Trend of Gastrointestinal and Liver Diseases in Iran: Results of the Global Burden of Disease Study, 2010

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Received: 20 Apr. 2015
Accepted: 10 Jun. 2015

ABSTRACT

BACKGROUND

The general pattern of epidemiologic transition from communicable to non-communicable diseases is also observed for gastrointestinal and liver diseases (GILD), which constitute a heterogeneous array of causes of death and disability. We aimed to describe the trend of GILD in Iran based on the global burden of disease (GBD2010) study from 1990 to 2010.

METHODS

The trend of number of deaths, disability, adjusted life years (DALYs) and their age-standardized rates caused by 5 major GILD have been reported. The change in the rankings of major causes of death and DALY has been described as well.

RESULTS

The age standardized rates of death and DALYs in both sexes have decreased from 1990 to 2010 for most GILD. The most prominent decreases in death rates are observed for diarrheal diseases, gastritis and duodenitis, and peptic ulcer disease. Positive trends are observed for liver cancer, pancreatic cancer, and gall bladder cancer. Diarrheal diseases have retained their 1st rank among children under 5. Among adults, decreased ranks are observed for diarrheal diseases, appendicitis, gastritis and duodenitis, gall bladder diseases, pancreatitis, and all types of cirrhosis. The trends in age standardized rates of DALYs, deaths, and YLLs are negative for almost all GILD, and especially for diarrheal diseases. However, there is no upward or downward trend in rates of years lost due to disability (YLDs) for most diseases. Total numbers of DALYs and deaths due to acute hepatitis C, stomach cancer, and liver cancers are rising. The total DALYs due to overall digestive diseases except cirrhosis and DALYs due to cirrhosis are both somehow stable. No data has been reported for GILD that are mainly diagnosed in outpatient settings, including gastroesophageal reflux disease, irritable bowel syndrome, and non-alcoholic fatty liver disease.

CONCLUSION

The results of GBD 2010 demonstrate that the rates of most GILD are decreasing in Iran but total DALYs are somehow stable. However, as diseases detected in outpatient settings have not been captured, the burden of GILD seems to be underestimated. Population-based studies at national level are required for accurate reports.

KEYWORDS
Mortality; Disability; Burden; Gastrointestinal Diseases

Please cite this paper as:
Sepanlou SG, Malekzadeh F, Naghavi M, Forouzanfar M, Shahraz S, Moradi-Lakeh M, Malekzadeh R, Poustchi H. Trend of Gastrointestinal and Liver Diseases in Iran: Results of the Global Burden of Disease Study, 2010. *Middle East J Dig Dis* 2015;7:121-37.

INTRODUCTION

During last 2 decades, an epidemiologic transition has happened across the world, which is especially noticeable in developing countries, and has resulted in an obvious shift from communicable infectious diseases to chronic non-communicable diseases (NCD).[1-3] Similar shift has been observed among GILD.

Study of regional and national disease trend is an important and necessary step for priority setting in health research, and can help the authorities and policy makers to use the evidence based data for appropriate prevention and treatment of diseases. Data on trend of prevalence, incidence and mortality rates remain sparse especially in developing countries. In Iran the trends of infectious diseases have been reported periodically mainly by the Ministry of Health and trends of gastrointestinal cancers have been estimated mostly based on pathology based national cancer registries and a few population-based cancer registries in five provinces in Northern and Southern Iran (Golestan, Mazandaran, Gilan, Ardabil, and Kerman). As for other diseases in the category of GILD, the data are sparse and almost no population-based study at national level has been done on their trend. The Global Burden of Disease (GBD) study has been the first attempt to estimate the levels and trends of diseases at global, regional, and national level using novel and sophisticated statistical methods and unique metrics.[4-12] Details of methods reported elsewhere.[13,14] In the present paper, we have investigated the results of GBD 2010 on the trend of GILD in Iran from 1990 to 2010.

MATERIALS AND METHODS

The details of major methods used in GBD for estimating deaths, years of life lost due to premature death (YLLs), years of life lost due to disability (YLDs), and disability adjusted life years (DALYs) have been adequately described elsewhere.[15] In the current paper, we investigated the trend of the above mentioned metrics for major gastrointestinal and hepatic diseases. Total numbers as well as age-standardized rates have been reported. The diseases studied in this paper included: infections of gastrointestinal tract (diarrhea, typhoid and paratyphoid fevers), acute hepatitis (A, B, C, and E), cancers of digestive system (esophagus, stomach, colon and rectum, liver, gall bladder. biliary tract and pancreas), end stage liver diseases (cirrhosis), and all other digestive diseases including: gastritis and duodenitis, peptic ulcer disease, appendicitis, paralytic ileus and intestinal obstruction without hernia, inguinal and femoral hernia, non-infective inflammatory bowel disease, vascular disorders of intestine, gall bladder and bile duct disease, pancreatitis, and yet other digestive diseases. The changes in ranking of these diseases in terms of their overall number as well as rates from 1990 to 2010 have been illustrated. Line trends of major gastrointestinal and hepatic diseases from 1990 to 1995, 2000, 2005, and 2010 have been presented. Age-standardized rates have been reported to adjust for the effect of ageing and the population growth.

RESULTS

Tables 1 and 2 demonstrate the estimated age standardized rates of deaths and DALYs for 25 gastrointestinal and hepatic diseases in 1990, 2005, and 2010, separately for women and men in Iran. The death and DALY rates for most causes have decreased from 2005 to 2010 in both men and women. Exceptions are acute hepatitis B and C in women and acute hepatitis E and colorectal cancer in men. The percent changes of death rates from 2005 to 2010 range between -24.2% for gastritis and duodenitis and -23.4% for peptic ulcer to 16.0% for acute hepatitis C in women. As for men, the percent changes range from -22.1% for peptic ulcer to 1.6% for hepatitis E. The same pattern is observed for DALY rates. The percent changes of DALY rates from 2005 to 2010 range from -23.0% for peptic ulcer and -15.4% for gastritis and duodenitis to 10.0% for acute hepatitis C in women. As for men, the respective figures are -24.4% for peptic ulcer and 2.3% for acute hepatitis E.

The percent changes from 1990 to 2005 are much more significant. The most substantial decreases in

death rates in both sexes are observed for diarrheal diseases, appendicitis, acute hepatitis A, gastritis and duodenitis, and gall bladder diseases. As for DALYs, diarrheal diseases, appendicitis, acute hepatitis A, gastritis and duodenitis, and cirrhosis due to causes other than hepatitis or alcohol are among the causes of DALYs with highest decrease in rate in both sexes. However, the decrease in acute hepatitis B in women is significant as well as gall bladder diseases in men.

The most substantial positive percent changes from 1990 to 2005 are observed for liver cancer, pancreatic cancer, and gall bladder cancer. The percent changes for both death and DALY rates for liver cancer and pancreatic cancer are over 100% in women. In men as well, the only observed positive percent changes belong to liver cancer, pancreatic cancer, and gall bladder cancer.

Figure 1 demonstrates the ranking of diseases in terms of absolute number of deaths that they cause among females and males under 5 years. Results show that diarrheal diseases are still the main important cause of death in both sexes. The changes in rankings from 2005 to 2010 are not noteworthy. However, decreases are observed for acute hepatitis A and B, appendicitis, gastritis and duodenitis, gall bladder and bile duct diseases, cirrhosis secondary to hepatitis C, and pancreatitis in both sexes.

Figure 2 shows the rankings of causes of death by numbers among women and men between 15 and 49 years of age. Similar to previous figure, changes in ranks are not noteworthy from 2005 to 2010. Stomach cancer, typhoid fevers, esophageal cancer, and colorectal cancer are the top 4 diseases in both years. However, the rankings show significant changes from 1990 to 2010. Increased ranks in terms of deaths numbers are observed for liver cancer secondary to hepatitis B, C and alcohol, as well as secondary to all other causes in women. Among men, increased ranks for liver cancers are less steep. Decreased ranks are observed for diarrheal diseases, appendicitis, gastritis and duodenitis, gall bladder diseases, pancreatitis, and all types of cirrhosis in both sexes.

Figure 3 demonstrates the rankings of diseases in terms of the number of deaths among women and men aged 50 years and more. Stomach cancer, esophageal cancer, and colorectal cancer are the top 3 in both women and men, unchanged from 1990 to 2010. Similar to previous figures, changes in rankings are not substantial from 2005 to 2010. Again similar to figure 2, liver cancers show increased ranks from 1990 to 2005 in both sexes. Diarrheal diseases, appendicitis, gastritis and duodenitis, gall bladder diseases, pancreatitis, and all types of cirrhosis show decreased ranks in both sexes from 1990 to 2005. Overall, acute hepatitis of all kinds and typhoid fevers have lower ranks in adults aged above 50 compared to adults between 15 to 49 years old.

Figure 4 shows the rankings of diseases in terms of age standardized DALY rates per 100,000 among women and men in 1990, 2005, and 2010. Stomach cancer, esophageal cancer, and colorectal cancer are the top 3 causes of DALY in 2005 and 2010 among both sexes. Liver cancers show increased ranks from 1990 to 2005. Diarrheal diseases and typhoid fevers, cirrhosis of all kinds, appendicitis, gastritis and duodenitis, gall bladder diseases, and pancreatitis have decreased ranks. Acute hepatitis A, B, and E show decreased ranks in oppose to the increased rank of hepatitis C in both sexes. The rank of peptic ulcer has not changed from 1990 to 2005 in men, but has a prominent increased rank in women.

