MOH/S/IKU/247.24(RR) - e

MINISTRY OF HEALTH MALAYSIA
INSTITUTE FOR PUBLIC HEALTH

MALAYSIAN BURDEN OF DISEASE AND INJURY STUDY 2019

Centre for Burden of Disease Research
Institute for Public Health
National Institutes of Health
Ministry of Health, Malaysia

MALAYSIAN BURDEN OF DISEASE AND INJURY STUDY 2019

Malaysian Burden of Disease and Injury Study 2019
NMRR-21-1355-60662

Contributors (in alphabetical order)
Chan Yee Mang, Khaw Wan-Fei, LeeAnn Tan, Mohamad Fuad Mohamad Anuar, Mohd Azahadi Omar, Mohd Azmi Suliman, Nazirah Alias, Nur Hamizah Nasaruddin, Shubash Shander Ganapathy, Tham Sin Wan, Wan Kim Sui

Reviewers and editorial
Heng Pei Pei, Muna Zahira Mohd Yusoff, Noor Ani Ahmad, Tania Gayle Robert Lourdes

Produced and distributed by:
Centre for Burden of Disease Research
Institute for Public Health
National Institutes of Health
Ministry of Health Malaysia
Blok B5 & B6, Kompleks NIH
No. 1, Jalan Setia Murni U13/52
Seksyen U13 Bandar Setia Alam
40170 Shah Alam, Selangor.
Tel : +603- 3362 7800

Published by Institute for Public Health, National Institutes of Health, Ministry of Health, Malaysia.

ISBN: 978-629-7768-02-1

Suggested Citation:
Institute for Public Health. 2025. Malaysian Burden of Disease and Injury Study 2019.

Disclaimer:
The views expressed in this report are those of the authors alone and do not necessarily represent the opinions of the other investigators participating in the surveys, nor the view or policy of the Ministry of Health Malaysia.

TABLE OF CONTENTS

List of Figures

List of Tables

Acknowledgement

The authors extend their heartfelt appreciation to the Director of the Institute for Public Health Malaysia for her continuous guidance, advice, and support throughout the study. This study on the Malaysian Burden of Disease and Injury was made possible by the generous funding from the Ministry of Health (MOH), Malaysia, and the authors express their gratitude for the financial assistance.

Additionally, the authors express their sincere gratitude to the Health Information Centre of the MOH for their invaluable contribution. Their cooperation and provision of a wealth of data were essential for conducting the analysis. The authors also extend their utmost appreciation to the Department of Statistics Malaysia for their diligent efforts in preparing and providing the necessary data.

Likewise, the authors would like to convey their heartfelt gratitude and sincere recognition to the dedicated specialists and consultants from various divisions, institutions, and hospitals within the Ministry of Health, Malaysia for their significant contributions to this study. Their unwavering commitment, invaluable expertise, and generous investment of time were vital in the meticulous preparation of this research. The authors are immensely grateful for their insightful contributions and collaborative spirit, which greatly enhanced the quality of the work.

The authors would also like to express their gratitude to all the co-authors from the Centre for Burden of Disease Research, Institute for Public Health, for their invaluable assistance and outstanding teamwork in facilitating the production of the Malaysian Burden of Disease and Injury Study report. Last but not least, the authors would like to extend their thanks to the Director General of Health, Malaysia, for granting permission to publish this report.

Thank you!

List of abbreviations

CSMF	Cause Specific Mortality Fractions
CDW	Combined Disability Weight
DALY	Disability-Adjusted Life Years
DW	Disability Weight
DOSM	Department of Statistics Malaysia
GBD	Global Burden of Disease Study
GHDx	Global Health Data Exchange
HMIS	Hospital Management Information System
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10th Revision
IHME	Institute for Health Metrics and Evaluation
LE	Life Expectancy
MBOD	Malaysian Burden of Disease and Injury Study
MCD	Medically Certified Deaths
MOH	Ministry of Health, Malaysia
NHMS	National Health and Morbidity Survey
NMCD	Non-Medically Certified Deaths
NRD	National Registration Department
VA	Verbal Autopsy
WHO	World Health Organization
YLD	Years Lived with Disability
YLL	Years of Life Lost

