

Sources of Macro-Economic Data **For Global Health Expenditure Indicators**

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Executive Summary

The WHO's Global Health Expenditure Database (GHED) is the international reference for health expenditure indicators for more than 190 countries from the year 2000 onwards based on a standardized international framework (SHA 2011). In order to accurately compare indicators across countries and over time, international sources of robust and comprehensive macro-economic data need to be selected. This paper outlines proposals for selecting these sources.

Following the introduction, section two of the paper describes the macro-economic series used and their principal sources including the International Monetary Fund, the World Bank, the UN, the Organisation for Economic Cooperation and Development (OECD) and EUROSTAT. Section three outlines the considerations taken into account when selecting the respective sources:

- data availability
- coherence and completeness
- consistency between sources
- stability, and
- metadata and accessibility

Section four of the paper presents the results of an analysis based on the above considerations and section five provides a discussion of the findings including the below list of preferred sources by macro series.

Macro Series			Preferred Source
Expenditure	GDP	Gross Domestic Product	IMF WEO
	GGE	General Government Expenditure	IMF WEO
	PFC	Private Final Consumption	IMF IFS or World Bank
Prices	XRT	Exchange Rate	World Bank
	PPP	Purchasing Power Parity	World Bank
	GDPD	GDP Deflator	IMF WEO
Population	POP	Population	UN

1. Introduction

This paper outlines proposals for selecting macro-economic data sources that underpin key health expenditure indicators published by WHO in the Global Health Expenditure Database.

This is important because many health expenditure indicators such as health spending as a share of the economy (CHE%GDP) and the prioritisation of health in the government spending (GGHE-D%GGE) are central to health financing dialogue and rely on macro-economic data. In the absence of timely consolidated expenditure reports, household surveys or health accounts studies produced in the country, macro-economic data are also used to estimate components of health expenditure such as out-of-pocket spending.

It is common, however, for underlying macro-economic data from alternative sources to differ and sometimes significantly, which can lead to different health expenditure indicator values and policy recommendations. Robust, transparent and consistent macro-economic data are crucial for international comparisons of health spending across countries and over time.

Following this introduction, section two of the paper describes the macro-economic series and their principal sources, section three outlines the considerations taken into account when selecting the respective sources.

Box 1 – Macro-economic series used in the Global Health Expenditure Database

Gross domestic product (GDP) is a basic measure of the overall size of a country's economy. It includes government and private final consumption, investment and the balance of trade (i.e. exports minus imports).

General government expenditure (GGE) is a measure of the total spending of a country's government. It includes the expenditure of all public entities (e.g. central, state and local government) as well as social transfers such as pensions and unemployment benefits. GGE includes both current and capital expenditure and is commonly used as a measure of fiscal space.

Private final consumption (PFC) is a component of GDP and includes all goods and services, including durable products purchased by households and non-profit institutions serving households (e.g. NGOs).

Exchange rate (XRT) is the value of one currency in terms of another currency, often US dollars. Given exchange rates can fluctuate significantly over time, an annual average is used for the purpose of constructing indicators.

Purchasing power parity (PPP) is a conversion rate that expresses the value of a currency in terms of its ability to purchase the same "basket" of goods and services in different countries. PPP values capture differences in costs of living in different countries and are an alternative common unit of expenditure instead of using exchange rates.

GDP deflator (GDPD) The GDP deflator captures price changes for a country's economy as a whole and allows measurements in constant prices that better reflect real changes in expenditure over time.

Population (POP) is the de facto number of people in a country, area or region as of 1 July of the year. Population values allow health expenditure to be considered in per capita terms, which facilitates the comparison of countries of different sizes.

2. Data sources for macro-economic indicators

Within the United Nations (UN), there is a well-established practice to preferentially source data from the UN organisation with the relevant mandate. In the case of macro-economic data, this notably includes the World Bank (WB) and the International Monetary Fund (IMF), which are specialised UN agencies. In the context of health expenditure, the Organisation for Economic Cooperation and Development (OECD) and EUROSTAT are important international organisations and co-partners of the International Health Accounts Team (IHAT) that developed the [System of Health Accounts 2011](#). Indeed, WHO has a working agreement with the OECD and EUROSTAT to align their health expenditure data as well as macro-economic series so as to ensure the consistency of data and indicators of common Member States. For Eurostat and OECD member states, WHO uses the same macro-economic data as these organisations. For other countries, WHO relies on the WB and IMF as the main sources of macro-economic data. The IMF produces several data series which include relevant macro-economic data and we thus need to make a choice among these sources. IMF publishes, among other databases, the World Economic Outlook (WEO), International Financial Statistics (IFS) and Government Finance Statistics (GFS).

On rare occasions when none of the above institutions publish macro-economic data for a particular series or year for a country, it is necessary to source the data elsewhere based on availability and an assessment of quality. These other sources are potentially diverse and include, for example, national sources such as the Central Bank or Statistics Office. Non-profit and for-profit research entities such as the Economic Intelligence Unit could also be considered. Given it is exceptional for there to be no data available from any of the main sources, the comparison of other sources is not included in this paper and is considered a last resort.

The data availability and publication schedule of each of the potential sources are summarized below.

