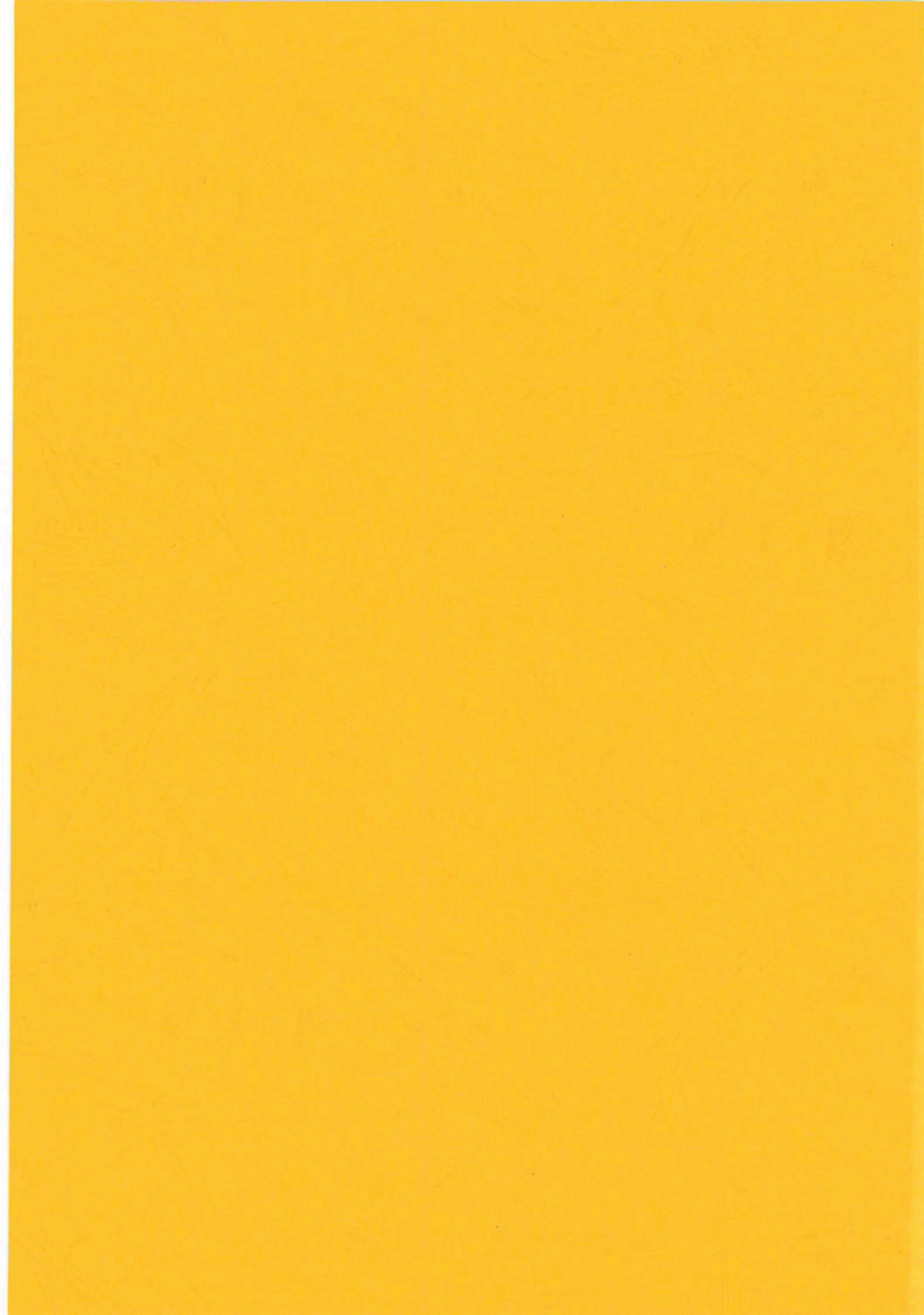




# THE SECOND MALAYSIAN BURDEN OF DISEASE AND INJURY STUDY

(Project Number: NMRR-10-758-6818)

Institute for Public Health,  
National Institutes of Health  
Ministry of Health, Malaysia  
2012





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ISBN : 978-983-2387-06-0

Suggested citation :

Institute for Public Health ( IPH ) 2012. Second Malaysian Burden of Disease and Injury Study.

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Published by the Institute for Public Health, Ministry of Health, Malaysia.

## *A*CKNOWLEDGEMENT

The authors would like to express their sincere gratitude and appreciation to the Director-General of Health Malaysia for his permission to publish this report. Special thanks to the Deputy Director of Health (Research and Technical Support) for the encouragement and support in the preparation and implementation of this study. This study was funded by the National Institutes of Health (NIH) research project grant under the National Burden of Disease and Injury Study 2011 (NMRR-10-758-6818). Our sincere acknowledgement is also extended to all research team members, working group members, data processing team and other individuals, for their dedicated efforts and commitments.

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## 1. Introduction

The growing demand for health services under limited resources poses a challenge for government to respond to people's health needs wisely. Inadequate information to guide decision on health policies and resource allocation is one of the obstacles for better policy development.

Evidence-based evaluation of policies to improve health and reduce inequalities, and the prioritizing and resourcing of these policies, requires four basic types of information:

- a detailed assessment of the magnitude and impact of health problems in the population, including information on the causes of loss of health in the population (both in terms of diseases and injury, and risk factors or broader determinants), in order to address the questions of what can be done to improve health and what are the best buys for the health dollar;
- information on health expenditure and health infrastructure (a national system of health accounts) detailing the availability of resources for health improvement and what the resources are currently used for;
- information on the cost-effectiveness of available technologies and strategies for improving health; and
- information on inequalities in health status, health determinants, and access to and use of health services (including both prevention and treatment)

The Global Burden of Disease Study, a comprehensive regional and global assessment of mortality and disability, is an example of an evidence-based input to public health policy debate. The study, which includes projections of the burden through the year 2020, uses the disability-adjusted life year (DALY) as a composite measure of years of life lost due to premature mortality (YLL) and years lived with disability (YLD). Future patterns of death

and disability are likely to change dramatically because of aging of the world's population, the epidemic of tobacco-related disease, the human immunodeficiency virus epidemics, and the likely reduction in death rates from communicable diseases in children.

Hence a study on disease burden in Malaysia is important to obtain information on short and long-term health outcomes, including impairments, functional limitations (disability) and, potentially, restrictions in participation in usual roles (handicap), and death. The First Malaysian Burden of Disease and Injury Study conducted in 2000 provided the first detailed and consistent epidemiological estimates for a broad range of diseases and injuries in Malaysia. The aim of the Second Burden of Disease and Injury Study is to provide estimates of burden of diseases and injuries in Malaysia for the year 2008.

## **2. Objectives**

### **2.1 General Objective**

The Second Malaysian Burden of Disease (BOD) and Injury Study aims to provide a comprehensive assessment of premature mortality and morbidity (non-fatal health outcomes) attributable to diseases and injuries by age and sex in 2008.

### **2.2 Specific Objectives**

- i. To derive internally consistent estimates of premature mortality by age and sex for 114 identified causes of disease and injury.
- ii. To derive internally consistent estimates of morbidity by age and sex for 114 identified causes of disease and injury.
- iii. To calculate the burden of premature mortality and morbidity in terms of Disability Adjusted Life Years (DALYs).



### 3. Methodology

#### 3.1 Introduction

This 2<sup>nd</sup> BOD and Injury study adopted the Global Burden of Disease (GBD) approach, using the concept of Disability Adjusted Life Years (DALY), in assessing the disease burden. DALYs for a disease or health condition are calculated as the sum of Years of Life Lost (YLL) in population and Years Lived with Disability (YLD) for incident cases of the health condition.

This study assessed the burden of disease and injury at the national level. The reference year for analysis is year 2008, even if this means estimating trends in the epidemiology (incidence or prevalence) of some diseases from older data. Age groups selected for this study are similar to GBD Study 2000 (0-4, 5-14, 15-29, 30-44, 45-49, 50-59, 60-69, 70-79, 80+).

The diseases and injuries were divided into three broad groups of causes as proposed by Murray and Lopez (1996) in the Global Burden of Disease 1990 study (GBD 1990):

Group I      Communicable, maternal, perinatal and nutritional conditions

Group II      Non-communicable diseases

Group III      Injuries

Each group was then divided into major cause subcategories and two further disaggregation levels in order to obtain a list of diseases and injuries based on GBD classification<sup>1</sup>. The disease and injury in the list were selected based on several criteria including:

- a) The probable magnitude ( $\geq 0.1\%$ ) as a cause of death or cause of disability;
- b) Level of health services provided for the cause;
- c) Diseases and injuries of local public health importance; and
- d) The availability of morbidity data for the cause of death or cause of disability

The calculation of burden of disease and injury was done using uniform age weights and standard age weights adopted in the Global Burden of Disease Study<sup>2</sup> or other available information.

The DALY used explicit preference values for different health states known as 'disability weight'. The weights for DALY calculation expressed on a scale from zero to one, with zero representing a state of optimal health (no loss) and one representing a state equivalent to death.

### **3.2 Source of Data**

Burden of Diseases and Injury Study used secondary data for disease burden estimations. Several identified sources of data were:

- Mortality data 2008 from Department of Statistic
- Population data 2008 from Department of Statistic
- Communicable diseases from e-notis 2008
- Database PPT2 (all discharges from government hospital) 2008
- Database PS101 (all discharges from private hospital) 2008
- All available disease registries
- Oral health data from NOHSA 2010, NOHSS 2007, NOHPS 2005.
- National Health Morbidity Survey 2006
- Any related data e.g. from studies etc.

### **3.3 DALYs Calculation**

DALYs for a disease or health condition are calculated as the sum of the years of life lost due to premature mortality (YLL) in the population and the equivalent 'healthy' years lost due to disability (YLD) for incident cases of the health condition:

$$\text{DALYs} = \text{YLLs} + \text{YLDs}$$

### **3.3.1 Years of Life Lost (YLL)**

Years of Life Lost (YLLs) are the mortality component of DALYs. The basic formula for calculating YLL for a specific cause of death or injury is:

$$YLL = N * LE$$

where N is the age and sex-specific number of deaths and L is the age and sex-specific mean life expectancy (LE). The mean LE for each age group and sex is estimated from the observed mean age at death in an age interval and the life expectancy figure at the exact ages defining the age interval with discounting at a rate of three percent, and the formula for YLL becomes:

$$YLL = N * (1 - e^{-0.03L}) / 0.03$$

### **3.3.2 Calculation of Life Expectancy (LE)**

Population and mortality data for 2008 was used for life expectancy calculation. Such data were used directly to construct life table if the coverage of death registration is 85% and above. However, adjustment for incomplete registration will be done if the coverage is below 85%.

### **3.3.3 Age and sex-specific number of deaths**

Mortality data for the year 2008 from the Department of Statistics were used to estimate cause-specific mortality (by age and sex) in Malaysia.

#### ***Cause-specific mortality estimates***

All death in National Vital Registration were coded either using ICD-10 classification (for medically certified death) or Malaysian Department of Statistic codes (for non-medically certified death). All data were examined for quality on causes of death using specific criteria<sup>3</sup>.

The medically certified death data underwent 3 stages of validation and verification. The first was step assessment of the accuracy of coding done by original coders (Department of Statistic) on cause of death by sex and age.

Then, coding of the death data were conducted by independent certified coders on the original data, based on cause of death, sex and age of the deceased. Finally, the findings (codes) of the deaths were compared between coding by original coders and independent coders. Cases with same codes were accepted whereby cases with disagreed codes were re-coded by a group of independent certified coders.

Deaths which were non-medically certified were coded according to the guideline produced by Department of Statistic Malaysia. For each specific codes, the non-medically certified death were re-coded into ICD 10 by an expert certified coder and physician based on expert consideration of available information including age, sex and cause of death.

All deaths were then combined and constituted the cause of death structure. Deaths coded into garbage categories (ill-defined cause of death) were redistributed, accordingly by age and sex stratum, based on the guideline for Global Burden of Disease 2005 Study<sup>4</sup> with some modifications.

### 3.3.4 Years Lived with Disability (YLD)

The loss of 'healthy' life due to non-fatal health conditions requires estimation of the incidence of the health condition (disease and injury) in specific time period. For each new case, the number of years of healthy life lost is obtained by multiplying the average duration of the condition (to remission or death) by a severity weight measures the loss of healthy life using an average health state weight. The basic formula for calculating YLD is:

$$YLD = I * DW * L$$

where I is the number of incident cases in the reference period, DW is the disability weight and L is the average duration of disability (measured in years). With discounting at the rate of three percent, the formula becomes:

$$YLD = I * DW * L * (1 - e^{-0.03L}) / 0.03$$

The steps below were undertaken to derive the epidemiological indicators for each of the identified diseases and injuries:

- 1) Research current knowledge of the selected disease.

- 2) Construct diagram of the natural history of the disease.
- 3) Identify the epidemiological indicators to be estimated.
- 4) Review published and non-published epidemiological data available.
- 5) Check internal consistency and quality of the estimates.
- 6) Apply the data to calculate YLDs.

### **3.4 Ethical consideration**

The permission to use the data was formally obtained from the data owner. Value judgment and measures taken in the analysis of disease burden were transparent and reproducible.

## RESULTS

### NATIONAL LEVEL

#### Mortality:

The total number of deaths estimated in Malaysia for the year 2008 was 124,857 with 72,202 (57.8%) males and 52,655 (42.2%) females. Based on death registered in 2008, the estimated life expectancy at birth for Malaysian males was 70.2 years and 74.8 years for females. The top two leading causes of death in both sexes were Ischaemic Heart Diseases and Cerebrovascular Diseases (Stroke) (Table 1). Road Traffic Injuries and Breast Cancer was the third leading cause of death in males and females, respectively.

#### Years of Life Lost (YLL):

The total number of YLLs in Malaysia for the year of 2008 was 1.5 million. Almost sixty percents of the YLLs were contributed by male (57.9%). Majority of YLLs were observed in the age group of 45-59 (26%), followed by 60-69 (18%) and 30-44 (16%).

Almost three quarter of YLLs were due to non-communicable diseases (68%) followed by communicable disease (20%) and injury (12%). Overall, the leading causes of YLLs were Ischaemic Heart Disease (17.1%), Cerebrovascular Diseases (9.6%), Road Traffic Injuries (8.3%) and Lower Respiratory Infections (4.2%) (Table 2). In men, other major contributors of YLLs were HIV; Trachea, Bronchus and Lung cancers; Nephritis and Nephrosis and Chronic Obstructive Lung Diseases. For women, Breast Cancer was at the third rank, whilst Road Traffic Injuries was ranked fifth, followed by Nephritis and Nephrosis; Trachea, Bronchus and Lung Cancers and Diabetes Mellitus.

Majority of YLLs in age group 0-4 were contributed by Group I (Communicable disease, Maternal, Perinatal and Nutritional status), while for age group 15-29, most YLLs were due to Group III (Injury) and among 30

years and above, majority of YLLs were contributed by Group II (Non-Communicable disease).

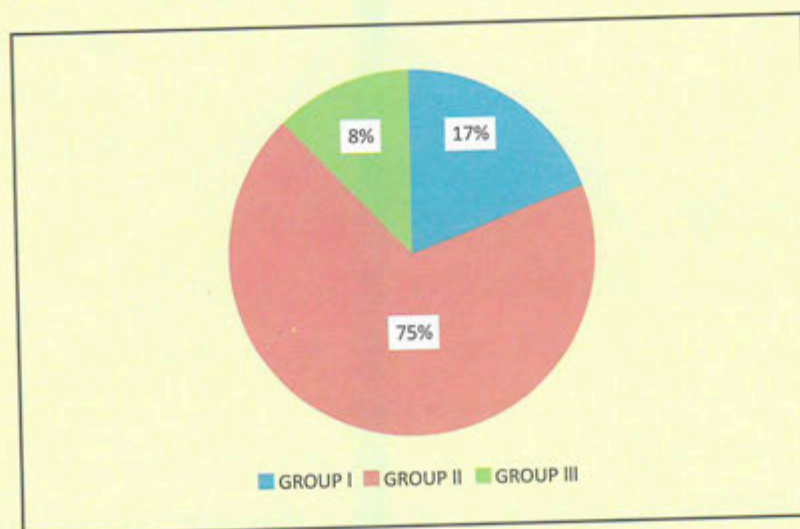
By disease category, the leading cause of YLL in Malaysia was caused by Cardiovascular and Circulatory Diseases (35%), followed by Malignant Neoplasm (21%), Infectious Disease (15%), Unintentional Diseases (13%) and Respiratory Diseases (6%).

