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Swiss CPI: Initial experience with the new Medicine Price Index
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1   Introduction

Since the 1990s, price changes in pharmaceutical products have been monitored using some 220 best-selling product packs on the Swiss pharmaceutical market. As prices in this market are largely subject to government authorization requirements, the Swiss CPI measured few price changes for the listed best-selling products. For this reason, neither price changes due to the introduction of similar – but more expensive – products (based on pack size, different dosage or form, slightly improved follow-on products, etc.) nor cheaper generic drugs had since been considered in the CPI.

This problem has now been resolved with the introduction of a new method which measures the average price per unit of active ingredient (across the whole product range), instead of prices in a fixed selection. This paper will summarize some technical aspects of the chosen method and present a comparison of the results computed with the new and the former methods.

2   Method and concept

The concept of the new Medicine Price Index in the CPI was already explained in detail in a previous Ottawa Group Paper[1], so the present paper will merely outline it in broad terms.

The data were derived from the monthly orders placed by Swiss pharmacies with pharmaceutical wholesalers. As a result, the Federal Statistical Office (FSO) has at its disposal the monthly sales figures for and the necessary product characteristics of all articles (= unit packs) ordered in Switzerland, in addition to the current prices paid by the general public. The sample is compiled from these data in a multi-stage selection process geared to sales.

The unit packs in the sample are combined to form homogeneous groups of articles, on the basis of their active ingredients and therapy categories, and average prices are then calculated for them using the geometric mean. This average price per active ingredient is then used as a "price representative" for actual price measurement purposes.[2]

By analogy with the Consumer Price Index, the elementary indices are calculated using the geometric mean, weighted with the cumulative annual sales and aggregated up to Medicine Price Index level.

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[1] Corinne Becker Vermeulen et al.: "Recent developments in the Swiss CPI: scanner data, telecommunications and health price collection" (Paper presented at the 9th Ottawa Group Meeting on Prices, 14 –16 May 2006, in London).

[2] Given the lack of opportunities for comparison and the limited options, the average price for 1 mg of the active ingredient accurately reflects the patients' actual consumption situation. At most, consumers have a say in the type of product (original preparation or generic product). However, they are unlikely to question pack sizes or the prescriptions as such.

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In Switzerland, pharmacy services are compensated by using a performance-based tariff system. These fixed charges, which are negotiated, are covered in a separate sub-index and aggregated with the "Medicines" sub-index to form the total Medicine Price Index.

This paper will describe the differences between the new and the former methods as regards the sampling and the aggregation methods.

2.1 Comparison of the two samples

Whereas the previous sampling method took the biggest-selling articles as its point of departure, ("bottom-up"), the new method uses the therapy categories with the highest sales, selecting the sales leaders within these categories as price representatives ("top-down").

The following table summarizes the main characteristics of both sampling methods.

Sample	Former method	New method
Therapy categories	No explicit selection: all articles on the "bestseller list" (2005: 16 ATC-1 therapy categories). Annual review of therapy-category weighting based on percentage sales.	Six ATC-1 therapy categories with the biggest sales (this corresponds to >70% of the total market and comprises 54 ATC-2 therapy categories). including 29 ATC-2 therapy categories with the biggest sales (this corresponds to >65% of the total market, >2,200 individual articles) Annual review of the selection and weighting of the therapy categories based on percentage sales.
Limits	None defined	Only dosages whose set units of quantity are known and computable (as a solution or in solid form). Annual sales of the articles taken into account >25,000 CHF The three biggest-selling active ingredients or combinations of active ingredients are chosen for each ATC-2 therapy category. Original and/or generic products are considered, provided their totalized group sales account for at least 25% within the active-ingredient group. If one of these products constitutes more than 75% of sales, it is the only one to be considered
Selection of articles	A set number of approximately 275 individual articles (out of 12,000) Article sales correspond to 25% of the total market. Revised annually on the basis of the 220 bestsellers. Articles which are eliminated are monitored for two more years.	As a rule of thumb, between 700 and 850 individual articles (out of 12,000) Article sales correspond to >42% of the total market. Articles are continually revised on the basis of biggest sales (= amount ordered in the completed quarter x current price paid by the general public).
Price	Retail price of the selected article pack Example: aspirin, active ingredient: ACETYLSALICYLIC ACID, dose: 500 mg, pack of 20 tablets.	Average price for a standardized unit of quantity of an active ingredient with a specific therapeutic benefit. Example: price for 1 mg of the active ingredient ACETYLSALICYLIC ACID calculated from 14 article packs, seven products ("brands") made by six different manufacturers, used in the same therapy category (central nervous system) as analgesics.
# Products (manufacturers' brands)	Approximately 250 products	More than 90 products
# Active ingredients	>200 groups	>75 groups
Percentage of patented original preparations	25%	30% (on the decline)

