

## NOTE

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# AVOIDABLE MORTALITY MEASURED BY YEARS OF POTENTIAL LIFE LOST (YPLL) AGED 5 BEFORE 65 YEARS IN KYRGYZSTAN, 1989–2003

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### ABSTRACT

There is considerable willingness in the entire medical society of Kyrgyzstan, which was directly involved in the reform process, to obtain reliable information about changes in population health that have occurred in the last decade, as well as about changes in mortality, which is the basic component of population health. The objective of this paper is to introduce the Year of Potential Life Lost (YPLL) in Kyrgyzstan caused by avoidable mortality in the population between 5 and 65 years of age during 1989-2003, and to provide a basis for setting the priorities for the reducing YPLL in the coming years. YPLL was calculated using data from the annual mortality tables according to causes of deaths and age for 1989, 1996, 1999 and 2003. YPLL is defined as the summation of the difference between 65 years of age and the age at death from the age of 5 and before 65. In 2003, the total number of YPLL due to avoidable mortality among those who died was 216,860, which represents a decline of 5.0% in comparison with 228,266 in 1989. During the study years, the largest proportion of YPLL in the population between 5 and 65 years of age resulted from injury and poisoning. In 2003, this proportion represented 41.5% of the total amount of YPLL due to all the causes studied here, followed by infections and parasitic diseases (12.0%), circulatory disturbance of the brain (11.5%), chronic liver diseases and cirrhosis (11.4%), diseases of the respiratory system (9.2%), and malignant neoplasm of the upper airways and digestive tract (4.6%). The decline in avoidable mortality caused by injury and poisoning, infections disease, malignant neoplasm of the female breast and uterus has to be priority-driven direction for developing Health Policy in the coming years in Kyrgyzstan. Attention also has to be given to reducing of avoidable mortality caused by malignant neoplasm of the female breast by implementing screening programs.

Key Words: Avoidable mortality, YPLL, Cause of death, Kyrgyzstan

### INTRODUCTION

Avoidable mortality is a concept that was proposed by Rutstein *et al.*<sup>1)</sup> who created a list of conditions that were considered either treatable or preventable given current medical knowledge and technology.<sup>2)</sup> The other important issue is that most potentially avoidable mortality occurs in the group between 5 and 65 years of age. Deaths during this period of life due to avoidable causes lead to painful bereavement for the family and for society at large.<sup>3)</sup> There are a variety of methodological tools for the assessment of mortality, and among them the Years of Potential Life Lost (YPLL) provides a very accurate picture of avoidable mortality by weighting deaths

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occurring at younger ages more heavily than those occurring in the older population. Thus, the objectives of the present study are the following: the first, to calculate YPLL in Kyrgyzstan caused by avoidable mortality in the population between 5 and 65 years of age in following years 1989, 1996, 1999 and 2003, and the second, to provide a basis for setting priorities for the reduction of YPLL in the coming years.

## MATERIALS AND METHODS

The annual death tables with the number of deaths aggregated by cause of death and age at death were from the National Statistics Committee. The collecting and processing of death data in Kyrgyzstan are based on the completion of a death certificate with further civil registration. The registered death data for 1989, 1996, 1999, and 2003 were used in this study. These years were chosen for the following reasons: 1989 was the year characterized by social and economic

**Table 1** Categorizations of causes of avoidable mortality

<b>Cause of death</b>	
<b><i>Group 1 Causes of deaths avoidable through primary prevention</i></b>	
1	Malignant neoplasm of upper airways and digestive tract (C00-C26) <sup>a)</sup>
2	Malignant neoplasm of the trachea, bronchus, and lung (C30-C34)
3	Circulatory disturbance of the brain (I60-I69)
4	Chronic liver diseases and cirrhosis (K70-K77)
5	Injury and poisoning (S00-T98)
<b><i>Group 2 Causes of deaths avoidable through early detection and treatment</i></b>	
6	Malignant neoplasm of skin (C34-C44)
7	Malignant neoplasm of female breast (C55)
8	Malignant neoplasm of uterus (C53-C55)
<b><i>Group 3 Causes of deaths avoidable through improved treatment and medical care</i></b>	
9	Infectious and parasitic diseases (A00-B99)
10	Hodgkin's disease (C81-C85)
11	Leukemia (C91-C95)
12	Chronic rheumatic heart diseases (I05-I09)
13	Hypertensive diseases (I10-I15)
14	Diseases of respiratory system (J00-J99)
15	Gastric and duodenal ulcer (K25-K28)
16	Appendicitis (K35-K38)
17	Abdominal hernia (K40-K46)
18	Cholelithiasis or other gallbladder disorder (K80-K83)
19	Maternal mortality (O00-O99)