Executive summary

The Malaysian Burden of Disease and Injury study (MBOD) provides a detailed evaluation of the health landscape in Malaysia, revealing critical insights into health challenges the Malaysian population faces, focusing on diseases and injuries that contribute to Disability-Adjusted Life Years (DALY) for 2019. The study enhances the existing disease list by aligning it with national health priorities through extensive consultations with stakeholders, resulting in a curated selection of 162 diseases based on 369 diseases and injuries from the Global Burden of Disease (GBD) classification. This updated list accurately reflects local health challenges, including tropical diseases, while maintaining consistency with global estimation practices. Improvement of the mortality estimation methods and harmonising disease list codes from various data sources according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) enhance data accuracy, particularly for underreported deaths. The study provides a comprehensive analysis of Malaysia's health landscape using diverse datasets, including national health surveys and specialised registries.

Developed by the GBD study, the burden of disease is a summary measure of population health. The overall burden of disease, measured in DALY, combines the potential Years of Life Lost (YLL) due to premature death and the Years Lived with Disability (YLD), an equivalent of potential healthy years lost due to poor health, illness or disability.

In 2019, a total of 3,428,560 years of life were lost due to premature mortality in Malaysia, in which males contributed to around 2.03 million (59.1%) while females contributed to 1.40 million (40.9%) of the overall premature mortality. Cardiovascular diseases were the primary contributors to the fatal burden of the disease group, followed by neoplasms, and respiratory infections and tuberculosis. The top five diseases causing the most fatal burden of disease and injury in 2019 were ischaemic heart disease (18.3%), stroke (10.1%), lower respiratory infections (9.6%), road injuries (7.7%), and diabetes mellitus (3.9%). Collectively, ischaemic heart disease accounted for the highest YLL among males (21.0%) and females (14.5%), mainly affecting adults aged 30 and above. Road injuries maintained the second leading cause of fatal burden of disease and injury among males and were the first in ranking among those aged 5 to 29. Among females, breast cancer ranked fourth for the YLL, and it was in the second-ranking among those aged 30 to 44.

A total of 2.19 million years of life were lived with disability in Malaysia in 2019. Males contributed towards 1.15 million YLD (52.6%) and females 1.04 million YLD (47.4%). Mental disorders were the leading contributors to the non-fatal burden of the disease group in Malaysia, followed by diabetes and kidney diseases, as well as cardiovascular diseases. The top five diseases causing the most non-fatal burden of disease and injury in 2019 were diabetes mellitus (11.1%), depressive disorders (3.8%), ischaemic heart disease (3.8%), stroke (3.7%), and anxiety disorders (3.4%). Notably, diabetes remained a primary concern for both sexes, particularly for individuals aged 45 years and

above. Among the younger population (aged 15 to 44), substance use disorders were prominent among males, while mental disorders were in the led for females.

In 2019, a total of 5.62 million years of life were lost due to ill-health in Malaysia. This burden comprised 61.0% of YLL and 39.0% of YLD. Males accounted for 3.18 million DALYs (56.6%), while females contributed 2.44 million DALYs (43.4%). Cardiovascular diseases were the most significant contributor towards the total burden of the disease group in Malaysia, followed by neoplasms, and diabetes and kidney diseases. The top five diseases for the total fatal burden of disease and injury in 2019 were ischaemic heart disease (12.7%), stroke (7.6%), diabetes mellitus (6.7%), lower respiratory infections (5.9%), and road injuries (5.3%). Ischaemic heart disease accounted for the highest DALY for males (15.4%) and females (9.2%), notably a primary concern for both sexes, particularly for individuals aged 30 years old and above. There are some differences in the ranking of the leading causes for the DALY by sex. Road injuries remained the second leading cause among males. Among females, breast cancer ranked fifth, and it ranked second among those aged 30 to 44. The burden of disease varied by age group; neonatal conditions were the highest contributors for children under five, while road injuries dominated among those aged 15-29, and followed by cardiovascular diseases among the older people.

Burden of disease study for Malaysia provides a comprehensive macro-level assessment of the health landscape for the population, identifying ischaemic heart disease as the leading cause of total burden in Malaysia. Despite certain limitations, this study utilised the best available local data for accurate representation of disease burden and causes of death in Malaysia. By employing rigorous methodologies and critical appraisals of various data sources, the study highlights the pressing need for targeted public health interventions focusing on non-communicable diseases, particularly cardiovascular diseases and diabetes mellitus. Ultimately, this study serves as a vital resource for policymakers, guiding effective decisions and resource allocations to improve public health outcomes in Malaysia while strengthening local data sources for future assessments.