Figures 5, 6, 7, and 8 show the trends of age-standardized rates from 1990 to 2010 for major GILD in both sexes in terms of DALYs, deaths, YLLs, and YLDs per 100,000 respectively. The trends in rates of DALYs, deaths, and YLLs are negative for almost all diseases, and especially for diarrheal diseases. Acute hepatitis B, stomach cancer, appendicitis, and cirrhosis show substantial decline. In spite of decreases in rates of DALYs, deaths, and YLLs, there is no upward or downward trend in rates of YLDs for most of diseases. Exceptions are gastritis and duodenitis, and peptic ulcer disease, which demonstrate a downward trend in terms of YLD rates.

Figures 9 and 10 show the trends of total DALYs and deaths for all ages both sexes. Unlike rates

Table 1: The trend of age-standardized death rates per 100,000 due to gastrointestinal and liver diseases from 1990 to 2010 in Iran

A.Women

ASR (95% UI) in 1990				ASR (95% UI) in 2005				%change from1990 to 2005	ASR (95% UI) in 2010				%change from 2005 to 2010
Stomach cancer	15.5	8.7	23.5	Stomach cancer	11.1	6.6	17.9	-28.4	Stomach cancer	10.1	5.6	15.9	-8.9
Diarrheal diseases	9.1	6.5	12.5	Esophageal cancer	5.0	3.6	7.7	-34.3	Esophageal cancer	4.2	2.8	6.6	-15.6
Esophageal cancer	7.6	4.6	10.4	Colorectal cancer	3.5	2.9	4.6	-14.4	Colorectal cancer	3.4	2.6	4.5	-0.6
Colorectal cancer	4.0	2.7	4.8	Other digestive diseases	2.3	0.7	3.4	317.7	Other digestive diseases	2.2	0.7	3.5	-6.4
Cirrhosis hepatitis C	2.6	1.8	3.3	Diarrheal diseases	2.1	1.6	2.9	-76.6	Diarrheal diseases	1.7	1.2	2.5	-19.3
Cirrhosis other	1.3	1.0	1.7	Cirrhosis hepatitis C	1.6	1.3	2.4	-37.5	Cirrhosis hepatitis C	1.6	1.2	2.3	0.5
Cirrhosis hepatitis B	1.1	0.8	1.4	Liver cancer hepatitis C	1.6	0.8	2.1	118.3	Liver cancer hepatitis C	1.5	0.7	2.1	-7.0
Gallbladder cancer	1.1	0.6	1.9	Peptic ulcer	1.1	0.5	1.5	47.5	Typhoid fevers	1.0	0.1	2.1	-6.1
Appendicitis	1.0	0.4	1.5	Typhoid fevers	1.1	0.1	2.2	11.5	Liver cancer hepatitis B	0.9	0.5	1.3	-7.3
Gall bladder diseases	1.0	0.5	1.7	Liver cancer hepatitis B	1.0	0.5	1.3	124.2	Pancreatic cancer	0.9	0.5	1.4	-1.5
Typhoid fevers	1.0	0.1	2.0	Gallbladder cancer	1.0	0.5	1.6	-7.9	Gallbladder cancer	0.9	0.4	1.4	-8.9
Pancreatic cancer	0.9	0.5	1.4	Pancreatic cancer	0.9	0.6	1.4	3.9	Peptic ulcer	0.9	0.4	1.3	-23.4
Peptic ulcer	0.8	0.5	1.2	Cirrhosis other	0.7	0.6	1.0	-45.9	Cirrhosis other	0.7	0.5	0.9	-4.0
Liver cancer hepatitis C	0.7	0.5	1.2	Cirrhosis hepatitis B	0.7	0.5	1.0	-38.1	Cirrhosis hepatitis B	0.7	0.5	1.0	0.3
Gastrititis & duodenitis	0.7	0.4	1.1	Liver cancer other	0.5	0.3	0.6	145.9	Liver cancer other	0.5	0.2	0.7	-7.3
Other digestive diseases	0.6	0.3	1.2	Gall bladder diseases	0.5	0.4	0.7	-47.9	Liver cancer alcohol	0.4	0.2	0.6	-7.5
Cirrhosis alcohol	0.5	0.4	0.7	Liver cancer alcohol	0.5	0.2	0.6	127.5	Gall bladder diseases	0.4	0.3	0.7	-16.0
Acute hepatitis B	0.5	0.2	0.9	Appendicitis	0.4	0.2	0.6	-62.7	Appendicitis	0.3	0.1	0.6	-10.0
Liver cancer hepatitis B	0.5	0.3	0.8	Cirrhosis alcohol	0.3	0.3	0.5	-39.2	Cirrhosis alcohol	0.3	0.2	0.5	0.1
Acute hepatitis A	0.4	0.1	1.0	Gastrititis & duodenitis	0.3	0.2	0.6	-53.8	Acute hepatitis B	0.3	0.2	0.5	6.4
Acute hepatitis C	0.3	0.1	0.7	Acute hepatitis B	0.3	0.2	0.4	-45.8	Acute hepatitis C	0.3	0.1	0.6	16.0
Acute hepatitis E	0.3	0.1	0.5	Acute hepatitis C	0.2	0.1	0.4	-26.9	Gastrititis & duodenitis	0.2	0.1	0.5	-24.2
Liver cancer other	0.2	0.1	0.4	Acute hepatitis E	0.2	0.1	0.3	-36.6	Acute hepatitis E	0.2	0.1	0.3	-0.1
Liver cancer alcohol	0.2	0.1	0.4	Pancreatitis	0.2	0.1	0.3	-14.4	Pancreatitis	0.1	0.1	0.2	-11.8
Pancreatitis	0.2	0.1	0.3	Acute hepatitis A	0.2	0.1	0.4	-59.6	Acute hepatitis A	0.1	0.1	0.4	-6.3
All causes	746.8	670.5	839.1	All causes	532.4	489.4	578.2	-28.7	All causes	488.4	421.1	566.6	-8.3

B.Men

ASR (95% UI) in 1990				ASR (95% UI) in 2005			%change from1990 to 2005	ASR (95% UI) in 2010				%change from 2005 to 2010
Stomach cancer	32.3	21.4	46.7	**Stomach cancer**	24.4	14.6	33.5	-24.5	**Stomach cancer**	22.1	12.0	29.0	-9.2
Esophageal cancer	11.1	7.3	14.1	**Esophageal cancer**	7.4	5.9	11.5	-33.1	**Esophageal cancer**	7.0	5.1	10.6	-6.4
Diarrheal diseases	10.5	8.0	14.0	**Colorectal cancer**	4.9	4.4	5.9	-26.7	**Colorectal cancer**	4.9	3.9	6.2	0.3
Colorectal cancer	6.6	4.5	7.7	**Other digestive diseases**	3.0	0.6	4.0	474.2	**Other digestive diseases**	2.7	0.6	3.7	-8.5
Cirrhosis hepatitis C	3.5	2.4	4.5	**Cirrhosis hepatitis C**	2.5	2.0	3.6	-26.6	**Cirrhosis hepatitis C**	2.5	1.9	3.5	-0.2
Cirrhosis alcohol	2.6	1.8	3.3	**Liver cancer hepatitis B**	2.4	1.2	2.9	99.2	**Liver cancer hepatitis B**	2.2	1.1	3.0	-5.7
Cirrhosis hepatitis B	2.0	1.4	2.7	**Liver cancer hepatitis C**	2.3	1.1	2.8	111.2	**Liver cancer hepatitis C**	2.1	1.0	2.8	-5.8
Cirrhosis other	1.9	1.2	2.4	**Diarrheal diseases**	2.2	1.7	2.8	-79.0	**Diarrheal diseases**	1.9	1.4	2.6	-14.8
Peptic ulcer	1.6	1.2	2.4	**Cirrhosis alcohol**	1.8	1.4	2.6	-29.8	**Cirrhosis alcohol**	1.8	1.4	2.6	-0.2
Appendicitis	1.5	0.6	2.4	**Peptic ulcer**	1.7	0.7	2.1	3.1	**Acute hepatitis B**	1.5	0.9	2.6	0.0
Acute hepatitis B	1.4	0.6	2.2	**Acute hepatitis B**	1.5	1.0	2.2	6.0	**Cirrhosis hepatitis B**	1.5	1.1	2.1	-0.3
Typhoid fevers	1.4	0.2	2.7	**Cirrhosis hepatitis B**	1.5	1.1	2.2	-27.3	**Pancreatic cancer**	1.4	0.9	1.9	0.6
Gastrititis & duodenitis	1.3	0.9	1.9	**Pancreatic cancer**	1.4	0.9	1.8	13.9	**Typhoid fevers**	1.3	0.1	2.8	-2.7
Pancreatic cancer	1.3	0.9	1.8	**Typhoid fevers**	1.4	0.2	2.8	2.5	**Peptic ulcer**	1.3	0.6	1.8	-22.1
Liver cancer hepatitis B	1.2	0.9	1.8	**Cirrhosis other**	1.2	0.9	1.7	-36.2	**Cirrhosis other**	1.2	0.9	1.6	-2.4
Gall bladder diseases	1.1	0.6	1.8	**Liver cancer alcohol**	0.8	0.4	1.0	99.3	**Liver cancer alcohol**	0.7	0.4	1.0	-5.7
Liver cancer hepatitis C	1.1	0.8	1.7	**Liver cancer other**	0.6	0.3	0.8	64.2	**Liver cancer other**	0.6	0.3	0.8	-4.7
Other digestive diseases	0.5	0.4	0.8	**Gastrititis & duodenitis**	0.6	0.3	1.0	-55.2	**Gallbladder cancer**	0.5	0.3	0.8	-0.4
Gallbladder cancer	0.4	0.3	0.8	**Gallbladder cancer**	0.5	0.3	0.8	20.1	**Gastrititis & duodenitis**	0.5	0.3	0.9	-15.7
Liver cancer alcohol	0.4	0.3	0.6	**Appendicitis**	0.5	0.2	0.7	-69.8	**Appendicitis**	0.4	0.1	0.8	-9.2
Liver cancer other	0.4	0.3	0.5	**Gall bladder diseases**	0.4	0.3	0.6	-61.4	**Gall bladder diseases**	0.4	0.3	0.6	-7.4
Acute hepatitis A	0.3	0.1	1.0	**Acute hepatitis C**	0.3	0.2	0.6	14.0	**Acute hepatitis C**	0.3	0.2	0.5	-6.6
Acute hepatitis C	0.3	0.1	0.7	**Acute hepatitis A**	0.2	0.1	0.5	-40.9	**Acute hepatitis E**	0.2	0.1	0.4	1.5
Acute hepatitis E	0.2	0.1	0.5	**Acute hepatitis E**	0.2	0.1	0.3	-20.9	**Acute hepatitis A**	0.2	0.1	0.6	-5.3
Pancreatitis	0.2	0.1	0.3	**Pancreatitis**	0.1	0.1	0.2	-32.0	**Pancreatitis**	0.1	0.1	0.2	-4.7
All causes	1114.9	1019.0	1258.2	**All causes**	833.4	786.1	899.7	-25.2	**All causes**	784.1	715.5	905.3	-5.9