### **Years Lived with Disability (YLD):**

Total number of YLDs for Malaysian in 2008 was 1.3 million with slightly higher figures observed in males (52.7%) than females. Overall, the top three leading causes of YLD were Diabetes Mellitus (12 %), Unipolar Depressive Disorders (8.8%) and Osteoarthritis (4.9%) (Table 3). Similar ranking was observed in both females and males, except Alcohol Use Disorder was the third leading cause of death in males.

### **Disability Adjusted Life Years (DALYs):**

In 2008, the total burden of disease amongst Malaysians amounted to 2.85 million with males contributed a higher proportion compared to females. These burdens were attributable to non-communicable diseases (Group II) followed by communicable (Group I) and injury (Group III) (Figure 1).



**Figure 1. DALYs by major disease groups, Malaysia, 2008**

Almost one quarter of DALYs occurred in the age group of 45-59 (24%), followed by 30-44 (17%) and 60-69 (16%) (Figure 2). Group I (Communicable disease, Maternal, Perinatal and Nutritional status) was the main contributor of DALYs amongst those aged 0-4 years, while for age group 15-29 and 30 years and above, most DALYs were due to Group III (Injury) and Group II (Non-Communicable disease), respectively (Figure 3).

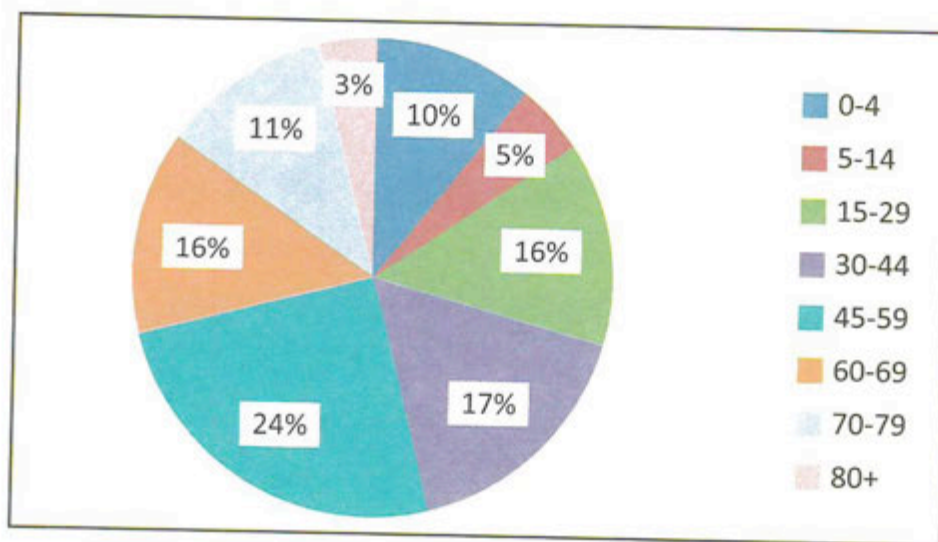


Figure 2. DALYs by age group, Malaysia, 2008

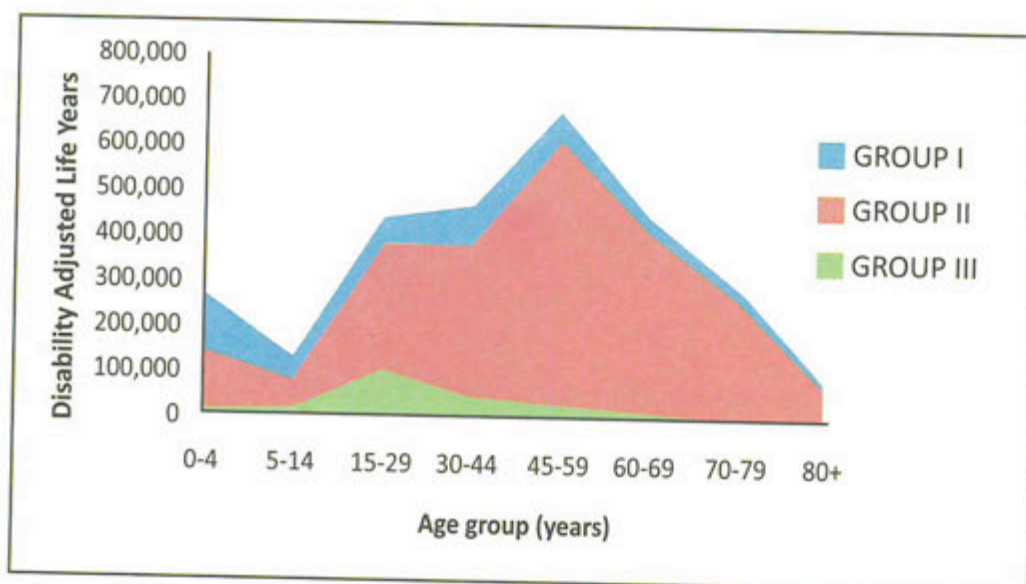


Figure 3. DALYs by age group and major diseases groups, Malaysia, 2008



The contribution of non-fatal (YLD) and fatal component (YLL) to overall DALYs by disease categories was shown in Figure 4. The burden of the two leading disease categories (Cardiovascular and Circulatory Disease and Malignant Neoplasm) was mainly contributed by the fatal component whereas for Mental and Behavioral Disorder, Diabetes Mellitus and Sense Organs Disease, the burden was mainly attributable to non-fatal conditions.

The leading diseases or injuries attributable to the overall burden of disease in terms of DALYs were Ischaemic Heart Disease, Cerebrovascular Disease, Diabetes Mellitus and Road Traffic Injuries, which contributed to almost 30% of total DALYs (Table 4).

In males, Ischaemic Heart Disease, Road Traffic Injury and Cerebrovascular Disease accounted for almost 26% of the total DALYs. Among females, Ischaemic Heart Disease, Cerebrovascular Diseases and Diabetes Mellitus were the leading causes of burden of disease. Together, they contributed 23.1 % of the total DALYs in females.

#### **CHILDREN AGED 0 - 4 YEARS:**

##### **MORTALITY:**

The total number of deaths amongst 0-4 year-old children was 3,899 with more than half among males (2,203) (Table 5). The top two leading causes of death in both males and females were Lower Birth Weight and Congenital Heart Anomalies. In male, the third leading cause was Lower Respiratory Infections, and in female Birth Trauma and Asphyxia were the ? third leading causes of death.

##### **YLL :**

The commonest cause of YLL in both male and female was Low Birth Weight, accounting for 21.7% and 17.4% of the total YLL for males and females, respectively (Table 6). The second commonest cause was Congenital Heart Anomalies followed by Lower Respiratory Infections in male and Birth Trauma and Asphyxia in females.

### **YLD :**

Overall, the top three leading causes of YLD were Low Birth Weight 15,343 (9.6%), Protein Energy Malnutrition 15,099 (9.5%) and Down's Syndrome 13,221 (8.3%) (Table 7). The top three commonest causes were observed in females but with different ranking. Among males, the third leading cause of YLD was Otitis Media.

### **DALYs:**

By disease category, the DALYs were contributed by Congenital Anomalies (29.9%), Neonatal Conditions (26.1%), Respiratory Infections (9.7%) and Nutritional Deficiencies (7.9%) (Figure 5). Majority of the burden for these four categories were contributed by morbidity components except for Neonatal Conditions with slightly higher mortality than morbidity.

The leading cause for burden of disease in male and female was Low Birth Weight, contributing about 14% of overall BOD among children 0 to 4 years old. (Table 8). Other commonest causes were Protein Energy Malnutrition, Down Syndrome and Birth Trauma & Asphyxia.

### **CHILDREN AGED 5 - 14 YEARS:**

#### **MORTALITY:**

The top two causes of death were due to Injuries (road traffic injuries and drowning), followed by Leukaemia, Lower Respiratory Infection and Meningitis (Table 9). Similar pattern was seen in male but drowning was the third leading cause of death among females.

#### **YLL:**

The top five leading causes of YLL among children 5-14 years old were Road Traffic Injuries, Drowning, Leukaemia, Lower Respiratory Infections and Meningitis & Encephalitis (Table 10). Those diseases contributed almost half

of YLL in this age group. Similar ranking was seen in male. However in female, they were in different order.

#### **YLD:**

Overall, the top four leading causes of YLD were Otitis Media (29.2%), Asthma (17.2%), Nutritional Anaemia (13.7%) and Epilepsy (6.4%) (Table 11). Similar pattern was observed in females. However, for male, the fourth leading cause was Hearing Loss.

#### **DALYs:**

By disease category, the leading causes of DALYs were Respiratory Infections (23.5%), Unintentional Injuries (14.4%), Respiratory Diseases (13.8%) and Nutritional Deficiencies (9.6%). Majority of these diseases were due to morbidity except for Unintentional Injuries (Figure 6).

The leading cause of burden of disease in both male and female were Otitis Media (20.4%), Asthma (12.3%), Nutritional Anaemia (9.6%) and Road Traffic injuries (6.7%) (Table 12).

### **15 - 29 YEARS OLD**

#### **MORTALITY:**

Majority of deaths in this age group were caused by Road Traffic Injuries (40.1%). It was also the commonest cause of death among male (46.9%) and female (20.6%) (Table 13).

#### **YLL :**

Road Traffic Injuries and Lower Respiratory Infections were the first and second leading cause of YLLs in this age group (Table 14). Drowning, HIV and Cerebrovascular Diseases were other diseases in the top five leading

causes in males. While Cerebrovascular Diseases, Meningitis & Encephalitis and Leukaemia were other top five leading causes of YLLs in female.

### **YLD :**

Alcohol Use Disorders and Unipolar Depressive Disorders is the leading cause of YLD in male and female, respectively. This was followed by Unipolar Depressive Disorder, Drug use Disorders, Diabetes Mellitus and Road Traffic Injuries in males; Anxiety Disorders, Abortion, Asthma and Schizophrenia in females (Table 15).

### **DALYs:**

By disease category, more than half of the burdens were contributed by Mental and Behavioural Disorders (30.3%) and Unintentional Injuries (22.5%). For Mental and Behavioural Disorders almost 100% were due to morbidity component (Figure 7)

Road Traffic Injuries (25.1%) was the first leading cause of DALYs in males, followed by other disorders from the Mental Disorder group and Diabetes Mellitus. Whilst Unipolar Depressive Disorder (18.9%) was the main leading cause of DALYs in females, followed by Road Traffic Injuries, Anxiety disorders, Asthma and Abortion (Table 16).

## **30 - 59 YEARS OLD**

### **MORTALITY:**

Ischaemic Heart Disease (20.0%), Cerebrovascular Diseases (9.2%) and Road Traffic Injuries (6.0%) were the top three causes of death. Similar pattern was seen in male but in female, Breast Cancer was the second commonest cause of death followed by Cerebrovascular Disease (Table 17).

### YLL :

Ischaemic Heart Disease and Cerebrovascular Diseases were the commonest causes of YLLs in males respectively. This was followed by Road Traffic Injuries, Lower Respiratory Infections and HIV. These top five causes contributed half of the YLL in males. Ischaemic Heart Disease and Breast Cancer were the two leading causes of YLLs in females, followed by Cerebrovascular Disease, Lower Respiratory Infections and Nephritis & Nephrosis (Table 18).

### YLD:

Diabetes Mellitus and Unipolar Depressive Disorders were the top two leading causes of burden of disease in males and females. Other leading causes of YLD in males were Alcohol Use Disorders, Gout and Cerebrovascular Diseases. In females, the other leading causes were Gout, Cerebrovascular Diseases and Nutritional Anaemia (Table 19).

### DALYs:

More than half of the burdens were attributable to Cardiovascular and Circulatory Diseases (20.9%), Malignant Neoplasm (11.9%), Diabetes Mellitus (10.2%) and Mental and Behavioural Disorders (9.6%). The two diseases were mainly due to mortality component but the remaining two were due to morbidity (Figure 8).

Overall, the top three leading causes of DALYs were Ischaemic Heart Disease (11.4%), Diabetes Mellitus (10.2%) and Cerebrovascular Diseases (7.5%). Similar ranking was seen in males. On the other hand, for females, Diabetes Mellitus, Cerebrovascular Diseases and Unipolar Depressive Disorders were the top diseases accountable for DALYs respectively (Table 20).

## **60 YEARS OLD and ABOVE**

### **MORTALITY:**

The commonest causes of death among elderly were Ischaemic Heart Disease (23.5%) and Cerebrovascular Diseases (15.4%). Similar patterns were seen in males and females (Table 21).

### **YLL:**

Similarly, the top leading causes of YLL among elderly were Ischaemic Heart Disease and Cerebrovascular Diseases. The other leading causes were Trachea, Bronchus & Lung Cancer and Chronic Obstructive Pulmonary Disease. Similar ranking was seen in males. In females, the third and fourth leading causes of YLL were Nephritis & Nephrosis and Lower Respiratory Infections (Table 22).

### **YLD:**

The top three leading causes of YLD were Diabetes Mellitus (13.3%), Hearing Loss (11.9%) and Cataract (9.0%). Similar patterns were seen in females. In males, the third leading causes were Cerebrovascular Diseases and Cataract respectively (Table 23).

### **DALYs:**

The top two disease categories accountable for DALYs were Cardiovascular and Circulatory Diseases (31.5%) and Malignant Neoplasm (12.4%) and were contributed mainly by mortality component. The third rank was Sense Organ Disorders (8.8%) in which its DALYs were contributed mainly by the morbidity component (Figure 9). The top three leading causes in both males and females were Ischaemic Heart Disease, Cerebrovascular Disease and Diabetes Mellitus. (Table 24)

## DISCUSSION

The present findings were based on critical appraisal of all available information on mortality and morbidity for 114 diseases and injuries.

In 2008, majority of the disease burden were non-communicable diseases (Group II) followed by communicable (Group I) and injury (Group III). The burden of the two leading disease categories (Cardiovascular and Circulatory Disease and Malignant Neoplasm) was largely contributed by the fatal component whereas for Mental and Behavioral Disorder, Diabetes Mellitus and Sense Organs Disease, the burden was non-fatal conditions.

Almost sixty percents of overall YLLs were contributed by males (61%)(Figure 10). Majority of YLLs were observed amongst adults in the age group of 45-59 (26%), followed by 60-69 (18%) and 30-44 (16%). The leading causes of YLL were Ischaemic Heart Disease (17.1%), Stroke (9.6%), Road Traffic Injuries (8.3%) and Lower Respiratory Infections (4.2%). Overall the top three leading causes of YLD were Diabetes Mellitus (12 %), Unipolar Depressive Disorders (8.8%) and Osteoarthritis (4.9%).

Similarly with other BOD studies, this study present the disease burden in DALYs as a summary measure of the population health. This approach allows us to make comparisons between diseases, by taking into account the fatal and non-fatal health outcomes. Thus, non-fatal health outcomes such as mental disorders would become apparent as an important health problem. This may not be possible if the traditional mortality-based measures were used.

In particular, the DALY measures the gap between a population's actual health status and some 'ideal' or reference status. In developing the DALY indicator, Murray and Lopez (1996) identified five valued choices that should explicitly made:

- How long 'should' people in good health expect to live?
- Is a year of healthy life gained now worth more to society than a year of healthy life gained sometime in future, for instance in 20 years' time?