01

Introduction

The growing demand for a high-quality healthcare service and the scarcity of resources poses a challenge for the government to adequately address the population's health needs[1]. Effective policy development requires comprehensive information about the population's health status to support informed decision-making and strategic planning. Various epidemiological indicators such as mortality rates, incidence or prevalence of disease and injury as well as prevalence of disability were used to assess population health status[2]. However, most of the available information and indicators were at times inconsistent, partial, fragmented and only addressed limited aspects of a population health status. Therefore, GBD was developed as a summary measure of population health[3].

The burden of disease study is widely regarded as the best summary measure that combines the impact of fatal and non-fatal conditions[4]. The burden of specific cause disease and overall loss of health is measured by quantifying the difference between living to old age in good health, and any deviation from a healthy state, may it be due to illness, injury, disability or death.

The overall burden of disease, as measured in DALY, combines the YLL due to premature death and the YLD, an equivalent of potential healthy years lost due to poor health, illness or disability[5]. In other words, DALY combines the impact of dying early and living with an illness. The health loss is thus a comparison against an ideal situation where everyone lives to their potential life expectancy, free of any disease or disability.

The first GBD study in 1990 generated estimates for 107 diseases and 483 sequelae (non-fatal health consequences), and the most recent GBD study in 2019, the list of diseases has increased to 369 diseases and injuries[6]. In Malaysia, the first MBOD in 2000 produced estimates for 102 diseases and injuries, whereas the subsequent study in 2014 have extended the list up to 112 diseases and injuries[7,8]. It is thus timely for Malaysia to revise the list, updated to the latest health priority based

on the current available local data and stakeholder needs. In this MBOD, the list has been extended further to a total of 162 specific diseases and injuries.

MBOD presents a comprehensive assessment of the magnitude and distribution of disease burden in Malaysia. DALY calculation in this report is mainly presented as relative numbers to gain insight on the proportion of a particular disease to the overall disease burden. The MBOD study was carried out to assist stakeholders in public health, health services and medical research in setting priorities and planning of services and resources.

Objective

The MBOD aims to provide a comprehensive assessment of the disease and injuries priority which lead to DALY by sex and age specific groups in Malaysian population for 2019.

Specific objectives:

i. To derive internally consistent estimates of YLL by sex and age specific in Malaysia for 2019.
ii. To derive internally consistent estimates of YLD by sex and age specific in Malaysia for 2019.
iii. To calculate the DALYs by sex and age specific in Malaysia for 2019.

02

Methodology

MBOD adapted the GBD study approach to measure the impact of diseases and injuries in a population in terms DALY[9,10]. It combines the years of healthy life lost due to living with ill health (non-fatal burden) with the years of life lost due to dying prematurely (fatal burden). One DALY represents one lost year of 'healthy life' due to premature death, illness or disability, or a combination of these factors[3].

2.1 Disease and injury category list

Selection and classification of diseases

The list of diseases and injuries used in MBOD must be relevant to national health priorities and timely to the current health situation of the country. The diseases and injuries to be quantified were selected based on the following criteria:

i. The probable magnitude (= 0.01%) of a particular disease or injury as a cause of death;
ii. Level of health services provided for the selected cause of death;
iii. Diseases and injuries of local public health importance; and
iv. The availability of morbidity data for selected diseases and injuries.
v. Policy interest relevant to Malaysia

In the MBOD 2009-2014 study[7], improvements in mortality estimation methods were made due to the use of Verbal Autopsy (VA)[11,12]. At the same time, the list of diseases and injuries was expanded from 102 to 112. It is therefore timely to develop a more updated and relevant list that reflects the current health situation in Malaysia. Thus, a series of discussions were held with subject matter experts and stakeholders to exchange opinions, share recommendations, and ultimately reach a consensus on the final selection of diseases and injuries for the MBOD. These

discussions were based on a comprehensive review of the previous MBOD study and the most recent GBD cause list, ensuring the inclusion of diseases that reflect both national and global health priorities. As a result, the final list has been updated to 162 diseases and injuries.

