

INTERNATIONAL MONETARY FUND

The Availability, Methodological Soundness, and Scope of Consumer Price Statistics in 2020

Vanda Guerreiro, Andrew Baer, and Anthony Silungwe

WP/22/53

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WORKING PAPER

IMF Working Paper
Statistics Department

The Availability, Methodological Soundness, and Scope of Consumer Price Statistics in 2020
Prepared by Vanda Guerreiro, Andrew Baer, Anthony Silungwe

Authorized for distribution by Mr. James Tebrake
March 2022

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ABSTRACT: This paper analyzes the availability, methodological soundness, and scope of Consumer Price statistics in IMF member and non-member countries in 2020. Consumer price statistics are instrumental in the development of monetary policy and in monitoring economic developments. They also often have administrative uses such as in determine wage increase or setting pension payments. This analysis examines the appropriateness of the current set of global consumer price statistics for current policy development and highlights regions where further development may be required. The analysis is based on the results of a new annual survey of CPI compilation practices in 207 economies as of the end of 2020. The survey was completed by statistical authorities between March 2021 and June 2021. In cases of non-response, IMF staff estimates were used. IMF Staff estimates were based on information taken from the IMF's Dissemination Standards Bulletin Board (DSBB) and country websites to provide the status of consumer price index compilation practices. These data summarize the following key aspects; i) Production, publication and scope of the Consumer Price Index Program, ii) Data sources, iii) CPI compilation methods and iv) Concepts and classifications.

JEL Classification Numbers:	E31
Keywords:	Consumer Price Index; Index Methodology
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WORKING PAPERS

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Glossary

AFRITAC	Africa Regional Technical Assistance Center
CAPTAC-DR	Central America, Panama, and the Dominican Republic Technical Assistance Center
CARTAC	Caribbean Regional Technical Assistance Center
CCAMTAC	Caucasus, Central Asia, and Mongolia Regional Capacity Development Center
COICOP	Classification of Individual Consumption According to Purpose
CPI	Consumer Price Index
DSBB	Dissemination Standards Bulletin Board
e-GDDS	Enhanced General Data Dissemination System
HBS	Household Budget Survey
METAC	Middle East Regional Technical Assistance Center
NSDP	National Summary Data Page
PFTAC	Pacific Financial Technical Assistance Center
RCDC	IMF Regional Capacity Development Center
SARTTAC	South Asia Regional Training and Technical Assistance Center
SDDS	Special Data Dissemination Standard

Introduction and Background

Consumer price statistics are instrumental in the development of monetary policy and in monitoring economic developments. They also often have administrative uses such as in determine wage increase or setting pension payments. In March 2021, the IMF Statistics Department launched a new global survey to capture a broad set of data on the Consumer Price Index (CPI) compilation practices in 207 economies.¹ This survey aims to provide comprehensive and timely information on the methodology of the CPI for each member country, facilitating international and regional benchmarking and comparison. It is useful for i) monitoring progress on the development of CPI statistics in member economies, ii) assessing some quality-related features of the CPI and iii) surveillance purposes.

Box 1. Concept of Consumer Price Index (CPI)

“CPIs measure changes over time in the general level of prices of goods and services that households acquire (use or pay for) for the purpose of consumption.”

Consumer Price Index Manual: Concepts and Methods

Several countries publish information on the scope and nature of their CPI program on national statistical office (NSO) websites and on the IMF Dissemination Standards Bulletin Board. However, these data are not accessible in a consistent format to support analysis of the overall state of global CPI statistics. The novelty of this new survey is to create a consistent and comprehensive dataset on the sources and methods of the CPI statistical programs allowing comparisons with international standards and best practices.

Data was collected using an online survey comprising 56 questions. Responses for most questions in the online survey were prepopulated by IMF economists with the latest available information, where available. The prepopulated questionnaire was then sent to country CPI compilers for confirmation and updating. The information was confirmed or updated by 52 percent of survey respondents in the participating countries. For the remaining countries, the responses reflect only the information obtained by IMF economists.

Participating countries are grouped, for regional comparison purposes, according to four different nomenclatures: Analytical Country Groups used in the World Economic Outlook and other IMF publications; United Nations geographic regions (M49 Regions); IMF Area Departments (AD Regions); and countries covered by various IMF Regional Capacity Development Centers (RCDCs). Figure 1 shows the number of countries per each region according to each of the nomenclatures used.

¹ The term “economy,” as used in this paper, does not in all cases refer to a territorial entity that is a state as understood by international law and practice. The term also covers some non-sovereign territorial economies, for which statistical data are maintained and provided internationally on a separate and independent basis. The 207 includes the non-sovereign territories in which statistical data are maintained.

Figure 1. Number of Respondent Countries per Region

Analytical Regions	M49 Regions	AD Regions	RCDC Regions
Advanced Economies	Africa	AFR	AFRITAC Central
38	Americas	APD	AFRITAC East
Emerging and Developing Economies	Asia	EUR	AFRITAC South
160	Europe	MCD	AFRITAC West
	Oceania	WHD	AFRITAC West 2
			CAPTAC-DR
			CARTAC
			CCAMTAC
			METAC
			PFTAC
			SARTTAC

Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

The main aspects of CPI methodology analyzed in this paper are: i) Production, publication, and scope of the CPI, ii) Data sources, iii) CPI compilation methods, and iv) Concepts and classifications.

Production, Publication and Scope

The CPI is a high frequency indicator that is released monthly (or quarterly in some cases). In general, governments adopt a non-revisions policy, i.e., CPIs are not revised after dissemination because they are used as inputs to monetary policy decisions, to adjust wages and salaries, and to adjust government payments in many countries. The uses of the CPI are described in Box 2. Nonetheless when a significant error is detected, a revision can take place on an exceptional basis.

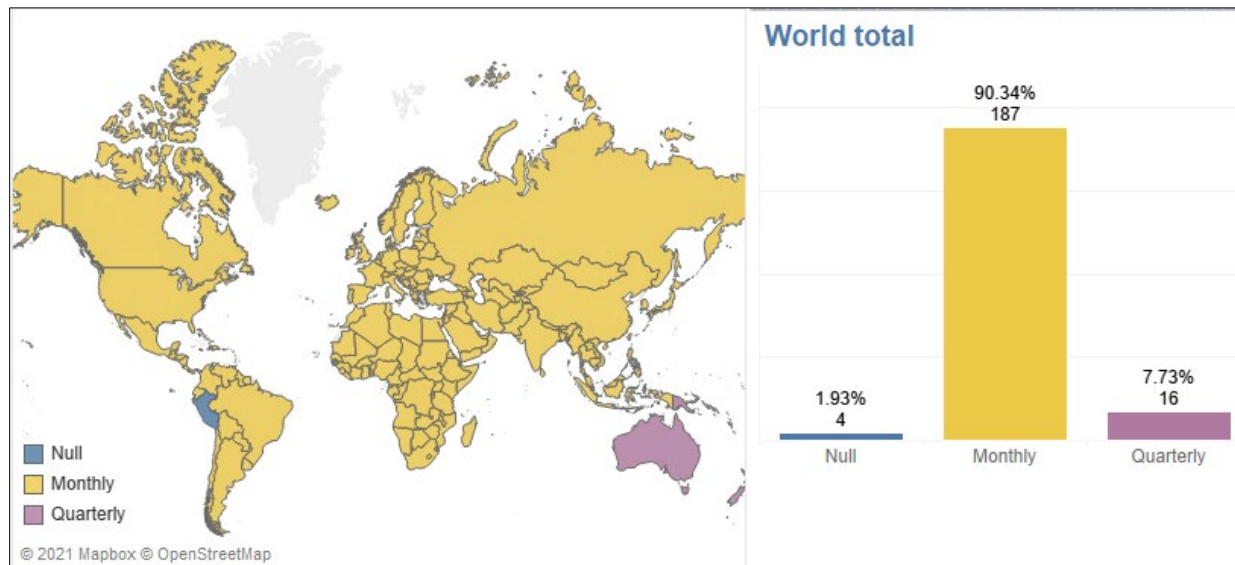
Box 2. Overview of the CPI Uses

“A CPI can be used for a variety of purposes, the most common ones being the indexation of wages, rents, contracts, and social security payments; the deflation of household final consumption expenditure in the national accounts; and the use as a general macroeconomic indicator, especially for inflation targeting and for setting interest rates. Elements of a CPI are also often used in the calculation of purchasing power parities and extrapolating purchasing power parities between benchmark years as required in the International Comparison Program (ICP).”