- How should we compare years of life lost through death with years lived with poor health or disability of various levels of severity?
- Are lost years of healthy life valued more at some ages than others? The GBD code to value a year of life at young adult ages more than in old age or infancy.
- Are people equal? Do all people lose the same amount of health through death at given age, even if there are variations in current life expectancies between population groups?

The Global Burden of Disease Study used the same values for all regions of the world. In particular, the study used the same life expectancy 'ideal' standard for all population subgroups, irrespective whether the current life expectancy was lower than that of other groups, it used the same 'disability weight' for everyone living in a specified health state, and gave equal weightage to a year of healthy life lost at any age (equal 'age weights').

Available mortality statistics by age, sex and causes at the national level for 2008 were used as input data for mortality estimation. We assumed the registration of mortality from the Malaysian Department of Statistic Report was complete. There were no other sources of mortality data to make formal verification. Disaggregated data were evaluated for quality in terms of proportion of deaths and the data were used to construct abridged life tables.

The process of establishing and developing a death registration system with totally medically certified requires considerable resources, and in many countries, they have taken more than a century to become efficient<sup>5</sup>. However, Malaysia has already established a near complete vital registration, and now should focus on strengthening the cause of death reporting mechanisms<sup>6</sup>. A complete review of medical certifications should be considered as a priority by relevant authorities and ministries of the government of Malaysia, in conjunction with studies to validate medically certified causes of death in hospitals<sup>7,8</sup>. Improvement in medically certified death could be initiated with improved training programmes for physicians in cause of death certification procedures and ICD-10 coding. Also, like other Asian countries, Malaysia should undertake pilot projects to improve cause of



death attribution for deaths occurring outside health facilities, using verbal autopsy methods<sup>9,10,11</sup>.

A large number of estimates describing the epidemiology of the main diseases in Malaysia are now available especially for communicable diseases, maternal conditions, certain non communicable diseases (diabetes, renal failure, cancer) and injuries. The quality of the data sources underlying the disease models varies from very good to speculative. We give a subjective impression of the accuracy of our estimates to the main causes with a brief justification for the classification of data quality into good, reasonable, poor and very poor estimates.

For many diseases and injuries the research team has no choice but to extrapolate the epidemiological data (such as prevalence and incidence) due to limited availability of such data in Malaysia. For example, the estimates for mental disorders, the largest contributor to YLD, are all based on data from studies outside Malaysia.

Cautions is needed when interpreting results of BOD studies because the approach is at macro level. The aim of BOD studies is to measure the health of a population not that of an individual. Estimates of severity and duration are based on the level of disability experienced by the average case in a particular health state. These generalizations do not consider the variation in disease experienced by individuals but for an estimate at the population level it is a reasonable approach.

Secondly, the absolute number of DALYs associated with a disease or injury is difficult to interpret. We therefore frequently presented figures in this study as relative numbers, i.e. a proportion of the overall disease burden.

Thirdly, the DALY is only a measure of one dimension relevant to health services, i.e. objective health status of people. Improving health status and reducing inequalities in health status should be the primary concern to a health system but there are other important dimensions such as autonomy, dignity, or even stress relief and reassurance for some health concerns. For instance, promptness and convenience in service provision may not alter DALYs but are valued by the user. Using BOD in priority setting should not

lead to the conclusion that health services are solely concerned with disease reduction.

Fourthly, the DALY is a health gap measure and reflects the burden at a particular time. Diseases for which there are successful control programs, e.g. vaccine preventable diseases, maternal conditions etc., may not ranked high in terms of burden of disease but this should not be taken as a license to reduce funding to the existing control program. However, it would indicate that little additional health gain could be expected from an expansion of the disease control program.

Fifthly, setting priority by BOD does not necessarily mean that highly ranked diseases should be given priority over those in lower ranks. We strongly agree with Mooney and Wiseman (2000) that priority setting should concentrate on how resources are used although we do not accept their conclusion that therefore estimating burden of disease is a waste of analytical resources. Decision-making is not solely based on the ranking of BOD; rather it also depends on the feasibility, effectiveness and affordability of intervention options. For example, in the case of dementia, where no effective intervention exists, spending more resources may not lead to improvement in the condition.

## **Strengths of the study**

### ***Utilization of local data sources***

This is a Malaysian national study and we used as much as possible our local data sources. For some conditions and specific diseases where to obtain reliable local information is not possible, we employed international estimates or studies from other countries. As we used only secondary data and did not try to conduct a new survey for primary data, we made a thorough review of our existing data and recommended extension of the coverage of hospital admission data collection to include all public and private hospitals. We also used large surveys data such as the National Health Morbidity Survey, National Eye Survey, Oral Health Survey and Cancer Registry. We

recommended that these surveys to be repeated at regular intervals and be extended into areas currently not covered, particularly mental disorders. Greater attention should be given to the quality of data collection.

### ***Multiple data sources***

The cross-checking of various data sources provided valuable insight into individual data source. In addition, when there were some doubts about the local data, we selected information that was deemed most relevant to the local situation. In the event that we could not find reliable local information, we used the GBD estimates.

### ***Internal consistency***

For nearly all conditions we tested the internal consistency of available data sources using the DISMOD program. Participation from policy makers and public health/ clinical experts were taken into consideration in order to attain high level of transparency in data management.

For this study, we consulted many disease experts and incorporated their advices and criticisms during the revisions of the data.

### **Limitations of the study**

#### ***Mortality Component***

The calculation of mortality component of disease burden (YLL) was relatively straightforward and the precision of these estimates was almost entirely dependent on the quality of information on underlying cause of death. Although Malaysia has a good vital registration system, the system allows deaths to be certified by lay person (i.e.: non-medically certified death). As such, almost half of the registered deaths in Malaysia are non-medically certified. This poses a challenge in the calculation of mortality burden since a large proportion of deaths were coded with ill-defined causes (e.g.: old age).

The mortality data included an unacceptably high proportion of deaths coded to ill-defined conditions and miss-specified vascular diseases, particularly cardiac arrest. These may be indicative of miscoding of deaths due to lack of knowledge on medical history, inadequate diagnosis by physician leading to lack of information on the medical card, or the families were unaware on the deceased medical status. These issues strongly suggested the need for urgent measures to improve the cause of death certification and coding practices among the physician at the hospital level, through adequate training programs<sup>12</sup>.

We make three major assumptions on the causes of death in this study. Firstly, the cause of death structure in certified deaths was the same as that of uncertified deaths. This was unlikely to be the case as there were reasons to believe that certain causes were more likely to be certified (e.g. injuries) and that death in the poor and in rural areas were more likely not to be certified and were likely to have different underlying causes. Secondly, the causes of certified deaths were accurate. We expected the accuracy at the level of individual deaths was rather poor but that the overall cause of death structure may be less affected as 'false negative' and 'false positive' diagnoses cancel each other out at the population level. Thirdly, we reallocated ill-defined codes from the ICD chapter of symptoms and ill-defined conditions within disease chapters to specific disease categories. Of course, there was considerable uncertainty about this procedure but we argued that leaving a large number of deaths in the ill-defined categories may lead to greater misinterpretations particularly when comparisons over time were made with different proportions of deaths allocated to ill-defined categories.

### ***Disability weights***

We used disability weights developed for the GBD and Dutch studies. This may not be relevant to local health state preferences and attitudes. Strong suggestion that work should be done to develop the formulation of Malaysian disability weights. The development of Malaysian specific weights would lead to estimates which better suit the needs of Malaysia health policy formulation.

However, the use of international weights may be close enough to Malaysia preferences while allowing direct international comparisons. Also, developing our own weights necessitates a considerable resource input.

### ***Data gaps and deficiencies***

Information essential for the analysis of BOD in Malaysia is difficult to obtain, as there is no unified national system. The BOD estimates were only as good as the data inputs. The quality of data was variable, ranging from nationally representative surveys to small local studies conducted by academic institutions. Selected data gaps identified from the study are summarized below.

We have already mentioned the vital contribution of the mortality analysis. The extrapolations made from VR diagnoses rely on a low percentage of certified deaths. Improvements in the VR system are currently being implemented but a verbal autopsy study was needed in Malaysia to strengthen the mortality data in the short term.

For descriptive epidemiological data, there was a lack of unified source of information although a variety of sources of information exist. All routine data systems were known to have some underreporting of events or to be unrepresentative of the national population. For instance, this was the case for most infectious diseases in the disease notification system. There was a need to improve laboratory confirmation and to capture events from private services. For some infectious diseases, there were two data collection systems presenting different figures for example Malaria. The data from the CDC MOH were not consistent with those from the Health State Department. It would be more efficient to re-look into these systems.

We recommended that greater attention be given to quality control measures in data collection and processing of these existing systems rather than developing new systems.

## **Potential impact of disease burden study in Malaysia**

The first set of results from the Malaysian burden of disease study has variety of uses, including quantification of the relative contribution of different diseases, injuries and risk factors to the total disease burden in the population. There are various other health status indicators currently used in Malaysia such as Infant Mortality Rate (IMR), Maternal Mortality Rate (MMR), disease-specific death rates, incidence, and prevalence. The BOD estimates are not to substitute other health status indicator; rather their use is as a complementary, comprehensive indicator to enhance policy formulation. Some of the potential impacts of the study are summarized below.

Systemic assessment of disease burden has multiple purposes for health planning. For example, this information contributes to debates on priorities for health service delivery, priorities for health research or improving curricula for professional training.

The extensive epidemiological modeling carried out in a burden of disease study identifies gaps in health information systems. Our scrutiny of information with a potential impact on the decision-making process should encourage actions to fill in data gaps and improve deficient data collection systems in Malaysia

The use of morbidity data for a comprehensive evaluation of disease impacts is a challenging exercise but it provides a more appropriate and balanced view on the impact of all health outcomes on overall population health.

This study will be the basis for further study of risk factors attributable to disease burden and sub-national estimates for Malaysia. Those results will be of interest for the planning of preventive services at a national and local level.

At a later stage, cost-effectiveness analyses of health intervention options for major diseases and risk factors are planned. Combining knowledge on the magnitude and distribution of health problems (from a burden of disease study) with economic evidence of efficiency (cost-effectiveness) provides policy makers with a powerful set of tools to facilitate their decision-making.

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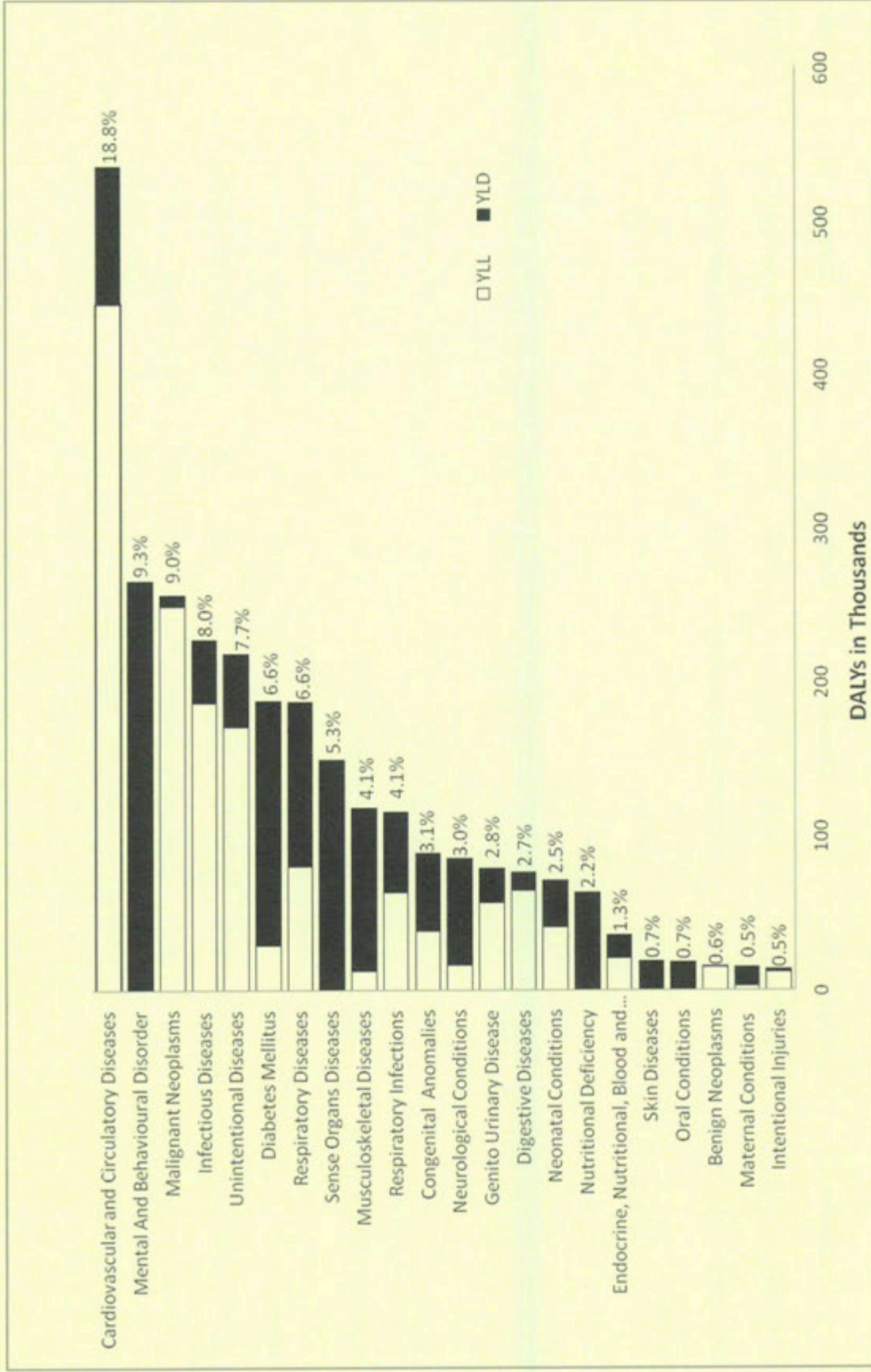


Figure 4: DALYs by diseases categories, Malaysia, 2008

**Table 1: Top 10 causes of death, Malaysia, 2008**

| Rank | Males (Total Death =72,202)           |        |      | Females (Total Death =52,655)         |       |      | Persons (Total Death =124,857)        |        |      |
|------|---------------------------------------|--------|------|---------------------------------------|-------|------|---------------------------------------|--------|------|
|      | Disease                               | Death  | %    | Disease                               | Death | %    | Disease                               | Death  | %    |
| 1    | Ischaemic heart disease               | 15,836 | 21.9 | Ischaemic heart disease               | 9,667 | 18.4 | Ischaemic heart disease               | 25,503 | 20.4 |
| 2    | Cerebrovascular diseases (Stroke)     | 7,725  | 10.7 | Cerebrovascular diseases (Stroke)     | 7,852 | 14.9 | Cerebrovascular diseases (Stroke)     | 15,577 | 12.5 |
| 3    | Road traffic injuries                 | 4,895  | 6.8  | Breast cancer                         | 2,077 | 3.9  | Road traffic injuries                 | 5,835  | 4.7  |
| 4    | Trachea, bronchus and lung cancers    | 2,816  | 3.9  | Lower respiratory infections          | 1,947 | 3.7  | Lower respiratory infections          | 4,762  | 3.8  |
| 5    | Lower respiratory infections          | 2,816  | 3.9  | Nephritis and nephrosis               | 1,790 | 3.4  | Trachea, bronchus and lung cancers    | 4,323  | 3.5  |
| 6    | Chronic obstructive pulmonary disease | 2,732  | 3.8  | Trachea, bronchus and lung cancers    | 1,507 | 2.9  | Nephritis and nephrosis               | 3,810  | 3.1  |
| 7    | Nephritis and nephrosis               | 2,020  | 2.8  | Diabetes Mellitus                     | 1,392 | 2.6  | Chronic obstructive pulmonary disease | 3,635  | 2.9  |
| 8    | HIV                                   | 1,421  | 2.0  | Colon and rectum cancers              | 1,160 | 2.2  | Diabetes Mellitus                     | 2,634  | 2.1  |
| 9    | Diabetes Mellitus                     | 1,241  | 1.7  | Road traffic injuries                 | 940   | 1.8  | Colon and rectum cancers              | 2,366  | 1.9  |
| 10   | Liver cancer                          | 1,227  | 1.7  | Chronic obstructive pulmonary disease | 903   | 1.7  | Breast cancer                         | 2,086  | 1.7  |

