

INDEXATION OF MEDICAL COSTS FOR SOUTH AFRICAN MEDICAL SCHEMES

Roseanne da Silva, BScHons, FIA, CFP, FASSA

Telephone: +27 (0)11 884 9128 • Fax: +27 (0) 11 884 4716 • Email: roseanne@worldonline.co.za

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ABSTRACT

Changes in medical scheme contributions from year to year are impacted by a number of factors including changes in prices for medical goods and services, utilisation, benefits, demographic profile and solvency requirements. A medical price index aims to isolate the trends in the costs of medical goods and services (incurred by medical scheme beneficiaries) and track these over the time. This paper discusses a methodology for developing such an index and describes the results of a pilot development.

1. INTRODUCTION

The Consumer Price Index (CPI) is used to calculate changes in index linked public and private contracts. It is also a major indicator of economic performance and can be used to compare the performance of different economies. The collection of raw data, compilation of various sub-indices and the final design of the CPI are quite complex, involving hundreds of individuals and thousands of observations drawn from a large and highly dynamic economic system.

Accurately measuring the rate of change in the price of goods and services (referred to as inflation) is a key responsibility of a national statistics agency. The

Consumer Price Index (CPI) is probably the most widely used of all figures produced by a national statistics agency. The International Labour Organization defines CPI to be a current indicator defined to measure changes over time in the general level of prices of goods and services that a particular population purchases or uses.

Levels of inflation in the prices of medical goods and services have exceeded general CPI in various economies around the world for at least the past decade. In South Africa, spending on private health care has increased at levels significantly exceeding CPI. There is, however, no generally accepted measure of private health care prices apart from the changes in medical scheme contributions. Medical scheme contributions are affected by a variety of other factors (in addition to pure price changes) such as administration costs, solvency requirements, benefit changes and utilisation trends. This paper aims to present a methodology for calculating an index of prices for medical goods and services as experienced by members of a particular set of medical schemes.

Section 2 of the paper provides a history of inflation calculations and section 3 introduces the methodologies used for CPI calculations around the world. Section 4 discusses the CPI calculation in South Africa and focuses on the medical component thereof. Section 5 describes the approach that has been taken to develop an index of private healthcare prices and Section 6 presents some of the results. The paper concludes with Section 7 which sets out some of the key challenges identified and areas for further research.

2. A BRIEF HISTORY OF INDEX DEVELOPMENT

The first CPI is believed to have been created by William Fleetwood, in 1707 (Vink et al, 2002). He compiled a simple index to estimate the average change in prices paid by Oxford University students over the previous two and a half centuries. During the 19th century, there was a marked increase in interest in price indexes. This was perhaps sparked by Joseph Lowe, considered the father of the CPI, who published a study on agriculture, trade and finance in 1823 (Vink et al, 2002). As part of this study he developed an index that measured the change in the value of a fixed set of goods over time – the ‘basket-based’ approach still widely used today.

After the Lowe index, further contributions were made by Laspèyres and Paasche during the latter part of the 19th century (Loretta, 1997). The Laspèyres index calculates the change in the value of a fixed basket of goods over time, using the expenditure data in the base period for weighting whereas the Paasche index uses the current expenditure data for weighting.

Marshall, in 1887, introduced the concept of chaining (ILO, 2004). This allows price movements over long periods of time to be measured by linking together indices measuring price movements from one year to the next.

In 1922, the work of Irving Fisher led to the development of what is now known as the Fisher index, the geometric average of the Laspèyres and Paasche indices (Vink et al, 2002). This remains the preferred index, from a theoretical viewpoint, for most purposes. By 1930, most of the theoretical foundation for the calculation of price indices had been laid. CPI construction is still, however, a field that attracts a large amount of research and comment as national statistical agencies and other parties concerned continue to improve methodologies in an effort to produce indices that are as unbiased as possible and most suited to their uses.

The International Labour Organisation (ILO) has promulgated standards for index calculations, the fourth revision of which was published in 2004 (ILO,2004). The manual highlights the importance of regular reviews of:

- the formulae used for index calculation;
- the frequency, completeness and quality of household surveys;
- procedures for quality adjustment and the introduction of new goods and new outlets;
- the use of probability sampling methods;
- relevance of results to sub-populations and the need to produce different indices; and
- the use of different indices for different objectives.

Loretto, 1997 distinguishes between a consumption approach and an acquisition approach to index calculation. In the former case, cost in the base year is considered regardless of when the item is consumed or paid for. In the latter case, the price is based on when the item is consumed.

A key challenge in index definition is determining the items to be included (Loretto, 1997). For example, to what extent should luxury goods and more expensive but irregular purchases be included? Relative price changes are also influenced by technological changes and environmental factors (Gordon, 2000). This suggests that substitution is likely. The Laspèyres index assumes no substitution while the Paasche index is likely to overstate the effects of substitution (Gordon, 2000).

Gordon, 2000 uses a medical example to illustrate the challenge of providing for technological advances. While twenty years ago cataract surgery required a week long hospital stay, it can now be performed on an outpatient basis. Gordon suggests that these kinds of technological shifts can be addressed by considering the use of inputs and suggests that for medical price inflation it is more appropriate to consider prices for a sample of specified treatments for particular diseases rather than the price of a day in hospital.

Dalton et al, 1998 notes relatively large demand elasticities for prescription drugs but relatively low demand elasticities for hospital and medical professional services.

Health insurers acting as agents for consumers tend to be more sensitive to price changes than the consumers themselves and so behavioural changes may be driven by changes in benefit design to address price increases in specific areas.

A review of the US CPI calculation methodology was conducted by the Boskin Commission in 1995 (Gordon, 2000). The Boskin report highlighted four sources of possible bias:

- *Substitution bias* occurs because a fixed market basket fails to reflect the fact that consumers substitute relatively less for more expensive goods when relative prices change.
- *Outlet substitution bias* occurs when shifts to lower price outlets are not properly handled.
- *Quality change bias* occurs when improvements in the quality of products, such as greater energy efficiency or less need for repair, are measured inaccurately or not at all.
- *New product bias* occurs when new products are not introduced in the market basket, or included only with a long lag.

