# Lesson 3. Poverty Measurement Tools

# 3.1 Welcome



### Notes:

This Lesson shows the theoretical and practical methodology for poverty measurement.

# 3.2 From Domains to Indicators



### Notes:

From this slide, statistical values which measure dispersion and inequality are introduced.

The mean in the arithmetic formulae and the medium are different. Different from the mean, the medium is not relied on exceptional values. Distribution of income or expenditure usually includes exceptionally expensive values. Thus, medium is usually used for measurement of poverty.

# 3.3 Bias of Distribution



### Notes:

The degree of asymmetry of distribution is called bias. Typical symmetric distribution is the normal distribution. Given the location of the peak is lower than the center, the distribution is called as the positive asymmetric distribution. If financial factors are shown in the horizontal axis, individuals or households in the vertical axis, their distribution is apt to be the positive asymmetric distribution. Thus, the distribution for poverty discussion can be regarded as the positive asymmetric distribution. Given the location of the peak is higher than the center, the distribution is called as the negative asymmetric distribution, quite rare in economy and society.

## 3.4 Indicator Compilation



Notes:

The slide shows the poverty gap index: the extent to which individuals fall below the poverty line (the poverty gaps) as a percentage of the poverty line.

The sum of these poverty gaps can be seen as the minimum cost of eliminating poverty, if it were somehow possible to perfectly target social transfers.

The division by the poverty line normalizes the measure, allowing for comparisons across countries and across time.

The poverty gap ratio also has its limitations, however. In particular, the measure only reflects the average depth of poverty, so cannot reflect changes in inequality among the poor. Additionally, it can actually rise rather than fall when people leave poverty, if the average poverty gap of those that remain increases as a result. An additional consideration is that data on the very lowest incomes can often be affected by poor data quality, which in turn will affect the usefulness of poverty gap measures.

## 3.5 Conceptual Metadata



#### Notes:

Deviation from the mean shows the dispersion of the individual data. Given they are summed, they would be zero. So, the mean deviation: average of summing absolute deviation can be used as the overall dispersion.

# 3.6 Methodological Metadata



### Notes:

Average summed squared deviation can express the overall dispersion. In order to adjust orders, it would be square rooted as the standard deviation.

# 3.7 Coefficient of Variation



### Notes:

The larger the data are, the larger are apt to be the mean and the standard deviation in different to variances. To adjust the size of data, the coefficient of variation; standard deviation divided by the mean is sometimes used for measurement of the overall dispersion.

## 3.8 Lorenz Curve



### Notes:

The Lorenz curve is a graph with the horizontal axis showing the cumulative proportion of the persons in the population ranked according to their income or expenditure and with the vertical axis showing the corresponding cumulative proportion of income or expenditure. The curve then shows the income or expenditure share of any selected cumulative proportion of the population. The diagonal line represents a situation of perfect equality, that is, all people have the same income or expenditure.

# 3.9 Measurement of Relative Poverty Gini's Coefficient



#### Notes:

The slide pictures the definition of the Gini's coefficient which is most popular as the inequality measurement. The Gini's coefficient is the rate of the area surrounded by the curve and the diagonal line divided by the triangle in the figure of the Lorenz curve. General distribution on life level is positive asymmetric. Thus the Gini's coefficient is also positive, not zero. The degree of inequality in general distribution on life level reflects on the size of the Gini's coefficient.

# 3.10 Example of Gini's Coefficient



Notes:

The slides shows a model example to calculate the Gini's coefficient. The area surrounded by the curve and the diagonal line is the triangle from the diagonal line and lines of the rectangle less three figures comprising the Lorenz curve.

# 3.11 Notes of Gini's Coefficient



#### Notes:

The Gini's coefficients should be used for evaluating inequality among similar distributions. Two distributions on the slides are symmetric. However, the Gini's coefficients are different. Since most distributions on incomes and expenditures are positive asymmetric distributions such as the left distribution on the slide, they can be evaluated with the Gini's coefficients.

# 3.12 Half of Medium



### Notes:

The medium is often used for measurement of relative poverty. Some rate of the medium such as half of medium is the typical relative poverty line.

# 3.13 Interquartile Range



### Notes:

The interquartile range is also one of indicators to show the dispersion.

## 3.14 Measurement of Relative Poverty



# Coefficient of Quartile Variance

Notes:

The larger the data are, the larger are apt to be the medium and the interquartile range in different to variances. To adjust the size of data, the coefficient of quartile variance; interquartile range divided by the first quartile plus the third quartile is sometimes used for the measurement of the overall dispersion.

## 3.15 Surveys as Data Sources



### Notes:

From this slide, methodology of household surveys is explained.