<sup>a)</sup> International classification of diseases and related health problems, 10<sup>th</sup> revision, WHO, 1994

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tensions related to the status of Kyrgyzstan as for other republics of the former Soviet Union; in 1996, the Comprehensive Health Care reforms intended to enhance the primary health care were begun; 1999 was chosen as an intermediate year between 1996 and 2003; and 2003 was the most recent year for which death data were available at the time of this study. Table 1 lists the causes of avoidable mortality used in this study. This list was adopted from the list proposed by Simonato *et al.* in 1998.<sup>4)</sup> All of the data on deaths that occurred in the population between 5 and 65 years of age, according to the death cause list mentioned above, were extracted from annual death tables for 1989, 1996, 1999 and 2003.

The first group of causes includes those whose etiology is in part attributable to lifestyle factors such as poor nutrition, limited physical activity and exercise, smoking, and overuse of alcohol. This group also includes deaths caused by injury and poisoning, which are influenced in part by legal and societal measures taken to improve daily life such as traffic safety and the control of illegal alcohol production. The second group is composed of causes that are amendable to secondary prevention through early detection and treatment. This group includes tumors of the breast and cervix. The third group includes causes that are amendable to improved treatment and medical care. Mortality from infectious diseases is affected in large part by antibiotic treatment and vaccinations as well as by cleaner water and food supplies, which are the main determinants of a decline in the number of deaths. The network of interactions within the health care system, such as accurate diagnoses, transportation to the hospital, and adequate medical and surgical care, is the key to decreasing the number of avoidable deaths caused by hypertension, ulcer, hernia and cholelithiasis.

YPLL is defined as the summation of difference between 65 years of age and the age at death, this definition has been used by the Centers for Diseases Control and Prevention (Atlanta, USA) for the assessment of premature mortality in the USA for many years.<sup>5)</sup> YPLL is calculated for all causes of deaths listed in Table 2. To achieve comparability among the YPLL values for the different study years, the values for 1989, 1996, and 1999 were adjusted by multiplying them by a constant of population growth, since the population increased gradually from 1989 to 2003.

## RESULTS

In 2003 the total amount of YPLL due to avoidable mortality in the population between 5 and 65 years of age was 216,860, which represented a decline of 5.0% compared with 228,266 in 1989. These YPLL values are presented in Table 2.

### *YPLL in group one*

In 2003, the YPLL in group one was 152,630, which represented an 8.8% decline from 167,270 in 1989. The lowest YPLL observed was 147,392 in 1999. In group one, the number of YPLL declined among causes of deaths from malignant neoplasm of the upper airways and digestive tract; malignant neoplasm of the trachea, bronchus and lung; and injury and poisoning. Thus, in 2003 YPLL caused by malignant neoplasm of the upper airways and digestive tract was 9,965, which represented a decline of 29.2% compared with YPLL in 1989, and a decline of 17.8% compared with the 1996 YPLL. YPLL due to malignant neoplasm of the trachea, bronchus and lung decreased from 6,608 in 1989 to 3,060 in 2003, representing a decline of 53.7%. In 1996, YPLL due to this malignant neoplasm was 3,593, which showed a decline of 14.8% by the year 2003.

YPLL caused by injury and poisoning declined from 115,372 in 1989 to 89,940 in 2003 by 22.0%, while the value was 102,890 in 1996, which showed a decline of 12.6% by 2003.