<i>Data availability</i>	GDP	GGE	PFC	XRT	PPP	GDPD	POP
World Bank	✓	✗	✓	✓	✓	✓	✓
IMF (WEO)	✓	✓	✗	✓	✓	✓	✓
IMF (IFS)	✓	✗	✓	✓	✗	✗	✗
IMF (GFS)	✗	✓	✗	✗	✗	✗	✗
UN	✓	✗	✓	✓	✗	✓	✓
OECD / EUROSTAT	✓	✓	✓	✓	✓	✓	✓

<i>Publication schedule</i>	Q1	Q2	Q3	Q4	Undefined	
World Bank	✓	✓	✓	✓		Details
IMF (WEO)		✓		✓		Details
IMF (IFS)					✓	
IMF (GFS)					✓	
UN				✓		Details
OECD / EUROSTAT				✓		Details

Below is a description of each source including its priority areas of focus as well as data collection/publication practices.

<u>World Bank</u>	The World Bank is an organisation of 189 countries providing countries with loans for development projects (188 World Bank countries are included among WHO's 194 Member States). The World Bank's World Development Indicators (WDI) are compiled from both World Bank and international sources. It is the main dataset of interest for macro-economic data. The sources for expenditure including GDP, GFC and PFC are cited as coming from the World Bank national accounts data and the OECD. The sources cited for the PPP conversion rates and GDP deflators are also from the World Bank. With the exception of the International Comparison Program (ICP) for PPP values, there appears to be limited detailed information publicly available about the aforementioned sources and associated methodologies, which present challenges for evaluating the quality of the data. Exchange rates come from the IMF IFS database and population figures are taken from the UN's World Population Prospects. The ease with which users can access data and metadata from the WDI website has made it a highly visible and visited source.
<u>IMF</u>	The IMF is an organisation working to foster global monetary cooperation, secure financial stability, facilitate international trade, promote high employment and sustainable economic growth, and reduce poverty around the world. The IMF's member countries overlap with that of the World Bank. The IMF has taken steps to enhance member country transparency and openness by setting voluntary standards for data dissemination and publishing a portal showing each country's compliance. Among the IMF's many datasets, three of particular interest are: International Financial Statistics (IFS), Government Finance Statistics (GFS) and the World Economic Outlook (WEO). Due to differences in data collection techniques, methodological issues, focus, and timing, the IFS, GFS and WEO data may differ. IFS and GFS data are gathered as part of an ongoing data collection effort in which member country statistical agencies provide public statistics to the IMF. Data from the country source are updated on their own schedule. Each publication takes into account the most recent revisions available, prior to publication. The data provided in the WEO might have more (estimated) or less time coverage than what is provided by the authorities but that decision is at the discretion of the IMF country desk officers. For a specific country-series pair, the date of the last update is indicated in the notes option you may choose to append to the report at the end of a query. WEO data are compiled by the Research Department. The historical data and projections are based on the information gathered by the IMF country desk officers in the context of their missions to IMF member countries and ongoing analysis of the evolving situation in each country. Historical data are updated on a continual basis as more information becomes available, and structural breaks in data are often adjusted to produce smooth

	series with the use of splicing and other techniques. IMF staff estimates continue to serve as proxies for historical series when complete information is unavailable. For more information, see here.
<u>UN</u>	The United Nations Statistics Division (UNSD) is committed to the advancement of the global statistical system. UNSD compiles and disseminates global statistical information, develops standards and norms for statistical activities, and supports countries' efforts to strengthen their national statistical systems. All of WHO's Member States are also UN Member States. Best practices for data dissemination are outlined in the Principles Governing International Statistical Activities and the Fundamental Principles of Official Statistics. UN Data is a portal providing access to all of the UN's major databases, of which the National Accounts Database is of particular interest for macro-economic data. UNSD updates this database annually using official national accounts data reported by the countries. If a full set of official data is not reported for a specific country, estimation procedures are employed to obtain estimates for the entire time series. For estimation purposes, other data sources are analysed to gather supplementary data on the national accounts of a country. The data gathered are then either used directly or estimation procedures are applied to obtain a complete and consistent set of time series. For more information, see here. With regard to population, the primary UN source is the World Population Prospects database published by the Population Division of the UN Department of Economic and Social Affairs. World Population Prospects is the authoritative source for population figures for all entities of the UN system. The Population Division prepares estimations for approximately half of the reported 233 countries and areas due to insufficient detail in reported demographic statistics or inconsistencies affecting the basic data. For more information, see here.
<u>OECD and EUROSTAT</u>	The OECD has 36 Member States, all of whom are WHO Members. The OECD publishes annual and quarterly national accounts collected from all OECD member countries and some other major economies on the basis of a standardised questionnaire as well as countries' own definitions and classifications. The OECD's population data comes from national statistics offices, EUROSTAT and the United Nations World Population Prospects. EUROSTAT is a Directorate-General of the European Commission with the main responsibilities of providing statistical information to the institutions of the European Union (EU) and to promote the harmonisation of statistical methods across its member states and candidates for accession as well as EFTA countries. EUROSTAT also publishes annual and quarterly national accounts on the basis of a standardised questionnaire. This is done in accordance with the European System of Accounts (ESA 2010) and Regulation 549/2013. Population data received from Member States is published annually in accordance with Regulation 1260/2013. The OECD and EUROSTAT's PPP values come from the most recent round of the Eurostat-OECD Purchasing Power Parity (PPP) Programme. As stated above, WHO has a working agreement with the OECD and EUROSTAT to republish their health expenditure data as well as macro-economic series so as to

	ensure the consistency of data and indicators of common Member States. In practice, this means that WHO publishes EUROSTAT data for their Member States and OECD data for their Members that are not covered by EUROSTAT.
<u>EIU</u>	The Economist Intelligence Unit (EIU) is an international think tank, owned by the Economist newspaper, which publishes macro-economic time series, forecasts and analysis. The EIU covers a large set of countries and draws on national and international sources to publish complete series. It is a key alternative source used when other international sources do not publish a particular country, series or year.