Research following the publication of the Boskin Commission Report has focussed on ways to address these sources of bias.

Milliman inc. publishes an annual study of medical costs for a “typical American family of four” (Milliman, 2006). The Milliman Medical Index (MMI) measures spending on the basis of coverage by a preferred provider organisation (PPO) and assesses changes over a five year period. Medical services are categorised into the broad groupings of inpatient hospital services, outpatient hospital services, physician services, prescription drugs and other services which includes ambulance, durable medical equipment, private day nursing and home health.

The average annual medical cost for a family of four was found to increase by 9.6% from 2005 to 2006. The annualised average rate of increase for the four year period from 2002 to 2006 was 9.7%.

The 2006 MMI was made up as follows:

Component	% of total costs	2006/2005
Inpatient	30%	9.3%
Outpatient	16%	12.6%
Physician	36%	5.9%
Pharmacy	14%	8.3%
Other	4%	Not provided

The Milliman report also notes that as medical costs have increased, employees have paid an increasing dollar amount of costs through cost sharing.

Changes in the population distribution (geographically and demographically), purchasing power and mix of goods available can affect the relevance of an index over time.

3. INDEX METHODOLOGIES

3.1 CPI calculation

The first step in calculating a CPI is to determine what goods and services should be included in the basket, as well as their relative weights. This is usually done using the results of a household expenditure survey. A point-of-purchase survey is also used to determine where the goods and services are acquired from, to determine where the prices should be collected (Loretto, 1997).

The next step is to classify all these goods and services, so that they can be aggregated into different groups for the compilation of sub-indices and finally into the CPI. Products are grouped because they have a common end use or because they are considered to be substitutes for each other. The basket with the weights is constructed periodically, in most cases depending on the frequency of the surveys on which the weights are based (Vink et al, 2002).

Prices are collected weekly, monthly, quarterly, biannually or annually depending on the volatility of the price of a good. These prices are calculated into an index with the help of a formula, the most commonly used being the Laspèyres formula.

Following the questions raised by the Boskin Commission regarding possible sources of bias in the CPI estimates, there is now an awareness that in order to create reliable and credible price indices, there is a need to review various elements of importance for the quality and accuracy of the CPI.

3.2 Basket composition and weights

To select the basket of items one needs a classification that will serve a number of important purposes:

- it provides the weighting and aggregation structure;
- it provides a scheme for stratification of products selected for price observations, whether by random or non-random sampling;
- it also dictates the possible set of sub-indices that can be prepared for publication; and
- it facilitates the production of indices for analytical purposes.

There are several factors that must be taken into account when a CPI classification system is being developed. First, it must be possible to incorporate into its detailed group new goods and services in a manner that minimizes the need for restructuring higher level categories. Second, the needs of users for sub-indices should be given a high priority. Third, the categories must be unambiguously mutually exclusive and at the same time provide complete coverage of all items within the scope.

The movement of the CPI is influenced by the weights assigned to different items in the basket. The quality of the weights used is important for the objectivity and reliability of the CPI estimates. For this reason the choice of sources from which the

weights are constructed is crucial. The main data source for household consumption expenditures in most countries is the household expenditure survey (HES), a sample survey of thousands of households that are asked to keep records of their expenditures on different kinds of goods and services over a specified period of time. The size of the sample usually depends on the resources available as well as the extent to which the results are being broken down by region/type of household. Biases might arise as households might under/overstate the extent of their expenditure on certain commodities, for example understating the amount spent on alcohol/gambling (Loretta, 1997).

It is common for a national statistical agency to also take into account statistics on the sales, production, imports and exports of consumer goods and services by adjusting the data from a HES. Due to the high costs associated with a HES, they are often not calculated as often as may be desired for CPI calculation. Some countries, however, conduct continuous HESs in order to update their CPI weights annually and improve their national accounts. Even using this system, there is still a time lag between the collection of data and the processing of it. The weights used still pertain to a period preceding the time reference period. Some countries use expenditure weights that are the average rates of expenditure over periods of two or three years in order to reduce ‘noise’ created by errors of estimation or erratic consumer behaviour over short periods of time.

To ensure the credibility of the index, prices have to be observed and recorded accurately. When the list of products is determined by a statistical agency, the objective is usually to select products that are considered to be representative of the larger group of products within an elementary aggregate. It also has to decide how specifically to describe the products selected for pricing. For example, milk can be seen as one product but various types of milk exist eg. low fat, full cream, fat free, organic and non-organic. Prices of these different types can vary significantly.

Price collection is a complex operation, much of it involving extensive fieldwork by a large number of individual collectors. The whole process requires careful planning and management, to ensure that the data collected conforms to the requirements laid down by the central office with overall responsibility for the CPI. These include the frequency and timing of price collection, item specification, coverage (geographic and outlet), item collection procedures and techniques, and data quality.

3.3 Index Calculation

The compilation of a CPI consists of collecting and processing price and expenditure data according to specified concepts, definitions, methods and practices. There is no fixed set of procedures that can be applied automatically in all circumstances. A

typical CPI consists of price data, used to form elementary aggregates which are then combined to form higher level indices and eventually the CPI.

Once the necessary data has been obtained, the first step in the actual calculation of the CPI is the calculation of elementary indices. Elementary aggregates are groups of relatively homogenous goods and services that are expected to have similar price movements. Each elementary aggregate will contain a large number of goods and services but only a few will be selected for pricing. These items are the ones whose price movements are believed to be representative of all the products within the elementary aggregate.

Elementary aggregates are usually calculated without the use of explicit expenditure weights as reliable weighting information is not usually available at such a low level. Weights are however implicitly introduced by the sampling process if items are selected with probabilities proportional to the size of some relevant variable for example, sales.

There are three main formulae used by statistical agencies in calculating elementary aggregates.

- The Carli index is the simple, unweighted arithmetic mean of the price ratios for the two periods.
- The Dutot index is the ratio of the unweighted arithmetic mean prices.
- The Jevons index is the unweighted geometric mean of the price ratio.

These formulae can be used to calculate month to month indices which show the change from one month to the next, chained monthly indices, which link together these month to-month changes by successive multiplication, or direct indices which compare the prices in each successive month directly with those of the reference month.

