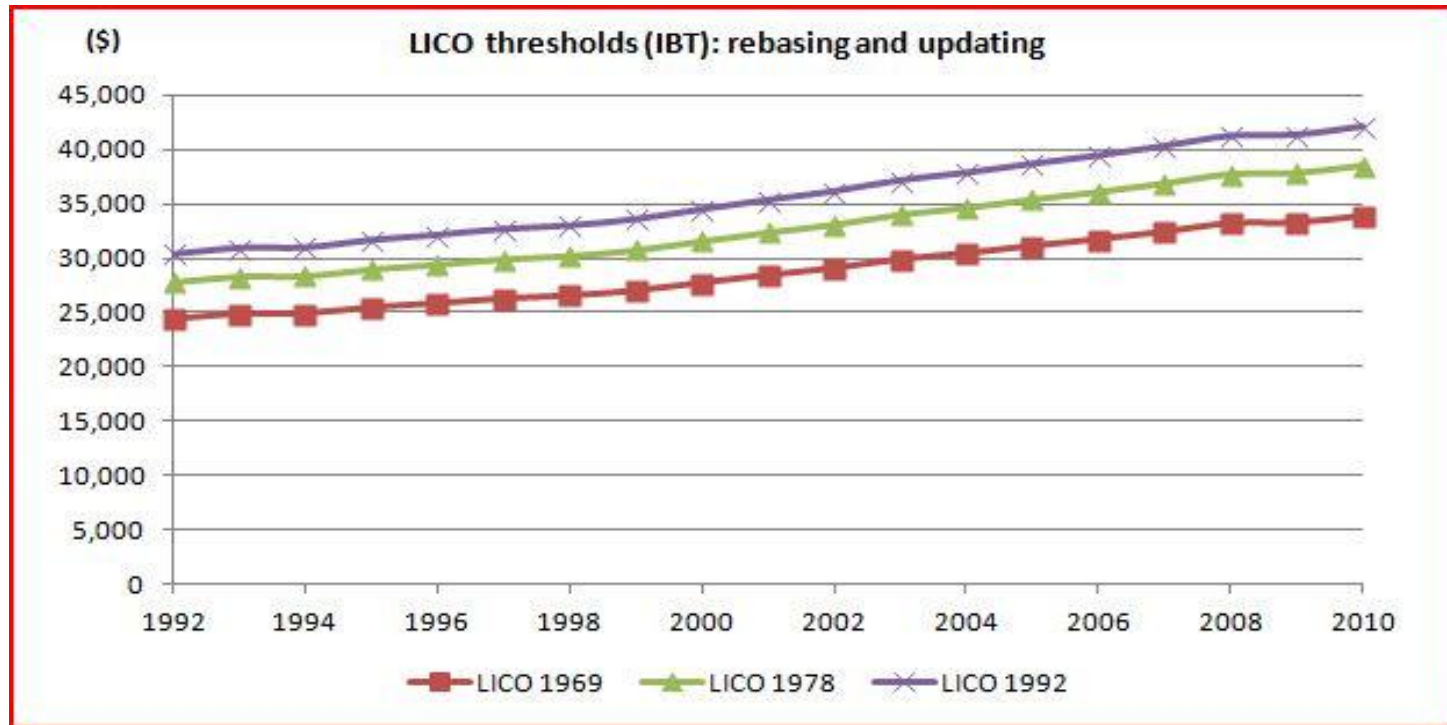
LICO methodology: summary

- Based on a simple idea, a back-door inference
  - It is a statistical prediction
- Based on decisions made by all Canadian consumers
- Five geographic areas are probably a serious limit
- There are numerous arbitrary choices
  - The 20 percentage points mark-up
  - Inclusions and exclusions in FSC
  - Regression model specification and assumptions
  - Income inclusions exclusions