Two kinds of surveys exist for measurement of poverty.

# 3.16 Unit of Observation

	Poverty Statistics for SDGs
Unit of Observation	
households	
Per capita approach	
<ul> <li>Assumes that resources are shared equitably amongst all members of the households</li> </ul>	
• Fails to account for economies of scale within households	
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### Notes:

Unit of observation is households, not individuals.

As explained before, the values for individuals are estimated by the per capita approach which assumes resources are shared equitably amongst all members of the households but fails to account for economies of scale within households.

## 3.17 Headcount Ratio



Notes:

Headcount ratio is proportion of the population that is in households whose income or expenditure is less than the poverty line, calculated with the same methodology as the poverty gap index.

# 3.18 Sampling Methodology



### Notes:

Those household surveys are implemented with the sampling methodology. Samples with the smaller size of units are selected from the population. The picture of the population is estimated from the data from samples. The population should comprise high quality data with quality metadata.

# 3.19 Planning of Survey

		Poverty Statistics for SDGs
Planning of Survey Purpose • For what reason will the survey be implemented? • What will be surveyed?	Unit • object • location • attribution	Time of survey <ul> <li>When does the unit exist?</li> <li>When do the data exist?</li> <li>When is the survey implemented?</li> </ul>
• What output will be disseminated?		

### Notes:

Planning of survey is significant. There are three significant factors.

Purposes do not always include measurement of poverty. The purpose of achieving detail information of income or expenditure fits to the purpose for measurement of poverty.

Units of the surveys are households, as mentioned previously, including issues of coverage.

There are three kinds of time: existence of the unit, existence of the data, and implementation of the survey.

# 3.20 Process of Design of Sampling



### Notes:

Practical sampling methodology is designed. Accuracy should be established both as the goal and the result. The sample size is decided based on the accuracy of goal and the sampling methodology. The results of the survey need to be used within the range from the accuracy of result.

# 3.21 Rotation of Samples



### Notes:

There are some practical devises for sampling methodology. In order to secure the accuracy and the stability in time series, units are divided into some groups. Only a group is changed once. Periods for the survey are different among groups. The methodology is called the rotation of sampling.

# 3.22 Factors of a Good Questionnaire of Household Surveys



Notes:

Household surveys are implemented by asking questions to members of households. Most of them are not familiar with the purpose, the reason, and the method of the survey. Thus, survey designers have to take care of how to capture high quality responses from them.

## 3.23 How to Deal with Seasonality?



### Notes:

Most of the people want to use the result of the survey to find a trend without seasonality and extraordinary happening. Survey designers should device the methodology with which seasonality of the result can be adjusted.

# 3.24 Estimation Methodology



Notes:

Estimation can be devised for non-sample data in the population.

If expenditures are surveyed for units of a sample survey, expenditures must be estimated for other units in the population.

This is a chart of the methodology of estimation.

Using data in the sample survey, a regression model could be constructed where expenditures are explained with region, age and occupations. The same regression model could be applied to the other units with data of their region, age and occupation..

# 3.25 Sampling Error and Standard Error



### Notes:

The sampling error should be estimated to evaluate the accuracy of the result of the survey but, in practice, is calculated as the standard error.

# 3.26 Relationship between Sampling Error and Standard Error

Poverty Statistics for SDGs
Relationship between Sampling Error and Standard Error
The resulting values vary according to the samples chosen.
If a sampling survey is repeated, different units are selected at each survey and therefore the resulting values vary.
+
In order to show the sampling error, use the value that shows the level of dispersion from the real values (stochastic level of dispersion).
+
Use standard errors to show the dispersion
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### Notes:

The slide shows more detail relationship between the two errors.

# 3.27 Counting the Uncounted

	Poverty Statistics for SDGs
Counting the Uncounted	
<ul> <li>Those who are the furthest behind are ofte uncounted.</li> </ul>	n
<ul> <li>The identification of people suffering from deprivation therefore requires sufficiently de data across multiple dimensions.</li> </ul>	etailed
<ul> <li>Exclusion by design leads to absence of re disaggregation</li> </ul>	levant
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#### Notes:

Consider those who are not surveyed because they tend to be main targets for the policy on poverty.

# 3.28 Data Consolidation



### Notes:

All of the consumption will not be able to be captured from the Household Expenditure Survey. Special Household Expenditure Survey will be effective for getting expenditures for infrequent expensive consumption for cars, facilities, travels, etc. Daily expenditures can be gained more accurately with Big Data such as scanner data, credit data, internet shopping records, etc. from the supply side: companies or public institutes.