The choice of formula (a number are shown in Appendix 1) and method can make a substantial difference to the results obtained. The differences between the results obtained under the different formulae increase with the variance of the price ratios, therefore the greater the dispersion of price movements, the more important the choice of formula.

Another important consideration is the properties of arithmetic and geometric means (from basic descriptive statistics) i.e.

- The geometric mean is always less than or equal to the corresponding arithmetic mean.
- If any observation = 0, the geometric mean = 0.
- Geometric means require positive numbers as a single negative number can change the sign of the result.

In a direct elementary index the prices of the current period are compared directly with those of the price reference period. In a chain index, prices in each period are compared with those in the previous period, the resulting short-term indices being

chained together, by successive multiplication, to obtain the long-term index. Another important property of an index is transitivity i.e. the equality of the chained monthly indices and the direct indices. Any index formula calculated as the ratio of average prices will be transitive as successive numerators and denominators will cancel out, leaving only the average price in the last period divided by the average price in the reference period. The Dutot and Jevons indices are therefore transitive but the Carli is not.

The next step in the process of construction is the combination of elementary aggregates to form higher level aggregates. Most statistical offices make use of some kind of derivation of the Laspèyres and Paasche indices.

When the quantities are those of the price reference period, the Laspeyres index is obtained. When quantities are those of the current period, the Paasche index is obtained. The Laspèyres and Paasche indices are both transitive.

4. THE CONSUMER PRICE INDEX IN SOUTH AFRICA

Statistics South Africa publishes three main indices on a monthly basis (Vink et al, 2002). They are:

- CPI – prices for all goods and services in main metropolitan areas;
- Core CPI – excludes volatile and regulatory priced items to give a better picture of inflationary pressures in the economy; and
- CPIx – excludes rates on mortgage bonds and is used for inflation targeting.

Inflation targeting was adopted by the South African Reserve Bank in 2000 and the targeted range for CPIx was set at 3% to 6% (Aron et al, 2004).

The CPI is a chained Laspèyres index with weights derived from consumer expenditure surveys conducted at 5-year intervals. Statistics South Africa (StatsSA) has indicated the intention to move to a 3-year survey interval (StatsSA,2005).

Given processing delays, the 1990 weights were applied from August 1991 to December 1996, the 1995 weights from January 1997 to December 2001, and the 2000 weights from January 2002. For each period of roughly 5 years, the index takes the form:

$$\text{CPI} = \frac{\sum (P_{it}Q_{io})}{\sum (P_{io}Q_{io})}$$

Where P_{it} = Price of item i ($i = 1, \dots, m$) in period t

P_{io} = Price of item i ($i = 1, \dots, m$) in the base period

Q_{io} = Quantity of item i purchased in the base period

The CPI basket is classified according to the International Trade Classification (ITC) of 17 main groupings including medical care and health expenses (StatsSA, 2006).

The survey of consumer prices is a monthly survey covering a sample of retailers

operating in the South African economy. It is combined with price data obtained directly from insurance companies, electricity companies etc. to obtain prices for the Consumer Price Index (CPI). In 2004 StatsSA piloted a method of deploying price data collectors to observe and record prices at retail outlets (StatsSA, 2004).

The weighting system for the CPI is calculated from the Survey of Income and Expenditure of Households, last conducted in October 2000. The information obtained through this survey was re-weighted according to the 1996 Population Census figures in order to represent all households in South Africa. StatsSA conducts a Survey of Income and Expenditure of Households every five years, covering a sample of 30,000 households. In the year 2000 the survey collected information on approximately 1,000 different goods and services groups. Statistics SA made a further breakdown of these groups using supplementary sources. This process led to a list of approximately 1,500 groups on which the current calculation of the CPI is based.

The Survey of Retail Prices is a retail trade and service outlets sample survey covering prices of selected consumer goods and services sold to consumers in the 14 metropolitan and 39 other urban areas in the nine provinces. Currently, an average of 110,000 price quotations are collected each month from approximately 2,200 outlets by means of 6,700 questionnaires. The indices are based on retail trade and service prices. Price information refers to the first seven days of the relevant month. The collection of prices depends on the frequency at which these prices tend to change (Vink et al, 2002).

Statistics agencies in many countries assume that although price levels differ between rural and urban areas, the movements of the price levels in urban areas adequately reflect the movement of prices in the rural areas. The South African situation is however somewhat different with quite a large proportion of our country being rural. The magnitude of this rural population implies that such an assumption might result in too gross an inaccuracy. StatsSA therefore publishes separate 'rural areas' and 'total country' CPIs (Haglund, 2000).

The use of fixed weights over a period of five years is cause for concern, as consumer spending patterns are changing more and more rapidly, especially in South Africa, as opportunities for economic growth are still being opened up to the majority of the population that was previously denied equal access opportunities. There has been an increasing awareness, globally, of the need to update weights more frequently, with some countries conducting HESs continuously and updating weights annually.

The medical care and health expenses component of CPI had a weight of 5.95% in 1995 (Haglund, 2000). This includes

- Doctors' fees (1995 weight 2.69%)
- Hospital fees (1995 weight 0.72%)

- Medical and pharmaceutical products (1995 weight 1.18%)
- Therapeutic appliances and equipment (1995 weight 0.12%)
- Contributions to medical aid funds (1995 weight 1.24%)