Table 2: Top 10 causes of premature mortality (YLLs), Malaysia, 2008

| Rank | Males (Total YLL = 918, 110)          |         |      | Females (Total YLL =594,797)       |        |      | Persons (Total YLL =1,512,907)     |         |      |
|------|---------------------------------------|---------|------|------------------------------------|--------|------|------------------------------------|---------|------|
|      | Disease                               | YLLs    | %    | Disease                            | YLLs   | %    | Disease                            | YLLs    | %    |
| 1    | Ischaemic heart disease               | 173,040 | 18.8 | Ischaemic heart disease            | 85,192 | 14.3 | Ischaemic heart disease            | 258,232 | 17.1 |
| 2    | Road traffic injuries                 | 104,259 | 11.4 | Cerebrovascular diseases (Stroke)  | 69,571 | 11.7 | Cerebrovascular diseases (Stroke)  | 145,694 | 9.6  |
| 3    | Cerebrovascular diseases (Stroke)     | 76,123  | 8.3  | Breast cancer                      | 33,029 | 5.6  | Road traffic injuries              | 125,106 | 8.3  |
| 4    | Lower respiratory infections          | 37,688  | 4.1  | Lower respiratory infections       | 25,698 | 4.3  | Lower respiratory infections       | 63,386  | 4.2  |
| 5    | HIV                                   | 30,457  | 3.3  | Road traffic injuries              | 20,847 | 3.5  | Trachea, bronchus and lung cancers | 45,379  | 3.0  |
| 6    | Trachea, bronchus and lung cancers    | 28,640  | 3.1  | Nephritis and nephrosis            | 18,940 | 3.2  | Nephritis and nephrosis            | 40,915  | 2.7  |
| 7    | Nephritis and nephrosis               | 21,974  | 2.4  | Trachea, bronchus and lung cancers | 16,739 | 2.8  | HIV                                | 33,926  | 2.2  |
| 8    | Chronic obstructive pulmonary disease | 17,698  | 1.9  | Diabetes Mellitus                  | 15,582 | 2.6  | Breast cancer                      | 33,139  | 2.2  |
| 9    | Tuberculosis                          | 16,806  | 1.8  | Colon and rectum cancers           | 11,763 | 2.0  | Diabetes Mellitus                  | 29,822  | 2.0  |
| 10   | Liver cancers                         | 14,695  | 1.6  | Leukaemia                          | 8,915  | 1.5  | Colon and rectum cancers           | 24,444  | 1.6  |

**Table 3: Top 10 causes of disability burden (YLDs), Malaysia, 2008**

| Rank | Males (Total YLD =705,704)            |        |      | Females (Total YLD =631,083)      |        |      | Persons (Total YLD =1,336,786)    |         |      |
|------|---------------------------------------|--------|------|-----------------------------------|--------|------|-----------------------------------|---------|------|
|      | Disease                               | YLDs   | %    | Disease                           | YLDs   | %    | Disease                           | YLDs    | %    |
| 1    | Diabetes Mellitus                     | 79,762 | 11.3 | Diabetes Mellitus                 | 78,200 | 12.4 | Diabetes Mellitus                 | 157,962 | 11.8 |
| 2    | Unipolar depressive disorders         | 48,358 | 6.9  | Unipolar depressive disorders     | 69,723 | 11.0 | Unipolar depressive disorders     | 118,081 | 8.8  |
| 3    | Alcohol use disorders                 | 43,296 | 6.1  | Osteoarthritis                    | 38,106 | 6.0  | Osteoarthritis                    | 65,930  | 4.9  |
| 4    | Cerebrovascular diseases (Stroke)     | 33,770 | 4.8  | Hearing loss                      | 30,342 | 4.8  | Hearing loss                      | 61,929  | 4.6  |
| 5    | Hearing loss                          | 31,587 | 4.5  | Nutritional anaemia               | 26,016 | 4.1  | Cerebrovascular diseases (Stroke) | 59,560  | 4.5  |
| 6    | Osteoarthritis                        | 27,825 | 3.9  | Cerebrovascular diseases (Stroke) | 25,790 | 4.1  | Alcohol use disorders             | 52,144  | 3.9  |
| 7    | Chronic obstructive pulmonary disease | 22,052 | 3.1  | Asthma                            | 24,107 | 3.8  | Nutritional anaemia               | 47,648  | 3.6  |
| 8    | Nutritional anaemia                   | 21,632 | 3.1  | Cataract                          | 22,292 | 3.5  | Asthma                            | 43,322  | 3.2  |
| 9    | Otitis media                          | 20,144 | 2.9  | Otitis media                      | 19,094 | 3.0  | Otitis media                      | 39,238  | 2.9  |
| 10   | Asthma                                | 19,214 | 2.7  | Anxiety disorders                 | 18,250 | 2.9  | Cataract                          | 36,380  | 2.7  |

**Table 4: Top 10 causes of burden of disease (DALYs), Malaysia, 2008**

| Rank | Males (Total DALY =1,623,814)         |         |      | Females (Total DALY=1,225,880)    |        |     | Persons (Total DALY=2,849,634)    |         |     |
|------|---------------------------------------|---------|------|-----------------------------------|--------|-----|-----------------------------------|---------|-----|
|      | Disease                               | DALYs   | %    | Disease                           | DALYs  | %   | Disease                           | DALYs   | %   |
| 1    | Ischaemic heart disease               | 186,429 | 11.5 | Cerebrovascular diseases (Stroke) | 95,361 | 7.8 | Ischaemic heart disease           | 279,529 | 9.8 |
| 2    | Road traffic injuries                 | 120,396 | 7.4  | Diabetes Mellitus                 | 93,782 | 7.7 | Cerebrovascular diseases (Stroke) | 205,254 | 7.2 |
| 3    | Cerebrovascular diseases (Stroke)     | 109,893 | 6.8  | Ischaemic heart disease           | 93,101 | 7.6 | Diabetes Mellitus                 | 187,783 | 6.6 |
| 4    | Diabetes Mellitus                     | 94,001  | 5.8  | Unipolar depressive disorders     | 69,723 | 5.7 | Road traffic injuries             | 147,030 | 5.2 |
| 5    | Unipolar depressive disorders         | 48,358  | 3.0  | Osteoarthritis                    | 38,106 | 3.1 | Unipolar depressive disorders     | 118,081 | 4.1 |
| 6    | Alcohol use disorders                 | 43,519  | 2.7  | Breast cancer                     | 34,141 | 2.8 | Lower respiratory infections      | 74,010  | 2.6 |
| 7    | Lower respiratory infections          | 43,404  | 2.7  | Asthma                            | 31,573 | 2.6 | Osteoarthritis                    | 65,990  | 2.3 |
| 8    | HIV                                   | 39,934  | 2.5  | Lower respiratory infections      | 30,606 | 2.5 | Hearing loss                      | 61,929  | 2.2 |
| 9    | Chronic obstructive pulmonary disease | 39,749  | 2.4  | Hearing loss                      | 30,342 | 2.5 | Asthma                            | 59,539  | 2.1 |
| 10   | Hearing loss                          | 31,587  | 1.9  | Road traffic injuries             | 26,634 | 2.2 | Alcohol use disorders             | 52,367  | 1.8 |

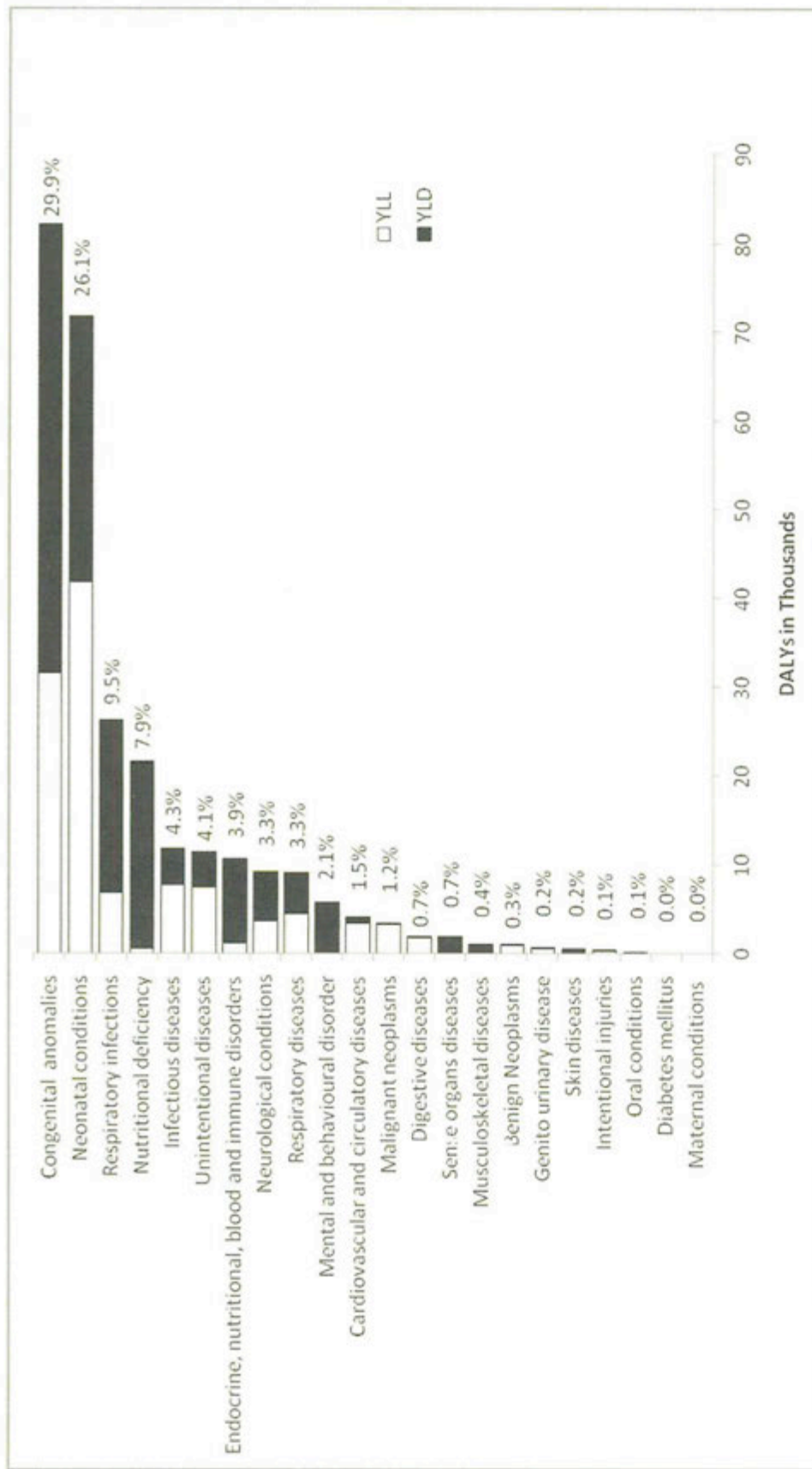


Figure 5: DALYs by diseases categories in the 0 - 4 year's age group, Malaysia, 2008

**Table 5: Top 10 causes of death, in 0 - 4 years age group, Malaysia, 2008**

| Rank | Males (Total Death =2,203)   |        |      | Females (Total Death =1,696 ) |        |      | Persons (Total Death =3,899) |        |      |
|------|------------------------------|--------|------|-------------------------------|--------|------|------------------------------|--------|------|
|      | Disease                      | Deaths | %    | Disease                       | Deaths | %    | Disease                      | Deaths | %    |
| 1    | Low birth weight             | 477    | 21.7 | Low birth weight              | 295    | 17.4 | Low birth weight             | 773    | 19.8 |
| 2    | Congenital heart anomalies   | 177    | 8.0  | Congenital heart anomalies    | 159    | 9.4  | Congenital heart anomalies   | 336    | 8.6  |
| 3    | Lower respiratory infections | 139    | 6.3  | Birth trauma & asphyxia       | 100    | 5.9  | Neonatal infections          | 232    | 6.0  |
| 4    | Neonatal infections          | 136    | 6.2  | Neonatal infections           | 9.6    | 5.7  | Lower respiratory infections | 231    | 5.9  |
| 5    | Birth trauma & asphyxia      | 114    | 5.2  | Lower respiratory infections  | 92     | 5.4  | Birth trauma & asphyxia      | 214    | 5.5  |
| 6    | Neural tube defects          | 64     | 2.9  | Neural tube defects           | 48     | 2.8  | Neural tube defects          | 112    | 2.9  |
| 7    | Meningitis & Encephalitis    | 46     | 2.1  | Meningitis & Encephalitis     | 48     | 2.8  | Meningitis & Encephalitis    | 94     | 2.4  |
| 8    | Road traffic injuries        | 46     | 2.1  | Diarrhoeal Diseases           | 39     | 2.3  | Road traffic injuries        | 73     | 1.9  |
| 9    | Drowning                     | 43     | 1.9  | Leukaemia                     | 28     | 1.6  | Diarrhoeal Diseases          | 71     | 1.8  |
| 10   | Diarrhoeal Diseases          | 32     | 1.4  | Road traffic injuries         | 27     | 1.6  | Drowning                     | 68     | 1.8  |

**Table 6: Top 10 causes of premature mortality (YLLs), in 0 - 4 years age group, Malaysia, 2008**

| Rank | Males (Total YLL =64,460))   |        |      | Females (Total YLL =50,524)  |       |      | Persons (Total YLL =114,983) |        |      |
|------|------------------------------|--------|------|------------------------------|-------|------|------------------------------|--------|------|
|      | Disease                      | YLLs   | %    | Disease                      | YLLs  | %    | Disease                      | YLLs   | %    |
| 1    | Low birth weight             | 13,975 | 21.7 | Low birth weight             | 8,797 | 17.4 | Low birth weight             | 22,772 | 19.8 |
| 2    | Congenital heart anomalies   | 5,177  | 8.0  | Congenital heart anomalies   | 4,738 | 9.4  | Congenital heart anomalies   | 9,915  | 8.6  |
| 3    | Lower respiratory infections | 4,064  | 6.3  | Birth trauma & asphyxia      | 2,976 | 5.9  | Neonatal infections          | 6,843  | 6.0  |
| 4    | Neonatal infections          | 3,969  | 6.2  | Neonatal infections          | 2,873 | 5.7  | Lower respiratory infections | 6,811  | 5.9  |
| 5    | Birth trauma & asphyxia      | 3,346  | 5.2  | Lower respiratory infections | 2,747 | 5.4  | Birth trauma & asphyxia      | 6,322  | 5.5  |
| 6    | Neural tube defects          | 1,874  | 2.9  | Neural tube defects          | 1,438 | 2.8  | Neural tube defects          | 3,312  | 2.9  |
| 7    | Meningitis & Encephalitis    | 1,350  | 2.1  | Meningitis & Encephalitis    | 1,427 | 2.8  | Meningitis & Encephalitis    | 2,776  | 2.4  |
| 8    | Road traffic injuries        | 1,349  | 2.1  | Diarrhoeal Diseases          | 1,166 | 2.3  | Road traffic injuries        | 2,145  | 1.9  |
| 9    | Drowning                     | 1,255  | 1.9  | Leukaemia                    | 829   | 1.6  | Diarrhoeal Diseases          | 2,099  | 1.8  |
| 10   | Diarrhoeal Diseases          | 933    | 1.4  | Road traffic injuries        | 797   | 1.6  | Drowning                     | 2,012  | 1.8  |