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The new sampling procedure permits better market coverage in line with sales and greater accuracy in the on-going revision of the sample. Including product groups (all pack sizes, all manufacturers' brands) takes better account of developing ranges and of consumer behaviour.

The former method mainly considered articles which generated large sales as unit packs. This is observed mainly for active-ingredient indications with current patent protection or high production costs. For active ingredients which are no longer under patent protection, product lines are diversified more often by the original manufacturers themselves or face competition from other manufacturers. Because active-ingredient sales are then spread over a larger number of articles, single unit packs are generally less prominent in sales figures. Thus, the previous sample took above-average account of product groups with just a few articles and under-average account of areas with more movement. With the new method, articles are taken into account according to their totalized active-ingredient group sales, irrespective of whether this group covers one or many articles.

The medicine data now required for calculating the price per standard unit are highly detailed and, despite comprehensive datasets, are not always available in a form we can compute and use. Active ingredients in solution (particularly vaccinations) are the main problem because the dosage indications and active-ingredient concentrations cannot always be converted into solid quantities of the active ingredient. At present, efforts are in progress to improve linkage between the available data sources and thus to continually upgrade the level of detail.

2.2　Comparison of aggregations

Under the former method, price representatives were aggregated direct at the level of ATC-1 therapy categories. Moreover, therapy categories with lower sales were grouped in a "Miscellaneous" category. The percentage sales of the categories constituted were used for the final aggregation.

The new method no longer aggregates the actual pack prices but average prices for each individual active ingredient for a specific therapy. In line with layering of the sample, aggregation is done in several stages, using the corresponding market shares, up to "Medicine Price" sub-index level.

| Aggregation	Former method	New method
Basic aggregation	275 article prices (incl. pharmacy charges) per therapy category (geometric mean). From the 16 therapy categories, the nine ATC-1 therapy categories with the biggest sales are selected as the classification category, and the remaining therapy categories are grouped together in the "miscellaneous" catch-all category. ➔ 10 ATC-1 therapy category indexes	>75 calculation cells: average prices of the standardized active-ingredient quantities: First, the geometric mean for each type of product (patented original preparation vs. generic/original preparation that is no longer patented) is calculated. If the original and/or alternative products account for more than 25% of active-ingredient group sales, the geometric mean is again established for the previously calculated average price in a second step. If a product type accounts for less than 25% of group sales, the second step is not required. ➔ >40 active-ingredient indexes (ATC-3 level)
Intermediate aggregation 1	None	Aggregation of the active-ingredient indexes, weighted by sales to ➔ 29 ATC-2 therapy category indexes
Intermediate aggregation 2	None	Aggregation of the indexes for each ATC-2 therapy category (using the respective sales) to the indexes per ATC-1 therapy category ➔ 6 ATC-1 therapy-category indexes
Intermediate aggregation 3	None	Aggregation of the indexes, weighted by sales, for each ATC-1 therapy category to the ➔ "Medicines" sub-index
Final aggregation	Aggregation of the indexes, weighted by sales, for each ATC-1 therapy category to ➔ Total "Medicine Price Index"	Aggregation of the "Pharmacy Charges" and "Medicines" sub-indexes, weighted by sales, to the ➔ Total "Medicine Price Index"