Table 2 Avoidable YPLL<sup>b)</sup> based on deaths in the population between 5 and 65 years of age in Kyrgyzstan

Causes of death	1989		1996		1999		2003		% change between years		
	YPLL per 1000 population	YPLL	% change from 1989 to 2003	% change from 1996 to 2003	% change from 1999 to 2003						
<b>Group 1 Causes of death avoidable through primary prevention</b>											
1 Malignant neoplasm of upper airways and digestive tract	14,073	3.3	12,118	2.9	10,475	2.47	9,965	2.5	-29.2	-17.8	-4.9
2 Malignant neoplasm of trachea, bronchus and lung	6,608	1.6	3,593	0.8	3,287	0.8	3,060	0.8	-53.7	-14.8	-6.9
3 Circulatory disturbance of the brain	21,201	5.0	28,209	6.6	27,572	6.5	24,975	6.2	17.8	-11.5	-9.4
4 Chronic liver diseases and cirrhosis	10,016	2.4	15,606	3.7	15,319	3.6	24,690	6.1	146.5	58.2	61.2
5 Injury and poisoning	115,372	27.2	102,890	24.2	90,740	21.4	89,940	22.3	-22.0	-12.6	-0.9
subtotal	167,270		162,416		147,392		152,630		-8.8	-6.0	3.6
<b>Group 2 Causes of death avoidable through early detection and treatment</b>											
6 Malignant neoplasm of skin	483	0.1	441	0.1	436	0.1	310	0.1	-35.9	-29.7	-29.0
7 Malignant neoplasm of the female breast	1,976	0.5	2,215	0.5	2,330	0.5	2,400	0.6	21.4	8.3	3.0
8 Malignant neoplasm of the uterus	1,799	0.4	2,551	0.6	2,061	0.5	2,400	0.6	33.4	-5.9	16.4
subtotal	4,259		5,208		4,828		5,110		20.0	-1.9	5.9
<b>Group 3 Causes of death avoidable through improved treatment and medical care</b>											
9 Infectious and parasitic diseases	14,825	3.5	21,888	5.2	27,167	6.4	26,090	6.5	76.0	19.2	-4.0
10 Hodgkin's diseases	1,933	0.5	1,179	0.3	2,182	0.5	860	0.2	-55.5	-27.1	-60.6
11 Leukemia	2,925	0.7	2,948	0.7	2,803	0.7	2,115	0.5	-27.7	-28.3	-24.5
12 Chronic rheumatic heart diseases	2,215	0.5	667	0.2	2,067	0.5	4,755	1.2	114.7	613.1	130.1
13 Hypertensive diseases	4,430	1.0	1,725	0.4	2,671	0.6	2,175	0.5	-50.9	26.1	-18.6
14 Diseases of respiratory system	24,291	5.7	27,102	6.4	23,301	5.5	19,940	4.9	-17.9	-26.4	-14.4
15 Gastric and duodenal ulcer	1,634	0.4	2,199	0.5	1,741	0.4	990	0.2	-39.4	-55.0	-43.1
16 Appendicitis	275	0.1	265	0.1	153	0.0	0	0.0	-100.0	-100.0	-100.0
17 Abdominal hernia	159	0.0	44	0.0	536	0.1	15	0.0	-90.6	-66.0	-97.2
18 Cholelithiasis or other gallbladder disorder	1,621	0.4	2,033	0.5	3,466	0.8	255	0.1	-84.3	-87.5	-92.6
19 Maternal mortality	2,429	0.6	1,141	0.3	331	0.1	1,925	0.5	-20.8	68.8	481.0
subtotal	56,738		61,191		66,418		59,120		4.2	-3.4	-11.0
Total amount of YPLL	228,266	53.2	228,814	53.7	218,637	51.4	216,860	49.9	-5.0	-5.2	-0.8

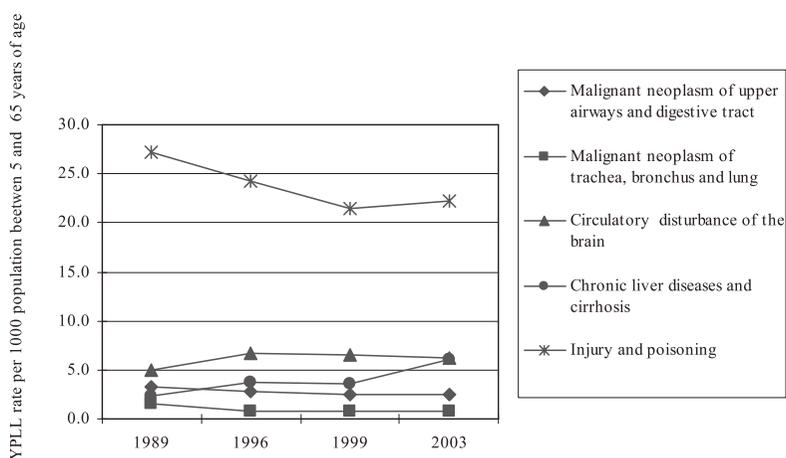
<sup>b)</sup>YPLLs for 1989, 1996 and 1999 are adjusted to the population between 5 and 65 years of age in 2003.