## 3.29 Non-sampling Error



#### Notes:

Non-sampling error should be taken into account. Typical examples of nonsampling error are incompleteness of survey drafting, wrong determination of survey subjects, no or wrong response, and errors in tabulation.

# 3.30 General Non-coverage in Household Surveys

Poverty Statistics for SDGs
General Non-coverage in Household Surveys
<ul> <li>Those resident in a household but not treated as a member</li> </ul>
<ul> <li>Foreign officials or military</li> </ul>
<ul> <li>People living in institutions, including hospitals, care homes, prisons, military barracks, factory barracks, religious orders, schools, and universities</li> </ul>
<ul> <li>The homeless</li> </ul>
<ul> <li>Those living in refugee camps</li> </ul>
<ul> <li>Mobile populations, including nomads/pastoralists and guest workers, and those in the course of migration</li> </ul>
<ul> <li>Those living in war zones or dangerous areas</li> </ul>
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### Notes:

Those resident in a household but not treated as a member applies particularly to servants, in both rich and developing countries.

Not all of those in categories listed in the slide are unrecorded: for example, a young person may be away at school but recorded as a family member.

## 3.31 Illustrative Checklist for Non-sampling Errors



#### Notes:

Non-sampling error is a catch-all term for errors that are not a function of selecting a sample. It includes errors that can occur during data collection and the processing of survey data. For example, while an interview is in progress, the respondent may make an error answering a question, or the interviewer may make an error asking a question or recording the answer. Sometimes interviews fail to take place or households provide incomplete data. Other examples of non-sampling error include matching error, modeling error where data are imputed and classification

error. Unlike sampling error, non-sampling error is difficult to quantify.

# 3.32 Doubtful Survey



### Notes:

Considering the effectiveness and conveniences, those surveys in the slide are preferable, but include bias both in the units and the results. Units of surveys should be selected impartially.

## 3.33 Data Compilation

	Poverty Statistics for SDGs
Data Compilation	
Survey Data Collection Coding Data Cleaning Tabulation	Publication
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### Notes:

After data collected in a survey, they are coded and cleaned. Code of data follow classifications, favorably the international classifications to secure international comparison. Based on the codes, the data are tabulated and published. The process from data collection to data cleaning is called as data editing.

## 3.34 Purchasing Power Parity



#### Notes:

From this slide, price theory and practice are elaborated.

Financial levels of poverty are relied on the levels of price. If they are compared among countries, they should be adjusted with the levels of price. The price levels are sometimes rated with the exchange rate. Purchasing Power Parity (PPP) is the comprehensive approach with which compares different countries' currencies. Price levels depend on goods and services. A basket of goods are designated before measuring prices. Expenditure for those goods are used as the weights to consolidate those prices.

# 3.35 Comparison of Items for CPI and PPP



#### Notes:

Consumer Price Index (CPI) shows the price levels in time series. Items for CPI are selected among goods and services based on their consumption in countries. Therefore, some items are different between PPP and CPI though the others are the same.

# 3.36 Elements of Price Change



#### Notes:

There are two kinds of price changes. One is the relative change of price levels among countries which is measured by PPP. Another is the change of price levels in time series which is measured by CPI.

# 3.37 Calculation of PPP



### Notes:

Exchange rate of currency 1 to currency 2 is calculated using the costs of the good in both currencies as in the slide.

## 3.38 Indices for PPP

			Poverty Sta	Poverty Statistics for SDGs	
ndices for PPP					
	representative products				
	sign	number	price		
base country h	i	k	P*h		
partner country	1	т	P*j		
P <sub>j/h</sub>	$= \sqrt{\left(\prod_{i=1}^{k} \frac{P_{ij}}{P_{ik}}\right)}$	$\left(\prod_{k=1}^{m} \frac{P_{lj}}{P_{lh}}\right)^{\frac{1}{k}} \left(\prod_{l=1}^{m} \frac{P_{lj}}{P_{lh}}\right)^{\frac{1}{k}}$	$\Big)^{\frac{1}{m}}$		
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### Notes:

Indices for PPP are calculated using prices in the country and the average among countries. All items are common to all countries. For 2011 PPP the indices follow the formula in the slide. In the square root of the Formula, the left side is the Laspeyres formula while the right side is the Paasche formula. The representative products are different between the base country and the partner country. The representative products in the base country are shown as *i*, those in the partner country shown as *l*. The number of the representative products in the base country are shown as *m*.



# 3.39 Ratio of Expenditures of Two Economies

### Notes:

PPP comprises price level ratio and currency ratio. Volume ratio: the wealth, which is important for measurement of the poverty level, is calculated as the expenditure ratio divided by PPP..

## 3.40 Summary of Lesson 3



## 3.41 No Poverty