Methodology: LIM
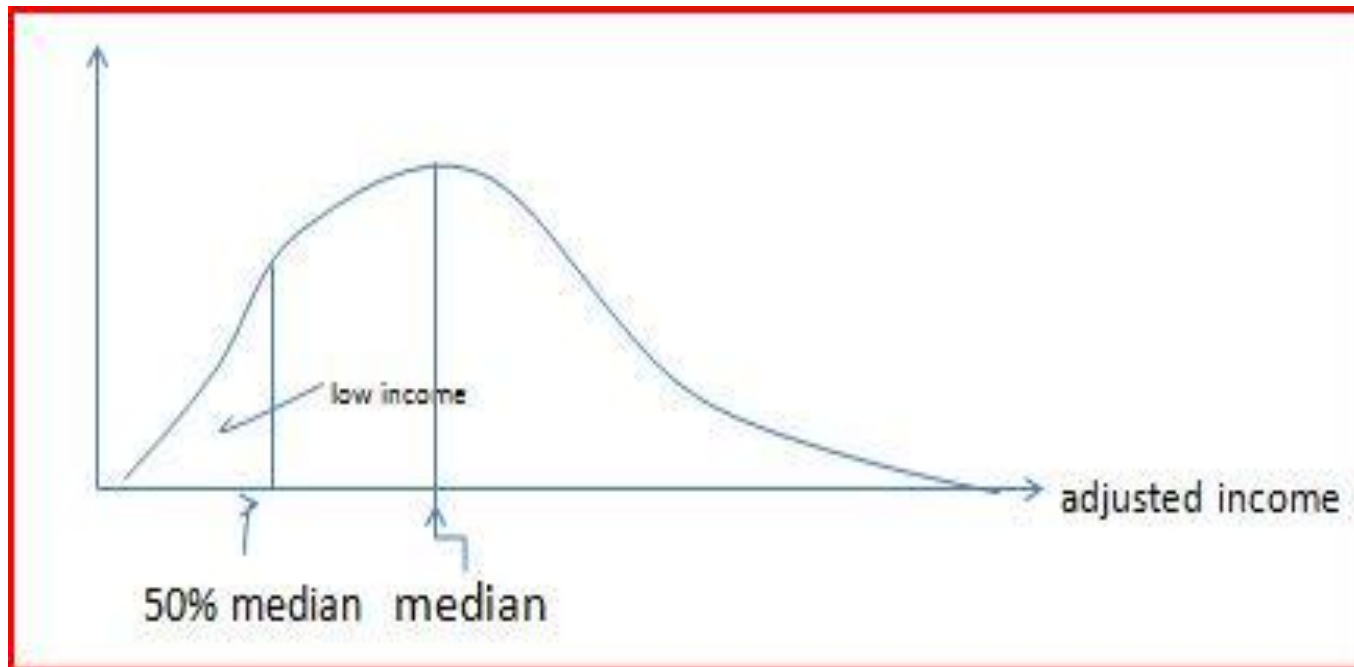
- ## LIM

    You are in low income if your income is less than half of the population median

- ## Rational

  - LICO was both criticized and appreciated widely
  - LICO is not transparent to the public
  - Why not "keep it simple,…"

LIM methodology

- LIM threshold – a graphical illustration

LIM methodology (current)

- ## Procedure
  - Define adjusted income for each person in a household

$$\frac{Household\ Income}{\sqrt{Household\ size}}$$

  - Estimate the median of the adjusted incomes of all persons in the population → Median
  - Calculate the LIM threshold of a household as half of the median, multiplied by the square root of the household size

$$\frac{Median}{2} * \sqrt{Household\ size}$$

Current LIM thresholds

- Current (2009) After-tax LIM thresholds

Household size	Threshold	Household size	Threshold
1 person	18,680	6 persons	45,756
2 persons	26,418	7 persons	49,423
3 persons	32,355	8 persons	52,835
4 persons	37,360	9 persons	56,040
5 persons	41,770	10 persons	59,071

LIM methodology: income

- These are the same as the income concepts used for the LICO

LIM methodology— evolution

- First version (1991): half of median adjusted family income
- 2010 Revision: to align with international practice

LIM: current and previous

Parameter	Current LIM	1991 LIM
Unit of sharing	Household	Economic family
Equivalence scale	Square root of household size	1 for 1st person 0.4 for 2nd person 0.4/0.3 for additional
Distribution	Adjusted income of household members	Adjusted income of economic families

LIM: rational of the 2010 revision

- The 2010 revision and international practices
  - "Household" allows a wider pooling of resources than economic family
  - There is empirical evidence to support the square root equivalence scale
  - Individual income distribution eliminates potential bias by correlation between EF size and poverty

LIM methodology: summary

- It is simple and transparent, telling us how people from the bottom fare relative to those from the middle