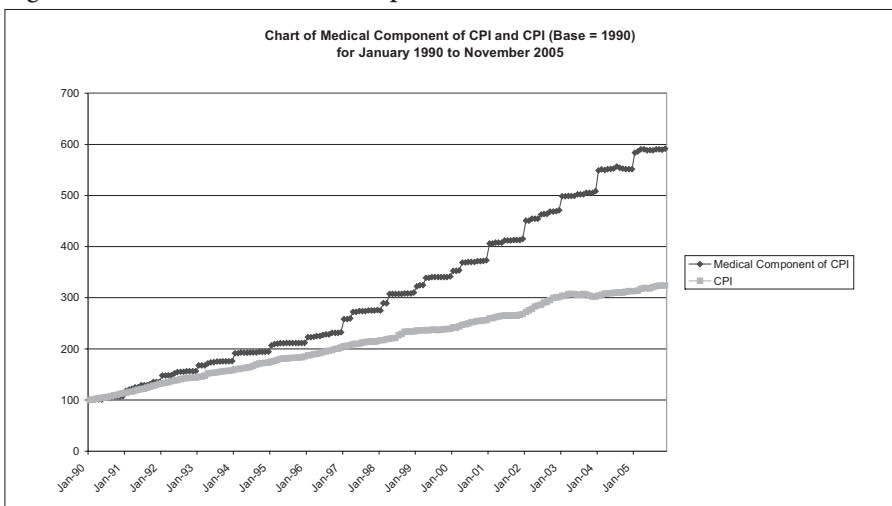
Doctors' and dentists' fees are surveyed annually in January. It appears that this is done with reference to tariffs published by regulators and professional bodies rather than by assessing actual charges to patients. Hospital fees are surveyed in January and in July. Day rates for different types of rooms (ward, single room) are collected (prices charged are independent of the kind of medical treatment). Prices for medicines are collected in January and in June based on a basket of items.

Approximately 15% of the South African population are covered by medical schemes. Contributions may be charged on the basis of income and the number of dependants only. The schemes reimburse medical expenses according to a defined benefit schedule that may include financial limits and co-payments. The CPI weight for doctors' fees, hospital fees and medicine relate to household expenditure less reimbursement benefits from medical schemes since the contributions to medical schemes are included separately.

Figure 1 illustrates the rate of change in the medical component of CPI compared to the total CPI over the period 1990 to 2005 (for historical metropolitan areas) as published by StatsSA.

From 1990 to 2004, the prices of medical products increased on average 4.5% faster than the overall CPI inflation rate. Some of this is ascribed to the cost of imported medicine over a period when the Rand was depreciating (Aaron et al, 2004).

Figure 1: CPI and the medical component of CPI



The increase in the prices of medical services was also consistently higher than CPI from 1989 onwards. This is attributed to the privatisation of some hospitals and clinics and the increase in medical scheme contributions (Aaron et al, 2004).

The step wise shape of the medical component of CPI can be ascribed to the influence of the annual increases in tariffs for doctors', dentists' and hospital fees and medical scheme contributions which tend to take effect on 1 January of each year.

5. A MEDICAL PRICE INDEX

5.1 Development of a medical price index

One of South Africa's largest medical scheme administrators commissioned the development of a medical price index (MPI) for South Africa in 2003. The index was intended to track the changes in the prices paid for medical goods and services by members of the schemes administered by the sponsor of the study. It was not the intention to suggest that this would be representative of the experience of either the medical scheme population or the private healthcare sector as a whole. It was hoped that the development of this fairly focussed index (from the perspective of the population covered) would lead to the development of an expanded data pool (if the usefulness of the outcome gave others the incentive to contribute data) and a more representative result.

The MPI is based on a subset of the total claims of all members on schemes administered by the sponsor for treatment dates from January 2001 to November 2005. The subset consists of baskets of claims derived from three sets of total claims extracts:

- Hospital;
- Medicine; and
- Other (all remaining services providers and claim types).

5.2 Data used

For the purpose of the MPI development, frequency is measured as the number of "hits". For hospitals, a hit is a hospital admission (also referred to as a hospital event) in order to address the technological development challenge noted in section 2 above. For medicines, a hit is a prescribed item. For other service providers a hit is a claim line (usually associated with a tariff code).

Tariff codes in South Africa are regulated by the Department of Health and a National Health Reference Price List (NHRPL) is published annually. Prior to 2006, tariffs were published by the South African Medical Association (SAMA) and the industry body of the medical schemes, the Board of Healthcare Funders (BHF).

Medication is coded with NAPPI (National Pharmaceutical Product Interface) coding which is a coding standard in the public domain for surgical products, ethical products (prescribed medication) and consumables.

Since all the claims data was available from the sponsor's administration system, it was not necessary to conduct an expenditure survey but rather to define a methodology for analysing a manageable and representative subset of data. This was done by identifying the most frequently used tariff codes and defining a basket of codes for each service provider category. The items included in each basket are based on hits (approximately 70% for medicines and 80% of hits for hospital and other service providers and claim types).

The sponsor confirmed the following regarding the claims information used for the development of the MPI:

- The data table is updated regularly;
- The data excludes any duplicate claims; and
- The claimed amount includes claims at SAMA tariff.

The claimed amount (rather than the benefit amount) was used to obtain a better indication of rates actually charged by the service providers and the SAMA tariff (up to 2005) was the maximum charge guideline.

To assist with the definition of the sub-groups of the MPI, the sponsor also provided:

- Practice type categories: grouping of practice types into categories.
- Hospital categorisation of tariff codes: tariff codes used by hospitals.
- List of tariff codes and their descriptors.

As a fairly arbitrary retrospective check, it was deemed desirable by the development team that the data used for the MPI covered at least 50% of the total claimed amount for the period. This check aimed to ensure that low frequency, high cost tariff codes were not omitted threatening the representativity of the results. This level of data included is significantly higher than that resulting from expenditure and pricing surveys in the CPI calculation process.

5.3 Calculation process

The MPI has been calculated using a chained Laspèyres approach to index calculation. This was done by establishing the baskets of items per practice type (service providers) as described above. The items included were determined according to:

- a. The top 80% of tariff codes by frequency, claimed by each service provider category over the period 2002 to 2004.
- b. For medicines, the top 70% NAPPI codes by frequency, claimed for chronic and acute medication over the period 2002 to 2004.
- c. Hospital facility costs categorised into sub-baskets (ward fees, theatre fees, ethicals (medicines), surgical and non-surgical consumables, and other hospital facility costs). For each sub-basket the top 80% tariff codes, by frequency claimed in private hospitals were included. The hospital facility costs exclude specialist

consultation and procedural costs – these are allocated to the specialist basket described in (a) above.

The 2001 data was distorted by tariff code adjustments and so it was not used for the purpose of defining the baskets.