**Table 7: Top 10 causes of disability burden (YLDs), in 0 - 4 years age group, Malaysia, 2008**

| Rank | Males (Total YLD =90,435)                |       |     | Females (Total YLD =69,031)              |       |      | Persons (Total YLD =159,466 )            |        |     |
|------|--|-------|-----|--|-------|------|--|--------|-----|
|      | Disease                                  | YLDs  | %   | Disease                                  | YLDs  | %    | Disease                                  | YLDs   | %   |
| 1    | Protein-energy malnutrition              | 8,229 | 9.1 | Low birth weight                         | 7,787 | 11.3 | Low birth weight                         | 15,343 | 9.6 |
| 2    | Low birth weight                         | 7,556 | 8.4 | Down's syndrome                          | 7,158 | 10.4 | Protein-energy malnutrition              | 15,099 | 9.5 |
| 3    | Otitis media                             | 6,294 | 7.0 | Protein-energy malnutrition              | 6,870 | 10.0 | Down's syndrome                          | 13,221 | 8.3 |
| 4    | Down's syndrome                          | 6,063 | 6.7 | Otitis media                             | 6,003 | 8.7  | Otitis media                             | 12,297 | 7.7 |
| 5    | Endocrine, nutritional, blood and immune | 4,710 | 5.2 | Endocrine, nutritional, blood and immune | 4,828 | 7.0  | Endocrine, nutritional, blood and immune | 9,538  | 6.0 |
| 6    | Birth trauma & asphyxia                  | 4,329 | 4.8 | Lower respiratory infections             | 3,398 | 4.9  | Birth trauma & asphyxia                  | 7,491  | 4.7 |
| 7    | Neural tube defects                      | 3,764 | 4.2 | Birth trauma & asphyxia                  | 3,162 | 4.6  | Lower respiratory infections             | 6,386  | 4.0 |
| 8    | Nutritional anaemia                      | 3,051 | 3.4 | Nutritional anaemia                      | 2,907 | 4.2  | Neural tube defects                      | 6,046  | 3.8 |
| 9    | Lower respiratory infections             | 2,988 | 3.3 | Neural tube defects                      | 2,283 | 3.3  | Nutritional anaemia                      | 5,958  | 3.7 |
| 10   | Epilepsy                                 | 2,603 | 2.9 | Epilepsy                                 | 1,675 | 2.4  | Epilepsy                                 | 4,278  | 2.7 |

**Table 8: Top 10 causes of burden of disease (DALYs), in 0 - 4 years age group, Malaysia, 2008**

| Rank | Males (Total DALY =154,895)              |        |      | Females (Total DALY =119,554)            |        |      | Persons (Total DALY =274,449)            |        |      |
|------|--|--------|------|--|--------|------|--|--------|------|
|      | Disease                                  | DALYs  | %    | Disease                                  | DALYs  | %    | Disease                                  | DALYs  | %    |
| 1    | Low birth weight                         | 21,531 | 13.9 | Low birth weight                         | 16,584 | 13.9 | Low birth weight                         | 38,115 | 13.9 |
| 2    | Protein-energy malnutrition              | 8,392  | 5.4  | Down's syndrome                          | 7,684  | 6.4  | Protein-energy malnutrition              | 15,555 | 5.7  |
| 3    | Birth trauma & asphyxia                  | 7,675  | 5.0  | Protein-energy malnutrition              | 7,163  | 6.0  | Down's syndrome                          | 14,134 | 5.2  |
| 4    | Lower respiratory infections             | 7,051  | 4.6  | Lower respiratory infections             | 6,145  | 5.1  | Birth trauma & asphyxia                  | 13,813 | 5.0  |
| 5    | Congenital heart anomalies               | 6,654  | 4.3  | Congenital heart anomalies               | 6,145  | 5.1  | Lower respiratory infections             | 13,197 | 4.8  |
| 6    | Down's syndrome                          | 6,451  | 4.2  | Birth trauma & asphyxia                  | 6,138  | 5.1  | Congenital heart anomalies               | 12,800 | 4.7  |
| 7    | Otitis media                             | 6,294  | 4.1  | Otitis media                             | 6,003  | 5.0  | Otitis media                             | 12,297 | 4.5  |
| 8    | Neural tube defects                      | 5,637  | 3.6  | Endocrine, nutritional, blood and immune | 5,369  | 4.5  | Endocrine, nutritional, blood and immune | 10,707 | 3.9  |
| 9    | Endocrine, nutritional, blood and immune | 5,339  | 3.4  | Neural tube defects                      | 3,721  | 3.1  | Neural tube defects                      | 9,358  | 3.4  |
| 10   | Neonatal infections                      | 5,060  | 3.3  | Neonatal infections                      | 3,338  | 2.8  | Neonatal infections                      | 8,398  | 3.1  |

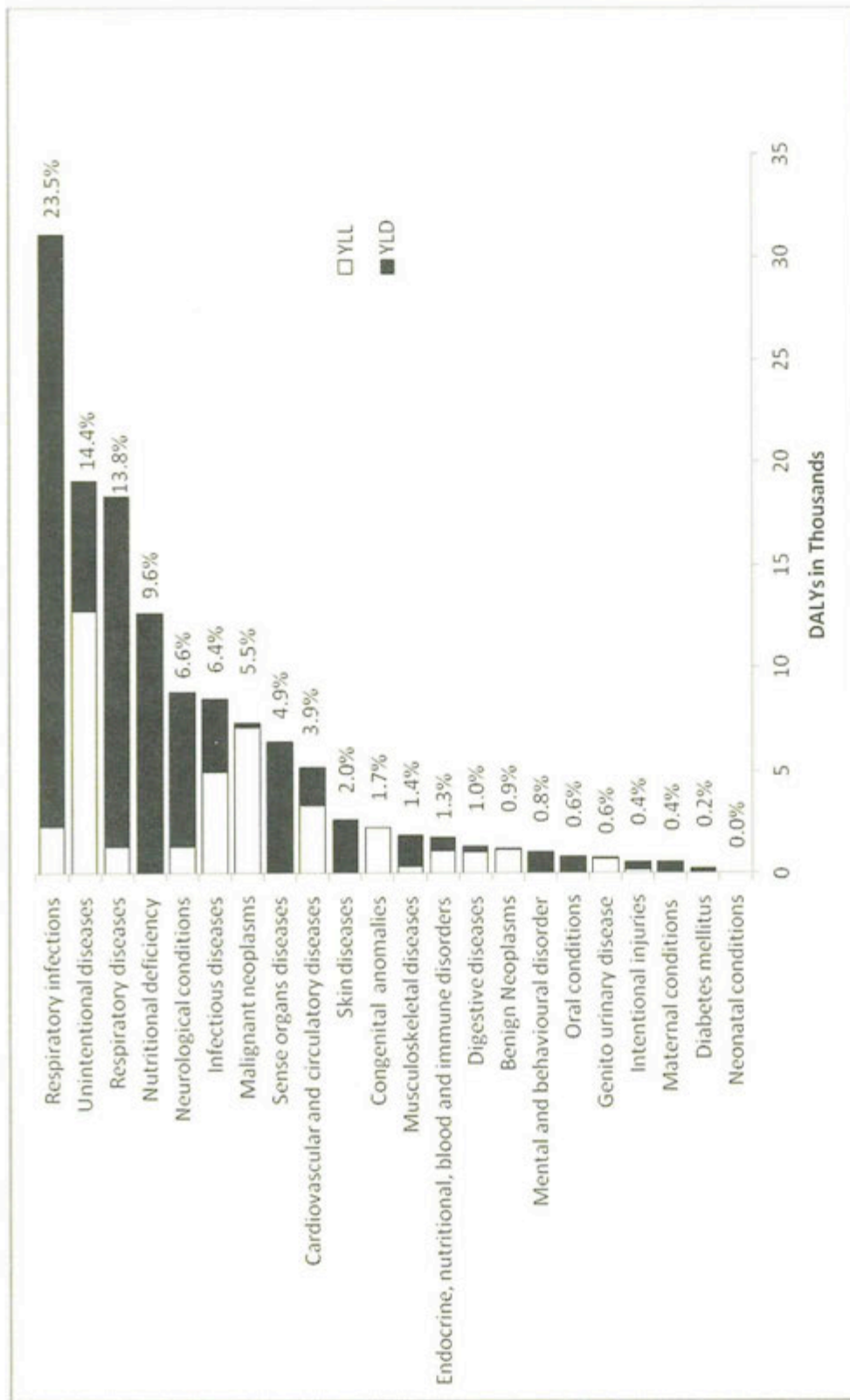


Figure 6: DALYs by diseases categories in the 5 - 14 years age group, Malaysia, 2008

**Table 9: Top 10 causes of death, in 5 - 14 years age group, Malaysia, 2008**

| Rank | Males (Total Death =843)                 |        |      | Females (Total Death = 559)              |        |      | Persons (Total Death =1,402)             |        |      |
|------|--|--------|------|--|--------|------|--|--------|------|
|      | Disease                                  | Deaths | %    | Disease                                  | Deaths | %    | Disease                                  | Deaths | %    |
| 1    | Road traffic injuries                    | 140    | 16.6 | Road traffic injuries                    | 81     | 14.5 | Road traffic injuries                    | 221    | 15.7 |
| 2    | Drowning                                 | 134    | 15.9 | Leukaemia                                | 54     | 9.6  | Drowning                                 | 175    | 12.5 |
| 3    | Leukaemia                                | 61     | 7.2  | Drowning                                 | 41     | 7.3  | Leukaemia                                | 115    | 8.2  |
| 4    | Lower respiratory infections             | 49     | 5.8  | Lower respiratory infections             | 31     | 5.6  | Lower respiratory infections             | 80     | 5.7  |
| 5    | Meningitis & Encephalitis                | 45     | 5.4  | Meningitis & Encephalitis                | 28     | 5.0  | Meningitis & Encephalitis                | 73     | 5.2  |
| 6    | Congenital heart anomalies               | 31     | 3.7  | Cerebrovascular diseases (Stroke)        | 24     | 4.3  | Congenital heart anomalies               | 53     | 3.8  |
| 7    | Endocrine, nutritional, blood and immune | 23     | 2.8  | Congenital heart anomalies               | 22     | 4.0  | Brain & other CNS cancer                 | 43     | 3.1  |
| 8    | Brain & other CNS cancer                 | 23     | 2.7  | Benign neoplasms                         | 20     | 3.6  | Benign neoplasms                         | 41     | 2.9  |
| 9    | Benign neoplasms                         | 21     | 2.4  | Brain & other CNS cancer                 | 20     | 3.6  | Cerebrovascular diseases                 | 40     | 2.9  |
| 10   | Inflammatory heart disease               | 20     | 2.3  | Endocrine, nutritional, blood and immune | 15     | 2.7  | Endocrine, nutritional, blood and immune | 38     | 2.7  |

**Table 10: Top 10 causes of premature mortality (YLLs), in 5 - 14 years age group, Malaysia, 2008**

| Rank | Males (Total YLL =23,832)                          |       |      | Females (Total YLL =16,184)              |       |      | Persons (Total YLL =40,017)              |       |      |
|------|--|-------|------|--|-------|------|--|-------|------|
|      | Disease  | YLLs  | %    | Disease                                  | YLLs  | %    | Disease                                  | YLLs  | %    |
| 1    | Road traffic injuries                              | 3,941 | 16.5 | Road traffic injuries                    | 2,341 | 14.5 | Road traffic injuries                    | 6,282 | 15.7 |
| 2    | Drowning   | 3,795 | 15.9 | Leukaemia                                | 1,558 | 9.6  | Drowning                                 | 4,973 | 12.4 |
| 3    | Leukaemia  | 1,720 | 7.2  | Lower respiratory infections             | 902   | 5.6  | Leukaemia                                | 3,278 | 8.2  |
| 4    | Lower respiratory infections                       | 1,388 | 5.8  | Drowning                                 | 1,178 | 7.3  | Lower respiratory infections             | 2,289 | 5.7  |
| 5    | Meningitis & Encephalitis                          | 1,281 | 5.4  | Meningitis & Encephalitis                | 805   | 5.0  | Meningitis & Encephalitis                | 2,086 | 5.2  |
| 6    | Congenital heart anomalies                         | 883   | 3.7  | Cerebrovascular diseases                 | 698   | 4.3  | Congenital heart anomalies               | 1,529 | 3.8  |
| 7    | Endocrine, nutritional, blood and immune disorders | 657   | 2.8  | Congenital heart anomalies               | 646   | 4.0  | Brain & other CNS cancer                 | 1,240 | 3.1  |
| 8    | Brain & other CNS cancer                           | 650   | 2.7  | Brain & other CNS cancer                 | 590   | 3.6  | Benign neoplasms                         | 1,168 | 2.9  |
| 9    | Benign neoplasms                                   | 579   | 2.4  | Benign neoplasms                         | 589   | 3.6  | Cerebrovascular diseases                 | 1,149 | 2.9  |
| 10   | Inflammatory heart disease                         | 558   | 2.3  | Endocrine, nutritional, blood and immune | 429   | 2.6  | Endocrine, nutritional, blood and immune | 1,086 | 2.7  |

**Table 11: Top 10 causes of disability burden (YLDs), in 5 - 14 years age group, Malaysia, 2008**

| Rank | Males (Total YLD =47,431)         |        |      | Females (Total YLD =44,884)       |        |      | Persons (Total YLD =92,315)       |        |      |
|------|-----------------------------------|--------|------|-----------------------------------|--------|------|-----------------------------------|--------|------|
|      | Disease                           | YLDs   | %    | Disease                           | YLDs   | %    | Disease                           | YLDs   | %    |
| 1    | Otitis media                      | 13,850 | 29.2 | Otitis media                      | 13,091 | 29.2 | Otitis media                      | 26,941 | 29.2 |
| 2    | Asthma                            | 6,489  | 13.7 | Asthma                            | 9,391  | 20.9 | Asthma                            | 15,880 | 17.2 |
| 3    | Nutritional anaemia               | 6,013  | 12.7 | Nutritional anaemia               | 6,639  | 14.8 | Nutritional anaemia               | 12,651 | 13.7 |
| 4    | Hearing loss                      | 4,355  | 9.2  | Epilepsy                          | 2,764  | 6.2  | Epilepsy                          | 5,937  | 6.4  |
| 5    | Epilepsy                          | 3,173  | 6.7  | Skin and subcutaneous diseases    | 1,848  | 4.1  | Hearing loss                      | 4,545  | 4.9  |
| 6    | Road traffic injuries             | 1,738  | 3.7  | Hepatitis B                       | 1,002  | 2.2  | Road traffic injuries             | 2,645  | 2.9  |
| 7    | Falls                             | 920    | 1.9  | Road traffic injuries             | 907    | 2.0  | Skin and subcutaneous diseases    | 2,594  | 2.8  |
| 8    | Cerebrovascular diseases (Stroke) | 909    | 1.9  | Cerebrovascular diseases (Stroke) | 657    | 1.5  | Hepatitis B                       | 1,887  | 2.0  |
| 9    | Hepatitis B                       | 885    | 1.9  | Abortion                          | 569    | 1.3  | Cerebrovascular diseases (Stroke) | 1,565  | 1.7  |
| 10   | Skin and subcutaneous diseases    | 745    | 1.6  | Lower respiratory infections      | 561    | 1.2  | Falls                             | 1,476  | 1.6  |