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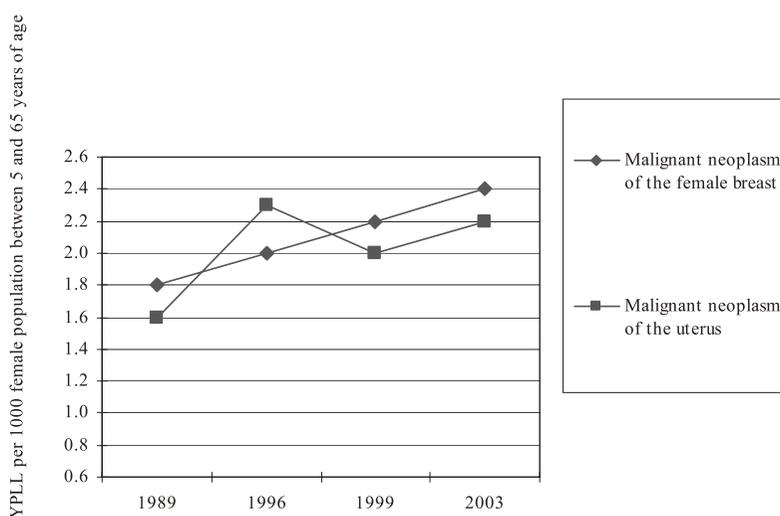
A considerable increase was revealed in YPLL caused by chronic liver diseases and cirrhosis, the YPLL value being 10,016 in 1989, while it was 24,690 in 2003, which represented a 2.5-fold increase; the 1996 YPLL was 15,606, and had increased to 58.2% by the year 2003. YPLL caused by circulatory disturbance of the brain was 24,975 in 2003, which represented a decline of 11.5% compared with that in 1996; however, this value was still higher than that of 21,201 in 1989. These historical trends are shown in Fig. 1.

*YPLL in group two*

In group two, YPLL due to malignant neoplasm of the female breast increased from 1,976 in 1989 to 2,400 in 2003 by 21.4%, while the YPLL in 1996 was 2,215, for an increase from



**Fig. 1** Trends of YPLL rate per 1000 population between 5 and 65 years of age in group one



**Fig. 2** Trends of YPLL rate per 1000 female population between 5 and 65 years of age in group two

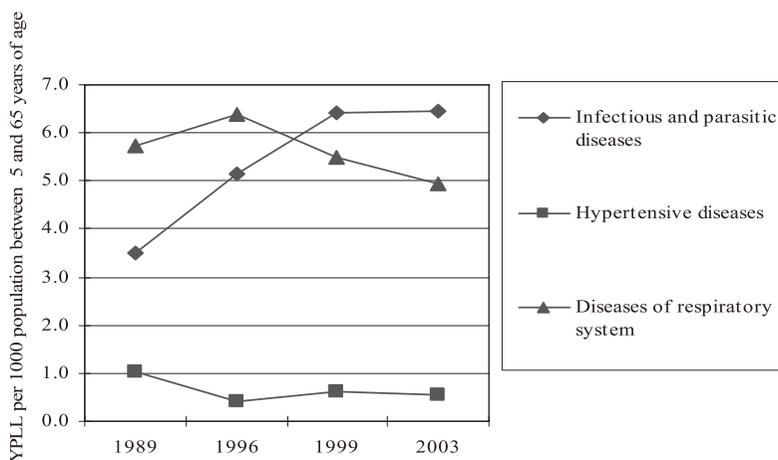


Fig. 3 Trends of YPLL rate per 1000 population between 5 and 65 years of age in group three