Consumer Price Index Manual: Concepts and Methods

The IMF’s [Special Data Dissemination Standards](#) (SDDS) and the Enhanced General Data Dissemination System recommend monthly dissemination of the CPI. Figure 2 confirms that 187 of surveyed countries (90 percent) follow these recommendations. Only 16 surveyed countries, including Australia, New Zealand, and other Oceania countries, publish a quarterly CPI. One surveyed country has suspended publication of their CPI and no information is available for three countries.

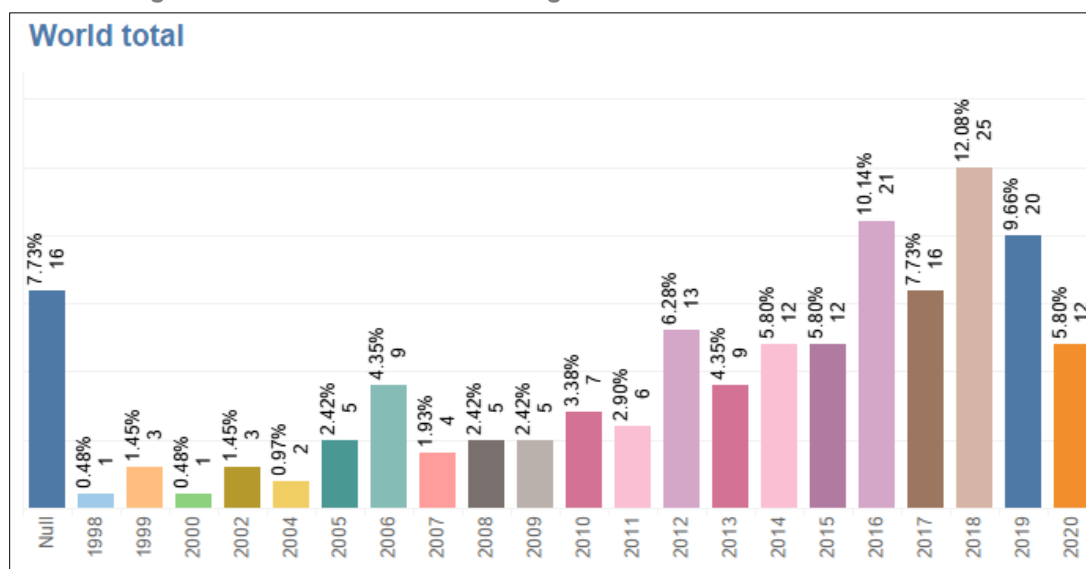
Figure 2. What is the Frequency of Your CPI?



Source: IMF staff – 2020 Global Annual Survey on CPI Statistical Programs.
 * NULL = Countries not answering the question or not publishing a CPI

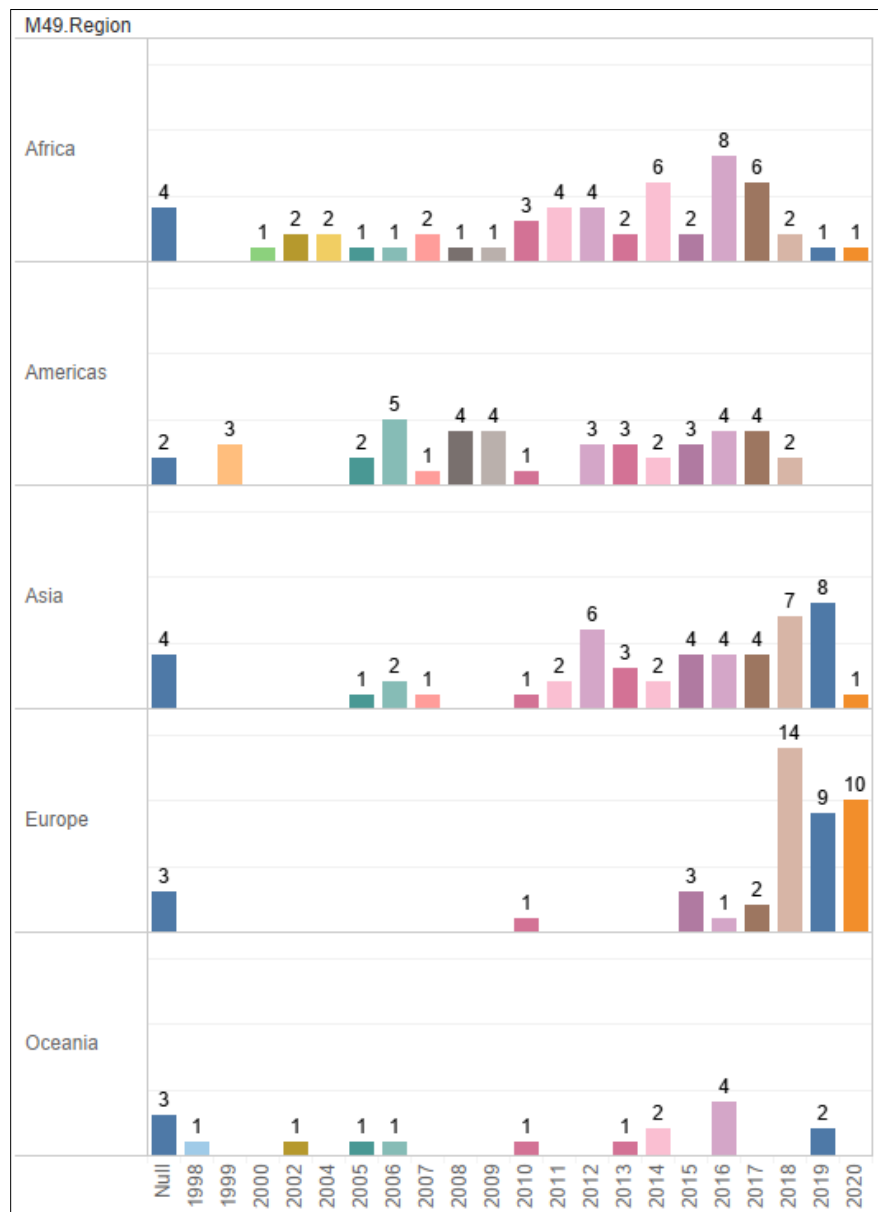
A CPI is calculated as a weighted average of the relative price changes of the goods and services covered by the index. The weights attached to each good or service reflect their relative importance as measured by their shares in the total consumption of all households. The weight determines the impact that its price change will have on the overall index. International standards recommend that CPI expenditure weights should be updated at least every five years. The weights reference period pertains to the period during which household expenditure data were collected, however some countries price-update the weights every year and reported the reference period as such. Figure 3 shows that 106 member countries had a weight reference period within 5 years or less of 2020. Information on the weight reference period is not available for 16 countries.