**Table 12: Top 10 causes of burden of disease (DALYs), in 5 - 14 years age group, Malaysia, 2008**

| Rank | Males (Total DALY =71,264)   |        |      | Females (Total DALY =61,068)   |        |      | Persons (Total DALY =132,332) |        |      |
|------|------------------------------|--------|------|--------------------------------|--------|------|-------------------------------|--------|------|
|      | Disease                      | DALYs  | %    | Disease                        | DALYs  | %    | Disease                       | DALYs  | %    |
| 1    | Otitis media                 | 13,850 | 19.4 | Otitis media                   | 13,091 | 21.4 | Otitis media                  | 26,941 | 20.4 |
| 2    | Asthma                       | 6,781  | 9.5  | Asthma                         | 9,552  | 15.6 | Asthma                        | 16,333 | 12.3 |
| 3    | Nutritional anaemia          | 6,013  | 8.4  | Nutritional anaemia            | 6,639  | 10.9 | Nutritional anaemia           | 12,651 | 9.6  |
| 4    | Road traffic injuries        | 5,679  | 8.0  | Road traffic injuries          | 3,248  | 5.3  | Road traffic injuries         | 8,927  | 6.7  |
| 5    | Hearing loss                 | 4,355  | 6.1  | Epilepsy                       | 3,032  | 5.0  | Epilepsy                      | 6,544  | 4.9  |
| 6    | Drowning                     | 3,808  | 5.3  | Skin and subcutaneous diseases | 1,902  | 3.1  | Drowning                      | 4,990  | 3.8  |
| 7    | Epilepsy                     | 3,512  | 4.9  | Leukaemia                      | 1,567  | 2.6  | Hearing loss                  | 4,545  | 3.4  |
| 8    | Lower respiratory infections | 1,931  | 2.7  | Lower respiratory infections   | 1,462  | 2.4  | Lower respiratory infections  | 3,393  | 2.6  |
| 9    | Leukaemia                    | 1,731  | 2.4  | Cerebrovascular diseases       | 1,355  | 2.2  | Leukaemia                     | 3,297  | 2.5  |
| 10   | Meningitis & Encephalitis    | 1,499  | 2.1  | Drowning                       | 1,182  | 1.9  | Cerebrovascular diseases      | 2,715  | 2.1  |

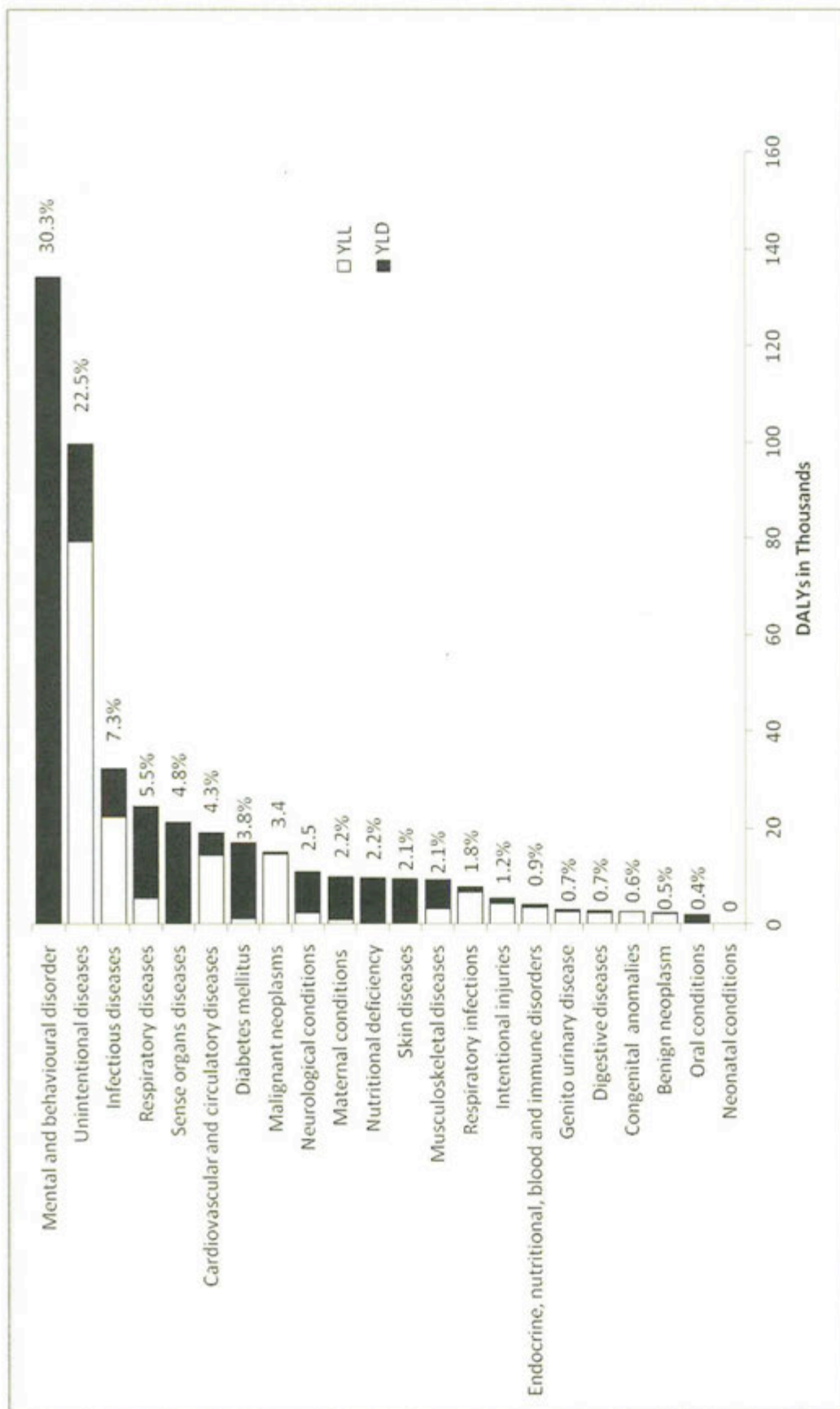


Figure 7: DALYs by diseases categories in the 15 - 29 years age groups, Malaysia 2008



**Table 13: Top 10 causes of death, in 15 - 29 years age group, Malaysia, 2008**

| Rank | Males (Total Death = 4,804)              |       |      | Females (Total Death = 1,619)            |       |      | Persons (Total Death = 6,423)            |       |      |
|------|--|-------|------|--|-------|------|--|-------|------|
|      | Disease                                  | Death | %    | Disease                                  | Death | %    | Disease                                  | Death | %    |
| 1    | Road traffic injuries                    | 2,235 | 46.5 | Road traffic injuries                    | 331   | 20.4 | Road traffic injuries                    | 2,566 | 39.9 |
| 2    | HIV                                      | 156   | 3.2  | Lower respiratory infections             | 98    | 6.0  | Lower respiratory infections             | 253   | 3.9  |
| 3    | Lower respiratory infections             | 155   | 3.2  | Cerebrovascular diseases                 | 62    | 3.8  | Cerebrovascular diseases                 | 206   | 3.2  |
| 4    | Drowning                                 | 151   | 3.1  | Meningitis & Encephalitis                | 55    | 3.4  | HIV                                      | 177   | 2.8  |
| 5    | Cerebrovascular diseases                 | 144   | 3.0  | Leukaemia                                | 51    | 3.1  | Drowning                                 | 170   | 2.6  |
| 6    | Ischaemic heart disease                  | 118   | 2.5  | Endocrine, nutritional, blood and immune | 44    | 2.7  | Leukaemia                                | 161   | 2.5  |
| 7    | Leukaemia                                | 110   | 2.3  | Tuberculosis                             | 42    | 2.6  | Meningitis & Encephalitis                | 150   | 2.3  |
| 8    | Meningitis & Encephalitis                | 95    | 2.0  | Nephritis and nephrosis                  | 35    | 2.2  | Ischaemic heart disease                  | 140   | 2.2  |
| 9    | Endocrine, nutritional, blood and immune | 89    | 1.8  | Asthma                                   | 34    | 2.1  | Endocrine, nutritional, blood and immune | 133   | 2.1  |
| 10   | Interpersonal violence /homicide         | 82    | 1.7  | Congenital heart anomalies               | 33    | 2.1  | Tuberculosis                             | 113   | 1.8  |

**Table 14: Top 10 causes of premature mortality (YLLs), in 15 - 29 years age group, Malaysia, 2008**

| Rank | Males (Total YLLs = 125,147)             |        |      | Females (Total YLLs = 43,605)            |       |      | Person (Total YLLs = 168,752)            |        |      |
|------|--|--------|------|--|-------|------|--|--------|------|
|      | Disease                                  | YLLs   | %    | Disease                                  | YLLs  | %    | Disease                                  | YLLs   | %    |
| 1    | Road traffic injuries                    | 58,635 | 46.9 | Road traffic injuries                    | 8,963 | 20.6 | Road traffic injuries                    | 67,598 | 40.1 |
| 2    | Lower respiratory infections             | 3,996  | 3.2  | Lower respiratory infections             | 2,627 | 6.0  | Lower respiratory infections             | 6,624  | 3.9  |
| 3    | Drowning                                 | 3,970  | 3.2  | Cerebrovascular diseases                 | 1,666 | 3.8  | Cerebrovascular diseases                 | 5,411  | 3.2  |
| 4    | HIV                                      | 3,928  | 3.1  | Meningitis & Encephalitis                | 1,488 | 3.4  | HIV                                      | 4,482  | 2.7  |
| 5    | Cerebrovascular diseases                 | 3,745  | 3.0  | Leukaemia                                | 1,377 | 3.2  | Drowning                                 | 4,478  | 2.7  |
| 6    | Ischaemic heart disease                  | 3,015  | 2.4  | Endocrine, nutritional, blood and immune | 1,194 | 2.7  | Leukaemia                                | 4,248  | 2.5  |
| 7    | Leukaemia                                | 2,871  | 2.3  | Tuberculosis                             | 1,115 | 2.6  | Meningitis & Encephalitis                | 3,950  | 2.3  |
| 8    | Meningitis & Encephalitis                | 2,462  | 2.0  | Nephritis and nephrosis                  | 941   | 2.2  | Ischaemic heart disease                  | 3,605  | 2.1  |
| 9    | Endocrine, nutritional, blood and immune | 2,279  | 1.8  | Congenital heart anomalies               | 906   | 2.1  | Endocrine, nutritional, blood and immune | 3,473  | 2.1  |
| 10   | Interpersonal violence /homicide         | 2,100  | 1.7  | Asthma                                   | 896   | 2.1  | Tuberculosis                             | 2,946  | 1.7  |

**Table 15: Top 10 causes of disability burden (YLDs), in 15 - 29 years age group, Malaysia, 2008**

| Rank | Males (Total YLD = 145,702)    |        |      | Females (Total YLD = 128,232) |        |      | Person (Total YLD = 273,934)  |        |      |
|------|--------------------------------|--------|------|-------------------------------|--------|------|-------------------------------|--------|------|
|      | Disease                        | YLD    | %    | Disease                       | YLD    | %    | Disease                       | YLD    | %    |
| 1    | Alcohol use disorders          | 20,342 | 14.0 | Unipolar depressive disorders | 32,487 | 25.3 | Unipolar depressive disorders | 52,481 | 19.2 |
| 2    | Unipolar depressive disorders  | 19,994 | 13.7 | Anxiety disorders             | 10,865 | 8.5  | Alcohol use disorders         | 25,693 | 9.4  |
| 3    | Drug use disorders             | 11,768 | 8.1  | Abortion                      | 8,498  | 6.6  | Anxiety disorders             | 17,511 | 6.4  |
| 4    | Diabetes Mellitus              | 9,466  | 6.5  | Asthma                        | 8,369  | 6.5  | Diabetes Mellitus             | 15,781 | 5.8  |
| 5    | Road traffic injuries          | 9,255  | 6.4  | Schizophrenia                 | 6,937  | 5.4  | Schizophrenia                 | 14,797 | 5.4  |
| 6    | Schizophrenia                  | 7,860  | 5.4  | Bipolar affective disorder    | 6,445  | 5.0  | Asthma                        | 14,278 | 5.2  |
| 7    | Anxiety disorders              | 6,646  | 4.6  | Diabetes Mellitus             | 6,314  | 4.9  | Road traffic injuries         | 12,063 | 4.4  |
| 8    | Asthma                         | 5,909  | 4.1  | Nutritional anaemia           | 6,013  | 4.7  | Drug use disorders            | 11,993 | 4.4  |
| 9    | Bipolar affective disorder     | 5,105  | 3.5  | Hearing loss                  | 5,920  | 4.6  | Bipolar affective disorder    | 11,551 | 4.2  |
| 10   | Skin and subcutaneous diseases | 4,688  | 3.2  | Alcohol use disorders         | 5,351  | 4.2  | Nutritional anaemia           | 9,753  | 3.6  |

**Table 16: Top 10 causes of burden of disease (DALYs), in 15 - 29 years age group, Malaysia, 2008**

| Rank | Males (Total YLD = 165,526)       |        |      | Females (Total YLD = 105,167) |        |      | Person (Total YLD = 259,130)  |        |      |
|------|-----------------------------------|--------|------|-------------------------------|--------|------|-------------------------------|--------|------|
|      | Disease                           | DALYs  | %    | Disease                       | DALYs  | %    | Disease                       | DALYs  | %    |
| 1    | Road traffic injuries             | 67,890 | 25.1 | Unipolar depressive disorders | 32,487 | 18.9 | Road traffic injuries         | 79,661 | 18.0 |
| 2    | Alcohol use disorders             | 20,342 | 7.5  | Road traffic injuries         | 11,771 | 6.9  | Unipolar depressive disorders | 52,481 | 11.9 |
| 3    | Unipolar depressive disorders     | 19,994 | 7.4  | Anxiety disorders             | 10,865 | 6.3  | Alcohol use disorders         | 25,693 | 5.8  |
| 4    | Drug use disorders                | 11,813 | 4.4  | Asthma                        | 9,265  | 5.4  | Anxiety disorders             | 17,511 | 4.0  |
| 5    | Diabetes Mellitus                 | 10,077 | 3.7  | Abortion                      | 8,586  | 5.0  | Diabetes Mellitus             | 16,955 | 3.8  |
| 6    | Schizophrenia                     | 7,860  | 2.9  | Schizophrenia                 | 6,937  | 4.0  | Asthma                        | 16,188 | 3.7  |
| 7    | Asthma                            | 6,924  | 2.6  | Diabetes Mellitus             | 6,879  | 4.0  | Schizophrenia                 | 14,797 | 3.3  |
| 8    | Anxiety disorders                 | 6,646  | 2.5  | Bipolar affective disorder    | 6,445  | 3.8  | Lower respiratory infections  | 12,255 | 2.8  |
| 9    | Cerebrovascular diseases (Stroke) | 6,560  | 2.4  | Nutritional anaemia           | 6,013  | 3.5  | Drug use disorders            | 12,038 | 2.7  |
| 10   | HIV                               | 6,241  | 2.3  | Hearing loss                  | 5,920  | 3.4  | Bipolar affective disorder    | 11,551 | 2.6  |