3. Considerations for selecting sources

Ideally, all of the macro data would come from a single, recognised source that harmonised the data within and between related series, over time and across countries. Standard classifications and methods would be applied and detailed metadata would be published for each value. In reality, however, there are no sources that publish all the series we need for all WHO member countries and all years. This is especially problematic when macro data are related such as in the case of GDP, GGE and PFC for which there isn't a single source for all series and all countries and sometimes different sources report different numbers. As such, it is necessary to evaluate and choose between alternative sources.

Considerations used in this comparison have helped inform a general approach to selecting sources. Each data series published by a source was reviewed against these considerations without any particular prioritisation or weighting with the results described in the following section.

Consideration	Rationale	Questions
Availability	For comparability across countries and over time, it is preferable to limit the number of different sources, which may have different methods and updating schedules. These sources should have available data of all required macro-series 2000-2016 for WHO member states.	• How many data points does the source publish for a particular series (i.e. what is the relative coverage of countries and years)? • How has this coverage changed over time? Is it increasing?
Coherence and comprehensiveness	Macro-economic data is often inter-related and it is important that there is consistency between series such as GDP, GGE and PFC.	• To what extent does the source publish a complete and consistent series of related macro-economic data? • Are the trends and levels observed coherent across related series?
Consistency between sources	The publication of similar macro series by different sources can suggest the sharing and/or alignment of data. This doesn't inherently imply increased accuracy but it does constitute a form of triangulation.	• Are the values from different sources similar? • Is there a systematic lag with one source aligning with another?
Stability	Historical data with less frequent and smaller revisions will tend to be more stable and result in fewer changes to health expenditure indicators. This stability can facilitate a coherent and consistent analysis and policy dialogue. Stability as a criterion by itself does not imply robust data because frequent, large revisions could be necessary to improve accuracy.	• Has the published data changed significantly since previous versions? • Are changes documented with explanations and do previous versions remain available as an archive?
Metadata & Accessibility	Detailed metadata contributes to increased transparency, interpretability, so that it is easier for users to understand its possible uses and limitations.	• What level of detailed metadata does the source publish (e.g. definitions, source citation/reference, methods of estimation/modification)? • How easily is the metadata accessible?