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In Switzerland, pharmacy services are not compensated for by a margin on the articles but on the basis of a negotiated payment per purchase and article. In contrast to the former method, these payments – commonly known as pharmacy charges – are no longer added to the article prices during basic aggregation but are recorded in a separate sub-index, weighted by sales and added to the total "Medicine Price Index". It is up to the pharmacists themselves to decide whether to collect payment for a service or not. The new method takes more realistic account of this fact also via weighting of sales.

3   Comparison of changes between 2005 and 2007

The Medicine Price Index used in the CPI, calculated according to the former method, was compared for this period with the index calculated by the new method. To simplify matters, a constant weighting structure was assumed for the newly calculated index and the indices were converted into a common index base.

Graph 1: Comparison of medicine price movements using the former and the new methods (base January 2005=100)
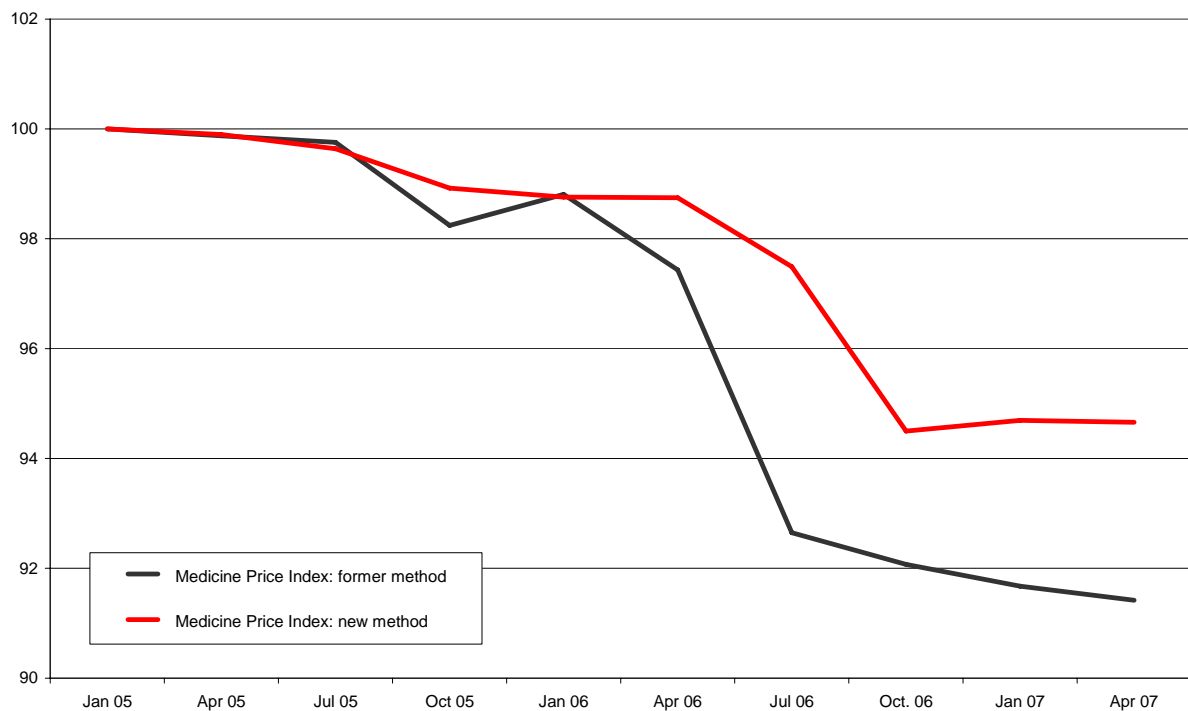
In Switzerland, the price of medicines paid for by health insurance companies are subject to government authorization. On their market launch, prices are set within the framework of the authorization application procedure, and these prices usually remain unchanged until patent protection on the relevant medicine lapses. Only thereafter, with the emergence of rival products, is the medicine price revised. On the basis of the set "bestseller" list used, the former method did not take account of either (cheaper) imitator products or of the (more expensive) follow-on products, which is why, in the initial phase, only the price movements of "old" original preparations were monitored. Over the period under study, only price reductions were measured with the former method. It was not until between October 2005 and January 2006, that an increase in prices was revealed, and that turned out to be the effect of the end of a major campaign among wholesalers to promote vitamin preparations.