The average amount claimed per practice type per month for each of the items included in the basket was calculated. Claimed amounts (rather than benefit amounts paid) were used to remove distortions due to benefit design and utilisation influences as far as possible.

The costs per MPI category were rolled up using frequency weightings. When determining the weighting in most cases, the average frequency over the three year period (2002 to 2004) was used. In a number of cases annual weightings were used to allow for the introduction of new codes. A chain-linking methodology was employed to ensure that no distortions were created.

The chain-linking methodology involved calculating the index value in the month where the change was to take effect using the historic weights and the new weights. The former is used to assess the rate of change over the previous period and the latter for the rate of change to the subsequent period.

By using chain-linking, the index is not distorted at the time the basket is changed. The index is only affected by a change in constituents to the extent that the new (or removed) constituents showed different rates of inflation to the index as a whole.

The MPI is reported at the following five major category levels:

- General Practitioners (GPs);
- Specialists;
- Hospitals;
- Medicine; and
- Other service providers.

During the construction of the baskets it was found that a number of items showed significant changes in their contribution towards the baskets over the period. Some examples of these are:

- Consultation codes for general practitioners and specialists changed from a flat cost per consultation to time based consultation fees during the development period.
- Contracts with hospitals implemented during 2002 meant that a sub-set of the hospitalisation basket had to be introduced. This was introduced using a chain-linking methodology.

Some other adjustments that were required were:

- Some auxiliary and other practice types were excluded to reduce volatility. These practice types made up less than 7% of total amount claimed.
- Hospital drug and surgical data was not accurately captured at the time of claims

capture as items were aggregated in the hospital bill. To overcome this problem, baskets of drugs and surgicals were created based on samples of data provided by the hospital groups. The prices were tracked using a price file provided by the service provider.

The adjustments were required to ensure that the index reflected price changes rather than changes in charging mechanisms.

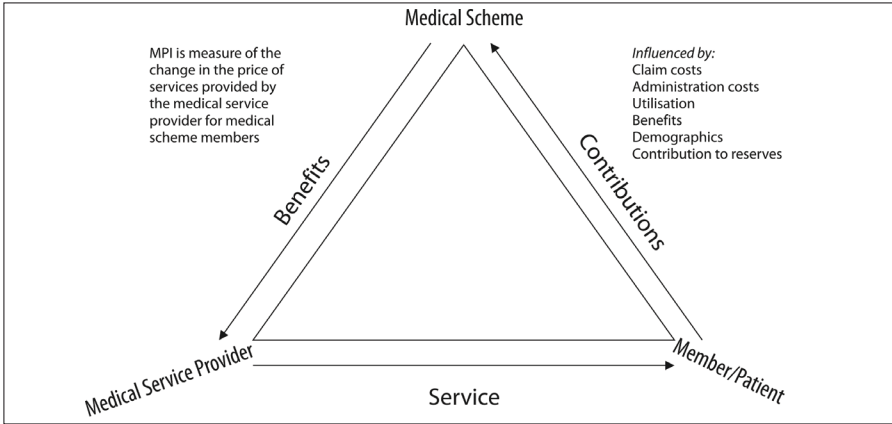
5.4 Application of the MPI

The following principles were adopted in the development of the index and it is important that they are taken into account in interpreting the results:

- The MPI is intended to be an objective measure of price inflation and is independent of benefit structures, demographic changes of members on the medical schemes as well as changes in utilisation.
- The MPI is intended to be used to compare inflation in the cost of services to various other financial indicators such as the Consumer Price Index (CPI), the Medical component of CPI and the exchange rate against different currencies.
- The MPI aims to track price changes (not utilisation) so care should be taken when comparing to medical scheme contribution increases which are affected by factors such as benefit changes, utilisation changes, legislative changes and requirements, contributions to reserves and demographic changes.
- The data used for the MPI is based on the amount claimed rather than the amount paid in order to remove distortions due to differences in benefits. This further distances the link between the MPI and contributions.
- The weightings per category and item are fixed and reviewed annually, so technology changes and changes in medical practice may influence the various index components with a lag.
- As the items are only added when utilisation reaches a significant enough level, the impacts of new technology will not be included immediately.
- The MPI is based on medical scheme data and therefore does not include factors such as public health care and expenses paid directly by consumers.

The MPI is a measure of the change in the price of medical services claimed by members of the included schemes and service providers (e.g. the doctor, hospital) in respect of these members. These medical service costs are in respect of services that are provided by the medical service provider to the medical scheme beneficiary. The member pays a contribution to the medical scheme so that the member and his/her dependants have medical cover.

The diagram below was compiled to illustrate the factors that influence rate of change in medical scheme contributions in addition to the changes in the prices of medical goods and services (that is measured by the MPI).



The MPI does not include the impact of:

- administration costs (costs that the medical scheme incurs for administration);
- utilisation changes (increase or decrease in the use of services);
- case mix (changes in the way in which services are provided);
- benefit structures (such as limits and exclusions);
- demographics (such as age, gender, family size); and
- contribution to reserves (required to maintain solvency levels).

These factors do however influence medical scheme contribution increases.

5.5 Comparison to Medical Component of CPI

At the time of writing, the medical component of CPI contributed 7.15% to the overall CPI for historical metropolitan areas (StatsSA, 2006) and consisted of the following products:

	% weighting CPI	% of Medical Component of CPI basket
Doctors fees, nurses fees and fee for related services	2.29%	32%
Hospital, nursing-home fees and fee for related services	0.64%	9%
Medical and pharmaceutical products	2.61%	37%
Therapeutic appliances and equipment	0.16%	2%
Contributions to medical aid funds	0.98%	14%
Insurance	0.47%	7%
Total: Medical care and health expenses	7.15%	100%

The prices of these items are surveyed (Haglund, 2000):

- For medicines in January and June annually;
- Doctors and dentists annually;

- Hospitals twice a year (January and July); and
- Contributions to medical aid three times a year (January, April and July).

The insurance item relates to health insurance products sold by proprietary insurers (such as dread disease and hospital cash products). These products provide cover for health-related contingencies on a defined benefit basis as indemnification of medical expenses may only be covered through medical schemes.