Figure 3. What is Your Current Weight Reference Period? – World View



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.
 * NULL = Countries not answering the question

Figure 4. What is Your Current Weight Reference Period? – Regional Group



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not answering the question

In the Africa region the state-of-play of weight updates require further attention. Figure 4 shows that a large majority of the countries compiling the CPI are using weights that are older than five years, thus not in line with the international standards.

The situation is similar in the Americas region, where only 10 of 41 compiling countries report a weight reference period within five years of 2020.

Broadly the same lack of timeliness is seen in the weights for most countries in the Oceania region.

Europe and Asia are the regions where weights are more frequently updated for most of the countries.

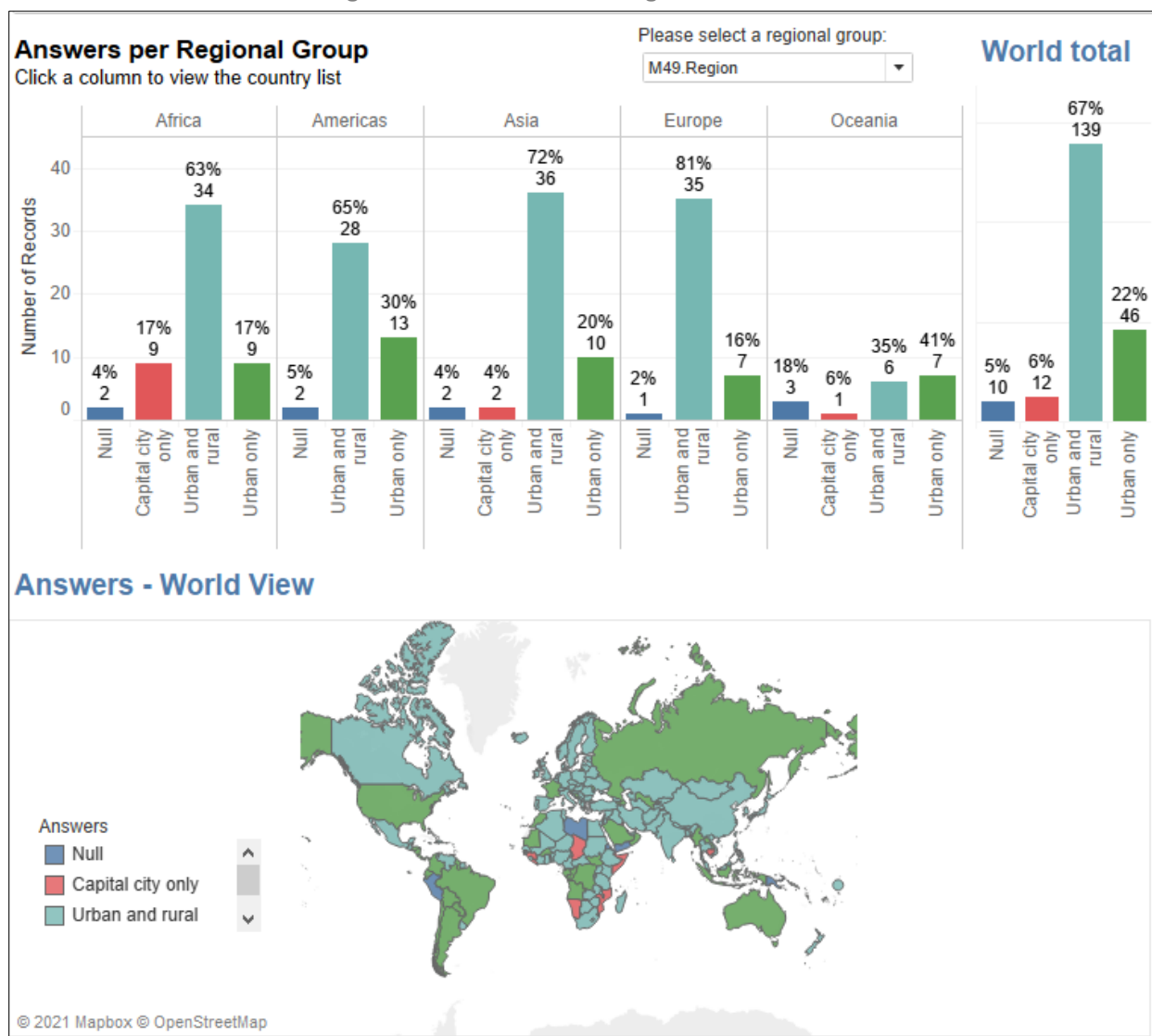
The geographic coverage of the CPI refers to coverage of the expenditure weights and the areas where prices are collected. Coverage of CPI expenditure weights is an indicator of quality. When expenditure weights are based on data collected in both rural and urban areas, the index is considered to have national coverage. Ideally the CPI has full country coverage in terms of expenditure and prices as further explained in Box 3. Figure 5 illustrates that most countries (67 percent) collect expenditure data in both rural and urban areas, i.e., weights have full country coverage. As can be seen in the map in Figure 5, countries in South America and Oceania are mostly covering urban areas only.

Box 3. Regional Coverage

“Concerning the regional coverage of the CPI, the general rule is that a national CPI should cover expenditures and prices throughout the country. However, comprehensive coverage is not always necessary, especially if regional CPIs are not published and the sampling program ensures that the index is representative of the whole country.”

Consumer Price Index Manual: Concepts and Methods

Figure 5. What is the Coverage of Your Index?