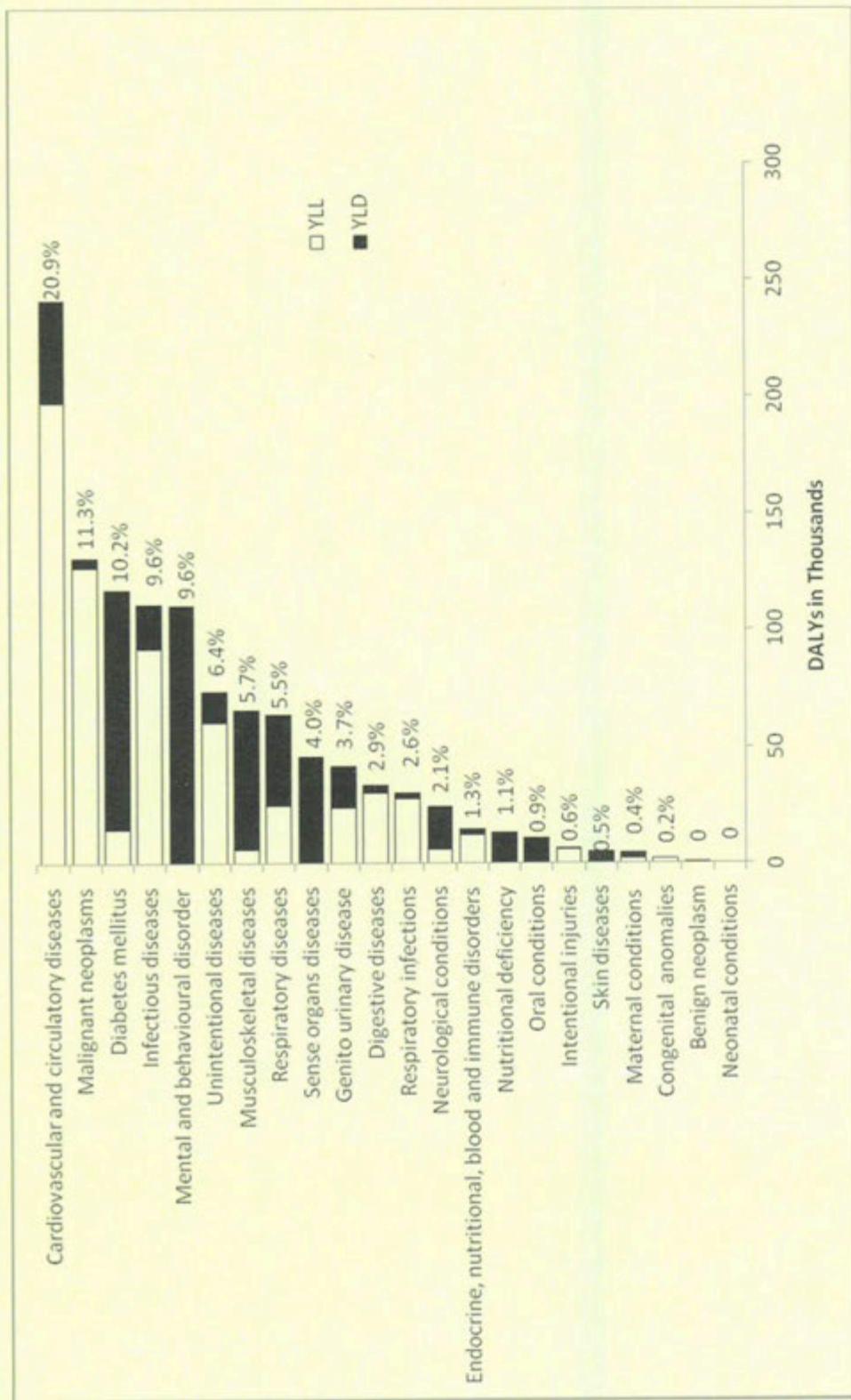


Figure 8: DALYs by diseases categories in the 30 - 59 years age groups, Malaysia 2008

**Table 17: Top 10 causes of death, in 30 - 59 years age group, Malaysia, 2008**

| Rank | Males (Total Death = 22,882)             |       |      | Females (Total Death = 11,306)     |       |      | Person (Total Death = 34,187)      |       |      |
|------|--|-------|------|------------------------------------|-------|------|------------------------------------|-------|------|
|      | Disease                                  | Death | %    | Disease                            | Death | %    | Disease                            | Death | %    |
| 1    | Ischaemic heart disease                  | 5,467 | 23.9 | Ischaemic heart disease            | 1,357 | 12.0 | Ischaemic heart disease            | 6,825 | 20.0 |
| 2    | Cerebrovascular diseases                 | 1,975 | 8.6  | Breast cancer                      | 1,249 | 11.0 | Cerebrovascular diseases           | 3,132 | 9.2  |
| 3    | Road traffic injuries                    | 1,695 | 7.4  | Cerebrovascular diseases           | 1,157 | 10.2 | Road traffic injuries              | 2,041 | 6.0  |
| 4    | HIV                                      | 1,203 | 5.3  | Lower respiratory infections       | 510   | 4.5  | Lower respiratory infections       | 1,466 | 4.3  |
| 5    | Lower respiratory infections             | 956   | 4.2  | Nephritis and nephrosis            | 404   | 3.6  | HIV                                | 1,305 | 3.8  |
| 6    | Trachea, bronchus and lung cancers       | 773   | 3.4  | Trachea, bronchus and lung cancers | 384   | 3.4  | Breast cancer                      | 1,251 | 3.7  |
| 7    | Nephritis and nephrosis                  | 640   | 2.8  | Diabetes Mellitus                  | 384   | 3.4  | Trachea, bronchus and lung cancers | 1,157 | 3.4  |
| 8    | Tuberculosis                             | 559   | 2.4  | Road traffic injuries              | 347   | 3.1  | Nephritis and nephrosis            | 1,045 | 3.1  |
| 9    | Liver cancers                            | 476   | 2.1  | Ovary cancer                       | 275   | 2.4  | Diabetes Mellitus                  | 816   | 2.4  |
| 10   | Endocrine, nutritional, blood and immune | 443   | 1.9  | Colon and rectum cancers           | 265   | 2.3  | Tuberculosis                       | 737   | 2.2  |

**Table 18: Top 10 causes of premature mortality (YLLs), in 30 - 59 years age group, Malaysia, 2008**

| Rank | Males (Total YLLs = 422,202)             |        |      | Females (Total YLLs = 217,581)     |        |      | Person (Total YLLs = 639,783)      |         |      |
|------|--|--------|------|------------------------------------|--------|------|------------------------------------|---------|------|
|      | Disease                                  | YLLs   | %    | Disease                            | YLLs   | %    | Disease                            | YLLs    | %    |
| 1    | Ischaemic heart disease                  | 96,243 | 22.8 | Ischaemic heart disease            | 25,171 | 11.6 | Ischaemic heart disease            | 121,414 | 19.0 |
| 2    | Cerebrovascular diseases (Stroke)        | 34,782 | 8.2  | Breast cancer                      | 24,583 | 11.3 | Cerebrovascular diseases (Stroke)  | 56,285  | 8.8  |
| 3    | Road traffic injuries                    | 33,882 | 8.0  | Cerebrovascular diseases (Stroke)  | 21,502 | 9.9  | Road traffic injuries              | 41,014  | 6.4  |
| 4    | HIV                                      | 25,598 | 6.1  | Lower respiratory infections       | 9,982  | 4.6  | Lower respiratory infections       | 27,954  | 4.4  |
| 5    | Lower respiratory infections             | 17,972 | 4.3  | Nephritis and nephrosis            | 7,539  | 3.5  | HIV                                | 27,889  | 4.4  |
| 6    | Trachea, bronchus and lung cancers       | 13,354 | 3.2  | Diabetes Mellitus                  | 7,240  | 3.3  | Breast cancer                      | 24,615  | 3.8  |
| 7    | Nephritis and nephrosis                  | 11,173 | 2.6  | Trachea, bronchus and lung cancers | 7,238  | 3.3  | Trachea, bronchus and lung cancers | 20,591  | 3.2  |
| 8    | Tuberculosis                             | 10,917 | 2.6  | Road traffic injuries              | 7,132  | 3.3  | Nephritis and nephrosis            | 18,713  | 2.9  |
| 9    | Endocrine, nutritional, blood and immune | 9,171  | 2.2  | Ovary cancer                       | 5,252  | 2.4  | Diabetes Mellitus                  | 14,703  | 2.3  |
| 10   | Liver cancers                            | 8,245  | 2.0  | Colon and rectum cancers           | 5,067  | 2.3  | Tuberculosis                       | 14,586  | 2.3  |

**Table 19: Top 10 causes of disability burden (YLDs), in 30 - 59 years age group, Malaysia, 2008**

| Rank | Males (Total YLD = 283,416)           |        |      | Females (Total YLD = 229,442) |        |      | Person (Total YLD = 512,857)          |         |      |
|------|---------------------------------------|--------|------|-------------------------------|--------|------|---------------------------------------|---------|------|
|      | Disease                               | YLD    | %    | Disease                       | YLD    | %    | Disease                               | YLD     | %    |
| 1    | Diabetes Mellitus                     | 51,663 | 18.2 | Diabetes Mellitus             | 50,760 | 22.1 | Diabetes Mellitus                     | 102,424 | 20.0 |
| 2    | Unipolar depressive disorders         | 23,014 | 8.1  | Unipolar depressive disorders | 29,964 | 13.1 | Unipolar depressive disorders         | 52,979  | 10.3 |
| 3    | Alcohol use disorders                 | 21,961 | 7.7  | Osteoarthritis                | 25,452 | 11.1 | Osteoarthritis                        | 43,280  | 8.4  |
| 4    | Osteoarthritis                        | 17,828 | 6.3  | Cerebrovascular diseases      | 12,502 | 5.4  | Cerebrovascular diseases              | 30,088  | 5.9  |
| 5    | Cerebrovascular diseases              | 17,586 | 6.2  | Nutritional anaemia           | 7,385  | 3.2  | Alcohol use disorders                 | 25,289  | 4.9  |
| 6    | Benign prostatic hypertrophy          | 15,532 | 5.5  | Anxiety disorders             | 6,556  | 2.9  | Chronic obstructive pulmonary disease | 17,467  | 3.4  |
| 7    | Chronic obstructive pulmonary disease | 14,289 | 5.0  | Edentulism                    | 6,044  | 2.6  | Benign prostatic hypertrophy          | 15,532  | 3.0  |
| 8    | Hearing loss                          | 7,708  | 2.7  | Schizophrenia                 | 5,568  | 2.4  | Nutritional anaemia                   | 13,010  | 2.5  |
| 9    | Drug use disorders                    | 7,307  | 2.6  | Cataract                      | 5,074  | 2.2  | Hearing loss                          | 12,727  | 2.5  |
| 10   | Ischaemic heart disease               | 7,148  | 2.5  | Hearing loss                  | 5,018  | 2.2  | Schizophrenia                         | 10,316  | 2.0  |



**Table 20: Top 10 causes of burden of disease (DALYs), in 30 - 59 years age group, Malaysia, 2008**

| Rank | Males (Total DALYs = 705,618)         |         |      | Females (Total DALYs = 447,022) |        |      | Persons (Total DALYs = 1,152,640) |         |      |
|------|---------------------------------------|---------|------|---------------------------------|--------|------|-----------------------------------|---------|------|
|      | Disease                               | DALYs   | %    | Disease                         | DALYs  | %    | Disease                           | DALYs   | %    |
| 1    | Ischaemic heart disease               | 103,391 | 14.7 | Diabetes Mellitus               | 58,001 | 13.0 | Ischaemic heart disease           | 131,198 | 11.4 |
| 2    | Diabetes Mellitus                     | 59,126  | 8.4  | Cerebrovascular diseases        | 34,005 | 7.6  | Diabetes Mellitus                 | 117,127 | 10.2 |
| 3    | Cerebrovascular diseases              | 52,369  | 7.4  | Unipolar depressive disorders   | 29,964 | 6.7  | Cerebrovascular diseases          | 86,373  | 7.5  |
| 4    | Road traffic injuries                 | 38,004  | 5.4  | Ischaemic heart disease         | 27,807 | 6.2  | Unipolar depressive disorders     | 52,979  | 4.6  |
| 5    | HIV                                   | 32,546  | 4.6  | Osteoarthritis                  | 25,452 | 5.7  | Road traffic injuries             | 46,666  | 4.0  |
| 6    | Unipolar depressive disorders         | 23,014  | 3.3  | Breast cancer                   | 25,450 | 5.7  | Osteoarthritis                    | 43,313  | 3.8  |
| 7    | Alcohol use disorders                 | 22,183  | 3.1  | Lower respiratory infections    | 10,418 | 2.3  | HIV                               | 36,375  | 3.2  |
| 8    | Lower respiratory infections          | 19,083  | 2.7  | Road traffic injuries           | 8,662  | 1.9  | Lower respiratory infections      | 29,501  | 2.6  |
| 9    | Osteoarthritis                        | 17,828  | 2.5  | Nephritis and nephrosis         | 8,464  | 1.9  | Alcohol use disorders             | 25,511  | 2.2  |
| 10   | Chronic obstructive pulmonary disease | 17,227  | 2.4  | Asthma                          | 8,463  | 1.9  | Breast cancer                     | 25,488  | 2.2  |