The list of diseases and injuries, also referred to as the "cause list" was divided into disaggregation levels, as proposed by Murray and Lopez in the first GBD study in 1990[5]. Each level was divided based on the GBD 2019 classification. Within each level, the cause list was broken down with increasing specificity.

Level 1 causes represent the three broad cause groups of: Communicable, maternal, neonatal and nutritional diseases (Group I), Non-communicable diseases (Group II) and Injuries (Group III). Level 2 causes are the disaggregation of Level 1, encompassing 27 disease groups such as tropical diseases, maternal disorders, mental disorders and transport injuries. Level 3 and 4 causes contains the finest level of specific causes as seen in the GBD classification. As for Level 5 and Level 6, they consist of sequelae for the diseases and injuries. For example:

Level 1 : Non-communicable diseases
Level 2 : Cardiovascular diseases (I00-I99)
Level 3 : Cerebrovascular disease (I60-I69)
Level 4 : Stroke (I63)
Level 5 (Sequelae) : Chronic ischaemic stroke
Level 6 (Sequelae) : Chronic ischaemic stroke severity level 1

Sequelae is defined as distinct, mutually exclusive categories of health consequences that can be directly attributed to a cause. However, in MBOD, we report the burden of disease estimates only up to level 3, which includes the 162 diseases and injuries. These estimates are presented for deaths, YLL, YLD, and DALY (**Table 1**).

Table 1: MBOD cause list hierarchy

MBOD cause list		
Level 1	**Level 2**	**Level 3**
Communicable, maternal, neonatal, and nutritional diseases	**HIV/AIDS and sexually transmitted infections**	HIV/AIDS
		Syphilis
		Other sexually transmitted infections
	Respiratory infections and tuberculosis	Tuberculosis
		Lower respiratory infections
		Upper respiratory infections
		Otitis media
		COVID-19
	Enteric infections	Diarrhoeal diseases
		Typhoid and paratyphoid
		Other intestinal infectious diseases
	Tropical diseases	Malaria
		Dengue
		Rabies
		Other tropical diseases
	Other infectious diseases	Meningitis
		Diphtheria
		Whooping cough
		Tetanus
		Polio
		Measles
		Viral hepatitis
		Other unspecified infectious diseases
	Maternal disorders	Maternal haemorrhage
		Maternal sepsis and other maternal infections
		Maternal hypertensive disorders
		Maternal obstructed labour and uterine rupture
		Maternal abortion and miscarriage
		Ectopic pregnancy
		Indirect maternal disorders
		Late maternal deaths
		Other maternal disorders
	Neonatal disorders	Neonatal preterm birth
		Birth asphyxia and trauma
		Neonatal sepsis and other neonatal infections
		Hemolytic disease and other neonatal jaundice
		Sudden infant death syndrome
		Other neonatal disorders

	Nutritional deficiencies	Protein-energy malnutrition
		Iron deficiency anaemia
		Iodine deficiency
		Other nutritional deficiencies
Non-communicable diseases	**Neoplasms**	Lip and oral cavity cancer
		Nasopharynx cancer
		Other pharynx cancer
		Oesophageal cancer
		Stomach cancer
		Colon and rectum cancer
		Liver cancer
		Gallbladder and biliary tract cancer
		Pancreatic cancer
		Larynx cancer
		Tracheal, bronchus, and lung cancer
		Malignant skin melanoma
		Non-melanoma skin cancer
		Breast cancer
		Cervical cancer
		Uterine cancer
		Ovarian cancer
		Prostate cancer
		Testicular cancer
		Kidney cancer
		Bladder cancer
		Brain and central nervous system cancer
		Thyroid cancer
		Mesothelioma
		Hodgkin lymphoma
		Non-Hodgkin lymphoma
		Multiple myeloma
		Leukemia
		Other malignant neoplasms
		Other neoplasms
	Cardiovascular diseases	Rheumatic heart disease
		Ischemic heart disease
		Stroke
		Hypertensive heart disease
		Non-rheumatic valvular heart disease
		Cardiomyopathy and myocarditis
		Atrial fibrillation and flutter