Table 2: The trend of age-standardized DALY rates due to gastrointestinal and liver diseases from 1990 to 2010 in Iran

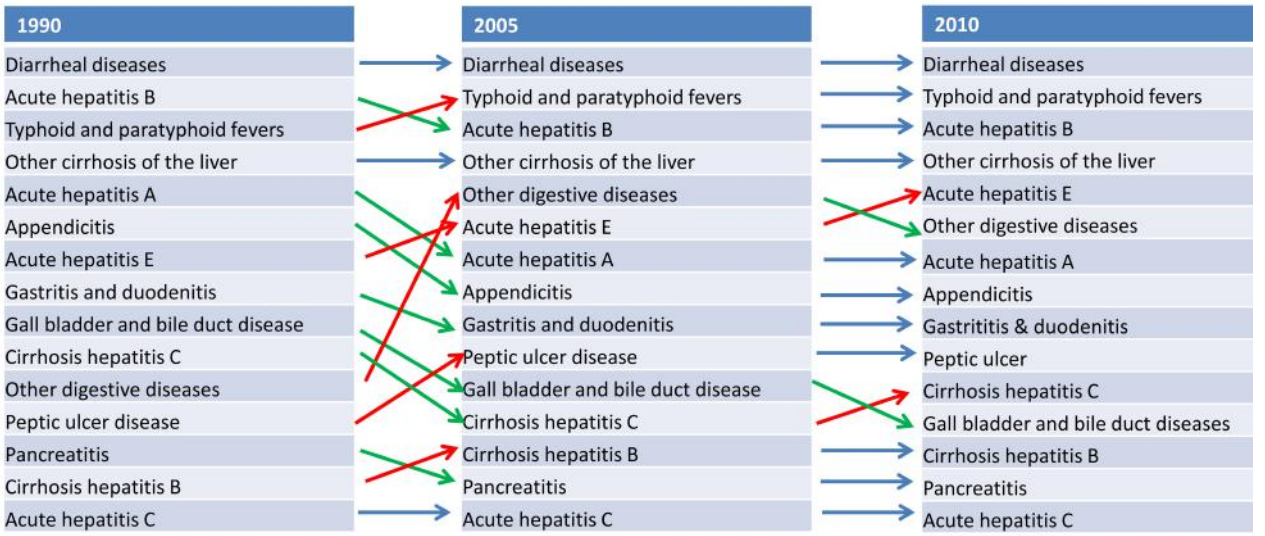
A.Women

ASR (95% UI) in 1990				ASR (95% UI) in 2005			%change from1990 to 2005	ASR (95% UI) in 2010			%change from 2005 to 2010
Diarrheal diseases	725.0	511.0	1027.3	Diarrheal diseases	262.1	187.2	350.9	-63.8	Diarrheal diseases	226.4	158.1	318.4	-13.6
Stomach cancer	335.9	193.9	502.1	Stomach cancer	234.2	137.0	358.9	-30.3	Stomach cancer	206.4	111.4	309.2	-11.9
Esophageal cancer	170.3	100.7	232.9	Esophageal cancer	108.9	75.7	170.1	-36.1	Esophageal cancer	89.1	57.8	143.3	-18.2
Colorectal cancer	96.9	64.6	116.1	Colorectal cancer	82.9	69.1	107.1	-14.4	Colorectal cancer	80.2	57.9	105.1	-3.3
Cirrhosis hepatitis C	63.6	45.8	80.4	Typhoid fevers	65.6	8.0	134.1	11.4	Typhoid fevers	61.6	8.7	125.8	-6.1
Typhoid fevers	58.9	7.1	121.1	Other digestive diseases	56.8	17.8	80.7	448.1	Other digestive diseases	49.9	16.7	74.7	-12.1
Cirrhosis other	57.8	40.4	78.7	Cirrhosis hepatitis C	35.8	28.2	55.4	-43.7	Cirrhosis hepatitis C	35.3	26.5	50.3	-1.5
Appendicitis	41.3	18.1	61.8	Liver cancer hepatitis C	32.5	16.5	42.1	127.0	Liver cancer hepatitis C	30.2	14.9	42.8	-7.2
Gastrititis & duodenitis	30.5	20.0	47.1	Cirrhosis other	28.2	21.4	39.6	-51.2	Cirrhosis other	25.9	18.9	35.9	-8.3
Acute hepatitis B	30.1	12.2	58.9	Liver cancer hepatitis B	23.6	11.7	30.4	136.9	Liver cancer hepatitis B	21.8	10.8	31.1	-7.6
Cirrhosis hepatitis B	28.3	20.8	36.3	Peptic ulcer	23.4	10.8	37.3	12.3	Gallbladder cancer	19.2	9.3	31.4	-10.3
Gall bladder diseases	27.7	17.8	39.8	Gallbladder cancer	21.4	10.7	35.2	-16.3	Pancreatic cancer	19.1	11.2	29.5	-2.3
Gallbladder cancer	25.6	13.3	49.6	Pancreatic cancer	19.6	12.3	30.5	4.8	Peptic ulcer	18.0	8.4	32.6	-23.0
Acute hepatitis A	22.2	6.0	61.1	Liver cancer other	17.0	8.3	22.1	159.9	Liver cancer other	15.9	7.0	24.1	-6.7
Peptic ulcer	20.9	12.5	44.0	Gall bladder diseases	17.0	11.4	26.1	-38.8	Cirrhosis hepatitis B	15.5	11.6	21.5	-1.8
Acute hepatitis E	18.8	9.0	33.6	Gastrititis & duodenitis	16.1	9.5	29.5	-47.1	Gall bladder diseases	15.3	9.7	23.8	-9.8
Pancreatic cancer	18.7	11.5	30.8	Cirrhosis hepatitis B	15.8	12.2	24.3	-44.2	Acute hepatitis B	14.3	7.2	28.8	4.2
Cirrhosis alcohol	15.1	10.8	19.0	Appendicitis	14.0	7.1	19.8	-66.1	Gastrititis & duodenitis	13.6	7.9	25.4	-15.4
Liver cancer hepatitis C	14.3	9.3	26.7	Acute hepatitis B	13.7	8.1	23.9	-54.4	Appendicitis	12.0	5.2	18.8	-14.0
Other digestive diseases	10.4	6.8	21.7	Acute hepatitis E	11.9	6.8	19.3	-36.8	Acute hepatitis E	11.8	5.4	23.7	-0.7
Liver cancer hepatitis B	9.9	6.5	19.0	Liver cancer alcohol	11.2	5.5	14.5	141.0	Liver cancer alcohol	10.3	5.1	14.6	-8.1
Liver cancer other	6.5	3.6	14.8	Acute hepatitis A	8.6	4.1	17.7	-61.2	Acute hepatitis A	8.2	3.9	16.8	-5.3
Acute hepatitis C	6.4	2.3	13.0	Cirrhosis alcohol	8.2	6.5	12.3	-45.6	Cirrhosis alcohol	8.0	6.1	11.1	-2.0
Pancreatitis	5.1	2.8	9.6	Acute hepatitis C	5.1	2.4	8.3	-20.0	Acute hepatitis C	5.6	2.3	10.5	10.0
Liver cancer alcohol	4.7	3.0	9.1	Pancreatitis	3.8	2.5	6.1	-26.5	Pancreatitis	3.4	2.2	5.1	-10.8
All causes	36910.1	33475.7	40685.6	All causes	27735.3	24936.0	30661.6	-24.9	All causes	25773.8	22728.4	29051.7	-7.1

