

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

### Definitive estimate-December 2020

The health crisis and the lockdown measures in the context of the Covid-19 crisis have impacts on the measures of short term statistics such as the Consumer Price Index (CPI).

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 the 16<sup>th</sup> March to 15<sup>th</sup> June 2020<sup>1</sup> and again from the 30<sup>th</sup> of October 2020 to the 4<sup>th</sup> of January 2021 in the territories where a lockdown has been implemented.** 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. **Their adjournment impacted temporary the quality of the CPI from March to June 2020 and in November and December 2020. They had no impact from July to October 2020.**

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** either because the consumption was prevented by the impossible move of households (transport, tourism), or because outlets were closed (in particular, during the lockdowns), or because confronted to the crisis, the households decided to adapt their consumption habits (food, for instance).

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

#### 1 – How to measure inflation when whole parts of the consumption disappear? An alternative index to the CPI

During the lockdown, some consumption segments simply disappeared (shows, tourism, restaurants, hairdresser, cars, guiding lessons...) either because these activities were not allowed according to the implementing order of 15 March 2020 related to measures for the struggle against the Covid-19 spreading, or because households adapted their consumption. Since the end of the lockdown, the 11 May, reopening of outlets has been progressively authorized and the structure of the consumption has got closer to what it was before the lockdown. However, some gaps still existed, for instance for transport, tourism, cultural services. From September on, health restrictions and the second lockdown since the 30 of October have prevented again the consumption of some products, even if non essential outlets reopened from the 28 November on.

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1 This adjournment lasted up to the 20 September in French Guyana, where price collection in physical outlets have resumed since this date.

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 the 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 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. The three methods were used.

The official consumer price index, which 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 prices during the lockdown. 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, June, July, August, September, October, November or December structure<sup>2</sup>).

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 to November 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 for each of the months from April to December 2020.

According to this exercise, fuel consumption dropped sharply in April and sharpened progressively but partially afterwards, as well as transport services, accommodation, catering services or cultural and sports services, whose recovery was however less marked; food consumption was contrariwise one of the few products whose consumption was maintained during the first lockdown. Therefore, the consumption structure during the first 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. From June to October, the service weight was still lower to what was observed in 2019 but that of manufactured products was higher, due to a correcting effect. In November, as during the first lockdown, the consumption structure was altered but in a lesser extent.

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 (+0.2% 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

2 Nine 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, June, July, August, September October, November or December 2020). These nine 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 the CPI is chained yearly.

changes measured with the CPI and the alternative index reversed from May to August: using the consumption structure observed in May 2020, prices would have increased by 0.1% in May (against +0.2% measured with the CPI); using the consumption structure observed in June 2020, prices would have slightly decreased in June (against +0.1% measured with the CPI) and would have risen by 0.2% in July (with the July 2020 consumption structure) against +0.4 measured by the CPI. Service prices were indeed more dynamic than the all-item index (because of transport services) whereas services were less purchased in June and July 2020 than in 2019. In August, prices dropped by 0.1% in average whether measured with the CPI basket or the August 2020 purchased basket. In September, however, the CPI dropped by 0.5% but only by 0.2% when measured with the September consumption structure: airfare and tourism prices decreased seasonally in September and their weight is higher in the CPI basket than in the alternative index. Contrariwise, clothes prices, whose weight is higher in the alternative basket, rebounded in September as every year after the summer sales. In October, prices are stable in average, whether measured with the CPI or the index using the October consumption structure. In November, prices increased by +0,2% when measured by the CPI and by +0,4% when using the November consumption structure: the food inflation is more weighted in the November basket and the downturn in the prices of the manufactured products is less weighted. In December, prices increased by 0.2% measured by the CPI and would be stable using the December consumption structure. Transport service weight is lower in the December consumption structure than in the CPI whereas its price increase, as usually in December.

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 was stable in December year on year after +0.2% in November, +0.1% in October, +0.0% in September, +0.2% in August, +0.8% in July, +0.2% in June, +0.4% in May and +0.3% in April whereas the index built from the December 2020 consumption structure increased by 0.1% in December after +0.4% in November, +0.3% in October, +0.2% in September, +0.3% in August, +1.0% in July, +0.2% in June, +0.5% in May and +0.6% in April. However, this gap existed 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 1.4 points between February and December 2020 (from +1.4% in February to +0.0% in December 2020), as with the index that uses the December 2020 consumption structure (from +1.5% in February to +0,1% in December).