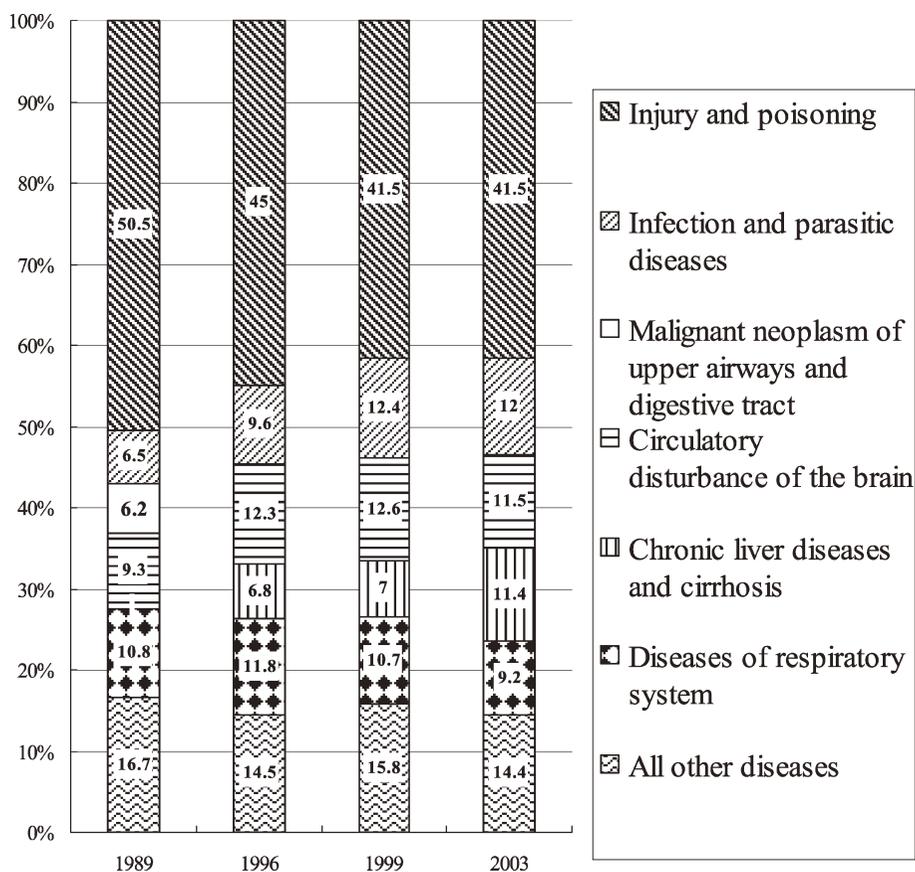


Fig. 4 Percentage distribution of leading YPLL caused by avoidable mortality in population between 5 and 65 years of age

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1996 to 2003 of 8.3%. YPLL caused by malignant neoplasm of the uterus was 1,799 in 1989, and had risen to 2,400 in 2003, representing an increase of 33.4%. The time trends for these YPLLs are presented in Fig. 2. Only YPLL due to malignant neoplasm of the skin declined by 35.9 % over this period from 482 in 1989 to 310 in 2003.

*YPLL in group three*

In group three, YPLL for deaths from infection and parasitic diseases and chronic rheumatic heart disease increased. YPLL due to infection and parasitic diseases was 14,825 in 1989 and had increased by 76% to 26,090 in 2003. The highest YPLL due to infection and parasitic diseases was 27,167 in 1996. In 1989, YPLL due to chronic rheumatic heart disease was 2,215 and had risen 114.7% to 4,755 by 2003. YPLL due to hypertensive diseases in 1989 was 4,430 and had declined 50.9% to 2,175 by 2003.

In 1989, YPLL due to respiratory diseases was 24,291, but dropped to 19,940 in 2003, a decline of 17.9%. Fig. 3 shows the time trends of some YPLL rates due to mortality avoidable through improved treatment and medical care. A significant decrease can be seen in YPLL for diseases that require invasive procedures, including the following causes of death: gastric and duodenal ulcer, appendicitis, abdominal hernia and cholelithiasis or other gallbladder disorders, and the total YPLL for deaths caused by these causes declined by 65.8% from 1989 to 2003.