B.Men

	ASR (95% UI) in 1990				ASR (95% UI) in 2005			%change from1990 to 2005		ASR (95% UI) in 2010			%change from 2005 to 2010
Diarrheal diseases	732.4	535.1	1019.4	**Stomach cancer**	491.1	288.7	670.0	-28.8	**Stomach cancer**	432.7	234.1	563.5	-11.9
Stomach cancer	690.0	462.9	1010.8	**Diarrheal diseases**	241.7	176.2	323.3	-67.0	**Diarrheal diseases**	211.7	150.2	294.0	-12.4
Esophageal cancer	238.7	154.8	305.7	**Esophageal cancer**	151.8	121.0	233.4	-36.4	**Esophageal cancer**	139.0	100.4	217.6	-8.4
Colorectal cancer	159.3	103.8	186.9	**Colorectal cancer**	111.8	99.5	135.1	-29.8	**Colorectal cancer**	109.2	86.9	139.1	-2.3
Cirrhosis hepatitis C	89.1	60.9	114.8	**Typhoid fevers**	85.6	10.6	174.7	2.4	**Typhoid fevers**	83.2	10.4	173.9	-2.9
Typhoid fevers	83.6	10.4	167.7	**Other digestive diseases**	77.0	20.1	100.1	628.0	**Other digestive diseases**	66.3	20.1	86.5	-14.0
Cirrhosis alcohol	73.6	48.6	93.9	**Cirrhosis hepatitis C**	58.9	45.1	84.7	-33.9	**Cirrhosis hepatitis C**	58.2	43.3	83.9	-1.2
Cirrhosis other	73.2	47.8	97.6	**Liver cancer hepatitis B**	52.6	29.0	64.8	67.0	**Liver cancer hepatitis B**	49.9	27.0	65.9	-5.2
Acute hepatitis B	55.6	24.1	108.8	**Acute hepatitis B**	48.6	34.4	72.7	-12.6	**Acute hepatitis B**	47.9	28.6	87.5	-1.5
Appendicitis	54.4	23.1	83.8	**Cirrhosis alcohol**	46.0	36.5	68.5	-37.6	**Cirrhosis alcohol**	45.5	34.9	65.6	-1.0
Cirrhosis hepatitis B	53.0	35.3	70.7	**Liver cancer hepatitis C**	45.1	23.8	56.1	77.8	**Liver cancer hepatitis C**	42.6	22.5	56.2	-5.6
DPeptic ulcer	46.8	32.6	84.4	**Cirrhosis other**	42.4	32.4	61.2	-42.2	**Cirrhosis other**	40.1	29.5	55.4	-5.2
Gastrititis & duodenitis	38.4	27.5	55.2	**Peptic ulcer**	40.5	17.9	67.2	-13.5	**Cirrhosis hepatitis B**	34.3	25.0	50.7	-1.3
Liver cancer hepatitis B	31.5	23.2	44.2	**Cirrhosis hepatitis B**	34.7	26.0	53.5	-34.5	**Pancreatic cancer**	31.1	19.9	41.1	0.9
Gall bladder diseases	30.0	18.7	45.0	**Pancreatic cancer**	30.8	20.8	40.3	11.7	**Peptic ulcer**	30.6	14.2	51.8	-24.4
Pancreatic cancer	27.6	19.9	39.9	**Liver cancer other**	19.4	11.2	24.0	43.7	**Liver cancer other**	18.7	10.4	25.3	-3.5
Liver cancer hepatitis C	25.4	18.4	37.4	**Gastritis & duodenitis**	18.6	11.9	29.7	-51.6	**Liver cancer alcohol**	16.5	9.0	21.9	-5.4
Acute hepatitis A	20.9	4.6	64.1	**Liver cancer alcohol**	17.5	9.5	21.6	67.0	**Gastrititis & duodenitis**	16.1	10.0	25.9	-13.6
Acute hepatitis E	17.9	7.7	37.2	**Appendicitis**	16.3	7.5	24.8	-70.1	**Appendicitis**	14.5	6.0	24.5	-10.7
Liver cancer other	13.5	9.2	19.8	**Gall bladder diseases**	13.8	9.7	19.8	-54.0	**Gall bladder diseases**	12.9	8.8	18.3	-6.6
Other digestive diseases	10.6	7.7	17.0	**Acute hepatitis E**	12.4	6.2	21.9	-30.8	**Acute hepatitis E**	12.7	5.3	26.6	2.3
Liver cancer alcohol	10.5	7.7	14.8	**Gallbladder cancer**	11.7	6.7	17.7	22.8	**Gallbladder cancer**	11.6	6.6	18.6	-0.7
Gallbladder cancer	9.5	5.8	18.1	**Acute hepatitis A**	10.1	4.1	26.3	-51.6	**Acute hepatitis A**	9.7	3.8	28.1	-4.2
Acute hepatitis C	7.7	3.1	15.7	**Acute hepatitis C**	9.2	5.4	14.6	20.8	**Acute hepatitis C**	8.4	5.2	13.4	-8.7
Pancreatitis	5.4	3.3	9.3	**Pancreatitis**	3.1	2.1	4.8	-41.9	**Pancreatitis**	3.0	2.0	4.6	-3.0
All causes	47559.6	43630.5	53182.4	**All causes**	35235.4	32538.1	38280.5	-25.9	**All causes**	32919.0	29785.7	37246.7	-6.6

A Female



B Male

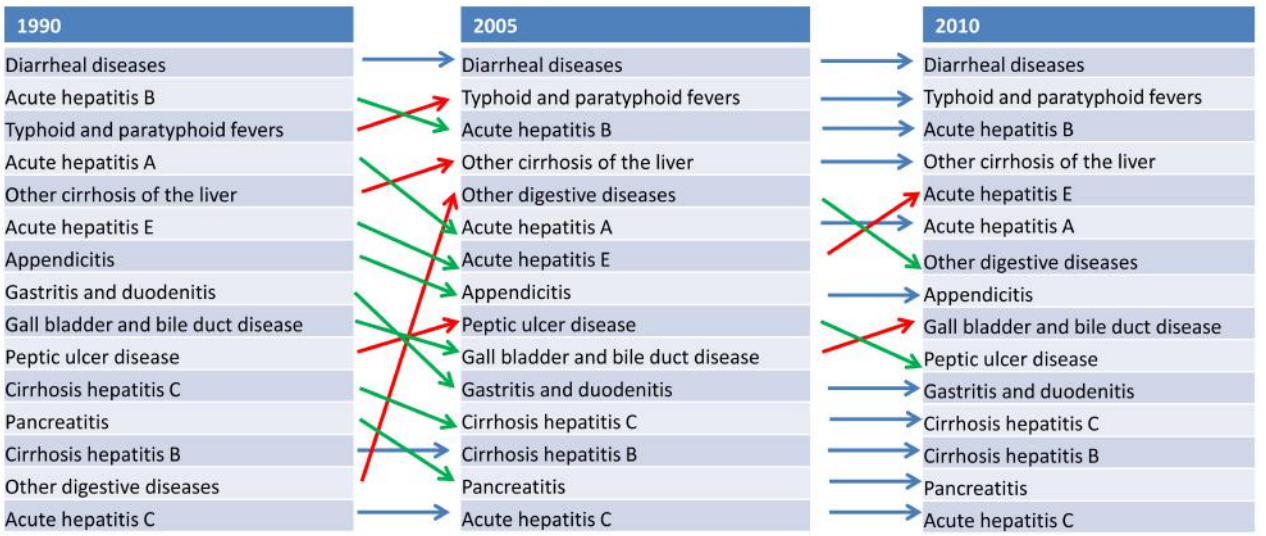


Fig. 1: Ranking of diseases based on death numbers in A) female and B) male under 5 years in 1990, 2005, and 2010

and except for diarrheal diseases and appendicitis, trends are generally not declining. Total numbers of DALYs and deaths due to acute hepatitis C, stomach cancer, and liver cancers are rising. The total DALYs due to overall digestive diseases except cirrhosis and DALYs due to cirrhosis are not increasing and somehow stable.