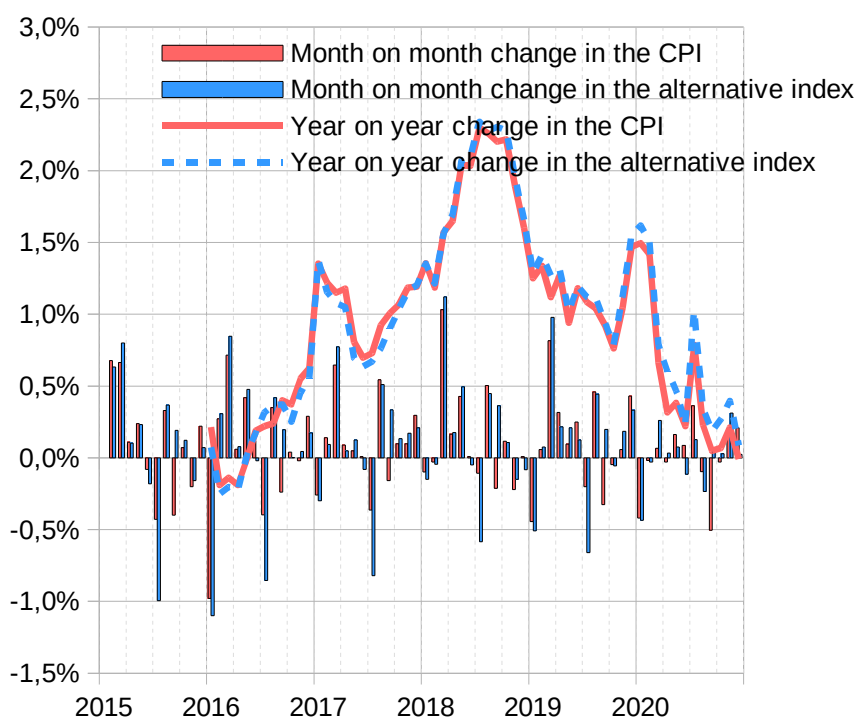
Figure 1: The Consumer Price Index and alternative indices using the consumption structure observed in April, May, June, July, August, September, October, November and December 2020 (annual and monthly rate)

	Monthly rate											Annual rate										
	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Febru	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
CPI	<b>0.1%</b>	<b>0.0%</b>	<b>0.2%</b>	<b>0.1%</b>	<b>0.4%</b>	<b>-0.1%</b>	<b>-0.5%</b>	<b>0.0%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>1.4%</b>	<b>0.7%</b>	<b>0.3%</b>	<b>0.4%</b>	<b>0.2%</b>	<b>0.8%</b>	<b>0.2%</b>	<b>0.0%</b>	<b>0.1%</b>	<b>0.2%</b>	<b>0.0%</b>	
Alternative indices																						
April 2020 structure	0.1%	<b>0.2%</b>	0.2%	-0.3%	0.0%	0.0%	-0.2%	-0.1%	0.6%	0.0%	1.8%	1.2%	<b>1.3%</b>	1.3%	0.8%	0.9%	0.7%	0.5%	0.7%	0.9%	0.6%	
May 2020 structure	0.2%	0.1%	<b>0.1%</b>	-0.2%	0.0%	-0.2%	0.1%	0.0%	0.4%	0.0%	1.6%	0.9%	0.8%	<b>0.7%</b>	0.4%	1.0%	0.5%	0.3%	0.4%	0.6%	0.2%	
June 2020 structure	0.2%	0.0%	0.1%	<b>-0.1%</b>	0.2%	-0.1%	-0.1%	0.0%	0.3%	0.0%	1.5%	0.8%	0.6%	0.5%	<b>0.3%</b>	0.9%	0.4%	0.2%	0.3%	0.4%	0.2%	
July 2020 structure	0.1%	-0.1%	0.1%	0.0%	<b>0.2%</b>	-0.1%	-0.2%	0.0%	0.3%	0.1%	1.5%	0.8%	0.5%	0.4%	0.2%	<b>0.8%</b>	0.4%	0.2%	0.2%	0.4%	0.1%	
August 2020 structure	0.2%	-0.1%	0.1%	0.0%	0.3%	<b>-0.1%</b>	-0.2%	0.0%	0.3%	0.1%	1.5%	0.8%	0.5%	0.4%	0.2%	0.9%	<b>0.4%</b>	0.2%	0.2%	0.3%	0.1%	
September 2020 structure	0.1%	-0.1%	0.1%	0.0%	0.2%	-0.1%	<b>-0.2%</b>	0.0%	0.3%	0.1%	1.5%	0.8%	0.5%	0.4%	0.2%	0.9%	0.4%	<b>0.2%</b>	0.2%	0.4%	0.1%	
October 2020 structure	0.1%	-0.1%	0.1%	0.0%	0.2%	-0.1%	-0.2%	<b>0.0%</b>	0.3%	0.1%	1.5%	0.8%	0.6%	0.5%	0.3%	0.9%	0.4%	0.2%	<b>0.3%</b>	0.4%	0.1%	
November 2020 structure	0.0%	0.0%	0.1%	-0.1%	0.1%	0.0%	-0.2%	0.0%	<b>0.4%</b>	0.1%	1.5%	0.9%	0.7%	0.6%	0.4%	0.7%	0.4%	0.2%	0.3%	<b>0.5%</b>	0.2%	
December 2020 structure	0.3%	0.0%	0.1%	-0.1%	0.1%	-0.2%	0.0%	0.0%	0.3%	<b>0.0%</b>	1.5%	0.8%	0.6%	0.5%	0.2%	1.0%	0.3%	0.2%	0.3%	0.4%	<b>0.1%</b>	