- It is relative – whether you are in low income or not depends both on your own income and those of others

- The thresholds change every year (This can make progress in poverty reduction more difficult)

- It is related to inequality but is not itself an inequality measure

- Theoretically it is possible to eliminate poverty under LIM but realistically, the "poor" will likely always be with us

- It is a Canada-wide line, which is in itself useful, and more geographic variations can be easily introduced with local LIMs

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Methodology: MBM

- Market Basket Measure (MBM): You are in low income if your <u>disposable income</u> is below your <u>local cost</u> of a <u>predetermined basket</u> of goods and services

$$\sum \text{🧺} * P_{ij} < \text{Disposable Income}$$

- The basket represents a modest, basic standard of living within the current Canadian context

Methodology: MBM

- Background
  - Request by FTP ministers responsible for social services
  - Designed by a working group of FPT officials
  - To monitor impact of the NCB and associated programs dealing with child poverty

- Roles and responsibilities
  - HRSDC leads the creation and revision of MBM
  - Statistics Canada collects data, calculates the thresholds and the disposable income, and disseminates statistics for HRSDC

The construction of the MBM thresholds

➢ MBM threshold for reference family living in MBM region j:

MBM $_j$ = cost of food in j +

        cost of clothing in j +

        cost of shelter in j +

        cost of transportation in j +

        other expenses in j

➢ Reference family: an economic family of 4 persons, one male and one female aged 25-49 with two children, a girl aged 9 and a boy aged 13.

The construction of the MBM thresholds

MBM j = **cost of food in j** + cost of clothing in j + cost of shelter in j +
cost of transportation in j + other expenses in j

- **Cost of food components in region j = $1.05 \sum P_{ij} \cdot Q_i$,**

  Q_i : quantity of item i from NNFB 2008 (i=1 to 60)

  P_{ij}: price of item i in region j

- Additional 5% for miscellaneous foods (coffee, tea, condiments, seasoning, spices and cooking materials)

- NNFB (2008) based on C*anada's Food Guide* and Canadians' consumption patterns (*CCHS Cycle 2: Nutrition (2004)*)
  - → But not all those liked to consume by Canadians are included in NNFB (e.g., soft drinks and confectioneries)

Canada's Food Guide (2007)

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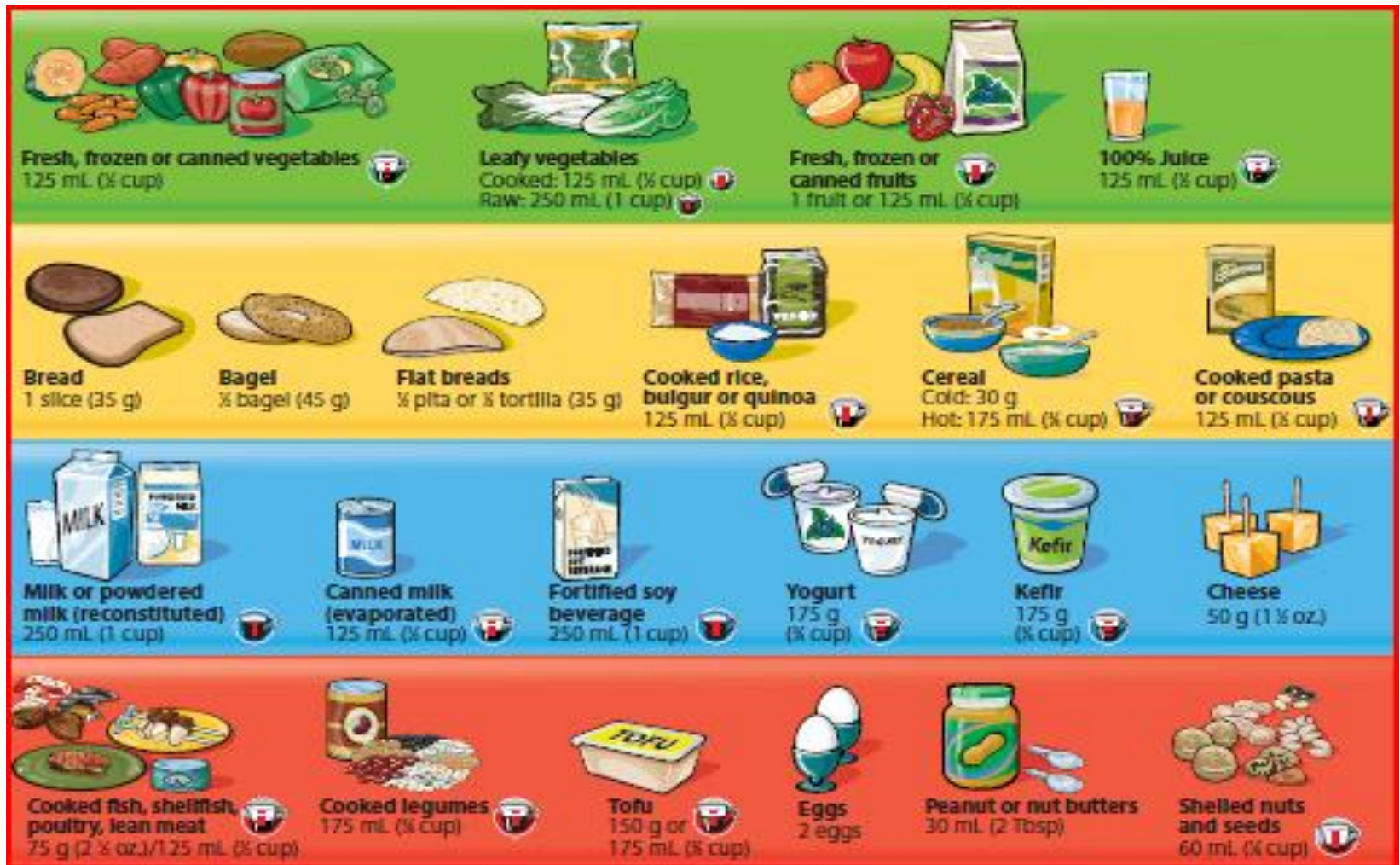
The MBM food basket