		Aortic aneurysm
		Peripheral artery disease
		Endocarditis
		Other cardiovascular and circulatory diseases
	Chronic respiratory diseases	Chronic obstructive pulmonary disease
		Asthma
		Interstitial lung disease and pulmonary sarcoidosis
		Other chronic respiratory diseases
	Digestive diseases	Upper digestive system diseases
		Appendicitis
		Cirrhosis and other chronic liver diseases
		Paralytic ileus and intestinal obstruction
		Inguinal, femoral, and abdominal hernia
		Inflammatory bowel disease
		Vascular intestinal disorders
		Gallbladder and biliary diseases
		Pancreatitis
		Other digestive diseases
	Neurological disorders	Alzheimer's disease and other dementias
		Parkinson's disease
		Idiopathic epilepsy
		Multiple sclerosis
		Other neurological disorders
	Mental disorders	Schizophrenia
		Depressive disorders
		Bipolar disorder
		Anxiety disorders
		Autism spectrum disorders
		Attention-deficit/ hyperactivity disorder
		Other mental disorders
	Substance use disorders	Alcohol use disorders
		Drug use disorders
	Diabetes and kidney diseases	Diabetes mellitus
		Chronic kidney disease
		Acute glomerulonephritis
	Skin and subcutaneous diseases	Dermatitis
		Psoriasis
		Bacterial skin diseases
		Scabies
		Fungal skin diseases
		Viral skin diseases
		Acne vulgaris
		Alopecia areata
		Other skin and subcutaneous diseases

	Sense organ diseases	Blindness and vision loss
		Age-related and other hearing loss
		Other sense organ diseases
	Musculoskeletal disorders	Rheumatoid arthritis
		Osteoarthritis
		Low back disorders
		Cervical disc disorders
		Other musculoskeletal disorders
	Congenital birth defects	Down syndrome
		Congenital heart anomalies
		Turner syndrome
		Klinefelter syndrome
		Other chromosomal abnormalities
		Orofacial clefts
		Neural tube defects (spina bifida & anencephaly)
		Other congenital birth defects
	Urinary diseases and male infertility	Urinary tract infection and interstitial nephritis
		Benign prostate hyperplasia
		Urolithiasis
		Male infertility
		Other urinary diseases
	Gynaecological diseases	Uterine fibroids
		Polycystic ovarian syndrome
		Endometriosis
		Other gynaecological disorders
	Endocrine, metabolic, blood, and immune disorders	Haemoglobinopathies and haemolytic anaemias
		Other endocrine, metabolic, blood, and immune disorders
	Oral disorders	Caries of deciduous teeth/ permanent teeth
		Periodontal diseases
		Edentulism
		Other oral disorders
Injuries	**Transport injuries**	Road injuries
	Unintentional injuries	Poisonings
		Falls
		Fire, heat and hot substances
		Drowning
		Other unintentional injuries
	Self-harm and interpersonal violence	Self-harm
		Interpersonal violence

Mapping of ICD-10

Since the list of diseases and injuries was revised, the corresponding ICD codes mapped to each specific cause have also been updated. The current cause list, consisting of three broad cause groups, 27 disease groups, and 162 specific causes with its corresponding ICD-10[13] mapping is available in the **Appendix 2**.

2.2 Years of life lost (YLL)

YLL represents the fatal burden of diseases and injuries, measured in terms of the years lost due to premature death. In this study, estimation of fatal burden takes into account all deaths, by age and sex that occurred in the population in the year of 2019.

Mortality data source

The total number of deaths from all causes was obtained from the Department of Statistics Malaysia (DOSM), the official source of national statistics in the country. Mortality data was obtained for the age at death, sex, and cause of death with its corresponding ICD-10 codes or DOSM codes for uncertified causes of deaths **(Appendix 3)**.

Malaysian mortality data was collected through the vital registration system by the National Registration Department. The compiled data was subsequently sent to the DOSM, who assigned ICD-10 codes to the registered causes of deaths and produces the national annual vital registration statistics.