4. Comparison of sources

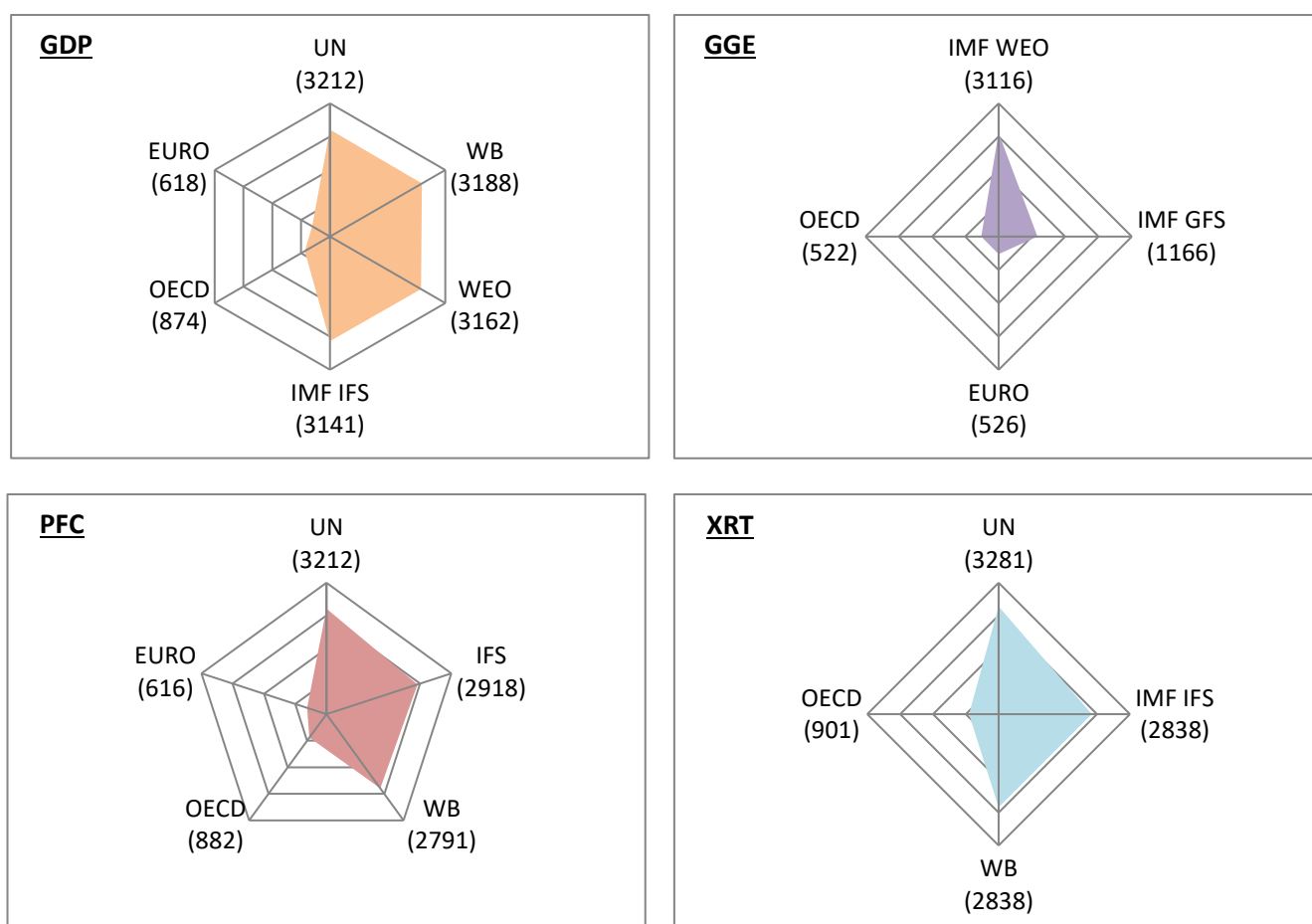
Availability

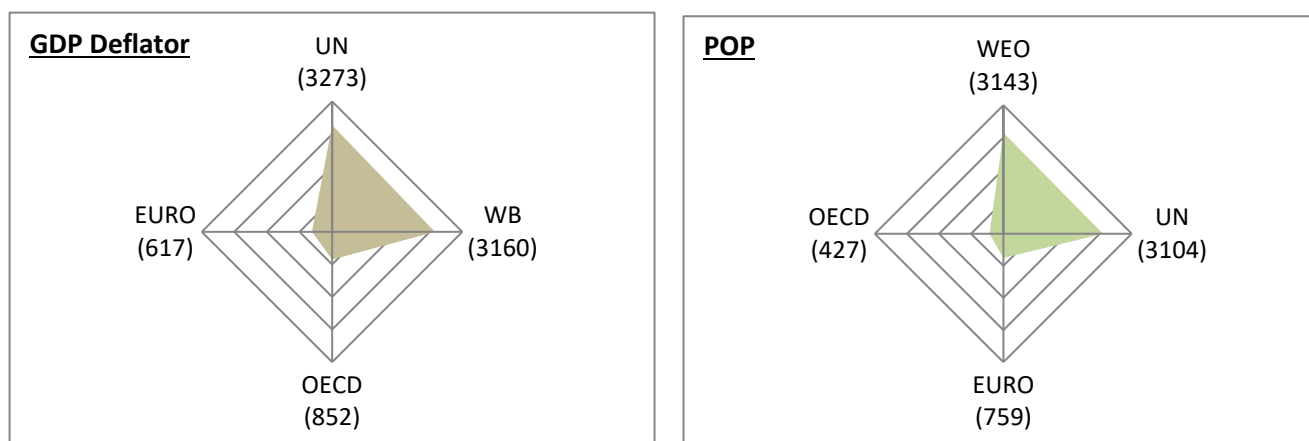
For comparability across countries and over time, it is preferable to limit the number of different sources, which may have different methods and updating schedules. In principle, it would be ideal to use a single source with robust data for all WHO Member states and all years for a given variable.

The analysis of availability or completeness is based on a simple count of data points for each macro-economic series. A comparison is also made between the versions of data published by the sources as of April 2017 and July 2018. Theoretically, the upper limit of data points for a given series is approximately 2,900 in 2017 and 3,100 in 2018 [i.e. 194 WHO Member States each with a full time series (2000-2015 in 2017) and (2000-2016 in 2018)]. The fact that certain sources have slightly more data points is due to the inclusion of non-UN Member States.

As illustrated below, there are generally a similar number of data points for the expenditure series (GDP, GGE and PFC) published by the IMF, WB and UN. The lower number of data points published by the OECD and EUROSTAT is the unsurprising consequence of publishing data for a smaller subset of countries. GGE is the exception to the above with IMF(WEO) publishing a near complete dataset and the only other alternative source, IMF(GFS), only publishing approximately 30% of data points.

The number of data points as of July 2018 published by source are shown below.





* OECD and EUROSTAT have less data points because they have fewer Member States

For the other macro-economic series related to prices (XRT, PPP and GDPD), there are a limited number of alternative sources. In the case of XRT, there are two original sources: the UN and IFS, which is in turn republished by the World Bank. In the case of PPP, the OECD and EUROSTAT have their own PPP conversion program as outlined above under the mandate criteria and the World Bank publishes data for all other countries, which IMF(WEO) republishes. For GDPD, the UN and WB have a similar number of data points. For population (POP), the UN and WEO have similar numbers of data points with OECD and EUROSTAT publishing the authoritative figures for their Member States.

Coherence and comprehensiveness

Another important consideration is coherence between related series and ensuring that levels and trends are consistent. Since the expenditure series (GDP, GGE and PFC) are related, it is preferable to use one source for the three series. Using a comprehensive source with coherent macro-series has important bearing on indicators such as health expenditure as a share of the economy (CHE%GDP) and the prioritisation of health as a share of government spending (GGHE-D%GGE). These considerations are also important for components of health expenditure such as out-of-pocket spending (OOPS).

Consistency between sources

The publication of similar data by different sources can suggest the sharing and/or alignment of data. Although this does not inherently imply increased accuracy, it does constitute a form of triangulation.