- The NNFB items (daily, by age and sex) are converted into weekly quantities to be purchased by reference family.

- The phase-in for the 2008 MBM
  - 2008: $(2/3)$NNFB1998+$(1/3)$NNFB2008
  - 2009: $(1/3)$NNFB1998+$(2/3)$NNFB2008
  - 2010: NNFB2008 only

The construction of the MBM thresholds

MBM j = cost of food in j **+ cost of clothing in j** + cost of shelter in j +
  cost of transportation in j + other expenses in j

- Cost of clothing component in region j = $\sum P_{ij} * Q_i$

  Q_i : quantity of item *I* from the revised A.L.L. clothing basket (i=1 to 107)

  P_{ij}: price of item *i* in region *j (j=1 to 11)*

  - A.L.L basket of clothing was above the MBM standard of living and certain items were not clear for pricing purpose
  - Prices are collected in 11 CMA/CAs (3-year moving average)

The construction of the MBM thresholds

MBM j = cost of food in j **+** cost of clothing in j + **cost of shelter in j** +

  cost of transportation in j + other expenses in j

- Cost of shelter in region j = weighted average of median shelter costs of 2 and 3 bedrooms in region j for ref. families

  - Median shelter cost
    - Renters   = rent + utility bills
    - Owners no mortgage = property tax + utilities + appliances
      - Owners with income no more than median income of renters
  - Weight: proportions ref. families with 2 and 3 bedrooms

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The construction of the MBM thresholds

MBM j = cost of food in j **+** cost of clothing in j + cost of shelter in j +

      cost of transportation in j + other expenses in j

- Cost of transportation component in region j

  = costs in cities with public transportation

  or

  = costs in areas without public transportation

  - Costs in cities with public transportation
    - Costs of annual bus pass for two adults and one 13 year old child, and
    - Spending on 12 round-taxi trips ($16 per ride in 2000, indexed by provincial CPIs)

The construction of the MBM thresholds

- Costs in areas without public transit service
    = 1/5 of purchasing cost of a 5-year old Ford Focus
        + annual drivers license fee
        + annual vehicle registration fee
        + annual mandatory fees for owing vehicle
        + cost of 1,500 litres of gasoline
        + cost of two oil changes and one tune up
        + additional maintenance costs
  - 1/3 of the cost of a Cavalier and 2/3 costs of the Focus in 2008.
  - Additional costs: average spending on tires, batteries and other automotive parts by 2nd income decile of reference families