DISCUSSION

GBD 2010 shows that compared with 1990 - the starting point of the first GBD study - the world's population has grown substantially older; that the main causes of disease burden have shifted from infectious diseases and childhood and maternal illnesses to non-communicable diseases such as coronary heart diseases and malignancies, and traffic injuries,[4,9] and that now a significant portion of DALYs are attributed to disability rather than premature death.[5] Since 1990, the average length of a human life has increased substantially, but many people spend these extra years with chronic disabling diseases such as musculoskeletal disorders, major depression, cancers, or diabetes.[7,8] In real life, one should consider life as a rectangle instead

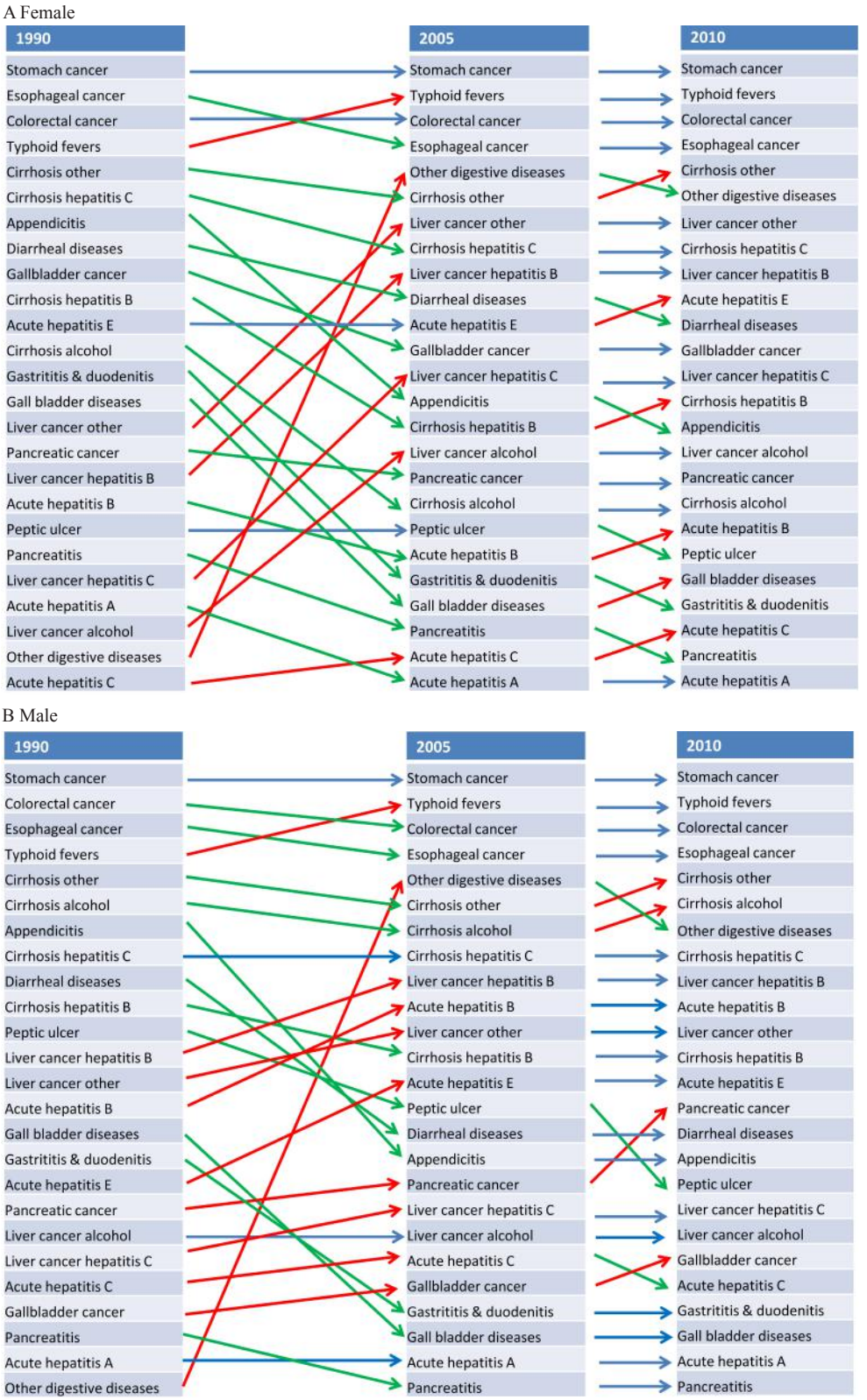
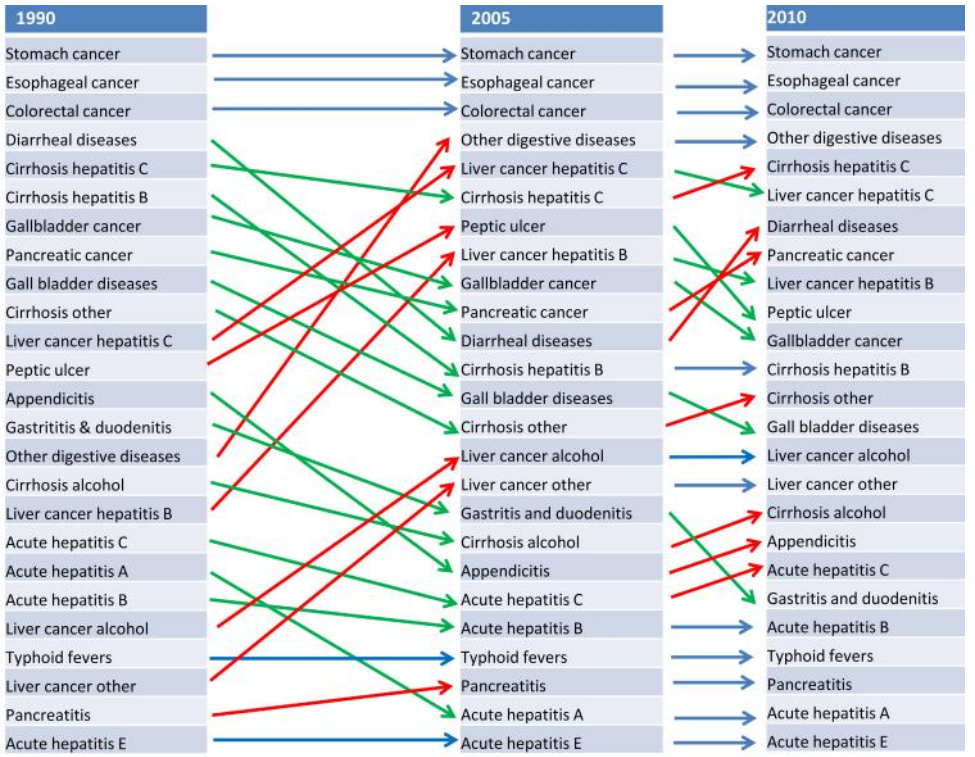


Fig. 2: Ranking of diseases based on death numbers in A) female and B) male 15-49 years in 1990, 2005, and 2010

A Female



B Male

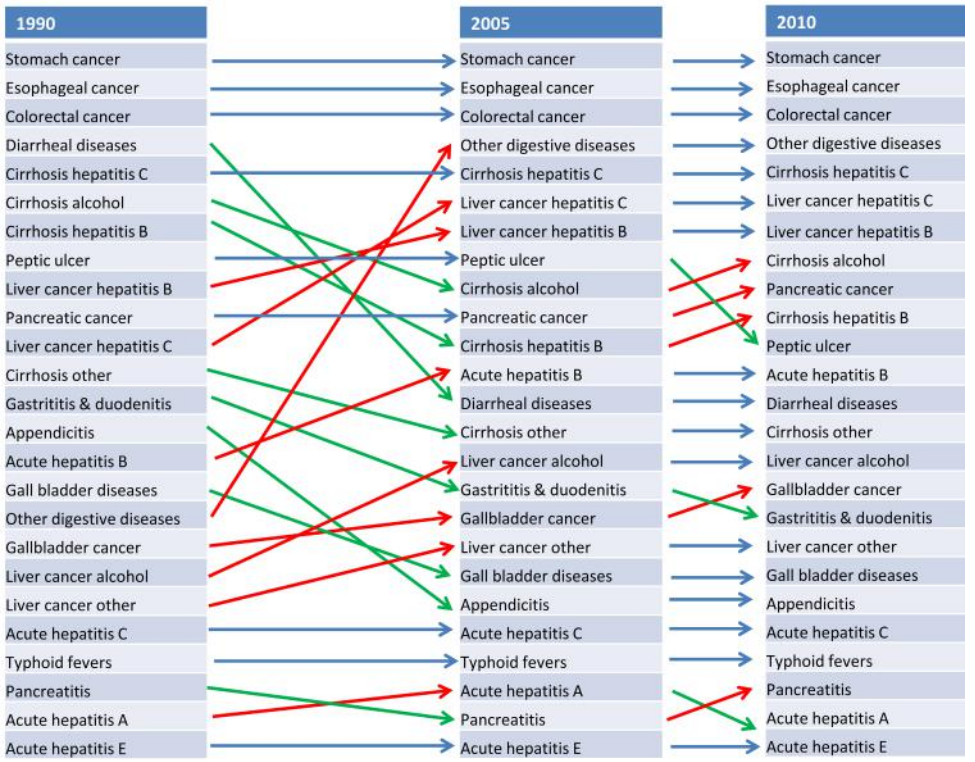
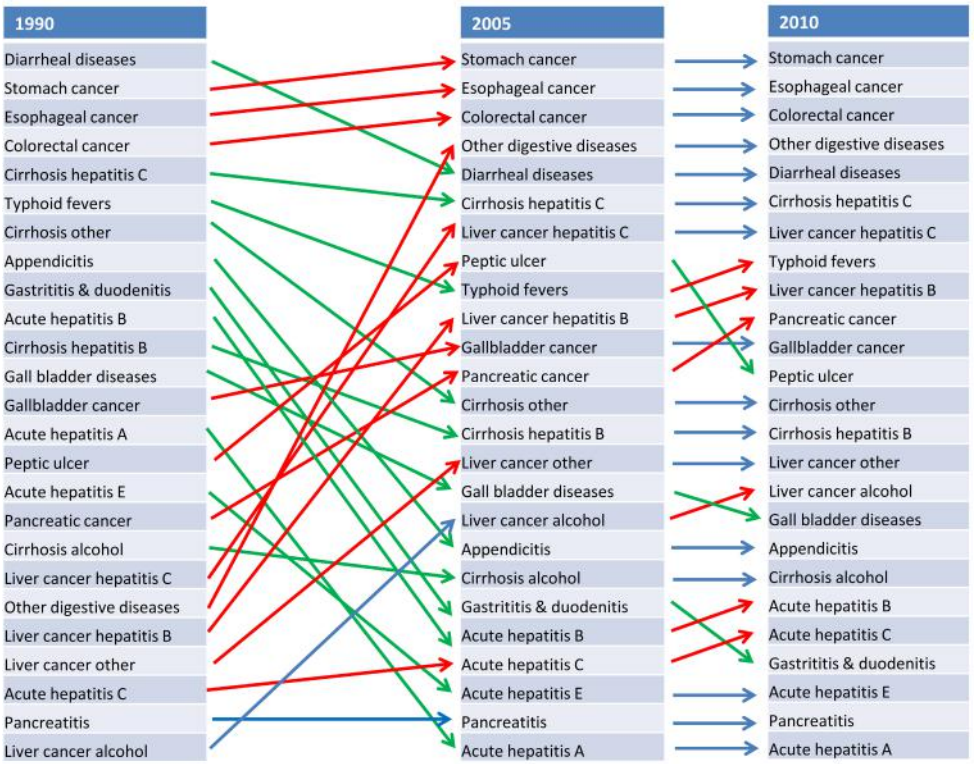