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 -0.1% 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). The year-on-year change in prices in June 2020 would have been +0.3% against +0.2% measured by the CPI

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



Scope: metropolitan France

How to read it: If the consumption structure, from 2015 on, was that observed in December 2020, the month-on-month change in prices in December 2020 would have been +0,0% against +0,2% measured by the CPI (i.e. the 2019 consumption structure for 2020 indices, the year Y-1 structure for the year Y index). The year-on-year change in prices in December 2020, measured with the December basket, would have been +0.1% against +0.0% measured by the CPI

## 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 November, INSEE carried out alternative kinds of price collection, as during the spring.

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, durable 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 has been adjourned from the 16<sup>th</sup> March to the 15<sup>th</sup> June and from the 30<sup>th</sup> November to the 4<sup>th</sup> January 2021. 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 November 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 are 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, durable goods and some other manufactured products.
- Some scanner data were usually unused (for clothes or durable goods sold in super and hypermarkets or for some small shops); they are used in order to register the prices of products that belong usually to the CPI basket.
- A price collection by phone was performed for services and in some small shop (bakery, butchery, cheese shop, fish shop, greengrocer's...).

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. However, this fall in the collected prices is less important than in April because some services closed during the spring were open in November/December and answered to our price collectors and also because more outlets provided a 'click and collect' or a 'call and collect' service.

### 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 are impacted by the health crisis but it is not the case for the other data sources that remain available.

- The use of scanner data is 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 term 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 not taken into account to calculate the index.

- 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 collected by phone (with a lower answer rate).
- Some prices come from administrative data, mandatory declarations or are official tariffs; in this case, data collection was not impacted by the health crisis; it is the case for fuel prices, health service prices, tobacco prices...

#### **2.4– Finally, about 15% of the CPI basket in share of the consumption were imputed in December due to the health situation**

Finally, the share of imputation due to the Covid-19 is about 15% in the November all-item index; these imputations include both missing data due to the adjournment of the price collection and the disappearance of some consumption segments. They did not take into account the usual imputations due to usual closure of outlets or missing products<sup>3</sup>. These imputations are almost completely performed by using the price evolution of similar products.

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<sup>3</sup> It is not always easy to determine if an outlet is closed because of the lockdown or if it would have been closed even without the lockdown. Therefore, the total imputation rate was compared to the imputation rate observed the same month the previous year. The difference between both is considered as due to the Covid-19 crisis.

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

Description	Imputation rate, (%)
<b>Overall</b>	15.0
<b>Food</b>	17.7
Fresh food	18.0
Other food	17.8
<b>Tobacco</b>	0.2
<b>Manufactured products</b>	12.0
Clothing and footwear	14.2
Medical products	1.7
Other manufactured products	14.1
<b>Energy</b>	1.2
<i>Petroleum products</i>	1.8
<b>Services</b>	18.7
Actual rentals and services for dwellings	2.1
Health services	1.6
Transport	13.2
Communication	0.0
Other services	28.1

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) .