"A revision of Chandra Sekar's decomposition method and its application to sex differentials in mortality in India"

By P.K. Murthy and

A.R.Gandhi

Extended Abstract

There are various indicators viz. Crude Death Rate, Age Specific Death Rate, Life Expectancy at Birth which reflect the mortality levels of a population. Of these, the life expectancy at birth is the most widely used indicator of overall health situation of any population. Over the time various techniques have been developed, which explain the contribution of various age groups to the change in life expectancy at birth. These techniques, known as techniques of decomposition of life expectancy at birth, help in understanding the contribution made by various age groups to the total change in life expectancy at birth over time or over population or over sexes. A number of methods of decomposition of LEB are available, but amongst them one suggested by Chandra Sekar (1949) seems to be the oldest, but could not gain popularity.

In 1949, Chandrasekaran (then Chandra Sekar) gave a method for decomposition of the life expectancy at birth so as to understand the contribution of various age groups to the total change in the LEB. Chandra Sekar defined four effects viz. Main Effect (ME), Operative Effect (OE), Effect Interaction Deferred (EID) and Effect Interaction Forwarded (EIF). According to Chandrasekaran (1986) the value of the Average Total Effect, say, obtained by averaging the Effect Interaction Deferred (EID) and the Effect Interaction Forwarded (EIF) is same as that of the value of the effect given by United Nations (1985) and also that of Pollard (1982).

The present paper proposes the averaging of the other two effects given by the Chandra Sekar (1949) method i.e. the Main Effect and the Operative Effect. The average of these two is referred to as Average Exclusive Effect. This average Exclusive Effect is found to be the same in definition as that of Exclusive Effect given by Arriaga (1984). And it is noticed to be the same as that of the Exclusive Effect given by the extended approach-3 to the Arriaga's (1984) method suggested by Murthy (2003). This Average Exclusive Effect (i.e. average of ME and OE) is also seen to be same as that of the Exclusive Effect given by the extended approach-3 to the Lopez and Ruzicka's (1977) method suggested by Murthy (2003). It has also been

shown by Murthy (2003) that the Exclusive Effect, obtained by the extension to the Lopez and Ruzicka's formulae, can be decomposed into Direct and Indirect Effects. These Direct and Indirect effect are same in definition to those given by Arriaga (1984). Thus looking at all the above, we can also decompose the Average Exclusive Effect, obtained by averaging the Main Effect and the Operative Effect given by Chandra Sekar (1949), into two effects namely, Direct and Indirect.

The above exercise thus shows very clearly that while the Chandra Sekar's (1949) original methodology is capable enough to give a range of variation for various effects, in its modified version it is also capable enough in producing the direct and the indirect effect, the exclusive effect, the interaction effect, and also the total effect which are same in definition to that of suggested by Arriaga (1984). In addition, Chandrasekaran's method in its modified version suggested by the present authors is seen to give the same total effect term as that of United Nations, Pressat, Pollard's and Andreev, etc.

Having done the revision in the method, the modified formulae are applied to the life table data for India, for the period 1993-97. The results of the analysis indicates an urgent need to reduce the female childhood mortality in selected states of India in order to improve the life expectancy at birth of India as a whole. The revised method has an advantage over the previous method, as it more precisely gives the contribution of various age groups to the overall change in Life Expectancy at Birth. The authors further suggest the use of exclusive effect term as an alternative to the United Nations (1985) formula as it is free from the total interaction effects, which of-course are very negligible by fact. We may state that Chandrasekaran's revised methodology may be considered as an extension of the famous United Nations (1985) method to give the direct, indirect, exclusive, interaction and total effect terms as that of Arriaga's (1984) and that of Lopez and Ruzicka's (1977) in their extended versions as suggested by Murthy (2003)