

How to compute a Consumer Price Index in the context of the Covid-19 crisis ?

Definitive estimate-June 2020

The health crisis and the lockdown measures in the context of the Covid-19 crisis have important impacts on the measures of short term statistics such as the Consumer Price Index (CPI). These statistics are all the more important to understand economic stakes during this period.

On the one hand, **in order to preserve price collectors but also consumers and salesmen, INSEE adjourned the collection of prices by INSEE collectors in physical outlets from March the 16th to June the 15th.** These prices collected on the field are only one data source among others used to compute the CPI; however, they represent more than four tenth of the CPI, in terms of consumption share.

On the other hand, CPI aims to describe an average measure of price changes for all the purchased items. The basket of products is renewed yearly but it remains fixed during a year; the slow changes in the consumption structure ensure that this basket fixity is globally neutral on the inflation measure. **The Covid-19 crisis disrupted deeply and suddenly the household consumption structure during the lockdown** either because the consumption was prevented by the impossible move of households (transport, tourism), or because outlets were closed (the implementing order of 15 March 2020 related to measures for the struggle against the Covid-19 spreading defined the first necessary outlets that were allowed to remain opened during the lockdown), or because confronted to the crisis, the households decided to adapt their consumption habits (food, for instance). Since the end of the lockdown, the 11th of May, some outlets have remained closed and some consumption habits have still been different from what they were before the lockdown.

In compliance with [Eurostat guidelines](#), shared with the different European countries, INSEE carried out new collection methods and adapted imputation methods.

The current note details the consequences on the inflation measure of the important shock that impacts the household consumption and then, gives an overview of the quality of data in a context of partial price collection in June.

1 – How to measure inflation when whole parts of the consumption disappear? An alternative consumer price index.

The implementing order of 15 March 2020 related to measures for the struggle against the Covid-19 spreading defined the first necessary outlets that were allowed to remain opened during the lockdown. If a part of the consumption that was purchased in the closed outlets might be purchased online, some other consumption segments simply disappeared (shows, tourism, restaurants, hairdressers, cars, guiding lessons...) and some of them were still closed in June.

Moreover, even if they did not disappear, the share of numerous consumption segments in the consumption decreased heavily, like fuel or more generally transport services. However, the consumer price index which is

a fixed-basket index (a Laspeyres-type index) uses a fixed consumption structure, updated each year. The assumption is that this structure slowly evolves and is usually true. But it does not fit the huge shock that occurred on consumption structure during the health crisis.

In compliance with [the methodological guidance note of the compilation of the HICP in the context of the Covid-19 crisis](#) by Eurostat,

- The CPI remains a fixed-basket index and the weights for each consumption segments remain unchanged (that is to say the one observed for the year 2019): for instance, whereas the household food expenditures increase with the lockdown, the food weight remains the one observed before the health crisis.
- When a consumption segment is not transacted any more, its price cannot be observed; the sub-index is consequently imputed (i) either with the price changes of a similar product or of the nearest higher aggregate (ii) or with the all-item index, (iii) or scarcely, in duly justified circumstances, by carrying forward the last observed price. Moreover, when the price of a product follows a highly seasonal pattern, the imputation reproduces the past seasonality.

This consumer price index that is consistent with the past habits of consumption enables to describe the inflationary / deflationary pressure in the economy, in particular the scarce drop in the fuel and transport prices. However, it could be quite far from the consumer feelings who, because of the health crisis, were no more able or no more eager to purchase some products. For that reason and in order to illustrate the consequences of this major shock on household consumption, alternative price indices were built. Contrary to the CPI that is a chained Laspeyres-type index (built on the past structure of the consumption, yearly updated), these indices use the current structure of the consumption (the April, May or June structure¹).

In order to compute such indices, the nowcasting exercise carried out by INSEE since the health crisis complete with now available business indicators for April and May² was used. Although the exercise was performed at a lower detailed level than the one used for CPI weights, it enables to illustrate what inflation should have been with a consumption basket purchased in April, May, or June 2020.

According to this exercise, fuel consumption dropped sharply in April and sharpened progressively meanwhile as well as transport services and accommodation and catering services whose recovery was however less marked; food consumption was contrariwise one of the few products whose consumption was maintained during the lockdown. Therefore, the consumption structure during the lockdown has a higher weight for food and a smaller weight for fuel, transport and accommodation services whose volatile prices have often a high contribution to the monthly change in prices. In June, the service weight was still lower to what was observed in 2019 but that of manufactured products was higher, due to a correcting effect.