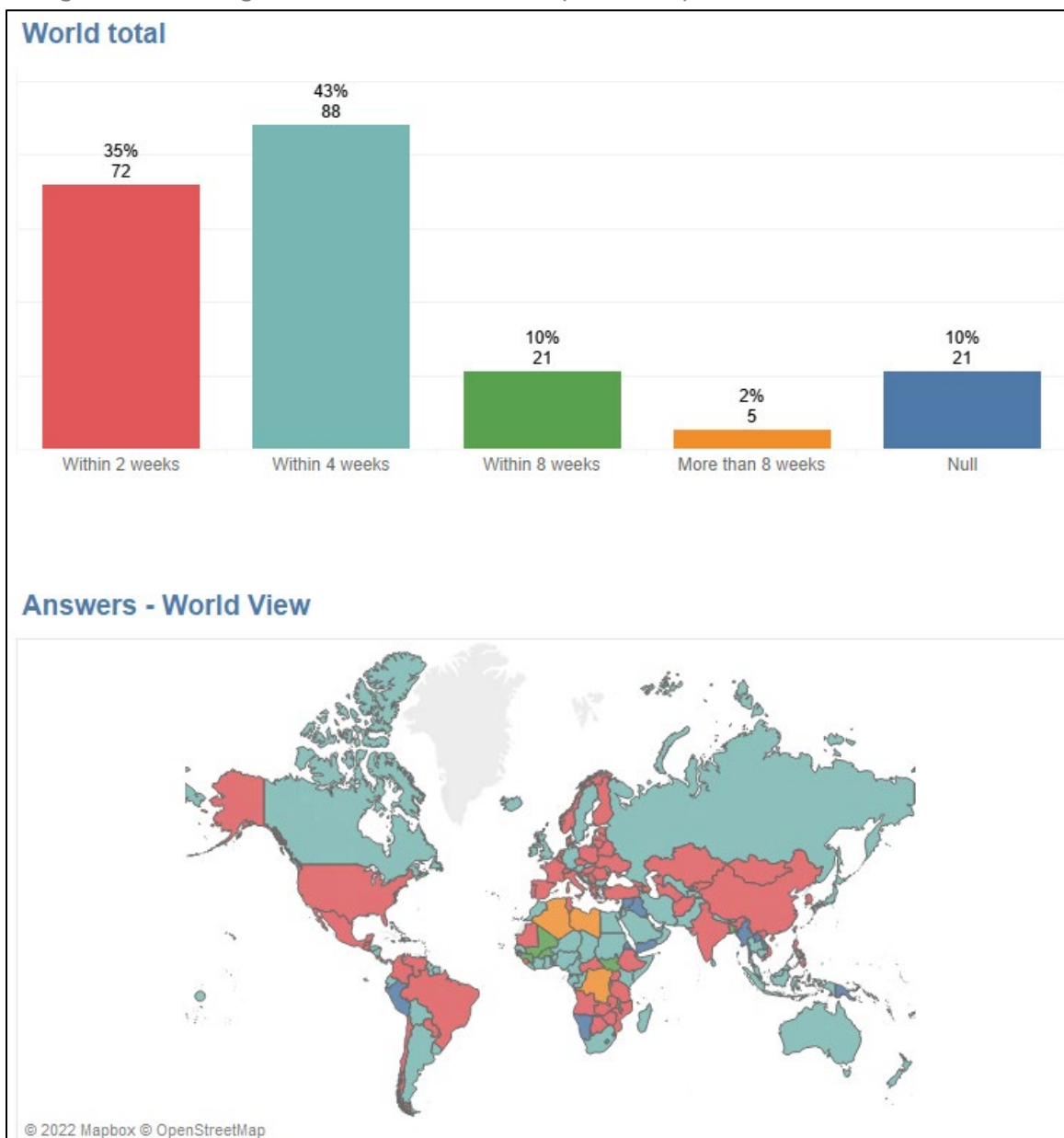


Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not answering the question

The timelines² of the CPI release is a key indicator of quality (See: [IMF Data Quality Assessment Framework](#)). The e-GDDS encourages dissemination within eight weeks of the reference period, while the SDDS requires dissemination within four weeks of the reference period. Only five surveyed countries failed to meet these timeliness requirements. All Advanced Economies and 75 percent of Emerging and Developing Economies release the CPI with no more than a four-week lag.

Figure 6. How Long After the Reference Month (or Quarter) Do You Disseminate Your CPI?



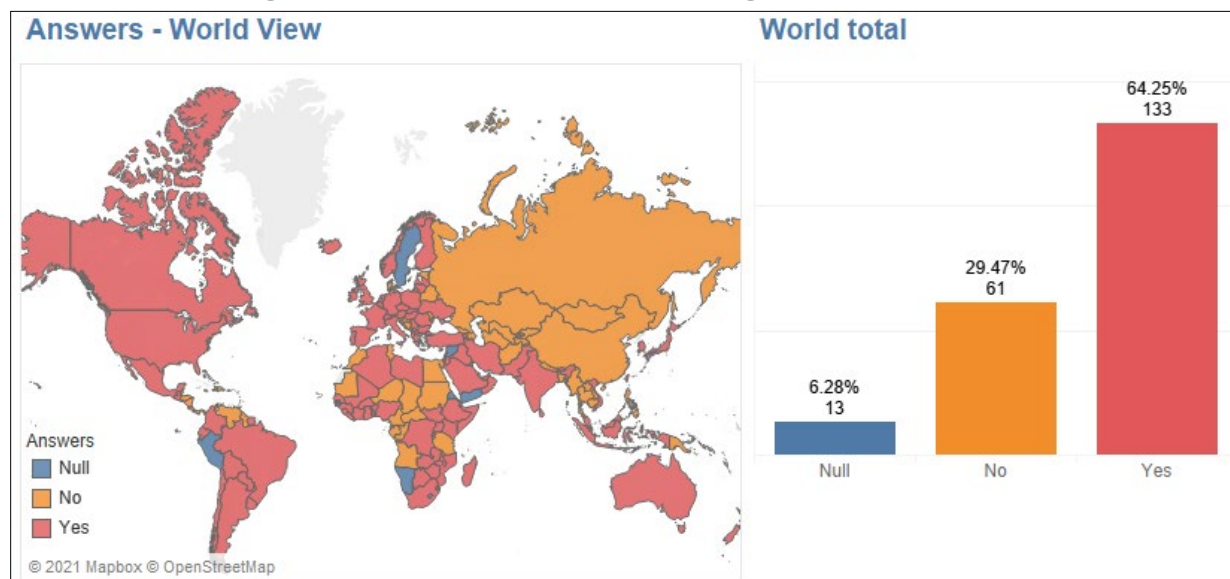
Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not answering the question

²Timeliness—pertains to how quickly and frequently the statistic is published” - *Consumer Price Index Manual: Concepts and Methods*.

Detailed CPI product indices and weights should be made available to the public. The weights are a fundamental aspect of the CPI. They allow policymakers and other data users to identify which expenditure categories are driving overall changes in the CPI and to make their own calculation, such as a core inflation measure. For example, in the U.S., health care and housing account for the highest shares of households' expenditures while for many other countries, food is the main component. Currently, 133 countries publish the detailed weights on their website.

Figure 7. Do You Publish the Detailed Weights on Your Website?



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

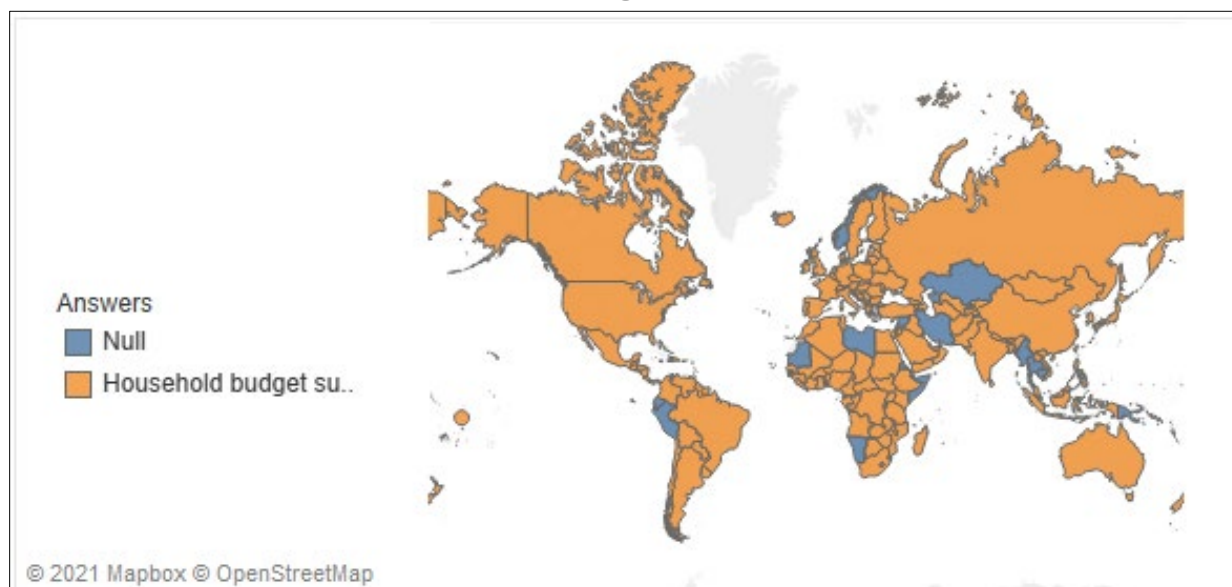
* NULL = Countries not answering the question

Data Sources

CPI calculation relies on two types of data: data pertaining to the prices of the items included in the CPI basket used to measure the price changes; and data on households' expenditures used to aggregate the elementary indices into successively higher-level indices.