The analysis of similarity looked at the number of shared observations that were significantly different by 5% or more. That is to say, two sources published the same data point for a given series, country and year that were at least 5% different from each other. These comparisons were aggregated and are presented in the appendices as tables such as the one below for GDP. They include:

- the number of observations published by each source (see diagonal in orange)
- the number of shared observations (upper right in green)
- percentages of share observations with a significant difference (lower left in blue)

For GDP, we see for example that IMF WEO and IMF IFS are very similar: only 4% of shared observations are significantly different (see the percentage in blue corresponding to the intersection of WEO and IFS). The number in green at the intersection of WEO and IFS shows the total number of shared observations (i.e. data points for countries and years where both sources publish a GDP value that can be compared). The total number of GDP data points published by each source is shown in orange along the diagonal (i.e. the source in the row and column are the same).

GDP		# of Shared Observations						
	# Obs	IFS	WEO	WB	EIU	UN	EURO	OECD
% of Shared Obs Different by >5%	IFS	3141	3138	3121	3066	3080	618	874
	WEO	4%	3162	3139	3080	3101	618	874
	WB	11%	11%	3188	3075	3127	618	874
	EIU	12%	12%	9%	3147	3086	607	874
	UN	14%	12%	14%	16%	3212	618	847
	EURO	0%	0%	0%	0%	0%	618	561
	OECD	1%	0%	3%	0%	1%	0%	874

Comparing the GDP data published by the IMF WEO, the World Bank (WB), EIU and the UN revealed that they are less similar. Around 10% of their shared observations have a large difference of 5% or more (see lower left in blue). This could possibly suggest different sources of original data or different estimation methods. As one would expect, the OECD and EUROSTAT (EURO) publish data for a selected group of countries that are republished by other sources so the dataset is smaller and there are few differences across sources.

For PFC, the values from the different sources have a large variation (see appendices). The UN has the largest difference from the other sources; the World Bank the least. For GGE, there are also large differences between all of the sources. IMF WEO is by far the most complete of the international sources, which sets it apart as a potential source to choose. These differences between sources are also observable in the 2017 version of the published data. The differences between the sources for PFC and GGE highlight the importance of the coherence and consistency of GDP, PFC and GGE for each country and the entirety of the published time series.

For the macro-economic series related to prices including exchange rates, PPPs and GDP deflators, there are fewer sources that publish the data and less significant differences between these sources. The OECD and EUROSTAT publish PPP values for 46 high-income countries, and the WB publishes the PPP estimates for all other countries. The published exchange rates are also similar due in part to the World Bank republishing the IMF IFS values. The largest differences are in relation to the UN data, which publishes [price adjusted rates of exchange](#) (PAREs) for countries and years where there is a major disparity between real GDP growth and growth when GDP was converted to United States dollars using IMF-based rates. This applies mainly to countries with fixed exchange rate regimes and countries going through a period of high inflation.

For population, the UN's Department of Economic and Social Affairs is the authoritative source for population figures for all entities of the UN system. Due to the update schedule of every two years, there are occasionally differences between the UN figures and those of the OECD and EUROSTAT, in which case the latter should be taken.

Stability

Historical data with less frequent and smaller revisions tend to be more stable and result in fewer changes to health expenditure indicators. As such, stability facilitates a more coherent and consistent analysis, which is important for effective policy dialogue. There are situations, however, when revisions to data are necessary. Stability is therefore a criterion that cannot be considered in isolation.

This analysis of stability identified changes between the values published in April 2017 and July 2018. Both series include historical data from 2000 onward. Changes were considered significant if the 2018 values were more than 5% different from the 2017 value. The below table shows these changes by series and source.

As illustrated above, most of the series are relatively stable with less than 5% of values changing significantly. The source IMF IFS was the exception to this with roughly 20% of data points changing. Further analysis of GDP from IMF IFS revealed that approximately 85% of these significant changes from 2017 to 2018 were to align with the IMF WEO figures, of which 92% remained stable. Of the IMF IFS changes, approximately 40% and 25% also aligned with the World Bank and UN figures respectively, which like IMF WEO were essentially unchanged from 2017 to 2018. Notably, only 6% of the IMF IFS revised values remained unique and unaligned with IMF WEO, the World Bank or UN. In other words, there was a delay in IMF IFS publishing the stable figures of IMF WEO, World Bank and the UN published the previous year. Further analysis of PFC from IMF IFS showed a similar situation with 28% of the revisions aligning with the World Bank or the UN. Unlike GDP, more of the IMF IFS revised values were unique with approximately 68% remaining unaligned with the World Bank or UN.

Series	Source	Changes > 5%	% total observations
GDP	IFS	598	19%
GDP	UN	189	6%
GDP	WEO	176	6%
GDP	WB	154	5%
GDP	OECD	3	0%
GDP	EURO	0	0%
GGE	WEO	162	5%
GGE	GFS	36	3%
GGE	EURO	2	0%
GGE	OECD	0	0%
PFC	IFS	686	24%
PFC	UN	262	8%
PFC	WB	139	5%
PFC	OECD	4	1%
PFC	EURO	0	0%

Series	Source	Changes > 5%	% total observations
XRT	IFS	70	3%
XRT	WB	70	3%
XRT	UN	17	1%
XRT	OECD	0	0%
PPP	WB	132	4%
PPP	OECD	0	0%
GDPD	UN	114	4%
GDPD	WB	92	3%
GDPD	EURO	0	0%
GDPD	OECD	0	0%
POP	WEO	82	3%
POP	UN	0	0%
POP	EURO	0	0%
POP	OECD	0	0%

Metadata and accessibility

Publishing metadata is an essential function of all agencies disseminating statistics at both the national and international levels because it enables users to make informed decisions about data accuracy and relevance. While all of the cited sources publish metadata, there are certain observable differences in terms of detail and ease of accessibility, which are summarised in the below table. The broad criteria used for assessing each source's metadata are taken from the [UN Principles Governing International Statistical Activities](#).