By using the consumption structure observed in April 2020 (*figure 1*), the measured price change in metropolitan France would have been more dynamic in April 2020 than that measured by the CPI (+0.3% against a stability measured by the CPI); the sharp fall in fuel prices in April had a lesser impact on the alternative index since its weight was lower in the April 2020 consumption. This gap between the price

1 Three alternative indices were computed; each one describes, for the whole period, the inflation that would be observed if the consumption structure would have been the one observed in April 2020 (respectively in May or June 2020). These three indices were not chained one with the other (which would have allowed to produce an index representative of the current consumption of the month). Indeed, monthly chaining causes a chain drift in indices and is not recommended by the index theory. This is why CPI is chained yearly.

2 The alternative indices, computed in the previous methodological notes, were revised accordingly in order to take into account these new pieces of information and are now computed on a monthly basis (because these newly available indicators are computed also on a monthly basis).

changes measured with the CPI and the alternative index reversed in June: using the consumption structure observed in June 2020 (*figure 2*), prices would have been stable in June (against +0.1% measured with the CPI); in June, service prices were indeed more dynamic than the all-item index (because of transport services) whereas services were less purchased in June 2020 than in 2019.

The gap between the indices is however also the consequence of seasonality effects: all these indices are not seasonally adjusted and their seasonality is different because of the different weight of highly seasonal products as airfares or tourism.

The year-on-year change in prices enables to take into account seasonality effects: the CPI increased by 0.2% in June year on year, after +0.4% in May and +0.3% in April whereas the index built from the June 2020 consumption structure increased by +0.4% in June after 0.6% in May and April. The index that uses the April 2020 consumption structure is more dynamic (+0.9% in June after +1.4% in May and April). However this gap was important even before the health crisis when the true consumption structure was nearer from that used for the CPI (*figure 2*).

To conduct a consistent analysis and to take into account seasonality effect, we should compare the change in the yearly price evolution for each index: with the CPI, the year-on-year change in prices decreased by 1.2 point between February and June 2020 (from +1.4% in February to +0.2% in June 2020) as with the index that uses the June 2020 consumption structure (from +1.6% in February to +0.4% in June). The fall in inflation was less sharp using the April 2020 consumption structure (a drop by 0.9 point, from +1.8% in February to +0.9% in June). Diagnostic on the evolution in inflation is similar whether considering the CPI or the June consumption structure because the consumption structure in June came back nearer to what it was in 2019.

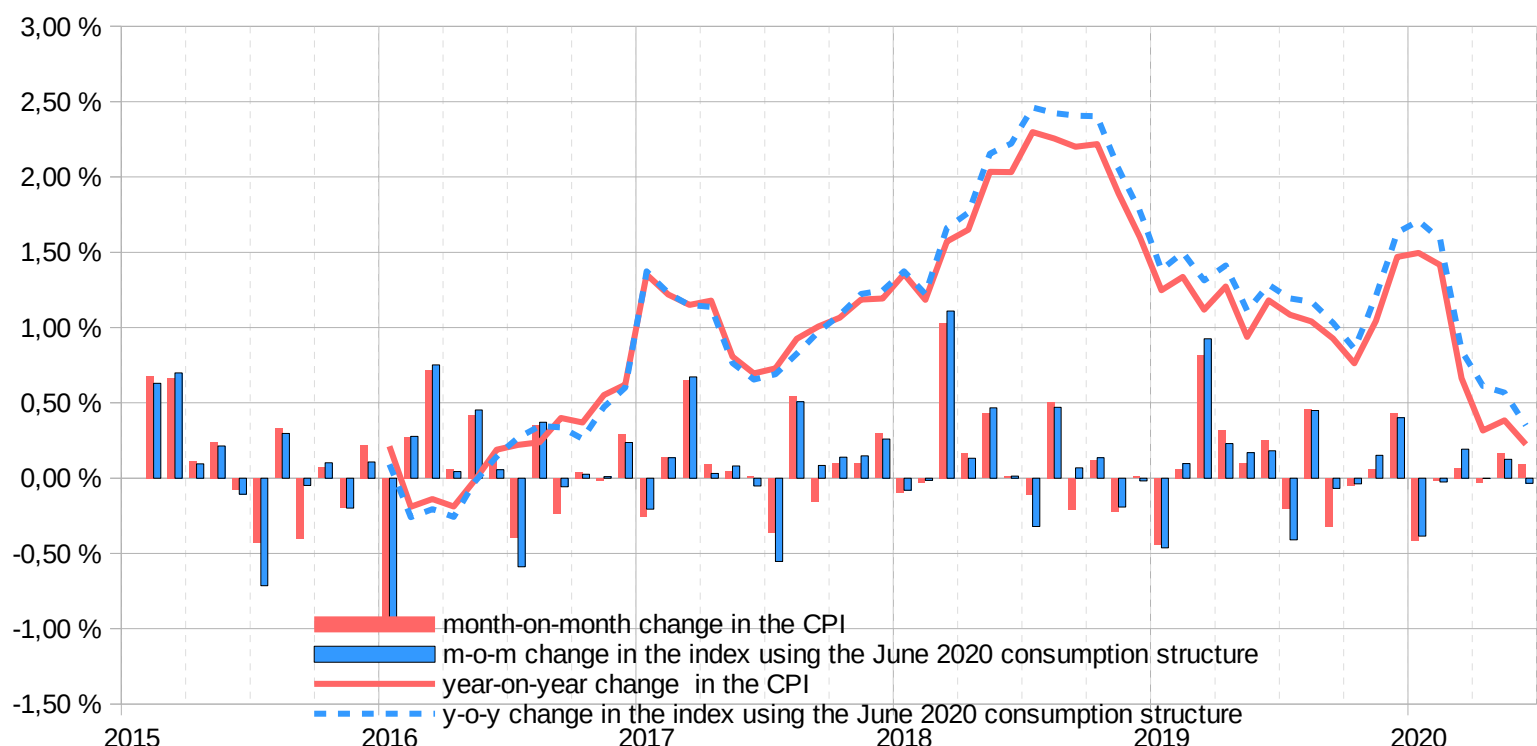
Figure 1: The Consumer Price Index and alternative indices using the consumption structure observed in April, May or June 2020 (annual and monthly rate)