There are a number of data sources which can be used to derive or validate the households' expenditures data. Most countries conduct a household expenditure survey, commonly known as the Household Budget Survey (HBS), to derive expenditure weights. Figure 8 shows that all respondents confirmed using the HBS as a data source to derive weights.

Figure 8. Do You Use the Household Budget Survey as the Data Source to Derive and Validate the CPI Weights?

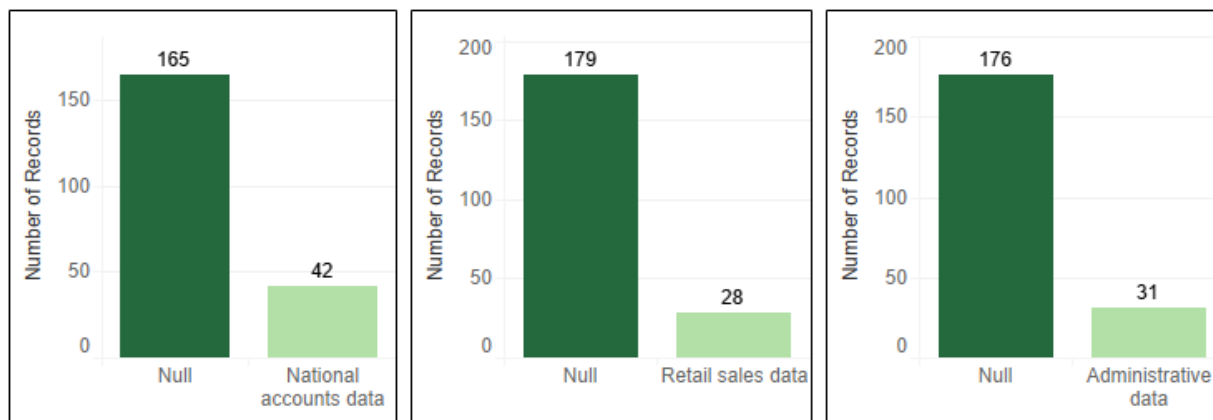


Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not using HBS and/or not answering the question

National accounts data were reported as the second most common source of data used to derive and validate the CPI weights as shown in Figure 9. Other sources used to compile weights include retail sales data and administrative data.

Figure 9. Other Data Sources to Derive and Validate the CPI Weights



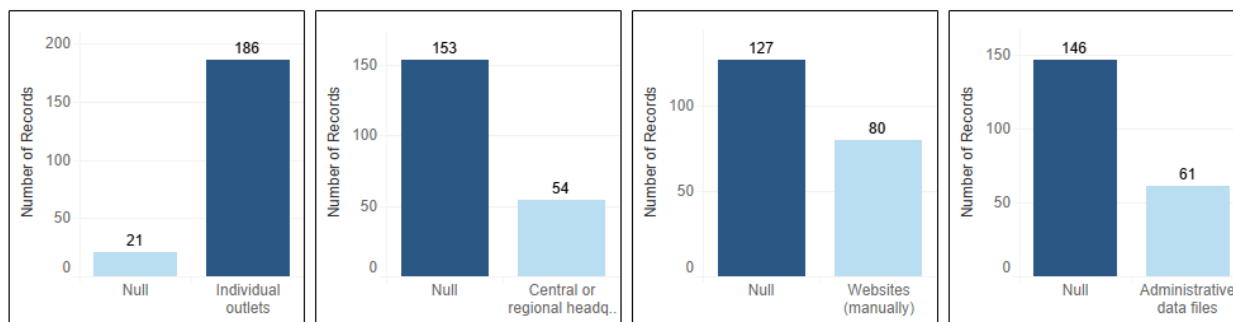
Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not using other data source and/or not answering the question

Figure 10 shows the different sources for the collection of prices. Prices are collected locally or centrally. For local price collection, data collectors visit individual physical outlets to collect prices on goods and services. This is the most common form of price collection. Central price collection refers to the collection of prices by staff in the national statistical office (headquarters and/or regional branches). Centrally collected prices include the prices of national chains with a national pricing policy (i.e., prices are the same in all locations), fixed or regulated prices from administrative sources, prices from websites, and the collection of scanner data.

Websites have increasingly been used as a source of price data. Data from websites can be collected manually or by web scraping.³ Currently 80 countries are retrieving data from websites manually. Administrative files obtained from national regulatory bodies, ministries, or other sources are used by 61 member countries for the collection of prices.

Figure 10. Data Sources for Price Collection

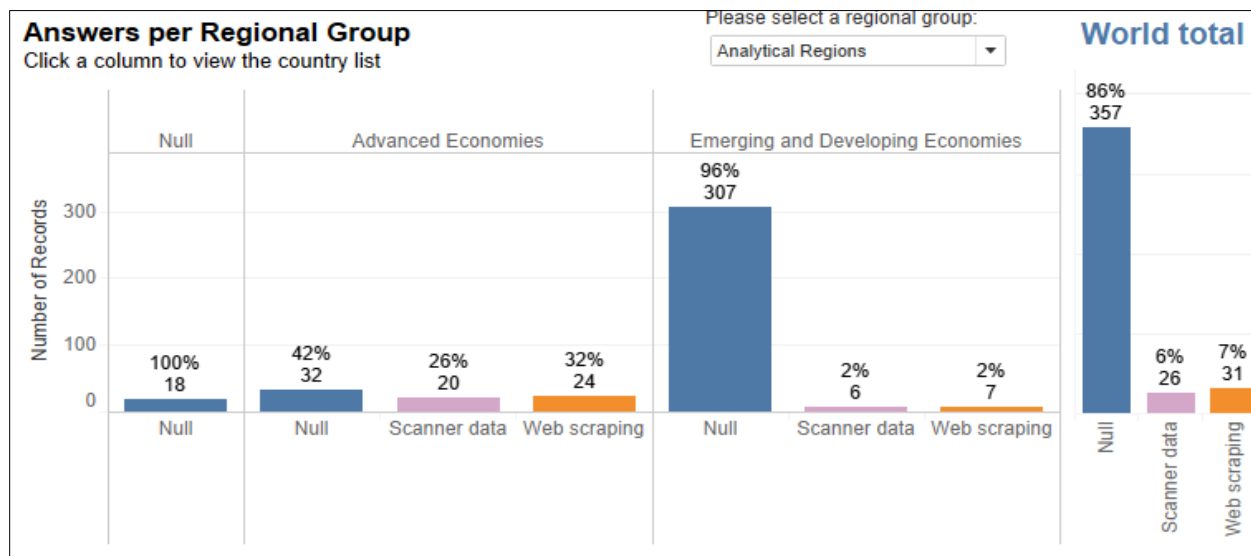


Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not using the data source and/or not answering the question

New data sources for CPI prices include web scraping and scanner data.⁴ Lockdowns and restrictions on movement in response to the COVID-19 pandemic limited in-person price collection in many countries during 2020. These restrictions accelerated the move by several national statistics offices to implement or expand the use of these new data sources. Figure 11 shows that 26 countries reported using scanner data and 31 countries reported using web scraping in 2020. These figures are expected to increase in the coming years.

Figure 11. Number of Countries Using Scanner Data and Web Scraping as a Source of Price Information



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not using other data source and/or not answering the question

³ Web scraping is an automated system to retrieve data from websites.