The prices of the goods and services included are inclusive of VAT. Medical scheme claims are also exclusive of VAT as a medical scheme cannot recover VAT charged. Some of the features that distinguish the medical component of CPI from the MPI described in this paper are:

- The medication items included in the medical component of CPI are not calculated at the NAPPI code level;
- Consultation fees at NHRPL tariff are used for the medical component of CPI (rather than the amount actually charged by the service provider);
- Medicine prices are surveyed from a sample of pharmacies while the MPI includes the cost of all items (included in the basket) for which claims were submitted;
- Only the contribution to medical schemes is used, rather than any reference to claim costs (this includes the administration costs and reserve loadings and the impacts of benefit and utilisation changes);
- The most popular option of a medical scheme is used for the contribution rate;
- The MPI does not include on data on health insurance claims (only medical scheme claims).

The MPI is based purely on the claims experience of the members on medical schemes administered by the sponsor. The claims have not been adjusted for any changes in benefits but the claimed amount has been used to reduce the impacts of any benefit changes. Using pure claims experience to determine the MPI causes fluctuations as the claims include a number of factors (for example negotiated fees) that cause the average cost per hit to vary.

The medical component of CPI is based on flat rates (provider fees per the NHRPL tariffs). The result is a more “stable” curve that increases step wise and has few peaks. The weightings used by Statistics South Africa may need to be revised as the time based consultation fees become more widely used.

The weightings of MPI and the medical component of CPI baskets (as measured in hits rather than amounts) are shown in the following table.

Note that hospitals make up a small portion of the basket by frequency in each case as hospital events are used to count frequency, as opposed to claims lines which are used to count frequency for other categories. As a result the average cost per claim for hospitals is relatively higher than the other categories. This ensures that the weighting of hospitals in the MPI reflects the relative spend on hospitals. The

effective MPI weightings of each category are included in Appendix 2. These effective weightings refer to the share of total Rand costs rather than the proportion of hits.

At November 2004	MPI	Medical component of CPI
General Practitioners	14%	33%
Specialists	28%	
Other providers	13%	
Hospitals	9%	9%
Medicines	36%	37%
Contributions to medical aid funds	Not included	14%
Insurance	Not included	7%
Total	100%	100%

The MPI does not take into account contributions to medical schemes (21% of medical component of CPI).

6. SOME RESULTS

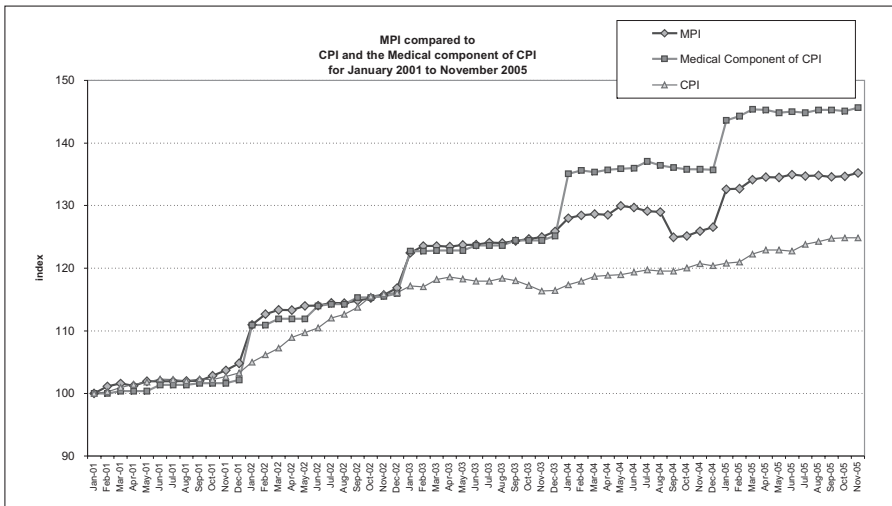
6.1 Overall MPI

The table below shows the annual increases per service provider category for each year included in the data provided. Year on year medical price inflation has been consistently higher than consumer price inflation but has varied significantly by service provider category. Price reductions in the medicine categories have reduced the overall index offsetting higher increases in the GP and specialist categories. The annual inflation figures for the main MPI categories are as follows:

	2001 to 2002	2002 to 2003	2003 to 2004	2004 to 2005
GPs	17.2%	10.4%	9.5%	33.0%
Specialists	7.2%	11.1%	10.5%	13.2%
Diagnostic specialists	4.9%	7.1%	7.0%	5.2%
Hospital overall	17.4%	11.3%	3.7%	5.0%
Medicine – Chronic	7.7%	3.5%	-3.2%	-4.0%
Medicine – Acute	10.7%	3.9%	-6.0%	-7.5%
MPI overall	11.7%	8.4%	4.2%	5.2%
CPI	9.2%	5.8%	1.4%	3.4%
Medical component of CPI	12.4%	8.9%	9.9%	6.7%

The comparison to the medical component of CPI is complicated by movements in specific components of the MPI discussed below. The overall MPI does not exhibit the step wise function to the same extent as the medical component of CPI because of the monthly price calculations, particularly of medication. The changes in the

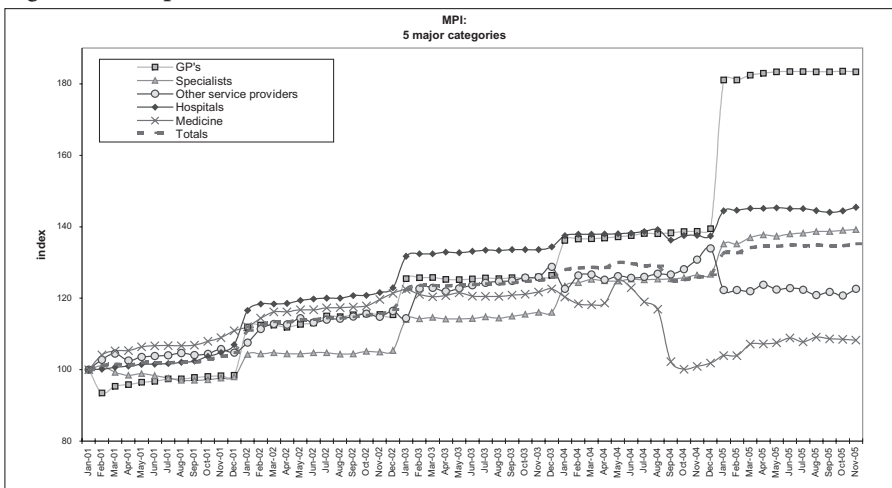
Figure 2: MPI results compared to CPI and the medical component CPI



regulation of medicine prices (described below) contributed to the significant deviation in the MPI from the medical component of CPI from 2004.