	Monthly rate			Annual rate		
	April	May	June	April	May	June
CPI	0.0%	0.2%	0.1%	0.3%	0.4%	0.2%
Alternative indices						
Using the April 2020 structure	0.3%	0.2%	-0.3%	1.4%	1.4%	0.9%
Using the May 2020 structure	0.1%	0.1%	-0.2%	0.9%	0.8%	0.4%
Using the June 2020 structure	0.0%	0.1%	0.0%	0.6%	0.6%	0.4%

Scope: metropolitan France

Lecture: If the consumption structure, from 2015 on, was that observed in June 2020, the month-on-month change in prices in June 2020 would have been +0.0% against +0.1% measured by the CPI (i.e. the 2019 consumption structure for 2020 indices, the year Y-1 structure for the year Y index).

Figure 2: The Consumer Price Index and an alternative index using the consumption structure observed in June 2020 (annual and monthly rate)



Scope: metropolitan France

Lecture: If the consumption structure, from 2015 on, was that observed in June 2020, the month-on-month change in prices in June 2020 would have been +0.0% against +0.1% measured by the CPI (i.e. the 2019 consumption structure for 2020 indices, the year Y-1 structure for the year Y index).

2 – How to measure inflation when the price collection in the field is adjourned?

2.1 – To mitigate the adjournment of price collection on the field in June, INSEE carried out new kinds of price collection.

Usually, about 160 000 prices are collected each month by INSEE's price collectors in physical outlets. INSEE uses other data sources but this on-the-field collection represents more than four tenth of the CPI basket. They are particularly important for fresh food produces, food sold in other outlets than super and hypermarkets, clothing and footwear, furniture, sustainable goods, other manufactured products (except cleaning and maintenance products and articles for personal hygiene and beauty products), other services (hotel and restaurant, services provided by craftsmen, cleaning services, hairdressing, mechanic...).

This price collection on the field was adjourned from the 16th March to the 15th June. As it was also done in other European countries and in compliance with the European guidelines, INSEE tried to compensate the consequence of the missing manual price collection for the month of June by developing new types of collection.

- When outlets usually visited by price collectors have a website and are still opened or at least offer an online trade, prices were collected online. Products concerned are mainly fresh food produces, meat, cheese, bread sold in super and hypermarkets, food products sold in minimarkets, hard-discounters... as well as clothes, sustainable goods and some other manufactured products.
- Some scanner data were usually unused (for clothes or sustainable goods sold in super and hypermarkets or for some small shops); they were used in order to register the prices of products that belong usually to the CPI basket.
- From May 2020 on, a price collection by phone was gradually performed for services and in some small shop (bakery, butchery, cheese shop, fish shop, greengrocer's...). With the reopening of some services (restaurants, driving schools...), collection by phone was extended.

This alternative price collections do not mitigate completely the adjournment of price collection on the field: the number of prices used in order to compute the CPI is really below the usual standards and consequently, all the estimation are less precise.

2.2– The CPI is usually built from various data sources, most of which were not impacted by the health crisis.

In order to compute the French CPI, INSEE uses different data sources. Prices collected on the field by price collectors were impacted by the health crisis but it is not the case for the other data sources that remain available.