⁴ Scanner data are files transmitted by the retailers that contain data on individual transactions, including date, quantities and values, and detailed variety characteristics.

Price collection should be spread over the reference month to ensure that price developments throughout the month are reflected in the average prices. The number of price observations collected per period varies according to a number of factors, including price volatility and the variation of prices between outlets. The frequency of price collection will vary by product depending on how frequently the prices change. For example, the prices of school fees are often collected once per year because tuition and fees change only at the beginning of each academic year, may be collected twice per year, while the prices for fresh fruits and vegetables, which are normally more volatile, should be collected several times during the month.

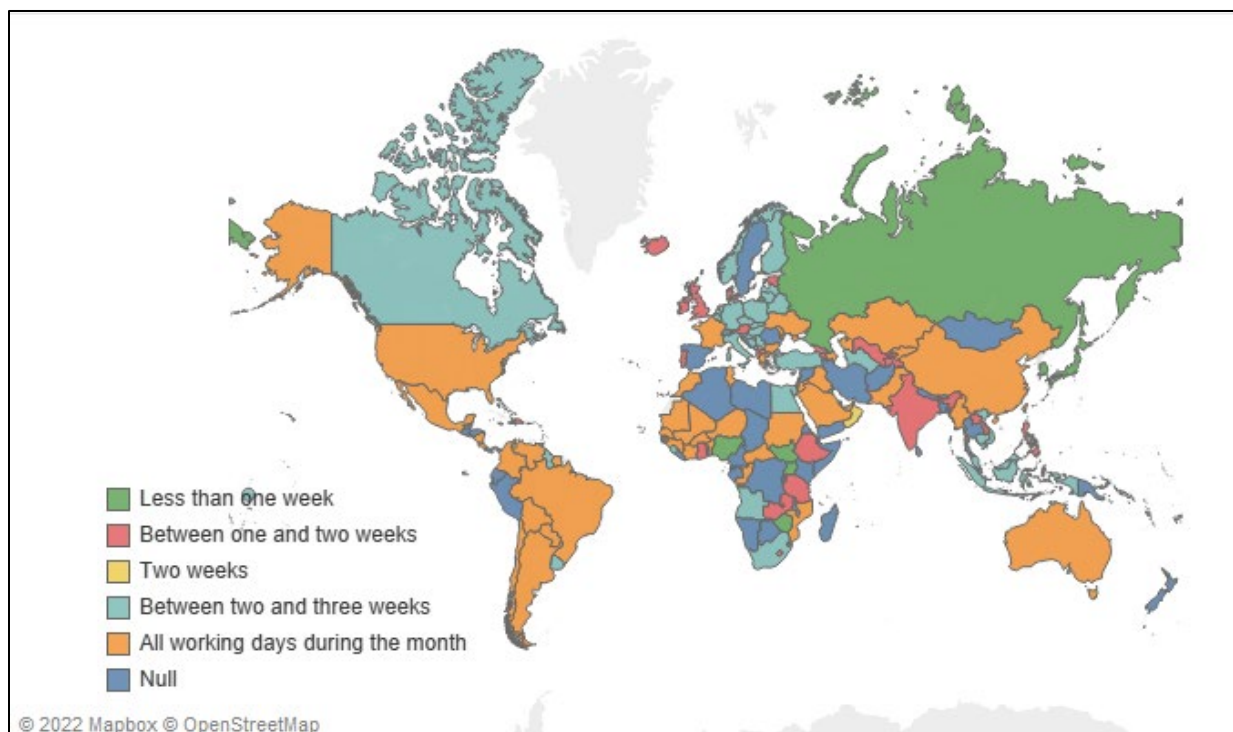
The price collection period refers to the period during which prices are collected each month. The duration of the price collection period varies from country to country and is driven largely by budgetary and staff resources. Figure 12 shows that most countries collect prices throughout the month.

Box 4. Price Collection Period

“Ideally, price collection would be organized so that prices are collected from different outlets throughout the month. This ensures that the prices used to calculate the index more broadly reflect the average price for the reference month.”

Consumer Price Index Manual: Concepts and Methods

Figure 12. What Is the Price Collection Period Each Month?



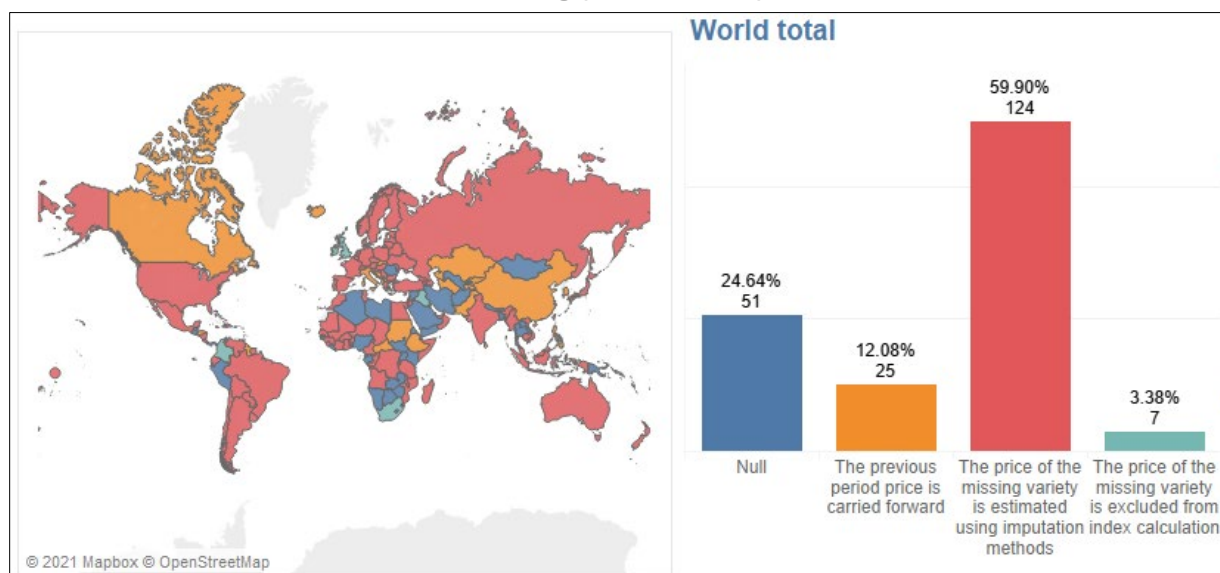
Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not answering the question

CPI Compilation Methods

A sampled variety can be missing in the market for a number of reasons, including seasonal non-availability. For example, certain types of clothing, footwear, and fresh fruits and vegetables are only available at specific periods during the year. When a variety is temporarily missing, its price should be estimated using one of the recommended imputation methods. Carrying forward the previous price observation or excluding the missing variety from the index calculation are discouraged. The vast majority of countries indicated that they impute for missing prices rather than carrying the price forward from the previous period or removing the variety from the index calculation. (Figure 13).

Figure 13. Which of These Options Best Describe the Method Used When a Variety Is Temporarily Missing (Non-seasonal)?



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not answering the question

Sampled varieties can become permanently missing. All permanently missing varieties should be replaced. When replacements happen the old variety and the replacement variety are often not directly comparable. Any change in the price determining characteristics of the variety signal that the old and replacement items are not comparable. For example, a new model of a car may not be directly comparable with the old model since there may be feature enhancements included in the base price. The CPI should reflect only pure price change and not changes due to differences in quality. Quality adjustment methods ensure that changes due to differences in quality are not reflected as price changes. Different methods can be used to account for changes in quality. Table 1 displays the number of countries by region that apply different quality adjustment methods. Eleven countries indicated that they do not perform any quality adjustments.