Fig. 3: Ranking of diseases based on death numbers in A) female and B) male 50+ years in 1990, 2005, and 2010

A Female



B Male

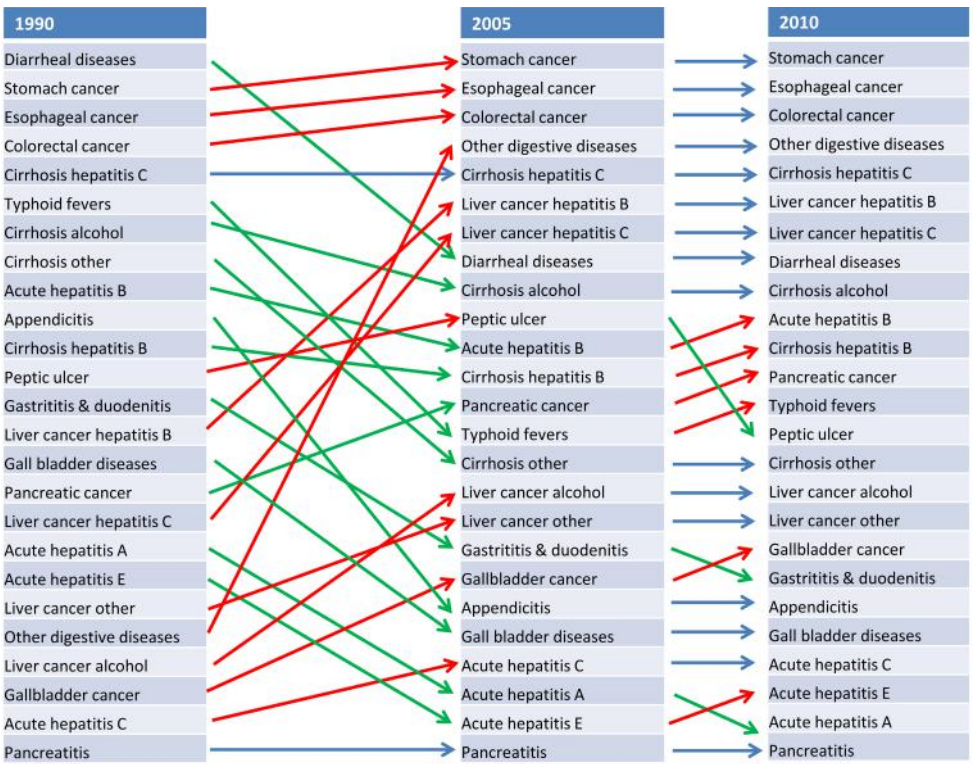


Fig. 4: Age standardized rates of DALYs in A) female and B) male in 1990, 2005, and 2010

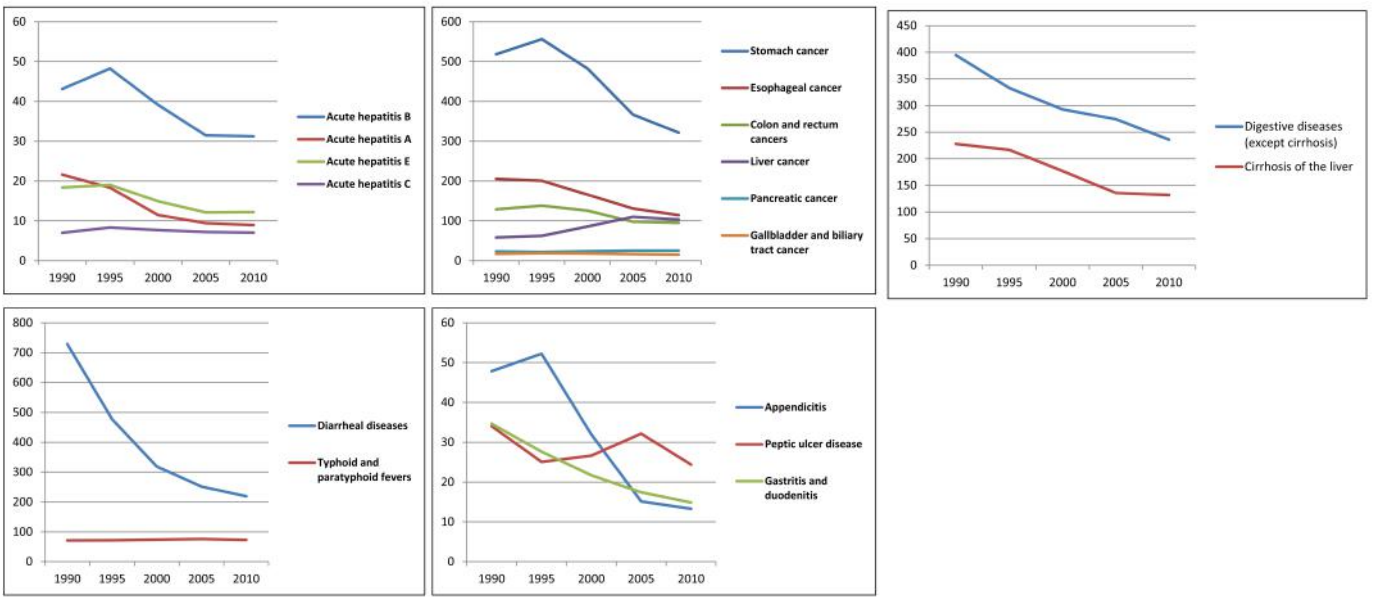


Fig. 5: Trend of DALYs per 100,000 for GILD (GBD 2010)

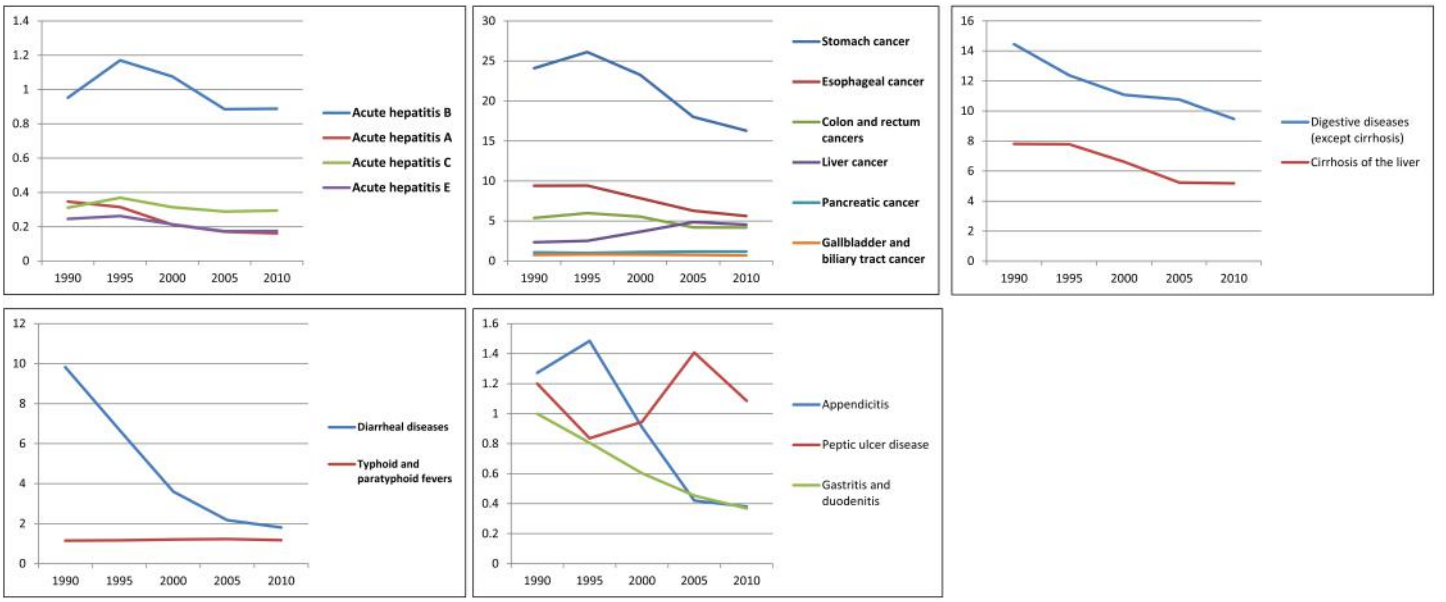


Fig. 6: Trend of deaths per 100,000 for GILD (GBD 2010)