There are currently two systems for certification of deaths practiced in Malaysia:

- **Medically certified deaths (MCD):** Deaths that occur in health facilities and the cause of death is certified by the attending physician

- **Non-medically certified deaths (NMCD):** Deaths that occur outside health facilities, reported to the local police station by the next of kin, who also provide a “lay” opinion of the cause of death

Redistribution methods

Missing Data & Error Check

Any missing values for age or sex associated with a specific cause of death was imputed using the most common or prevalent age or sex values for that particular cause, based on the available

data. Both sex-specific and age-specific checks were identified and corrected to ensure data accuracy. For sex-specific checks, we ensured that causes of death exclusive to males, such as prostate cancer and benign prostatic hyperplasia, are correctly assigned to male causes only. Similarly, for females, causes of death exclusive to females, such as cervical cancer, ovarian cancer, and pregnancy-related complications, were verified. Regarding age-specific checks, we ensure that causes such as sudden infant death syndrome were assigned only to those under one year of age, and self-inflicted injuries are not attributed to children aged four years or younger. The occurrence of missing values or errors was minimal. Following these error checks, we then proceeded to redistribute garbage codes.

Garbage Codes

Some of the assigned causes of death are ill-defined and may not accurately present the true underlying cause of death. The ICD codes for these ill-defined causes of death are collectively known as “garbage codes”. These garbage codes compromise the usefulness of mortality data from a policy perspective. They are considered as ill-defined causes of death if they represent;

- Causes that are not underlying cause or unlikely as a cause of death
- Intermediate causes of death (such as septicaemia)
- Immediate causes that occur in the final stages of dying (such as cardiac arrest and respiratory failure)
- Ill-defined or unspecified cause of death (such as ill-defined digestive diseases and unspecified diabetes, exposure to unspecified factor, unspecified cancer site)

Given that ill-defined causes of death lacked significance in mortality data, we followed the GBD and WHO guidelines to redistribute these causes to more defined categories. The redistribution process was carried out in one of the following ways:

a) **Specific cause allotment:** Ill-defined causes that can be specifically allotted within a level 3 cause, such as “exposure to unspecified factor” was allotted into “other unintentional injuries”.
b) **Specific disease group redistribution:** Ill-defined causes that cannot be specifically allotted but can be categorized within a defined disease group were proportionately redistributed into level 2 causes. For example, “unspecified cancer site” was proportionately redistributed into a specific disease group, which in this case was “neoplasms”.
c) **Broad cause redistribution:** Ill-defined causes that were unsuitable to be allotted to a specific cause or redistributed within a specific disease group, were proportionately redistributed within the broader level 1 causes. For example, a cause such as “sepsis” which could be related to any diseases within communicable or non-communicable diseases were redistributed proportionately across both of these broad cause groups.

Redistribution ensures that all death counts are accounted for, even for those with ill-defined causes. The list of garbage codes for redistribution is provided in **Table 2**.

Table 2: Garbage codes redistribution

Specific cause allotment	
Other unspecified infectious disease	A28, A48-A49, B82, B94-B96, B99
Other neonatal disorders	P28, P96
Other nutritional deficiencies	E64
Other malignant neoplasms	C14, C26, C39, C57, C63, C68, C75-C76, C97
Other neoplasms	D09, D37-D41, D48
Diabetes mellitus	E14
Other endocrine, metabolic, blood and immune disorders	E68, E85-E88
Other neurological disorders	G09, G80-G83, G91-G93, G99
Stroke	I69
Other cardiovascular and circulatory diseases	I27, I31, I44-I45, I47, I49-I51, I74, I81, I99
Other chronic respiratory diseases	J80-J81, J86-J90, J93-J94, J98
Other digestive diseases	I85, K65-K66, K71-K72, K75, K92
Chronic kidney disease	N19
Other musculoskeletal disorders	M86
Other chromosomal abnormalities	Q99
Other congenital birth defects	Q89
Road injuries	V99, Y85-Y86
Other unintentional injuries	X59
Disease group redistribution	
Redistribute to “sexually transmitted infections (excluding HIV/ AIDS)”	A64
Redistribute to “mental disorders”	F99
Redistribute to “neonatal conditions”	P95
Redistributed to “neoplasms”	C80
Redistribute to “cardiovascular diseases”	I10, I15, I70

Broad cause redistribution	
Redistribute to all causes (GROUP I & II) *Group I: Communicable diseases, maternal, perinatal and nutritional condition *Group II: Non-communicable diseases	A40-A41, D65, I26, I46, J96, N17, R00-R94, R96-R99, Y95
Redistribute to all causes (GROUP III) *Group III: Injuries	S00-T98, Y10-Y34, Y87, Y89

The highest garbage code was among those redistributed to all causes with 36.7%. Specific cause allotment was assigned to the corresponding group and disease group redistribution was carried out pro-rata within their specific groups.