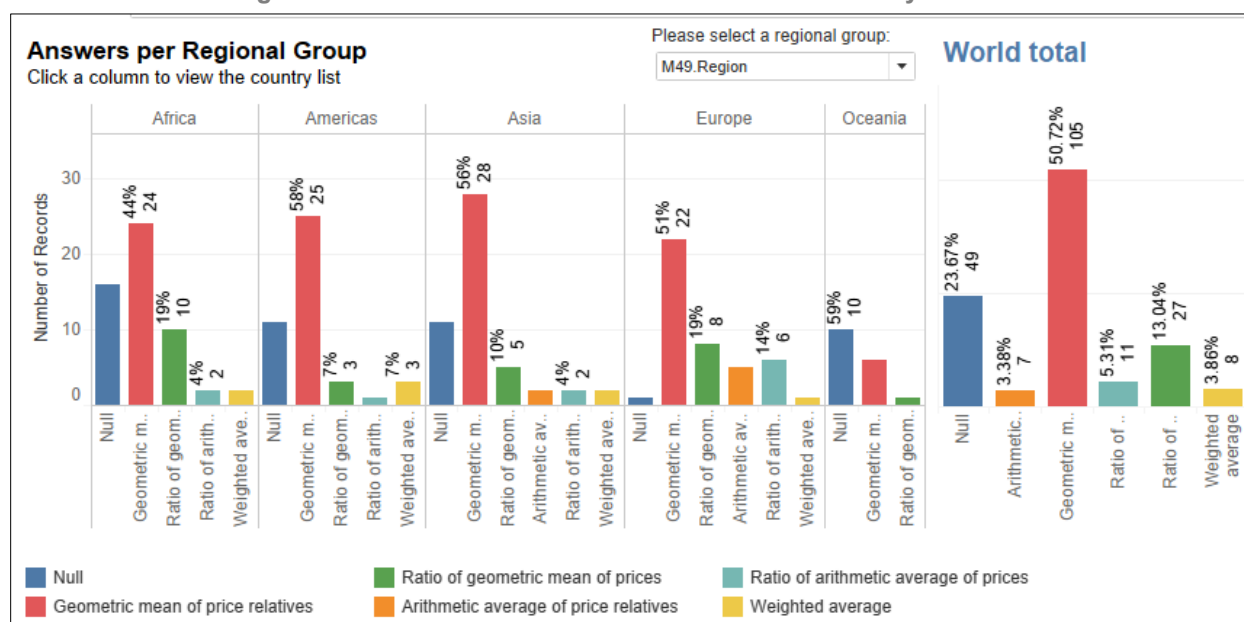
Table 1. Number of Countries by Quality Adjustment Method and Region

Questions	M49.Region				
	Africa	Americas	Asia	Europe	Oceania
40. Do you use Overlap pricing and imputation (indirect methods) for quality adjustment?	19	13	19	30	2
41. Do you use Direct adjustment for changes in size or quantity for quality adjustment?	17	14	18	30	3
42. Do you use Direct adjustment using option costs method for quality adjustment?	3	6	6	22	1
43. Do you use Direct adjustment using CPI staff or data collector knowledge for quality adjustment?	11	9	13	22	2
44. Do you use Hedonic adjustment methods for quality adjustment?	2	4	4	12	0
45. No quality adjustments made	2	3	4	2	0

Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

CPI calculation occurs in two stages. In the first stage, elementary indices are compiled. Elementary indices are the most detailed level at which indices are calculated. For each elementary index, prices are collected for a representative sample of varieties. Normally, weights are not available at the individual price level. While different formulas can be used to aggregate these unweighted prices to form the elementary index, the CPI Manual recommends using one of the geometric mean formulas, generally referred to as the Jevons formula. With the Jevons formula, the elementary index can be calculated either as the geometric mean of price relatives⁵ or the relative of geometric mean prices. With Jevons, both methods provide the same result. 132 countries reported using the Jevons formula to calculate elementary indices.

Figure 14 What Formula Is Used to Calculate Elementary Indices?



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

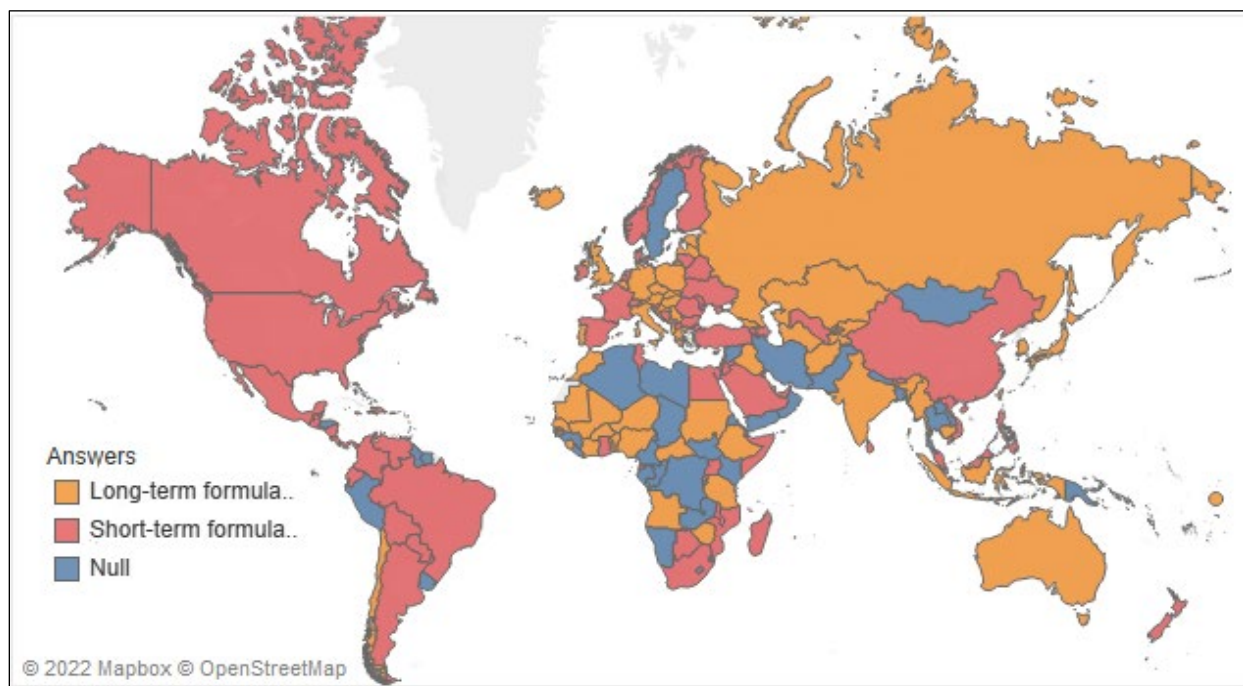
* NULL = Countries not answering the question

In the second stage of CPI index calculation, elementary price indices are averaged to obtain higher-level indices using the relative expenditure values of the elementary aggregates as weights. Upper-level indices can be calculated using either a short-term or long-term formula. With the short-term formula, long-term price indices are compiled by chaining together short-term price changes. The long-term formula calculates long-term price change directly each month. The short-term formula is recommended because it is more flexible. A

⁵ Price relative is a ratio of prices, pertaining different time periods, for the same item.

key advantage of the short-term formula is that it facilitates the introduction of new or replacement varieties without having to impute base period prices. When two successive periods of prices for the new or replacement variety are available, it can be used in place of the variety that is no longer available. Another advantage of the short-term formula is that it facilitates data validation, as it is the short-term change in price that identifies extreme price movement. Both methods are used by countries, however the short-term formula is more common. This is to be expected since this method is recommended by the *Consumer Price Index Manual: Concepts and Methods, 2020*.