For the period under review, the Medicine Price Index calculated using the new method also showed a downward price trend taken overall, but the curve was much flatter and at a consistently higher level than in the previous "Medicines" sub-index. A phase with a slight increase early in 2007 is also particularly noteworthy.

The major price cuts that occurred in July and October 2006 were due to the April and July 2006 price reviews ordered by the Swiss government. However, under the new method, these would have been reflected in the CPI just three months later, which also explains the visible time-lag in both series of indexes. Without these rounds of price cuts negotiated between government, health insurances and the pharmaceutical industry (estimated at CHF 500 million in sales, i.e. roughly 10% of annual sales),

the new index would have produced a change of -1.1% (instead of -5.3%) over the period under observation and would thus still have been well above the result obtained with the previous index (-2.4% instead of -8.9%).

The difference between the two indexes results from the differences in respect of the random samples and in particular from better account being taken of substitution through follow-on and imitator products.

4   Substitution

4.1   Substitution at article level

In every survey period, articles are reselected on the basis of order sales volumes (= order quantity x current price). The average price, based on the updated selection, is recalculated for the current period and the previous period, provided that the active-ingredient group already existed back then. In that way, big-selling new articles can be included in index calculation continuously, after three months at the earliest.

Average prices are calculated for each active ingredient in a particular ATC-3 indication or therapy category. If two types of products (original preparations and the corresponding alternatives) occur in the same calculation cell and have a market share of at least 25%, they are aggregated with the geometric mean in two stages. The percentage changes in average prices calculated at active-ingredient level constitute the elementary indexes and are aggregated in the basic aggregation to provide the index for each active ingredient for a specific ATC-3 therapy.

Unfortunately, no detailed analysis of article substitution can be offered in this paper because comparatively few new products came on the market or were not part of our sample during the period under observation. Articles where only the pack size or a non-therapeutic additional benefit (e.g. (flavouring, method of presentation, etc.) changed are rapidly incorporated into the calculation (at least in theory). With the former method, it was not possible to take product-range diversification into account. If an article pack was discontinued, the price series inevitably stopped, even though the corresponding replacement pack was already on the market at the time.

Using the new method, it has become possible to monitor not only price cuts, but also price increases, during the period under observation, in contrast to the former method. This also speaks for the better quality of the expanded sample.

4.2   Substitution at product-type level

The groups of active ingredients are chosen at the level of the ATC-2 therapy category. The three best-selling active ingredients are selected on a quarterly basis and assigned to the appropriate therapy category in level ATC-3, in accordance with the declaration. Using the geometric mean, the average prices per milligramme of active ingredient are calculated at this level. To ensure these average prices are comparable with the previous period, the prices for that period are also recalculated using the current sales-based selection. The resultant percentage changes are used to construct the elementary indexes and aggregated to form the active-ingredient index.

In the following graphs, January 2005 prices were used for the active-ingredient units and then adjusted in line with the quarterly percentage changes to illustrate substitution behaviour. In the subsequent periods, the actual price levels do not necessarily correspond to those presented here. The basic aggregate of the active-ingredient elementary indices is shown as a continuous line. The line of dashes in the same colour corresponds to the price movements of the original preparations, the line of lighter-coloured dashes to that of the (cheaper) alternatives to the originals (generic preparations or those with no patent protection). If both types of product are present, both average prices are once again calculated using the geometric mean to find the average price per active ingredient. As has already been said, movements in this price are represented by the continuous line.