Figure 3 illustrates the significant variation in price trends experienced by the different service provider categories under the MPI. These are described in more detail in the following sections.

Figure 3: Components of MPI



6.2 General Practitioners and Specialists

The GP component exhibits a step wise function reflecting the annual adjustment to tariffs on 1 January of each year. GPs received an average price increase into 2005 of 33%, mainly on consultations. This extraordinary increase was the combined effect of a 17% increase in 2005 NHRPL GP rates and a specific premium over the NHRPL rate in the order of 16% granted by medical schemes administered by the sponsor.

The specialists component also exhibits a step wise function but with lower increments than the GPs. Specialists were also affected by the higher increases at the beginning of 2005, but to a much lesser degree (as consultation codes are a much smaller portion of specialist spend).

6.3 Hospitals

The hospital component of the MPI exhibits a step wise function which appears to flatten out in 2003 to 2004. Hospitals show the highest cumulative price increases over time (ignoring the additional 2005 GP increase). This is mainly due to a relatively high increase in January 2003. Real increases have slowed somewhat over time.

Figure 4 shows the break down of the hospital component into its sub-categories. The ward fees show step ups at the beginning of each year as a result of tariff changes. This has been offset by a flattening in surgicals and theatre fees. The reduction in prices for non-surgical consumables in August 2004 is associated with the introduction of Single Exit Price (SEP) for medication (described in 6.4 below) which led to a shift in the tariff structure for hospitals.

Rebates on ethicals were effectively transferred into tariff prices to compensate hospitals for potential lost profit. Surgical prices continued to increase since they do not fall under SEP regulation.

Increases per year for each category are shown below

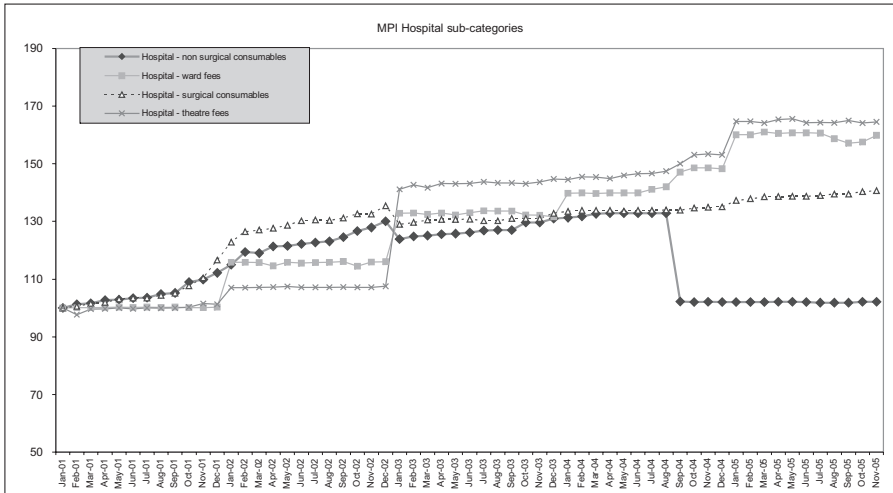
	2001 to 2002	2002 to 2003	2003 to 2004	2004 to 2005
Ethicals	17.4%	3.6%	-1.8%	-17.9%
Ward Fees	15.4%	15.0%	7.1%	12.2%
Surgicals	24.4%	1.0%	2.7%	3.7%
Theatre Fees	7.3%	33.3%	3.3%	11.5%

6.4 Medicines

The medicine MPI shows a steady upward trend to the end of 2002. It then appears to flatten out with a sharp drop from May to September of 2004 where after the upward trend continues.

The regulation of medicine prices was introduced in May 2004 with the publication of Single Exit Prices (SEP) by the Department of Health. Court action by

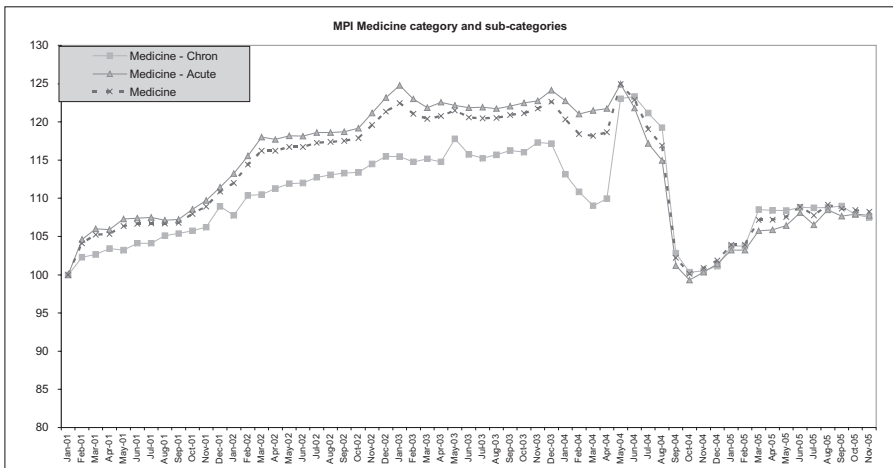
Figure 4: Hospital MPI



pharmacists relating to the dispensing fee regulations over the period May to September 2004 delayed the full implementation of the SEPs until September/October 2004.