- The use of scanner data was not impacted by the health crisis. Scanner data are used in order to follow manufactured food, cleaning and maintenance products and articles for personal hygiene and beauty products sold in super and hypermarkets (one tenth of the index in terms of consumption share) as well as medicine sold in pharmacy.
- Prices are also collected online; this online price collection was carried out even during the lockdown. Online price collection is used mainly for transport services, tourism, communication services, gas, electricity, insurances, financial services, some manufactured goods and cultural services.

For transport and tourism, prices are usually collected in advance and are registered in the index, the month when the service is provided; the prices of these services when they have been cancelled because of the health crisis were withdrawn from the price sample for June.

- Some prices are collected thanks to dedicated surveys like rents (the rents and charges survey, the social housing landlord survey); the prices of the rents and charges survey obtained from households were still collected.
- Some prices come from administrative data, mandatory declarations or are official tariffs; in these cases, data collection was not impacted by the health crisis; it is the case for fuel prices, health service prices, tobacco prices...

2.3– Which period is taken into account in the June index?

The Consumer price index tracks averaged changes in the prices over a given month. However, depending on the products, the price collection does not occur usually every day of the month. It is carried out according to different collection calendars defined in order to take into account different constraints. For instance, in order to collect a price in a given outlet, the opening days of the outlet have to be taken into account; or in order to reflect properly the shift in the calendar of the sales or of the holidays, the collection calendar is adapted.

Because of these issues, prices taken into account for the June index that came from scanner data, from price collection on the field or from the alternative collections (collection online, by phone) occurred from the 25th of May to the 19th of June; prices for tourism were collected from the 23rd of May to the 19th of June. Contrariwise, price collection for transport, health services or fuel was carried out during the whole month.

Price collection on the field by price collectors resumed the 15th of June: only one quarter of this price collection in June was therefore carried out according to usual standards (however, some outlets were still closed like cinema, shows...).

Regarding sales³, price collection calendar have not included any day of sales in June since 2017. The postponement of sales (due to the health crisis) has therefore no consequence on the year-on-year change in prices for June 2020. It should impact these year-on-year changes for July and August 2020 (that will include respectively 3 and 12 days of sales against 18 and 7 in July and August 2019 indices).

2.4– Finally, less than a quarter of the CPI basket was imputed

Finally, the share of imputation due to the Covid-19 is about 24% in the June all-item index; these imputations include both missing data due to the adjournment of the price collection and the disappearance of some consumption segments during the lockdown or that haven't reopened since the end of the lockdown (shows, festival...).

These imputation rates are particularly high for manufactured products, food and other services due to the adjournment of price collection and for transport services due to the cancellation of trips (*figure 3*). On the contrary, some aggregates remain well-followed: tobacco, energy, rents, communication services, health services. A table in the complementary data attached to the CPI dissemination for June provides information for each index about the imputation rate due to the health crisis.

As an evidence of the improvement of the quality of the imputation due to the resumption of the price collection and to the reopening of a lot of outlets, imputation are quasi-totally performed by the observed price change for the same products (about 22% of the CPI basket is imputed with this method); the imputation by the nearest aggregate estimation or a close consumption segment represents about 1% of the CPI basket. Imputation methods used when no price was observed for a close product, either the estimation based on the all-item index (about 1% of the CPI basket), or the carry-forward method (0.1% of the CPI basket) are marginal (*figure 4*).

3 See https://www.insee.fr/en/statistiques/documentation/IPC_op%C3%A9rations%20changement%20ann%C3%A9e%202020_EN.pdf for a description of how the CPI calendar takes into account sales in 2020 and before

Figure 3: imputation rate, in terms of consumption, according to the type of products in June

	Imputation rate
All-item	24.3
Food	27.3
Fresh food	45
Other food	24.3
Tobacco	0.4
Manufactured products	32.6
Clothing and footwear	47.2
Health products	18.8
Other manufactured products	32.7
Energy	2.8
Petroleum products	3.1
Services	23.6
Actual rentals and services for dwellings	0.8
Health services	1.7
Transports	25.2
Communications	0
Other services	35.1

Note: Here are only registered the imputations linked to missing data due to (i) a non-observation of prices because of the adjournment of the price collection in the physical outlets, because of the lockdown, (ii) the lack of transaction for some consumption segments in the context of the Covid-19 crisis (extraordinary closure of some outlets, for instance) .

Figure 4: imputation rate, in terms of consumption, according to the imputation method, in June

Imputation method	Share in terms of consumption
Estimation based on available prices for the same product	22.4%
Nearest aggregate estimation	0.9%
Estimation based on the all-item index	0.8%
Carry-forward	0.1%
Total	24.3%