of a line, "length" of life is not the only measure to be considered to determine quality of life; "width" of life should also be considered!

In Iran life expectancy has increased by 22 years for women and 21 years for men during last 45 years.[11] The incidence and mortality due to intestinal infections, mainly diarrheal diseases, typhoid and paratyphoid fevers, have decreased both among under 5 year children and adults (-40% decrease in years of life lost from 2000 to 2012). Similarly, trends of incidence and mortality rates of stomach cancer and esophageal cancer are declining in both men and women from 1975 to 2010. However, trends of colorectal cancer and liver cancer are stable or increasing in many countries during the same time period. All gastrointestinal and liver cancers have higher rates in men compared to women.

GBD 2010 study is a landmark study for assess-

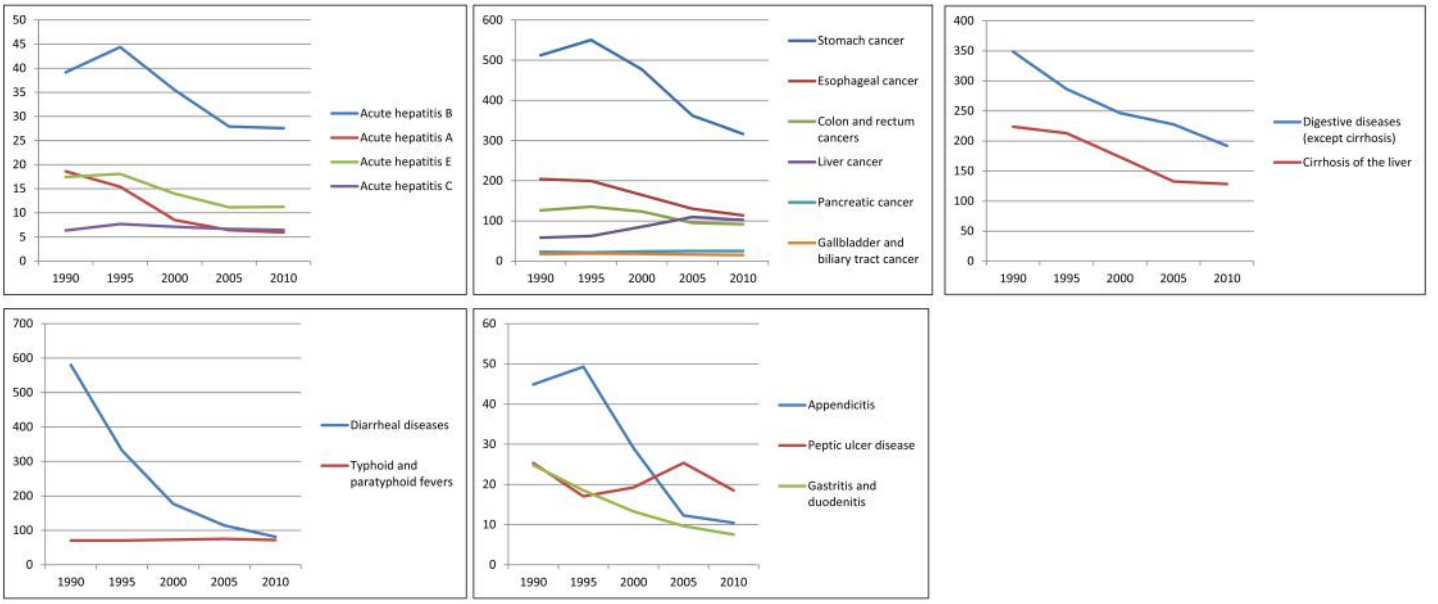


Fig. 7: Trend of YLLs per 100,000 for GILD (GBD 2010)

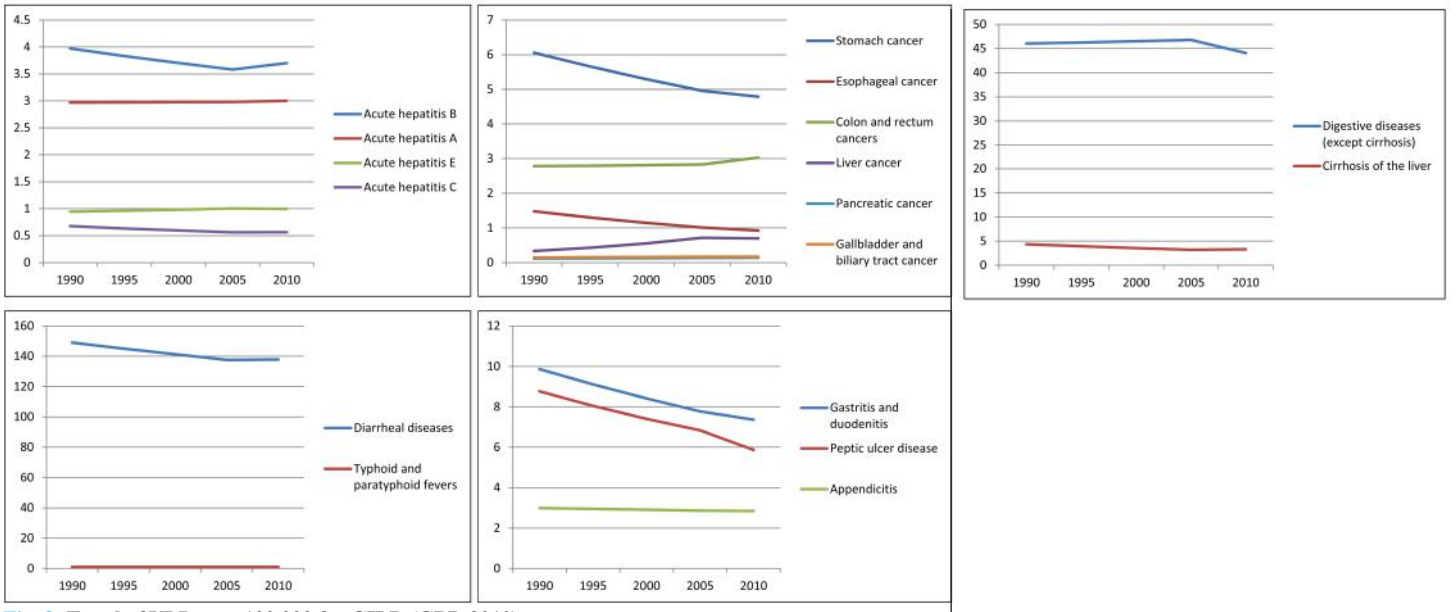


Fig. 8: Trend of YLDs per 100,000 for GILD (GBD 2010)

ing the trend of all diseases including GILD and their mortality and morbidity across the world and is a step forward in understanding changing risk factors of chronic diseases. In spite of being novel and very informative, this study has its own challenges especially in estimating the burden and trend of diseases in developing countries where data are of poor quality. Using population based local data from Iran, we will try to explain the challenges GBD 2010 faces and suggest strategies to improve the accuracy of future updates in GBD 2015.