The price of chronic drugs increased generally slower than acute drugs. Chronic and acute medicines were impacted differently by SEP, mainly due to the difference in the mix of brand and generic drugs (acute drugs are more heavily weighted to generic drugs, which had deeper rebates on average). Single exit prices of chronic

Figure 5: Medicine MPI



drugs dropped very little (due to lower rebates on average) while dispensing fees increased sharply (as pharmacists compensated for lost profits on all dispensed medicines). Mark-ups of over 40% during the interim period of SEP rollout (May to September 2004) were not uncommon. Acute medicine also experienced sharp increases in dispensing fees during this interim period, but this was evened out by a sharper drop in exit prices. Once dispensing fees were regulated both chronic and acute medicine prices dropped sharply (9% and 17% respectively for the last quarter of 2004 compared to the first quarter of 2004).

Another interesting point is the drop in chronic medicine prices at the beginning of 2004. This corresponds to the introduction of a chronic medicine formulary by the sponsor. Subsequent to the introduction of the formulary the prices of certain key chronic drugs were reduced, compounding the reduction effect.

6.5 Measuring utilisation

For the purposes of comparison to the MPI, the sponsor also developed an index of claim costs experienced by members of the schemes. This required adjustment for:

- changes in the age profile of the covered population;
- changes in the prevalence of chronic conditions;
- changes in the levels of benefits; and
- movement between benefit options.

These movements were specifically associated with the medical schemes administered by the sponsor and are therefore not included in this paper.

Considering the ratio between the medical cost index described above and the MPI gives an indication of changes in utilisation for each period considered.

7. CONCLUSION

The MPI presented in this paper has been developed with reference to the formulae used for CPI calculations internationally. The MPI describes the price changes experienced by the members of specific South African medical scheme members in respect of the medical expenditure (as submitted to the medical scheme). There is no other publicly available measure of trends in private health costs apart from medical scheme contribution increases.

An issue for consideration in the further development of the MPI is consideration of substitution, particularly generics as compared to brand name medicines. This also raises the issue of measuring changes in quality and healthcare outcomes associated with substitutions and medical technology developments. The MPI presented in this paper considers pure price changes without adjustments for quality.

Medical scheme contribution increases are also affected by factors other than the prices of medical goods and services such as changes in demographics, benefits and

reserving requirements. It is hoped that the presentation of these pilot results will demonstrate the potential usefulness of such an index and will stimulate further development work and the pooling of data for this purpose.

ACKNOWLEDGEMENTS

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APPENDIX 1 INDEX FORMULAE

Simple Aggregate Unweighted Index Formula

$$\text{Index} = \frac{\sum P_{it}}{\sum P_{io}} \times 1,000$$

Where P_{it} = Price of item i ($i = 1, \dots, m$) in period t
 P_{io} = Price of item i ($i = 1, \dots, m$) in the base period

Laspèyres Index

$$\text{Index} = \frac{\sum (P_{it}Q_{io})}{\sum (P_{io}Q_{io})} \times 1,000$$

Where P_{it} = Price of item i ($i = 1, \dots, m$) in period t
 P_{io} = Price of item i ($i = 1, \dots, m$) in the base period
 Q_{io} = Quantity of item i purchased in the base period

Laspèyres Price Relative Index Formula

$$\text{Index} = \frac{\sum E_{io} \frac{P_{it}}{P_{io}}}{\sum E_{io}} \times 1,000$$

Where P_{it} = Price of item i ($i = 1, \dots, m$) in period t
 P_{io} = Price of item i ($i = 1, \dots, m$) in the base period
 E_{io} = Expenditure on item i purchased in the base period
 $= P_{io}Q_{io}$

Paasche Index

$$\text{Index} = \frac{\sum (P_{it}Q_{it})}{\sum (P_{io}Q_{it})} \times 1,000$$

Where P_{it} = Price of item i ($i = 1, \dots, m$) in period t
 P_{io} = Price of item i ($i = 1, \dots, m$) in the base period
 Q_{it} = Quantity of item i purchased in period t

Fisher 'ideal' Index

$$\text{Index} = \sqrt{\text{Laspeyres index} \times \text{Paasche index}}$$

Marshall-Edgeworth Index

$$\text{Index} = \frac{\sum \{P_{it}(Q_{io} + Q_{it})\}}{\sum \{P_{io}(Q_{io} + Q_{it})\}} \times 1,000$$

Where P_{it} = Price of item i ($i = 1, \dots, m$) in period t
 P_{io} = Price of item i ($i = 1, \dots, m$) in the base period
 Q_{it} = Quantity of item i purchased in period t
 Q_{io} = Quantity of item i purchased in the base period

Tornqvist Index

$$\text{Index} = \prod \frac{P_{it}^w}{P_{io}} \times 1,000$$

Where P_{it} = Price of item i ($i = 1, \dots, m$) in period t
 P_{io} = Price of item i ($i = 1, \dots, m$) in the base period
 Q_{it} = Quantity of item i purchased in period t
 Q_{io} = Quantity of item i purchased in the base period

$$\text{and } w = \frac{P_{io}Q_{io}}{2 \sum P_{io}Q_{io}} + \frac{P_{it}Q_{it}}{2 \sum P_{it}Q_{it}}$$

APPENDIX 2

EFFECTIVE CONTRIBUTION OF DIFFERENT COMPONENTS

The index weight refers to the proportion of total hits while the total cost weighting relates to the product of hits and price to give the total spending per category.

MPI Components	Index weight				
	2005	2004	2003	2002	2001
General Practitioners	8%	8%	8%	10%	10%
Specialists	25%	25%	25%	25%	24%
Hospitals	30%	31%	30%	28%	29%
Medicine	26%	25%	25%	26%	26%
Other	11%	11%	11%	11%	10%
Totals	100%	100%	100%	100%	100%

MPI Components	Total cost weighting				
	2005	2004	2003	2002	2001
General Practitioners	8%	6%	6%	7%	7%
Specialists	25%	23%	22%	22%	21%
Hospitals	39%	43%	40%	39%	38%
Medicine	16%	17%	20%	21%	23%
Other	11%	12%	12%	12%	11%
Totals	100%	100%	100%	100%	100%

The “hit” is used as a measure of frequency. The difference in the average claim cost per hit across the categories means that the effective contribution to the total MPI is measured as the product of frequency and the average cost per hit i.e. the Total Cost Weighting.