During the study years, the largest proportion of YPLL in the population between 5 and 65 years of age resulted from injury and poisoning. In 2003, this proportion represented 41.5% of the total amount of YPLL due to all of the causes studied here, and was followed by infections and parasitic diseases, which made up 12.0%, circulatory disturbance of the brain, which made up 11.5%, chronic liver diseases and cirrhosis at 11.4%, diseases of the respiratory system at 9.2%, and malignant neoplasm of the upper airways and digestive tract at 4.6%. Fig. 4 shows the percentage distribution of YPLL for the leading causes of avoidable death in the study years. During those years, YPLL caused by injury and poisoning took first place among other leading causes of avoidable mortality, despite its marked decline from 50.5% in 1989 to 41.5% in 2003. In 2003, the portion of YPLL caused by infection and parasitic diseases occupied second place, doubling from 6.5% in 1989 to 12.0% in 2003. Since 1996 the YPLL caused by circulatory disturbance of the brain held steady at third place occupying 9.3% in 1989 and 11.5% in 2003. In 1989 the YPLL due to malignant neoplasm of the upper airways and digestive tract accounted for 6.2%, ranking it in fifth places; however, in 1996 this cause of death was replaced by YPLL due to chronic liver diseases and cirrhosis, which advanced to fourth place 11.5%. In 2003, YPLL due to was in fifth place at 9.2%.

## DISCUSSION

There is a study limitation arising from the fact that the International classification of diseases and related health problems, 10<sup>th</sup> revision (ICD-10), was introduced for coding causes of death in 2000, whereas causes of death were previously coded according to ICD-9. Thus, although this change in the coding system may have influenced our grouping of those thanks it doesn't seem to have produced a significant deviation to our YPLL calculations to the similarity of coding procedures in ICD-10 and ICD-9.

In this study, distinct differences in YPLL caused by avoidable mortality were found among three groups of causes of death across the years. Although, it was revealed that the total YPLL in the population between 5 and 65 years of age declined from 1989 to 2003 as well as from 1996 to 2003; this decline of YPLL took place only in groups one and three, but not in group

two during the study years. The changes of YPLL in group one are the most important, since mortality in this group is considered avoidable through primary prevention, which has been recognized as the main role of a reformed system of primary health care.

YPLL due to injury and poisoning declined during the study years, with its value being responsible for almost half of the total. Injury and poisoning made up 50.5% of the total YPLL due to all avoidable deaths in 1989, and dropped to 41.5% of the total by 2003. This percentage of YPLL due to injuries and poisoning was higher comparing with YPLL caused by unintentional injuries in the USA, where it were 29.7% in 1990 and 29.8 % in 1991.<sup>6)</sup> In the study years, the biggest portion of YPLL among injuries and poisoning was attributed to deaths caused by traffic accidents; however starting from 1996, dozens of deaths may have been caused by overdoses of heroin injected by intravenous drug users. YPLL in group one was also reduced due to the YPLL decline caused by malignant neoplasm of the upper airways and digestive tract as well as of the trachea, bronchus and lung. During the study years, YPLL caused by circulatory disturbance of the brain was highest in 1996, from which time it started to decline. The time trends presented in Fig. 1 show that YPLL caused by circulatory disturbance of the brain remained at the second or third place among the leading causes of death, during all of the study years YPLL remained higher in 2003 than in 1989. YPLL caused by circulatory disturbance of the brain was not mentioned among the leading causes in the USA in 1991, although it ranked seventh among leading causes of YPLL before 65 years caused by avoidable mortality in Slovenia in 1998.<sup>7)</sup>

In group one, which included causes of death that could be avoided through primary prevention, only YPLL caused by chronic liver diseases and cirrhosis steadily increased from 1989 to 2003, while other YPLLs in this group started to decline from 1996. That increase might have been a consequence of excessive alcohol consumption and the high rate of all forms of viral hepatitis in the decades previous to the current study years.