During the period under observation, two groups of active ingredients without patent protection (esomeprazole and pantoprazole) and a "mixed" active-ingredient group (omeprazole) were included in therapy category A02B (Ulcustherapeutica) with the two separate types of products.

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Graph 2: Substitution at product-type level

Therapy category A02B: Price levels
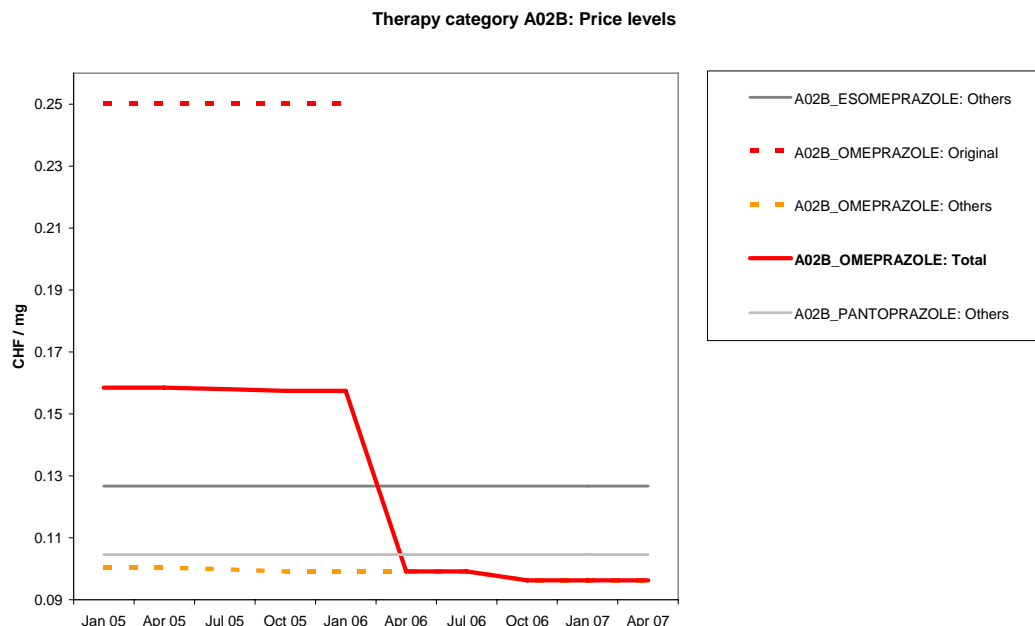
In January 2006, the original product still had a 27% share of sales, but from April 2006 this share dropped to less then 20%, which meant that the original product had fallen below the defined threshold level of at least a 25% market share. Thereafter, only alternative products were included in the calculation. Sales of the original, which is twice as expensive, have been declining since January 2005 (43%). The ongoing debate about spiralling costs has prompted a steadily growing acceptance of cheaper alternative products among patients. What is more, from 1 January 2006, the insurance excess for original products was increased from 10% to 20%, which probably had a direct impact on demand. This pattern can also be observed in most active-ingredient groups when a generic preparation comes on the market.

Under the former method, the (unchanged) price of the original article would still have been monitored, even though it had lost much of its representativity. When the random sample is renewed for each year, articles are replaced without direct substitution. If active-ingredient sales are spread over a larger number of articles, the active ingredient may be totally eliminated from the calculation despite still having substantial overall sales.

In this case, the new method measures a price reduction per milligramme of active ingredient. The "mixed" product series with original and alternative products is replaced by the "unadulterated" price series with the alternative products.

5 Permanent adjustment of active-ingredient selection

Besides taking account of substitution, constant updating of the random sample constitutes an improvement. Direct substitution of active ingredients is no longer possible on the grounds that they are not comparable. The index series of active ingredients which have become obsolete as the result of changes in sales are not discontinued, but the new active-ingredient index is started index-neutral. This corresponds to the method used in the CPI when product ranges change.