The construction of the MBM thresholds

MBM j = cost of food in j **+** cost of clothing in j + cost of shelter in j + cost of transportation in j **+ other expenses in j**

- **Other expenses in region j = λ* (costs of food and clothing components in region j)**

  - λ: Multiplier for other goods/services for all reference families (across the country) in the 2nd income decile

$$\lambda = \frac{Average\ expenditure\ on\ other\ goods\ and\ services}{Average\ expenditure\ on\ food\ and\ clothing}$$

   – Average expenditure on food and clothing is from MBM basket
   – λ = 0.741 in 2008

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The construction of the MBM thresholds

MBM j = cost of food in j **+** cost of clothing in j + cost of shelter in j +

cost of transportation in j **+ other expenses in j**

– What are in: personal care; household needs; furniture; basic telephone service; reading, recreation, entertainment; and school supplies. The category also includes envelopes, postage stamps, and religious and charitable donations. The reading, recreation and entertainment component includes a newspaper subscription, video rentals, YM/YWCA memberships, magazines, books, and tickets for movies and sports events + computer equipment and internet service fee

· Rules for adding a new item: 70% of households spent on in 7 out of 10 provinces.
· Cellular phone and garden supplies/services not included.

MBM thresholds: 2009

- Current MBM threshold for reference family

Community	Thresholds	Community	Thresholds
Quebec		Ontario	
Rural	28,321	Rural	28,775
Population under 30,000	29,290	Population under 30,000	29,935
Population 30,000-99,999	27,874	Population 30,000-99,999	27,941
Population 100,000 to 499,999	28,597	Population 100,000 to 499,999	29,303
Quebec	28,946	Ottawa	31,412
Montreal	29,869	Hamilton/Burlington	29,252
		Toronto	32,503

MBM methodology: equivalence scale

- MBM for an EF of size n (within the MBM region)

$$\mathbf{MBM}_n = \mathbf{MBM}_4 \sqrt{n/4}$$

Example: in 2009, the threshold for the reference family in Montreal was $29,869, then the thresholds for other EFs in Montreal are

EF size	1	2	3	5	6	7	8	9	10
MBM ($)	14,935	21,121	25,867	33,395	36,582	39,513	42,241	44,804	47,227

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MBM methodology: disposable income

- Disposable income: income available to purchase the goods and services in the MBM basket

  = Total income - Income taxes - non-discretionary expenses

  - Non-discretionary expenses include:
    - C/QPP, EI, RPP contributions,
    - union and professional dues,
    - Child/spousal support payment,
    - Work-related child care expenses,
    - Out-of-pocket medical expenses,
    - Public health insurance premiums.

MBM methodology: 2008 v.s. 2000 MBM

Components	2008 MBM	2000 MBM
Basket		
Food	2008 NNFB + 5%	1998 NNFB
Shelter	Weighted average + costs of homes without mortgages, all subject to income test	Mean of median rent of 2- & 3-bedrooms rental units
Clothing	No change from 2003 components	Before 2003: A.L.L After 2003: revised
Transportation	Private: Focus, 2 drivers + costs of tire, battery etc. Public: +1 child bus pass	Private: Cavalier, 1 driver Public: 2 adults bus pass
Other	+computer equipment + internet services	
Geography	49 regions (retro. to 2005)	48 regions
Disposable income	No change	
Equivalence scale	Square root of EF size	Old LIM: 1, 0.4/0.3….

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The MBM methodology: comments

- **MBM methodology**
  - It follows the cost of basket approach
    - ➤ The basket represents a modest, basic standard of living (so MBM does not measure poverty but risk of poverty)
  - It reflects consensus among FTP ministries
    - ➤ With opinions from politicians and experts
  - It has its own income concept
    - ➤ Special needs: originally designed to measure child poverty

MBM
Arbitrary choices and implicit assumptions

- Data limitations imply that one has to make certain assumptions in calculating the costs of the MBM basket

  - The cost of the basket in rural areas is the same as in the smallest urban centre(s) surveyed within a province

  - The rent is assumed to include utilities (water, heat and electricity) as well as the following amenities: a stove, a refrigerator and use of a washer and dryer

  - For cars, the payment part: "The payments are calculated assuming the purchaser takes out a loan with a term of 36 months"