In recent years, data availability has increased substantially due to digitisation and improvements in information technology that have overcome challenges in storing and disseminating large datasets. All of the below sources now provide users with open access and a bulk download option. Many also promote use through portals and visualisations.

To varying extents, all of the sources provide supporting documentation including methodological definitions, country notes and metadata for each data point. The OECD, EUROSTAT and the UN appear to provide the most detail on estimation methods and changes to data submitted by national statistical

agencies. The World Bank and IMF(WEO) appear to publish the most detailed notes on revisions and their archives of previous versions are equally accessible.

	World Bank	IMF (WEO)	IMF (IFS)(GFS)	UN	OECD / EUROSTAT
Open access	✓	✓	✓	✓	✓
Country consultation	partial	✓	✓	✓	✓
Methodological definitions	✓	✓	✓	✓	✓
Documentation of estimation methods	partial	✗	✗	✓	partial
Metadata by data point (e.g. source, estimation methods)	✓	✓	✓	✓	✓
Country notes	partial	✓	✓	✓	✓
Visualisations	✓	✗	✓	partial	✓
Clear updating schedule	✓	✗	✗	✓	✓
Revision history and archives	✓	✓	partial	✗	✓
Searchable content	partial	✗	✗	✗	partial
Frequently asked questions	✓	✓	✗	✗	✓
Contact details	✓	✓	✓	✓	✓
Bulk download	✓	✓	✓	✓	✓

5. Discussion

The WHO's Global Health Expenditure Database is the international reference for health expenditure indicators for more than 190 countries from the year 2000 onwards based on a standardized international framework (SHA 2011). In order to accurately compare indicators across countries and over time, international sources of robust and comprehensive macro-economic data need to be selected. Based on the considerations and analysis outlined above, the following preferred sources are listed for each series.

Macro Series			Preferred Source
Expenditure	GDP	Gross Domestic Product	IMF WEO
	GGE	General Government Expenditure	IMF WEO
	PFC	Private Final Consumption	IMF IFS or World Bank
Prices	XRT	Exchange Rate	World Bank
	PPP	Purchasing Power Parity	World Bank
	GDPD	GDP Deflator	IMF WEO
Population	POP	Population	UN

The preferred sources of macro-economic series for non-OECD/Eurostat countries are the IMF WEO for GDP, GGE and GDPD while for PFC it is the IMF IFS or World Bank. IMF WEO is suggested for its completeness, stability, abundant metadata and the consistency that it brings to the indicators involving GDP and GGE. The IMF IFS and World Bank are preferred sources of PFC for their data availability and coherence with the other expenditure series. The World Bank is the preferred sources for XRT and PPP to increase consistency in indicators using USD and PPP figures. The UN is the reference source of population for all UN agencies including WHO. For OECD/EUROSTAT countries, as was described, the OECD/EUROSTAT figures are published.

It is important to note that the expenditure macro-series should always be considered together, especially for the alignment of the values of GDP and PFC and GDP and GDPD. It is suggested to first check for GGE availability then compare its values with GDP and PFC. In cases where the preferred sources are not internally consistent, the sources should be reconsidered. In situations where the preferred source does not exist for a country or where certain data points in the time series are unavailable, further country-specific analysis can help identify an appropriate alternative.

The above serves as a suggested general approach but may vary depending on a country's specific situation and the available macro data. The final choice of sources should be based on knowledge of the country, estimation methods and the quality of the macro-economic series. This list of preferred sources will be reviewed and reassessed as new data and information become available.

Appendices

Summary rationale for choice of primary sources

GDP = IMF WEO

- Completeness of the source (3162 data points compared with 3141 for IFS and 3188 for WB)
- Consistent with IFS. Only 4% different
- Stable data source
 - Only 5% of data points changed by >5% from 2017 compared with 19% of IFS data points changing by >5%. IFS changes were to align with WEO in >80% of cases (see above discussion)
 - Only a limited number of countries affected by these revisions. Of the data points with >5% difference between IFS and WEO sources, 5 countries are affected for most years. Another 13 are affected for just 1-4 years.
 - Except for Liberia which appears to be a currency and rebasing issue, the difference in IFS and WEO GDP for the above countries is between 5 and 20%
- GDP and GGE are used in health financing indicators, preferable to have same source.
- Detailed, readily accessible metadata

GGE = IMF WEO

- By far the most complete source (3116 data points compared with 1166 for GFS)
- Includes general government (i.e. all levels of government not just central). According to IMF WEO metadata:
 - 55% of countries include multiple levels of government and/or social security
 - 45% of countries include central government only
- Stable data source (only 5% of data points changed by >5% from 2017. GFS changes did not align at all with WEO data. Note all GGE sources significantly different from each other making it difficult to triangulate.
- Detailed, readily accessible metadata