In the ATC-C03A therapy category (cardiovascular: diuretics), a marked jump in market shares was registered following the introduction and promotion of generic products. In January 2005, original products with the active ingredients furosemide (76%) and spironolactone (81%) were clearly outperforming alternative products. At the beginning of the period, there was no alternative to toresamide.

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Graph 3: Elimination of a group of active ingredients …

Therapy category C03A: Price levels
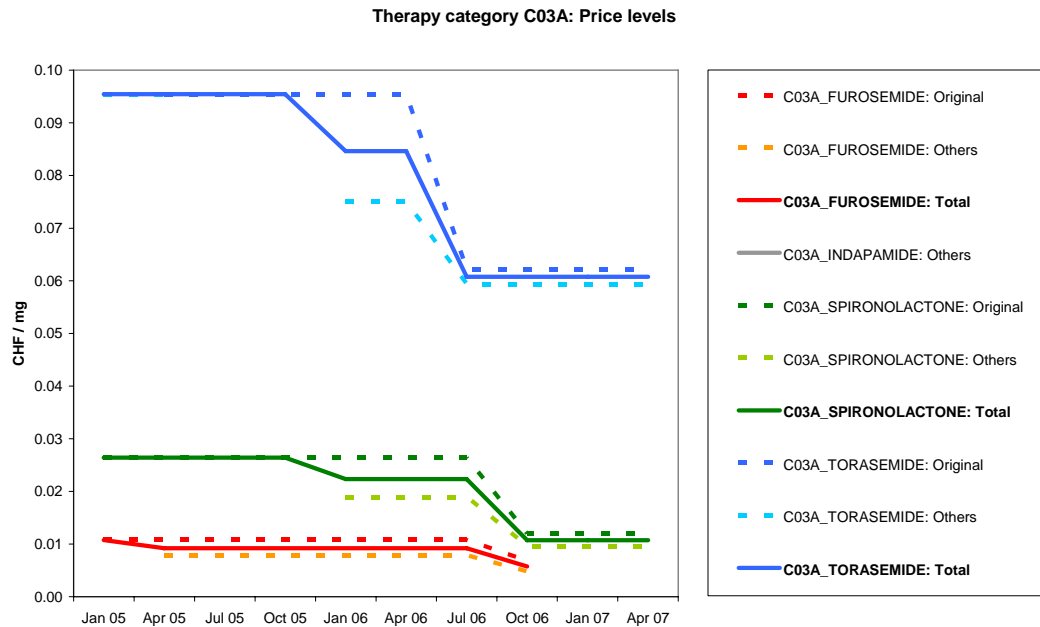
The arrival on the market of toresamide generic products (in January 2006, they already had a market share of 42%), the growing importance on the market of spironolactone generic products (34% in January 2006) and the review of the previously set prices for original products ordered by the Swiss government (as per April and July 2006 respectively) started prices moving. Price cuts are shown in these graphs, but lag three months behind because the newly stipulated prices were not yet available when the data were supplied. This is another reason why the price survey is to be conducted monthly with effect from 2008. In future, changes in prices will be reflected no later than one month afterwards.

From October 2006, there was a marked drop in the series for furosemide. It was replaced by the big-selling indapamide group of active ingredients with their considerably higher milligramme price. This means that the graph scale will have to be adjusted. As has already been said, even with the new method, a change of this kind cannot be directly recorded or active ingredients directly substituted, and there is no direct influence on the results. However, the advantage is that permanent account can be taken of big-selling active ingredients.