Local studies in Iran imply that gastroesophageal reflux disease (GERD) and peptic ulcer disease,[16-22] irritable bowel syndrome (IBS),[17] inflammatory bowel diseases (IBD),[23-27] chronic nonalcoholic fatty liver disease (NAFLD),[28,29] and chronic active

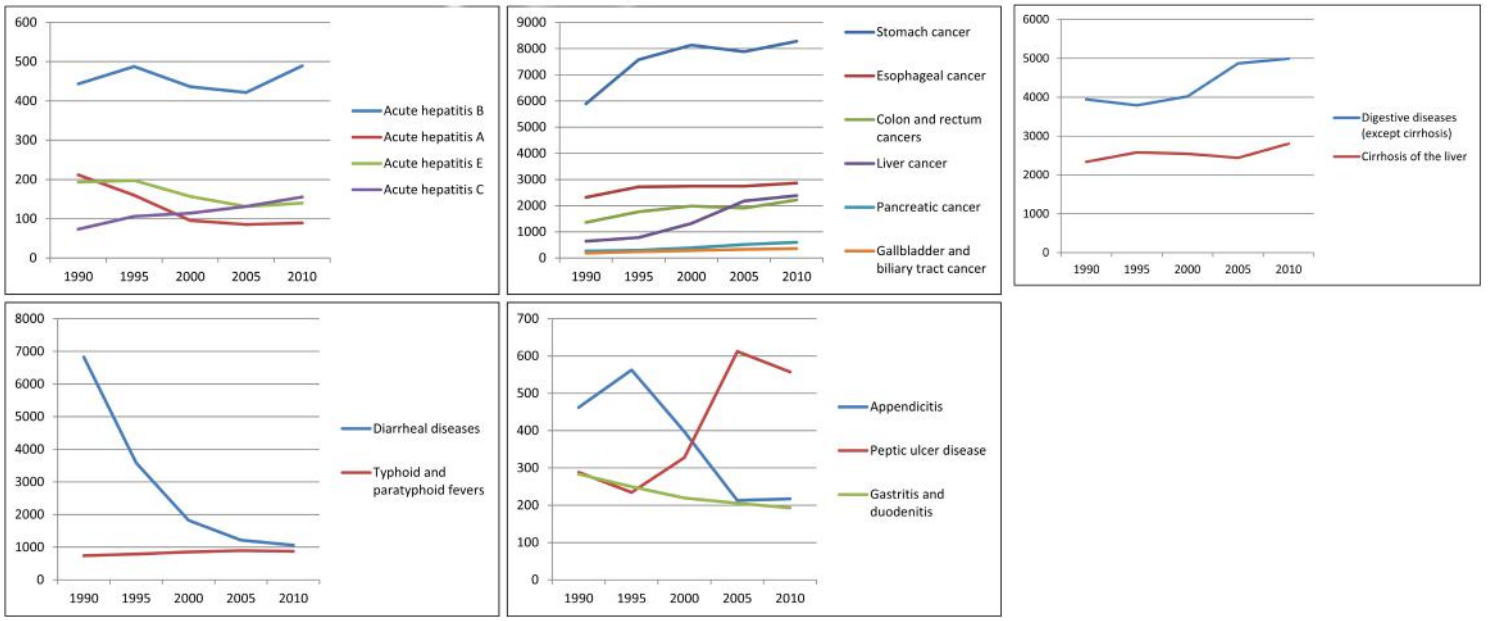


Fig. 9: **Trend of total deaths in all ages, both sexes for GILD (GBD 2010)**

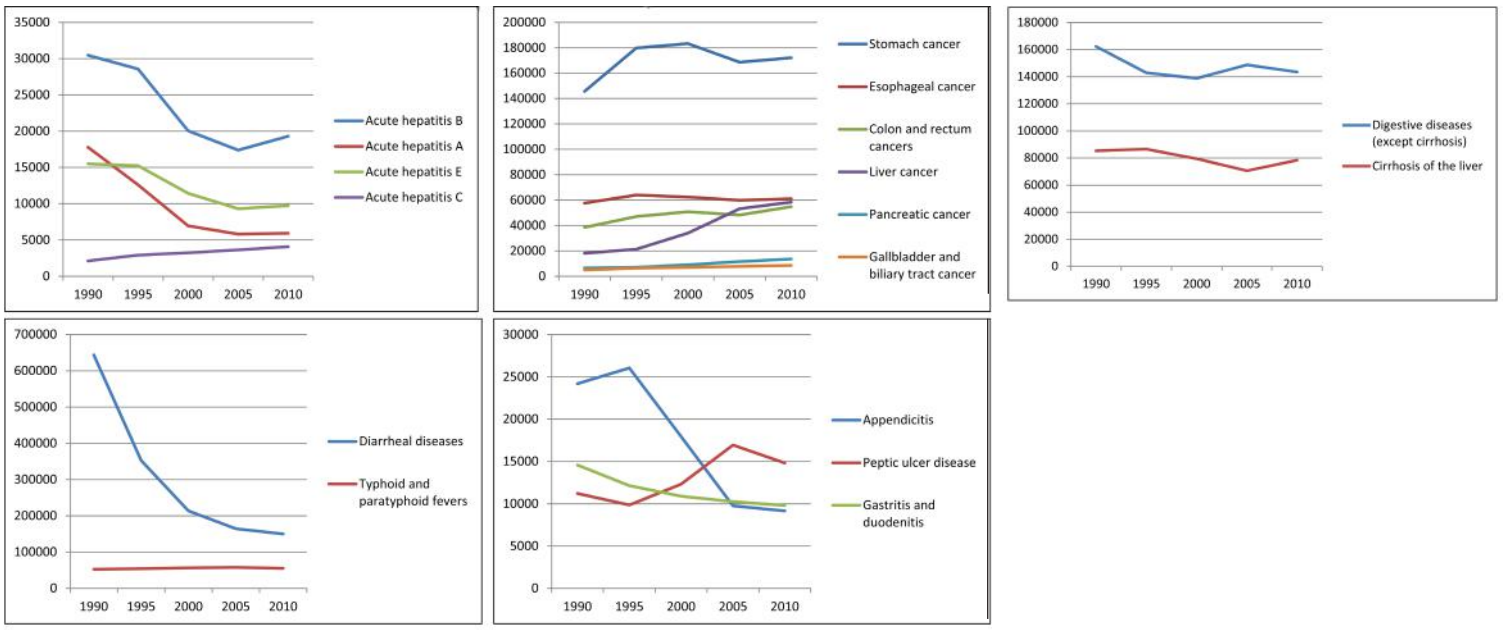


Fig. 10: **Trend of total DALYs in all ages, both sexes for GILD (GBD 2010)**

and inactive HBV infection[30] are amongst the main causes of disability due to GILD in Iran. Among these common diseases, GERD, IBD, and NAFLD show a remarkable increasing trend during the recent decades.[22,26,29] However, these studies have their own limitations. Some of them are not population-based and others have reported outpatient or inpatient data of specific referral clinics or hospitals. This is the source of the challenge GBD faces in reporting those GILD that are detected in outpatient settings. This category of GI and hepatic diseases have not been adequately addressed and estimates even do not exist (eg. for the case of GERD and NAFLD) or seem to be lower than existing estimates (eg. for the case of

IBD) in GBD results.

Limited population based cancer registries established in Iran during last 2 decades confirm the findings of GBD 2010 and show an increasing trend for gastric and colorectal cancer and a declining trend of esophageal cancer. The reason for declining trend of squamous cell cancer of esophagus[31,32] which seems to be paralleled by an increasing incidence of adenocarcinoma of esophagus[33] is most likely due to improvement is socioeconomic status of rural population in Iran and concomitant improvement in quality of nutrition.[34] Gastric cancer has remained as the most common cancer in Iran with no declining trend.[31,35,36] The reason for increasing prevalence of gastric cancer seems to be partly due to high *H.pylori* infection along with several important risk factors specifically common in Iranian population including tobacco, opium, poor oral health, high salt intake, and overweight and obesity.[37-47] A special characteristic of gastric cancer in Iran is the high incidence of proximal or so called cardia gastric cancer.[48,49] Risk factors for gastric cardia cancer are obesity, overweight, and GERD which is becoming very common in Iran during last two decades.[49] Therefore, prevailing risk factors for non-cardia cancer along with addition of risk factors for gastric cardia cancer are probably the main reasons for the increasing incidence of gastric cancer in Iran.[41,48]

Despite the concordance of GBD results with population-based studies regarding gastric, esophageal, and colorectal cancers, the reported increasing trend of liver cancer seems to be overestimated.[31,36,50,51] Primary liver cancer is not among the 10 most common cancers in Iran and majority of reported cases of liver cancer are actually metastatic secondary liver neoplasia with primary origin mainly from GI tract.[36,51] HCV infection is very uncommon in Iran[52] and the HBV infection is of genotype D1 in more than 90% of cases.[30] For these reasons, liver cancer has been reported to be uncommon and there is no increasing trend reported from local studies and cancer registries during last 2 decades in Iran.[53,54]

It is evident that GBD has had numerous achievements since its establishment, including development of unique metrics for measurement of health across countries. The results have urged policy-makers and other stakeholders especially in developing countries to identify priorities and take action for preventing the prevailing diseases and their risk factors at national level. However, cost-effective interventions may require more detailed and more accurate national and even sub-national estimates. In this regard, we have recently started an important study to especially investigate the trend of national and sub-national burden of gastrointestinal and liver diseases as part of national and sub-national burden of diseases (NASBOD) study in Iran.[55,56] This study, which contains a comprehensive systematic review can be a reliable source to be used in future updates of GBD studies. Local gray literature, non-English sources of data, access to micro-data of national surveys and specific sub-studies (on hospital data and prescriptions) will enrich the input data of NASBOD compared to GBD. The study can be adopted by other developing countries that are facing similar challenges.

CONFLICT OF INTEREST

The authors declare no conflict of interest related to this work.

FUNDING

This study was supported by grants from Iranian association of gastroenterology and Hepatology.

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