MBM
Arbitrary choices and implicit assumptions

- A mixture of behaviour-based and non-behaviour-based elements

  - NNFB in part is determined by actual spending patterns (*CCHS Cycle 2: Nutrition (2004)*)

  - But not all goods commonly consumed by Canadians are included in NNFB (e.g., soft drinks and confectioneries)

  - Multiplier for other goods/services depends on average spending patterns of families in the 2nd income decile

  - Homeowners without a mortgage from the 2nd income decile are employed when calculating the shelter component

MBM: arbitrary choices

- Arbitrary choice may have important implications

"The age of the used car and the frequency of replacement of that car have an effect on the amount of the private transportation component. For example, if a six year-old car were purchased every six years, instead of a five-year-old car every five years, the cost of private transportation would be reduced by $900."

Michaud et al. (2004)

Comparisons: strength and weakness

	LICO	LIM	MBM
Relative/Absolute	Relative	Relative	Absolute
Transparency/simplicity	Little	Much	Some
Behavioural assumption	Some	No	Some
Choice and judgement	Some	Few	Many
Rebasing frequency	Periodical	Annual	Periodical
Regional variability	5	No	49
International comparison	Not feasible	Feasible	Not feasible
Cost of construction	No additional cost	No additional cost	High

Impacts of low income measures and statistics

- Low income statistics have been employed by many analysts to study the characteristics of the worse-off families

- Low income measures have enabled us to report important trends and composition of worse-off Canadians

- They provided the context for policy debates and program developments
  - Child poverty
  - Lone mothers
  - Senior Canadians

Some comparisons

- The 3 lines measure low income differently. For example, low-income incidence means:
  - Under LICO--proportion of the population who are likely to spend a high proportion of income on necessities
  - Under LIM--proportion of the population whose income is below half of the median of the distribution
 - Under MBM--proportion of the population whose disposable income is below their local cost of the MBM basket

Some comparisons

- We are likely to commit both Type I and II errors

    - Type I: not all poor would be identified
        - Examples: those who have to spent a lot on health care may end up with little for food shelter and clothing

    - Type II: those who are identified may not be truly poor
        - Examples: Self-employed with negative income, recipients of capital gains or household transfers but with little earned income – LIM may identify them. In addition they may be using their wealth to fund expenditures.
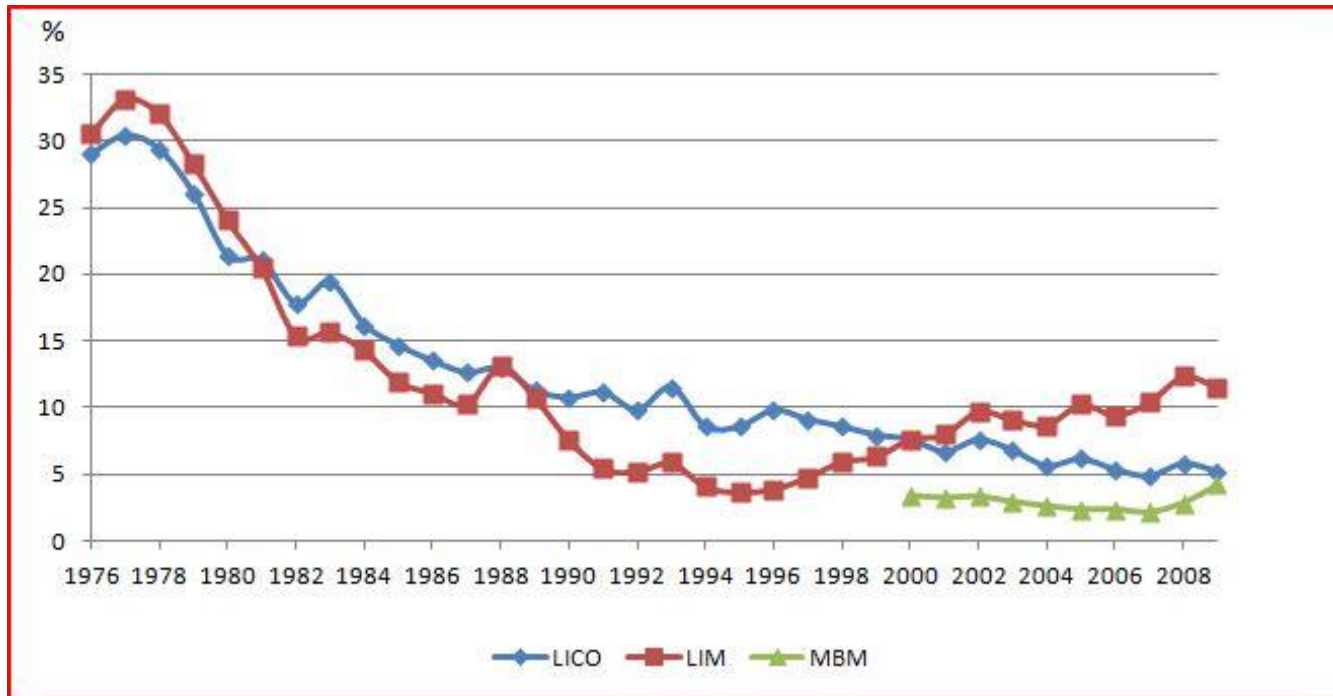
Canada