PFC = IMF IFS or World Bank

- Similarly complete source (2791 data points for WB compared with 2918 for IFS)
- World Bank similar to IFS. Only 20% different
 - Of the data points with >5% difference between IFS and WB sources, 18 countries are affected for most years. Another 40 are affected for just 1-4 years.
 - Over 50% of the different data points have a difference of <10%. There are 35 countries with a difference between 20% and 100%. A case by case comparison is needed to evaluate the robustness of the respective sources.
- PFC from WB is a more stable data source
 - Only 4% of data points changed by >5% from 2017 compared with 21% of IFS data points changing by >5%. GFS changes did not align at all with WEO data
- WB has detailed, readily accessible metadata

XRT = World Bank

- Similarly complete source (2838 data points compared with 3159 for UN)
- WB is priority source for PPP so preferable to have the same source for these series. WB takes IMF IFS exchange rates.
- XRT from WB has remained stable. Only 3% of data points changed by >5% from 2017
- XRT from different sources are similar.

- Detailed, readily accessible metadata

PPP = World Bank

- The most complete and only alternative source.
- The OECD and EUROSTAT publish PPP values for 46 high-income countries, and the WB publishes the PPP estimates for all other countries
- Values have remained stable. Only 4% of data points changed by >5% from 2017
- Detailed, readily accessible metadata

POP = UN

- The UN and WEO have similar numbers of data points but the UN is the recognised source for all entities in the UN system.
- The OECD and EUROSTAT publish the authoritative figures for their Member States
- Values are stable.
- Metadata is detailed and readily available.

Summary of the macro-economic series used in GHED 2018 update

This summary provides the readers with description on the sources of the macro-economic indicators used in the GHED as published in December 2018. It shows that this guidance can be applied in most of the countries and this should lead to significant improvements in the comparability of the health expenditure indicators across countries and time.

For the GDP series, 89% of data points comply with the preferred source, 78% of PFC data points comply, 93% of GGE data points comply, 92% of INT\$ data points comply, 62% of X-R data points comply and 100% of POP comply, based on the count of the sources as described in the metadata. The secondary sources for GDP include UN (4%), followed by IMF IFS (3%), WB WDI (2%) and EIU or other (1%). The secondary sources for PFC include UN (11%), WB (6%) WDI, and EIU (4%). The secondary sources for GGE include EIU (3%) and WB WDI (2%). The secondary sources for INT\$ includes WHO estimate (8%). The secondary sources for X-R include IMF IFS (25%), UN (13%), and EIU (1%). The secondary source of GDPP includes UN (13%).

In some countries, there are two and more sources for the same macro-economic indicator over the whole period of 2000-2016. This is mostly observed for GGE (9 countries), INT\$ (5 countries), PFC (2 countries) and GDP (2 countries).

Completeness

Series	Source	Data Points 2017	Data Points 2018
GDP	UN	3064	3212
GDP	WB	2979	3188
GDP	WEO	2970	3162
GDP	IFS	2231	3141
GDP	OECD	760	874
GDP	EURO	582	618
GGE	WEO	2938	3116
GGE	GFS	1102	1166
GGE	EURO	495	526
GGE	OECD	521	522
PFC	UN	3064	3212
PFC	IFS	2017	2918
PFC	WB	2666	2791
PFC	OECD	761	882
PFC	EURO	582	616

Series	Source	Data Points 2017	Data Points 2018
XRT	UN	3064	3281
XRT	IFS	2692	2838
XRT	WB	2604	2838
XRT	OECD	690	901
PPP	WB	2931	3130
PPP	OECD	688	884
GDPD	UN	3032	3273
GDPD	WB	2949	3160
GDPD	OECD	727	852
GDPD	EURO	565	617
POP	WEO	2957	3143
POP	UN	3088	3104
POP	EURO	718	759
POP	OECD	567	427

Stability

Series	Source	Count changes > 5%	% total observations
GDP	IFS	598	19%
GDP	UN	189	6%
GDP	WEO	176	6%
GDP	WB	154	5%
GDP	OECD	3	0%
GDP	EURO	0	0%
GGE	WEO	162	5%
GGE	GFS	36	3%
GGE	EURO	2	0%
GGE	OECD	0	0%
PFC	IFS	686	24%
PFC	UN	262	8%
PFC	WB	139	5%
PFC	OECD	4	1%
PFC	EURO	0	0%

Series	Source	Changes > 5%	% total observations
XRT	IFS	70	3%
XRT	WB	70	3%
XRT	UN	17	1%
XRT	OECD	0	0%
PPP	WB	132	4%
PPP	OECD	0	0%
GDPD	UN	114	4%
GDPD	WB	92	3%
GDPD	EURO	0	0%
GDPD	OECD	0	0%
POP	WEO	82	3%
POP	UN	0	0%
POP	EURO	0	0%
POP	OECD	0	0%

Consistency between sources

GDP (2018 Data)

		# of Shared Observations							
% of Shared Obs Different by >5%	# Obs	IFS	WEO	WB	EIU	UN	UNECE	EURO	OECD
	IFS	3141	3138	3121	3066	3080	868	618	874
	WEO	4%	3162	3139	3080	3101	873	618	874
	WB	11%	11%	3188	3075	3127	873	618	874
	EIU	12%	12%	9%	3147	3086	862	607	874
	UN	14%	12%	14%	16%	3212	873	618	847
	UNECE	2%	2%	1%	5%	2%	873	618	626
	EURO	0%	0%	0%	0%	0%	0%	618	561
	OECD	1%	0%	3%	0%	1%	2%	0%	874