Figure 1. What Formula Is Used to Compile Upper-level Indices?



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

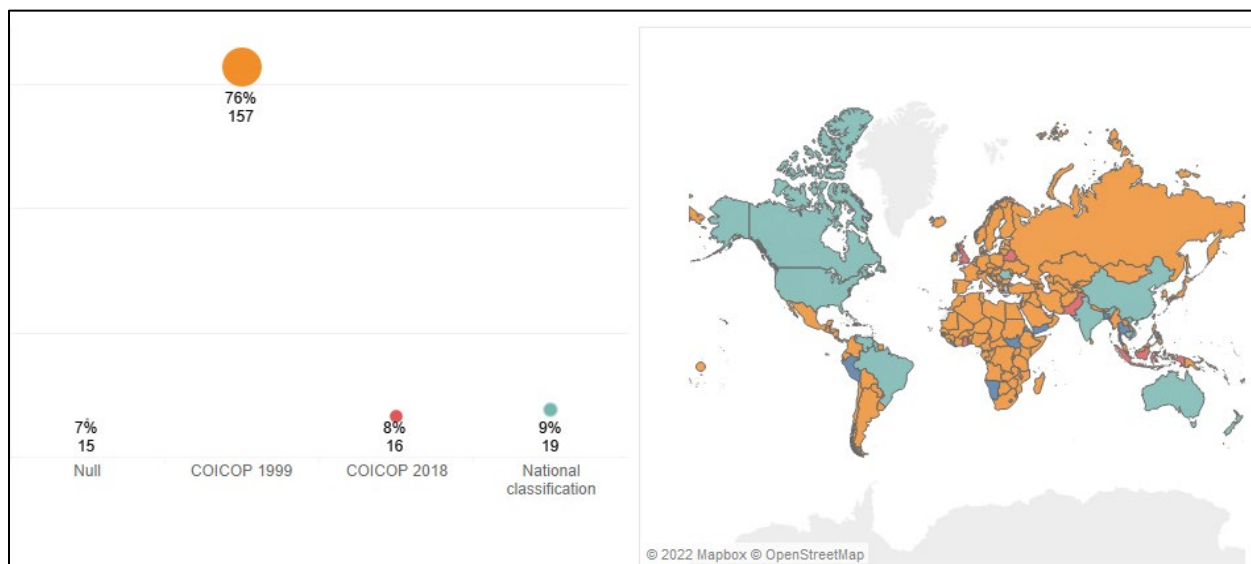
* NULL = Countries not answering the question

Concepts and Classifications

Consumer price indices are classified according to expenditure categories. The internationally recommended classification system for the CPI is the United Nations' Classification of Individual Consumption According to Purpose (COICOP). COICOP 1999 is used in the large majority of countries. The United Nations recently released an updated version of the COICOP⁶ classification (COICOP 2018) to reflect changes in consumption patterns and the emergence of new goods and services since the 1999 version. In the next few years, it is expected that countries will transition to COICOP 2018. Some larger economies, including Australia, Brazil, China, India, and the U.S., use their own national classifications instead of COICOP.

⁶ The Classification of Individual Consumption According to Purpose (COICOP) is the international reference classification of household expenditure. The objective of COICOP is to provide a framework of homogeneous categories of goods and services, which are considered a function or purpose of household consumption expenditure.

Figure 2. Which Product Classification Is Currently Used?

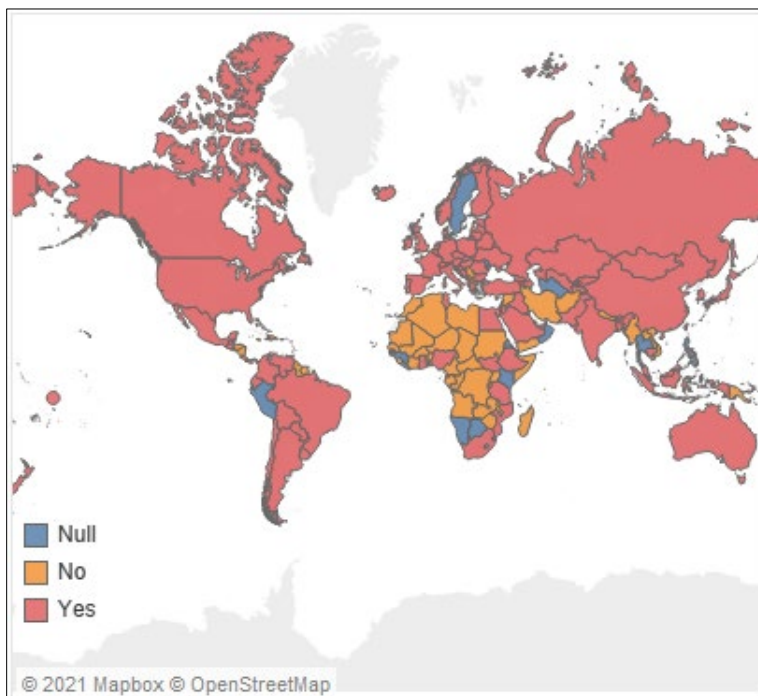


Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not answering the question

Most countries have produced metadata, or a sources and methods document, that is available on their websites; however, the level of detail recorded is usually not adequate to fully assess compliance with international standards and quality standards such as the IMF’s Data Quality Assessment Framework.

Figure 3. Is There a Document Explaining Current CPI Compilation Methods Posted on Your Website?



Source: IMF staff – 2020 Global Annual Survey on the CPI Statistical Programs.

* NULL = Countries not answering the question

Conclusions

While CPI statistics are generally of high quality there are significant regional disparities. CPIs are released monthly except in the case of Australia, New Zealand and some other countries in Oceania which disseminate quarterly. The frequency and timeliness of CPI weight updates, however, do not follow recommended best practice in many countries. This means that many CPIs are not adequately representative of current expenditure patterns which could introduce bias into the index. The CPI in the majority of countries covers the expenditure of both urban and rural areas, with a relatively few countries that cover the expenditure of the capital city only. Timeliness of publication is generally good with almost every country releasing the CPI less than four weeks after the reference period. The data sources used for weights and prices, however, are mostly limited to direct collection from households and outlets, revealing some room for improvement. The use of new data sources for price collection, such as web scraping and scanner data, is still limited. This shows that there are many opportunities to modernize the collection of prices.

Compilation methods are broadly in line with international best-practices and recommendations, in particular regarding the estimation of missing prices, quality adjustment methods, and the index calculation formulas used for elementary and upper-level indices. The implementation of COICOP 2018 is a work-in-progress as of 2020, as 157 surveyed countries reported using COICOP 1999. A major point of concern is the lack of information publicly available on the sources and methods used to compile the CPI. This is especially true in Africa, where most countries do not publish methodology documents on their websites. For many countries that do publish some metadata on methods, the level of detail is well below full transparency.

Looking forward, the IMF Statistics Department intends to conduct a CPI compilation practices survey on an annual basis to monitor progress and assess the global quality of CPI statistics. This information will also be useful for member countries to benchmark their CPI program with regional and global benchmarks.

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PUBLICATIONS

The Availability, Methodological Soundness, and Scope of Consumer Price Statistics in 2020
Working Paper No. WP/22/53