In group two, it was observed that the YPLL caused by malignant neoplasms of the female breast and uterus steadily increased during the study years. This is due to the unfortunate fact that the screening programs for early detection of those malignant neoplasms have still not been introduced into medical practice in Kyrgyzstan, though it's obvious that reduced incidence and mortality have been achieved in countries that have implemented programs for cervical cancer and breast cancer screenings.<sup>8)</sup>

In group three, which included causes of death that are avoidable through improved treatment, the biggest increase in YPLL was revealed in infectious and parasitic diseases. The main reasons for this deterioration are the rapid increase in the number of deaths caused by tuberculosis and the consistently high number of deaths caused by all forms of viral hepatitis. Recently, the WHO recommended that the Directly Observed Treatment Short course (DOTS) strategy aimed to control tuberculosis should be implemented throughout the whole country; and the impact of this strategy could be confirmed by the decreasing trend of mortality from tuberculosis in coming years. Moreover, vaccination against Hepatitis B as a measure to control viral hepatitis was introduced recently into the national vaccination schedule. Infection and parasitic diseases were among the leading causes of death during all of the study years. The fact that these causes of death are not ranked among the leading ones in other countries suggests that more attention should be paid to strengthening the control measures against infectious diseases. The doubling of YPLL caused by chronic rheumatic heart disease is explained by chronic economic problems that required reductions in the number of cardio-surgeries aimed at correcting valve failure. YPLL caused by hypertensive disease was halved during the study years, a drop that could have resulted from the introduction of clinical guidelines for hypertensive disease. A similar phenomenon may also explain the reductions in the death rate and YPLL due to gastric and duodenal ulcer, since the clinical guidelines for this disease were introduced in parallel with the

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hypertensive disease guidelines.

The composition of the 5 leading causes of YPLL during the study years in Kyrgyzstan differs from that in developed countries such as USA and Slovenia. In 1991, the composition in USA was as follows: injury: 29.8%; malignant neoplasm: 15.2%; heart disease: 11.7%; HIV/AIDS: 6.3%.<sup>6)</sup> In 1998, in Slovenia<sup>7)</sup> the composition of the six leading avoidable causes of YPLL was: external causes of death: 32.2%; malignant neoplasm: 22.3%; cardiovascular diseases: 15%; gastrointestinal tract diseases: 7.4%; and respiratory system disease: 2.0%. The composition in Kyrgyzstan also differed from that in developing countries. For instance, in 1990, the composition of the 5 leading avoidable causes of YPLL in countries of the Middle Eastern Crescent was as follows: infection: 36.8%; birth related diseases: 15.5%; injuries: 12.9%; cardiocerebravascular diseases: 14%; and malignant neoplasm: 3.2%.<sup>9)</sup> Thus, the composition of Kyrgyzstan differs from that of developed countries in that YPLL caused by injuries were a higher percentage of the total, while at the same time YPLL due to infection and parasitic diseases took second place in Kyrgyzstan showing a similarity with high proportion as that in developing countries.

## CONCLUSION

In conclusion, from 1989 to 2003 the total amount of YPLL caused by avoidable mortality in the population between 5 and 65 years of age decreased to 5.0%, and this improvement took place largely with respect to causes of death that are avoidable through primary prevention. Despite the fact that YPLL due to injuries and poisoning declined, further efforts are scheduled to be undertaken to reduce avoidable mortality caused by chronic liver diseases and cirrhosis, which might be achieved through a decrease in excessive alcohol consumption, which causes most injuries and leads to cirrhosis.

The steady increase in mortality due to malignant neoplasms of the female breast and uterus, requires the prompt implementation of screening programs; otherwise the number of deaths due to these causes that are avoidable through early detection and treatment will steadily increase year by year. Infectious and parasitic diseases were among the leading causes of avoidable mortality during the study years, mostly due to a rise in the number of deaths from tuberculosis. Thus, measures for bringing tuberculosis under control are to be strengthened in the coming years. It is gratifying to observe the decline in causes of avoidable deaths such as those from hypertensive disease and gastric and duodenal ulcers, which might be reduced even further through the implementation of clinical guidelines.

The decline in avoidable mortality in Kyrgyzstan caused by injury and poisoning, infectious disease, and malignant neoplasms of the female breast and uterus has to be priority for developing of the Health Policy in the coming years. Attention also has to be paid to reducing avoidable mortality caused by such malignant neoplasms by implementing the existing screening programs.

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