GDP (2017 Data)

		# of Shared Observations							
% of Shared Obs Different by >5%	# Obs	IFS	WEO	WB	EIU	UN	UNECE	EURO	OECD
	IFS	2231	2228	2226	1889	2231	490	300	363
	WEO	26%	2970	2946	2502	2970	820	582	760
	WB	20%	11%	2979	2490	2979	820	582	760
	EIU	20%	10%	10%	2555	2555	734	528	721
	UN	23%	13%	15%	13%	3064	820	582	760
	UNECE	18%	2%	4%	4%	5%	820	566	526
	EURO	26%	3%	4%	3%	4%	0%	582	464
	OECD	29%	2%	8%	2%	5%	3%	0%	759

PFC (2018 Data)

		# of Shared Observations						
% of Shared Obs Different by >5%	# Obs	IFS	WB	EIU	UN	UNECE	EURO	OECD
	IFS	2918	2654	2840	2879	833	616	882
	WB	19%	2791	2756	2747	834	616	877
	EIU	23%	15%	3050	3006	827	605	882
	UN	26%	18%	25%	3212	840	616	866
	UNECE	6%	2%	11%	4%	840	615	626
	EURO	0%	1%	7%	0%	0%	616	561
	OECD	3%	4%	4%	2%	2%	0%	882

PFC (2017 Data)

		# of Shared Observations						
% of Shared Obs Different by >5%	# Obs	IFS	WB	EIU	UN	UNECE	EURO	OECD
	IFS	2017	1933	1715	2017	467	314	376
	WB	25%	2666	2285	2666	781	582	760
	EIU	26%	15%	2479	2479	700	528	729
	UN	27%	19%	24%	3048	788	582	761
	UNECE	25%	6%	13%	5%	788	566	526
	EURO	31%	2%	8%	2%	0%	582	480
	OECD	28%	5%	1%	3%	3%	0%	761

GGE (2018 data)

	# Obs	# of Shared Observations				
		GFS	WEO	EIU	EURO	OECD
% of Shared Obs Different by >5%	GFS	1166	1160	1074	523	514
	WEO	31%	3116	2797	526	521
	EIU	41%	41%	2844	495	490
	EURO	3%	14%	8%	526	429
	OECD	3%	15%	16%	0%	522

GGE (2017 data)

	# Obs	# of Shared Observations				
		GFS	WEO	EIU	EURO	OECD
% of Shared Obs Different by >5%	GFS	1102	1096	896	491	473
	WEO	36%	2936	2319	495	520
	EIU	48%	45%	2343	431	449
	EURO	7%	14%	11%	495	396
	OECD	7%	21%	17%	0%	521

XRT (2018 data)

		# of Shared Observations					
% of Shared Obs Different by >5%	# Obs	IFS	WB	EIU	UN	UNECE	OECD
	IFS	2838	2838	2764	2838	552	651
	WB	0%	2838	2764	2838	552	651
	EIU	4%	4%	3159	3159	816	901
	UN	6%	6%	4%	3281	833	901
	UNECE	9%	9%	1%	3%	833	595
	OECD	8%	8%	2%	0%	2%	561

XRT (2017 data)

		# of Shared Observations					
% of Shared Obs Different by >5%	# Obs	IFS	WB	EIU	UN	UNECE	OECD
	IFS	2692	2603	2249	2676	571	468
	WB	0%	2604	2185	2604	572	468
	EIU	6%	6%	2567	2567	736	658
	UN	6%	6%	3%	3064	832	690
	UNECE	14%	14%	4%	3%	833	595
	OECD	11%	11%	2%	0%	2%	690

PPP (2018 data)

		# of Shared Observations	
		# Obs	
		OECD	WB
% of Shared Obs Different by >5%	OECD	884	884
	WB	2%	3130

PPP (2017 data)

		# of Shared Observations	
		# Obs	
		OECD	WB
% of Shared Obs Different by >5%	OECD	688	688
	WB	0%	2931

GDPD (2018 data)

		# of Shared Observations			
		# Obs	UN	WB	OECD
			UN	WB	EURO
% of Shared Obs Different by >5%	UN	3273	3160	617	852
	WB	12%	3160	617	852
	EURO	0%	0%	617	561
	OECD	0%	1%	0%	852

GDPD (2017 data)

		# of Shared Observations			
		# Obs	UN	WB	OECD
			UN	WB	EURO
% of Shared Obs Different by >5%	UN	3032	2901	549	695
	WB	15%	2949	565	727
	EURO	0%	0%	565	464
	OECD	1%	3%	0%	727

POP (2018 data)

		# of Shared Observations			
		# Obs	UN	WB	OECD
			UN	WB	EURO
% of Shared Obs Different by >5%	UN	3104	2957	718	427
	WEO	16%	3143	739	427
	EURO	11%	4%	759	330
	OECD	0%	0%	0%	427

POP (2017 data)

		# of Shared Observations			
		# Obs	UN	WB	OECD
			UN	WB	EURO
% of Shared Obs Different by >5%	UN	3088	2957	718	567
	WEO	17%	2957	698	567
	EURO	11%	4%	718	389
	OECD	1%	0%	0%	567