Some comparisons

- The 3 lines may give different results (incidence and trend). Low income rates (1976-2009)
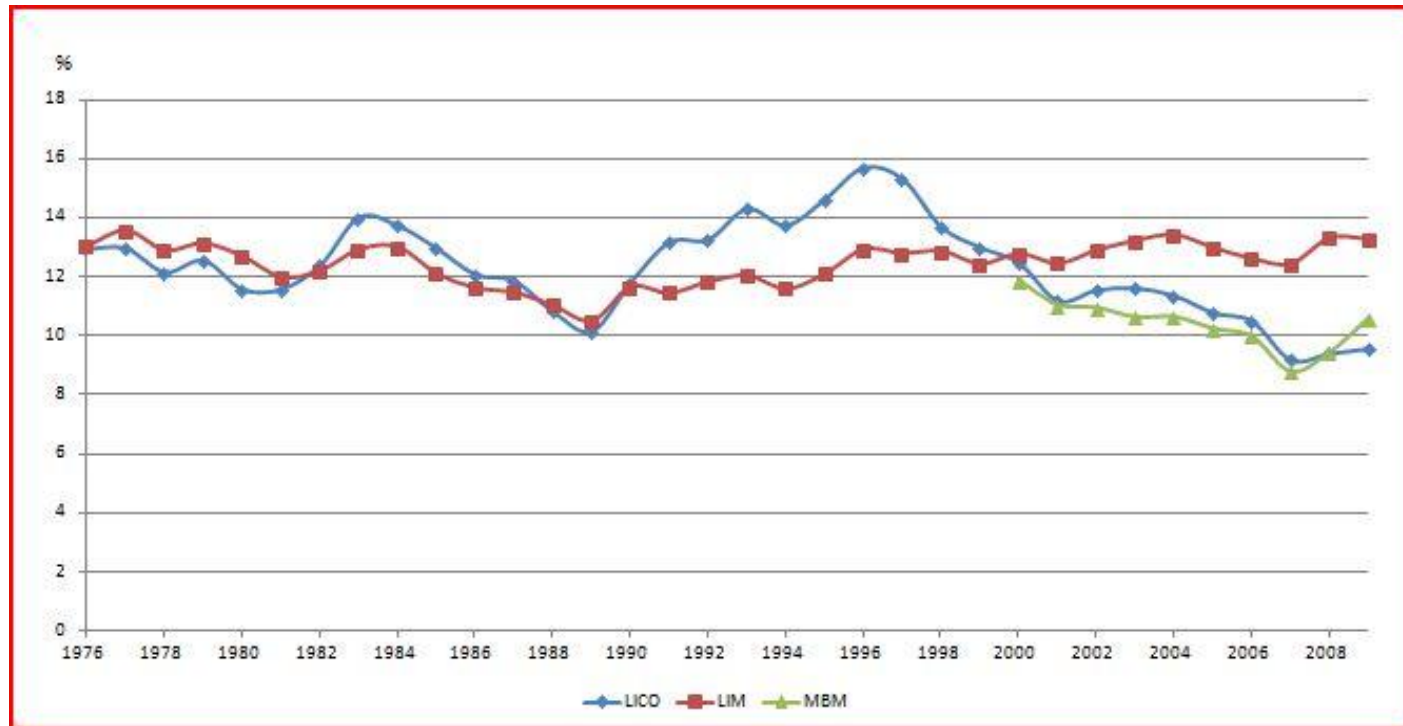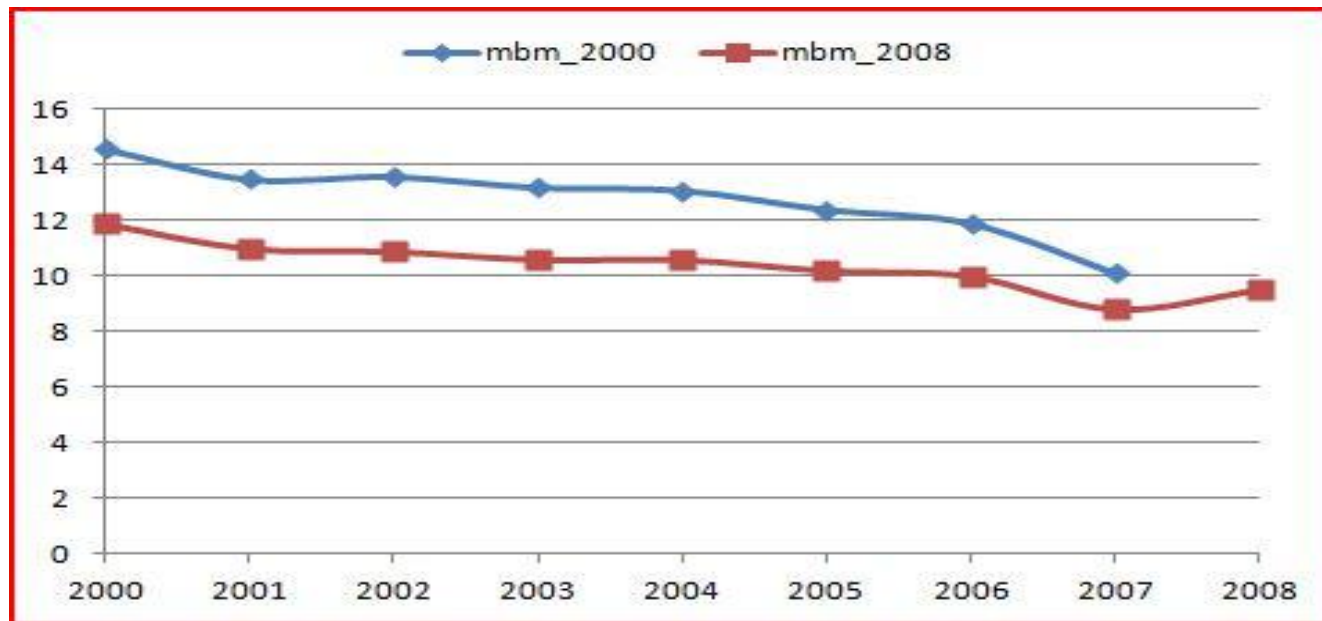
Some comparisons

- Not necessarily a bad thing

Low income rates among senior (1976-2009)

Some comparisons

- One may not want to put too much weight on the count

    Low income incidence under current and previous MBMs

Some comparisons

- Using multiple lines has both advantages and disadvantages
- All lines are subject to miss-use

Summary and discussion

- Different lines measure low income from different angles

    - Different sets of assumptions

- LICO has the longest history; LIM is simple and internationally comparable; MBM is intuitive and considers regional variations

- All contribute to the debates on socio-economic polices

- LICO will become less relevant; LIM can be counterintuitive sometimes; MBM contains many judgements and arbitrary choices

- All contain arbitrary choices and assumptions

- Multiple lines multiple indexes might be the best choice in lieu of consensus

Summary and discussion

- Poverty indexes are simple aggregate statistics

- To produce these statistics, one needs thresholds to identify those likely to be poor and then aggregate them

- We will never be able to build a perfect poverty line since poverty is multi-dimensional, complex and controversial

- STC attempts to give broad indication of groups at risk of poverty and the evolution (trend) of low income so as to provide the context for policy discussion

- The lines are not measuring rod one can use to find out if the "Jones" are poor or not. Nor are they intend to be used as legislative standards or as tools for performance evaluation