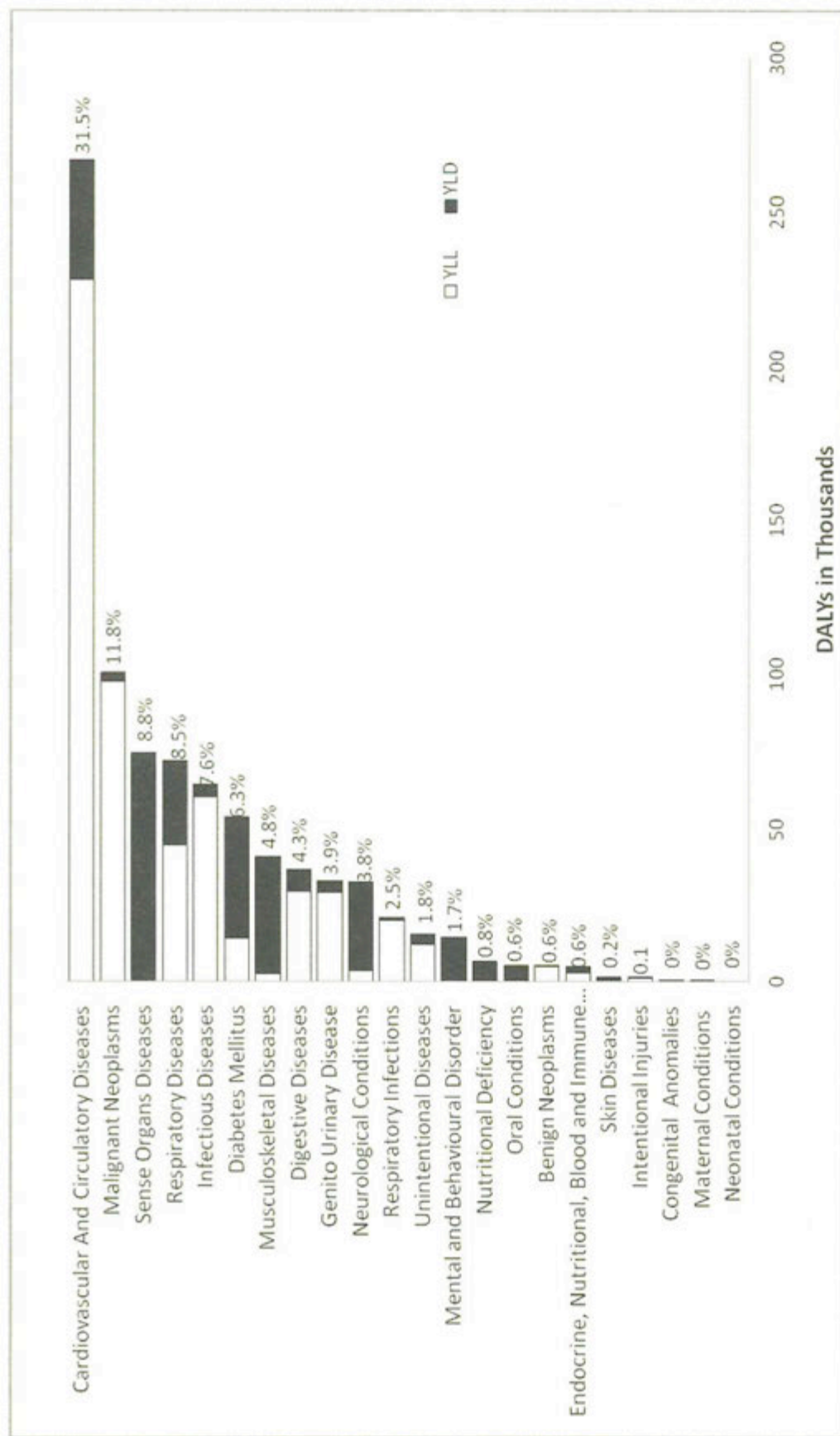


Figure 9: DALYs by diseases categories, in 60+ years age groups, Malaysia, 2008

**Table 21: Top 10 causes of death, in 60+ years age group, Malaysia, 2008**

| Rank | Males (Total Death =41,471)           |        |      | Females (Total Death =37,476)         |       |      | Persons (Total Death =78,947)         |        |      |
|------|---------------------------------------|--------|------|---------------------------------------|-------|------|---------------------------------------|--------|------|
|      | Disease                               | Death  | %    | Disease                               | Death | %    | Disease                               | Death  | %    |
| 1    | Ischaemic heart disease               | 10,239 | 24.7 | Ischaemic heart disease               | 8,280 | 22.1 | Ischaemic heart disease               | 18,519 | 23.5 |
| 2    | Cerebrovascular diseases (Stroke)     | 5,563  | 13.4 | Cerebrovascular diseases (Stroke)     | 6,591 | 17.6 | Cerebrovascular diseases (Stroke)     | 12,153 | 15.4 |
| 3    | Chronic obstructive pulmonary disease | 2,546  | 6.1  | Nephritis and nephrosis               | 1,341 | 3.6  | Chronic obstructive pulmonary disease | 3,418  | 4.3  |
| 4    | Trachea, bronchus and lung cancers    | 2,029  | 4.9  | Lower respiratory infections          | 1,216 | 3.2  | Trachea, bronchus and lung cancers    | 3,136  | 4.0  |
| 5    | Lower respiratory infections          | 1,516  | 3.7  | Trachea, bronchus and lung cancers    | 1,106 | 3.0  | Lower respiratory infections          | 2,732  | 3.5  |
| 6    | Nephritis and nephrosis               | 1,317  | 3.2  | Diabetes Mellitus                     | 987   | 2.6  | Nephritis and nephrosis               | 2,657  | 3.4  |
| 7    | Colon and rectum cancers              | 814    | 2.0  | Colon and rectum cancers              | 876   | 2.3  | Diabetes Mellitus                     | 1,773  | 2.2  |
| 8    | Diabetes Mellitus                     | 785    | 1.9  | Chronic obstructive pulmonary disease | 872   | 2.3  | Colon and rectum cancers              | 1,690  | 2.1  |
| 9    | Road traffic injuries                 | 780    | 1.9  | Breast cancer                         | 811   | 2.2  | Liver cancers                         | 1,144  | 1.4  |
| 10   | Liver cancers                         | 741    | 1.8  | Liver cancers                         | 404   | 1.1  | Road traffic injuries                 | 935    | 1.2  |

**Table 22: Top 10 causes of premature mortality (YLLs), in 60+ years age group, Malaysia, 2008**

| Rank | Males (Total YLL = 282,469)           |        |      | Females (Total YLL =266,903)          |        |      | Persons (Total YLL = 549,372)         |         |      |
|------|---------------------------------------|--------|------|---------------------------------------|--------|------|---------------------------------------|---------|------|
|      | Disease                               | YLLs   | %    | Disease                               | YLLs   | %    | Disease                               | YLLs    | %    |
| 1    | Ischaemic heart disease               | 73,471 | 26.0 | Ischaemic heart disease               | 59,220 | 22.2 | Ischaemic heart disease               | 132,691 | 24.2 |
| 2    | Cerebrovascular diseases (Stroke)     | 36,358 | 12.9 | Cerebrovascular diseases (Stroke)     | 45,144 | 16.9 | Cerebrovascular diseases (Stroke)     | 81,502  | 14.8 |
| 3    | Trachea, bronchus and lung cancers    | 14,953 | 5.3  | Nephritis and nephrosis               | 10,162 | 3.8  | Trachea, bronchus and lung cancers    | 24,017  | 4.4  |
| 4    | Chronic obstructive pulmonary disease | 14,520 | 5.1  | Lower respiratory infections          | 9,440  | 3.5  | Chronic obstructive pulmonary disease | 20,142  | 3.7  |
| 5    | Lower respiratory infections          | 10,268 | 3.6  | Trachea, bronchus and lung cancers    | 9,064  | 3.4  | Lower respiratory infections          | 19,708  | 3.6  |
| 6    | Nephritis and nephrosis               | 9,102  | 3.2  | Breast cancer                         | 7,978  | 3.0  | Nephritis and nephrosis               | 19,264  | 3.5  |
| 7    | Road traffic injuries                 | 6,452  | 2.3  | Diabetes Mellitus                     | 7,778  | 2.9  | Diabetes Mellitus                     | 13,944  | 2.5  |
| 8    | Liver cancers                         | 6,186  | 2.2  | Colon and rectum cancers              | 6,169  | 2.3  | Colon and rectum cancers              | 11,870  | 2.2  |
| 9    | Diabetes Mellitus                     | 6,166  | 2.2  | Chronic obstructive pulmonary disease | 5,622  | 2.1  | Liver cancers                         | 9,120   | 1.7  |
| 10   | Colon and rectum cancers              | 5,701  | 2.0  | Liver cancers                         | 2,934  | 1.1  | Road traffic injuries                 | 8,066   | 1.5  |

**Table 23: Top 10 causes of disability burden (YLDs), in 60+ years age group, Malaysia, 2008**

| Rank | Males (Total YLD =138,720)              |        |      | Females (Total YLD =159,494)            |        |      | Persons (Total YLD =298,214)            |        |      |
|------|---|--------|------|---|--------|------|---|--------|------|
|      | Disease                                 | YLDs   | %    | Disease                                 | YLDs   | %    | Disease                                 | YLDs   | %    |
| 1    | Diabetes Mellitus                       | 18,477 | 13.3 | Diabetes Mellitus                       | 21,056 | 13.2 | Diabetes Mellitus                       | 39,533 | 13.3 |
| 2    | Hearing loss                            | 16,410 | 11.8 | Hearing loss                            | 19,172 | 12.0 | Hearing loss                            | 35,581 | 11.9 |
| 3    | Cerebrovascular diseases (Stroke)       | 12,148 | 8.8  | Cataract                                | 16,925 | 10.6 | Cataract                                | 26,859 | 9.0  |
| 4    | Cataract                                | 9,934  | 7.2  | Alzheimer's disease and other dementias | 15,552 | 9.8  | Alzheimer's disease and other dementias | 23,276 | 7.8  |
| 5    | Osteoarthritis                          | 9,611  | 6.9  | Osteoarthritis                          | 11,865 | 7.4  | Cerebrovascular diseases (Stroke)       | 23,183 | 7.8  |
| 6    | Alzheimer's disease and other dementias | 7,724  | 5.6  | Cerebrovascular diseases (Stroke)       | 11,036 | 6.9  | Osteoarthritis                          | 21,477 | 7.2  |
| 7    | Chronic obstructive pulmonary disease   | 6,555  | 4.7  | Rheumatoid arthritis                    | 7,757  | 4.9  | Unipolar depressive disorders           | 12,067 | 4.0  |
| 8    | Ischaemic heart disease                 | 6,118  | 4.4  | Unipolar depressive disorders           | 6,932  | 4.3  | Rheumatoid arthritis                    | 11,439 | 3.8  |
| 9    | Unipolar depressive disorders           | 5,134  | 3.7  | Ischaemic heart disease                 | 5,179  | 3.2  | Ischaemic heart disease                 | 11,297 | 3.8  |
| 10   | Rheumatoid arthritis                    | 3,682  | 2.7  | Nutritional anaemia                     | 3,073  | 1.9  | Chronic obstructive pulmonary disease   | 8,151  | 2.7  |

Table 24: Top 10 causes of burden of disease (DALYs), in 60+ years age group, Malaysia, 2008

| Rank | Males (Total DALY =421,162)           |        |      | Females (Total DALY=426,398)            |        |      | Persons (Total DALY=847,559)            |         |      |
|------|---------------------------------------|--------|------|---|--------|------|---|---------|------|
|      | Disease                               | DALYs  | %    | Disease                                 | DALYs  | %    | Disease                                 | DALYs   | %    |
| 1    | Ischaemic heart disease               | 79,588 | 18.9 | Ischaemic heart disease                 | 64,399 | 15.1 | Ischaemic heart disease                 | 143,988 | 17.0 |
| 2    | Cerebrovascular diseases (Stroke)     | 48,506 | 11.5 | Cerebrovascular diseases (Stroke)       | 56,180 | 13.2 | Cerebrovascular diseases (Stroke)       | 104,686 | 12.4 |
| 3    | Diabetes Mellitus                     | 24,644 | 5.9  | Diabetes Mellitus                       | 28,834 | 6.8  | Diabetes Mellitus                       | 53,478  | 6.3  |
| 4    | Chronic obstructive pulmonary disease | 21,075 | 5.0  | Hearing loss                            | 19,172 | 4.5  | Hearing loss                            | 35,581  | 4.2  |
| 5    | Hearing loss                          | 16,410 | 3.9  | Cataract                                | 16,925 | 4.0  | Chronic obstructive pulmonary disease   | 28,292  | 3.3  |
| 6    | Trachea, bronchus and lung cancers    | 15,114 | 3.6  | Alzheimer's disease and other dementias | 15,738 | 3.7  | Cataract                                | 26,859  | 3.2  |
| 7    | Lower respiratory infections          | 10,823 | 2.6  | Osteoarthritis                          | 11,865 | 2.8  | Trachea, bronchus and lung cancers      | 24,242  | 2.9  |
| 8    | Cataract                              | 9,934  | 2.4  | Nephritis and nephrosis                 | 10,858 | 2.5  | Alzheimer's disease and other dementias | 23,488  | 2.8  |
| 9    | Nephritis and nephrosis               | 9,920  | 2.4  | Lower respiratory infections            | 9,847  | 2.3  | Osteoarthritis                          | 21,503  | 2.5  |
| 10   | Osteoarthritis                        | 9,638  | 2.3  | Trachea, bronchus and lung cancers      | 9,128  | 2.1  | Nephritis and nephrosis                 | 20,778  | 2.5  |

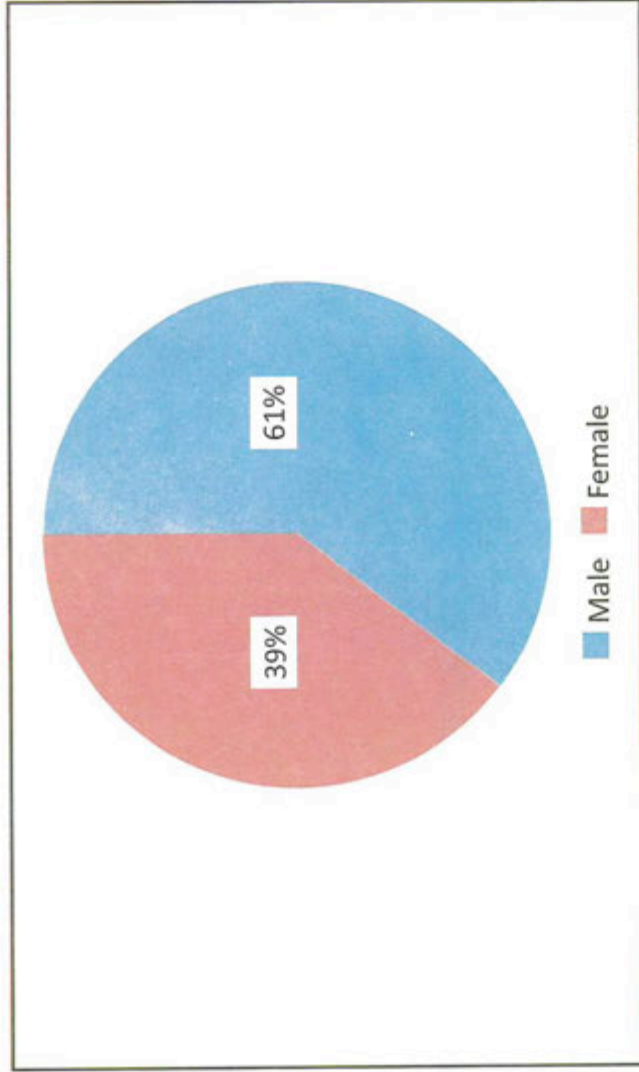
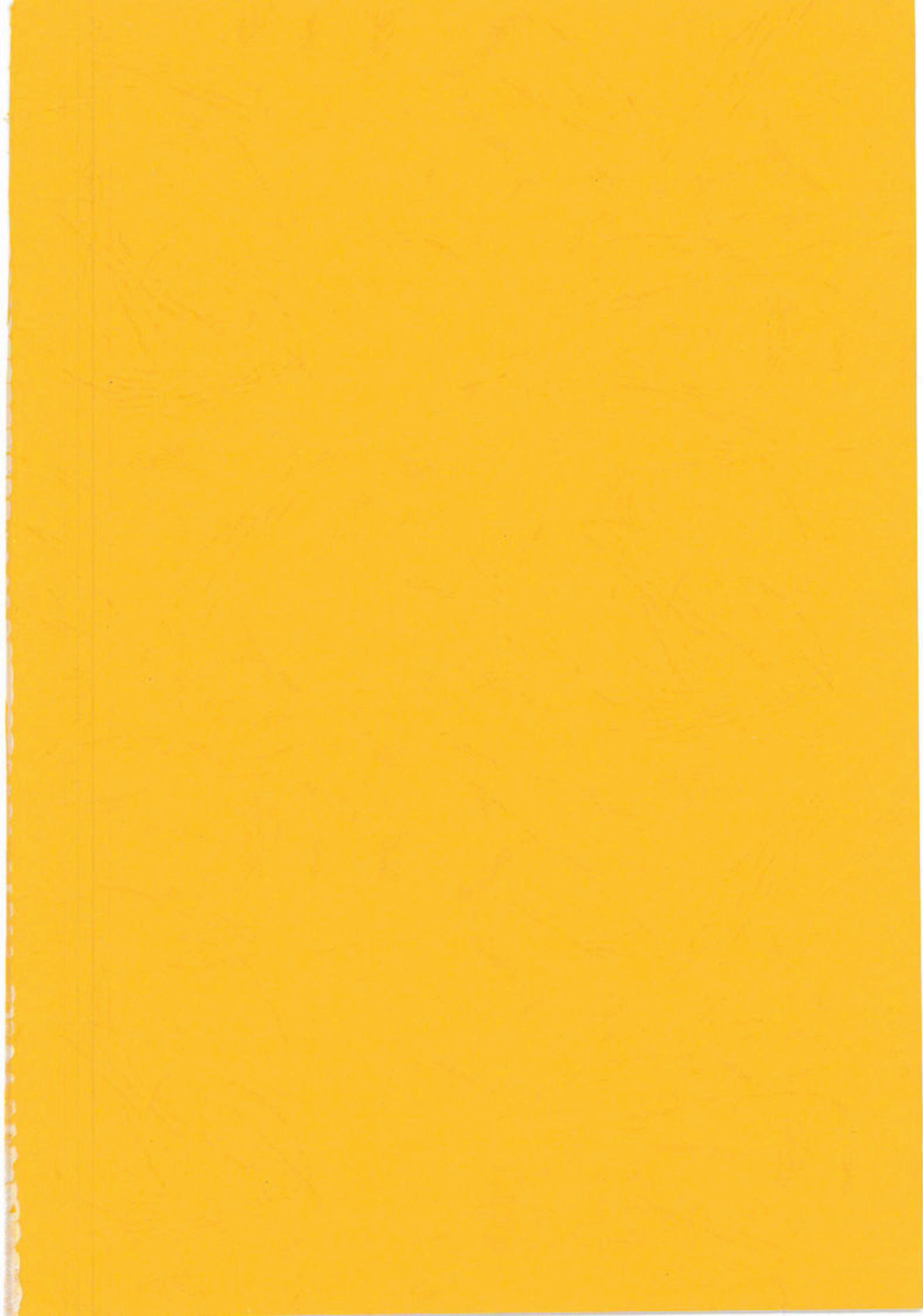


Figure 10: Percentages of YLL by sex







ISBN 978-983-2387-06-0



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