Graph 4: … and its replacement by a new group of active ingredients, based on new sales figures

Therapy category C03A: Price levels
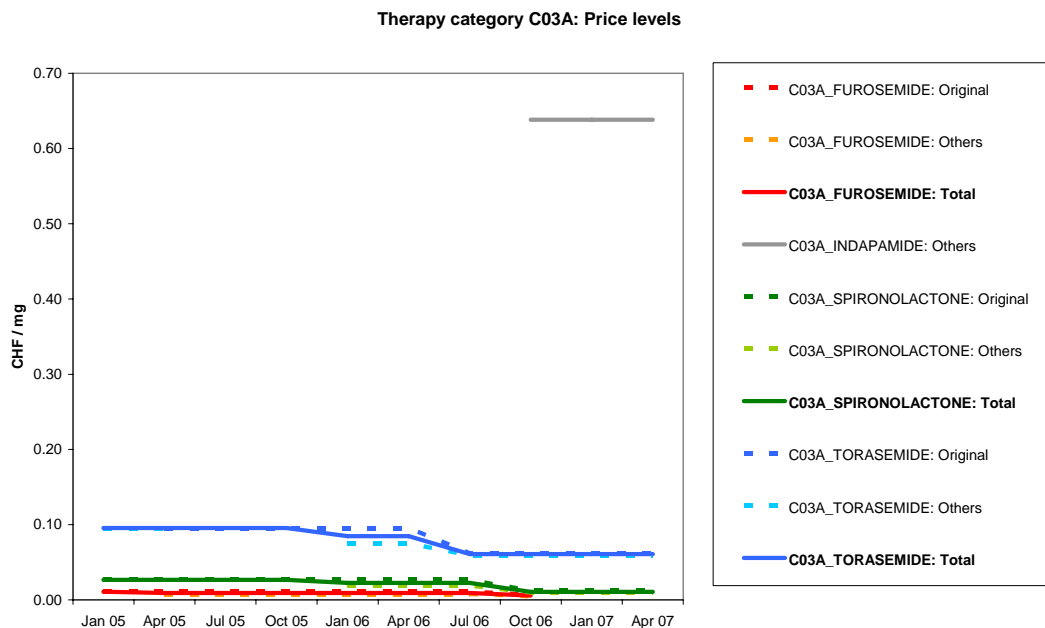
6   Upcoming tasks / Looking to the future

From 2008, Switzerland will be publishing a Harmonized Index of Consumer Prices (HICP) in keeping with the EUROSTAT guidelines used in the EU. This calls for monthly price surveys in most areas of consumption. The transition from quarterly to monthly surveys of medicine prices starting from 2008 marks a definite improvement in index quality. In future, much faster account can be taken of price and sales movements with the monthly survey. The delays referred to in the text will be reduced to one month at most, thus making the figures much more informative. The monthly calculation method will inevitably mean adjustment of the IT solution chosen for the Medicine Price Index[3].

Including further therapy categories or more groups of active ingredients would not be a problem. However, the genuine benefits of an expanded sample would have to be investigated. As things stand, the choice spread over therapy categories produces a fairly stable sample with perfectly adequate market coverage.

7   Conclusions

The approach chosen for the new Medicine Price Index constitutes a worthwhile innovation for the Swiss Consumer Price Index. Index quality has been upgraded thanks to the improved random sample and the incorporation of substitution at article and product level without notably increasing the index-production workload.

A source of high-quality data is the crucial prerequisite for an index of this type. In Switzerland, pharmacy order data represent an excellent source which is also being continually improved.

Translating the selection and aggregation procedure into an appropriate IT solution generated an amount of work which should not be underestimated and which was considerably greater than that involved in the conceptual phase. A solution outside the CPI calculation application ("PRESTA 3") was chosen because of the ongoing basket update and of the comparatively complex sampling procedure. Including data processing and index chaining, periodic calculation of the Medicine Price Index takes one to two hours, making it much less time-consuming than the previous on-line survey.

The forthcoming transition from quarterly to monthly data acquisition provides a good opportunity to put the finishing touches to the application. So, from 2008, an even better stand-alone solution will be available for a Medicine Price Index that can appropriately reflect medical products' price movements.

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[3] SAS Enterprise Guide