Cause Specific Mortality Fractions (CSMF)

Following garbage code redistributions, the final death count is obtained by summation of both MCD and NMCD. The NMCD constituted 37.2% of the total death count for mortality data in 2019. To improve the quality of NMCD before the final summation, CSMF was applied to it, ensuring that the causes of death are appropriately adjusted according to physician-certified patterns of mortality for deaths occurring outside health facilities. The CSMF was derived using verbal VA data collected in 2019.

Calculating Years of Life Lost

YLL was calculated by summing the number of deaths for each specific causes at 5-year age intervals, multiplied by the remaining life expectancy (LE) for the specific age group. LE is the number of remaining years a person could potentially live, and was obtained from the DOSM.

YLL YEARS OF LIFE LOST = **N** NUMBER OF DEATHS X **LE** LIFE EXPECTANCY

2.3 Years lived with disability (YLD)

YLD represents the non-fatal burden of diseases and injuries, measuring the healthy years lost due to ill health[9]. Prevalence estimates for each disease and injury, including breakdown of the severity proportion and percentage contributing to its sequelae, was calculated and estimated. These prevalence, together with a set of disability weights for each condition, was used to calculate the YLD.

Morbidity data source

Local prevalence data sources are available for some specific causes of disease and injuries; however, the lack of sufficient data for others poses challenges in estimating the non-fatal burden. The prevalence of diseases and injuries was derived from a wide range of sources[14]. Where possible, national data sources and local studies were used to obtain the most reliable estimates for Malaysia.

Administrative data sources, including disease surveillance data, disease registries and hospitalisation data, were evaluated for their representativeness and adjusted as needed to estimate the prevalence of certain diseases and injuries. Similarly, surveys, epidemiological studies, and local studies were evaluated for their representativeness and quality before being used to estimate the prevalence.

Regional and international studies were used to produce estimates where local data was not available or deemed unreliable. Regional studies were prioritised over those from other areas based on the assumption that they offered a more accurate local representation of local conditions. Meta-analysis and systematic reviews, where available, were used to obtain the most accurate estimates in the absence of local and regional data.

When reliable sources for disease prevalence or other estimation parameters were unavailable, incidence or prevalence estimates were sourced from the Global Health Data Exchange (GHDx) website using the GBD Results Tool from the Institute for Health Metrics and Evaluation (IHME)[15].

We also used DISMOD-II to assist in the calculation of YLD, particularly when detailed epidemiological data were lacking or incomplete, and to provide estimates for diseases with limited local data. DISMOD-II is a tool to help estimate the epidemiology of a disease. The potential input variables for disease calculation were incidence, prevalence, remission, case fatality, duration, mortality and RR mortality. DISMOD-II is a freely available software commonly used for burden of disease analysis. To model disease estimates, the Malaysian population age structure and general mortality rates need to be defined within DISMOD-II.

Severity distribution and disability weights

Each disease is represented by a conceptual model of health loss that outlines the major sources of health loss caused by different severity levels and stages of a disease. In most cases, the major sources of health loss, also called the sequelae, were based on GBD 2019.

The disability weight (DW) reflects the health loss experienced by a person while in that health state. DW express the health loss on a scale from 0 (no health loss/ healthy) to 1 (total health loss/ death). DW for each sequelae was obtained from the GBD 2019 Supplement (**Appendix 4**).

Calculating Years Lived with Disability

YLD was calculated by multiplying the prevalence of the disease sequelae to its disability weight by age group and sex. The total YLD for each disease and injury was obtained from the sum of YLD from all the sequelae of that disease.

YLD YEARS LIVED WITH DISABILITY = **P** PREVALENCE X **DW** DISABILITY WEIGHT

YLD was interpreted as the total number of years spent in less than full health by the population, weighted according to the health loss associated with each disease.

Details of the specific disease models and sequelae used in this study were described further in **Appendix 5**.

2.4 Disability-adjusted life years (DALY)

DALY represents the total burden of diseases and injuries. The DALY for each disease and injury was calculated by summing the YLL and YLD for the disease or injury. The burden of disease of a disease group was calculated by summing the DALYs across all the diseases or injury in the group and the total burden of disease was calculated by summing the DALY across all diseases and injuries.

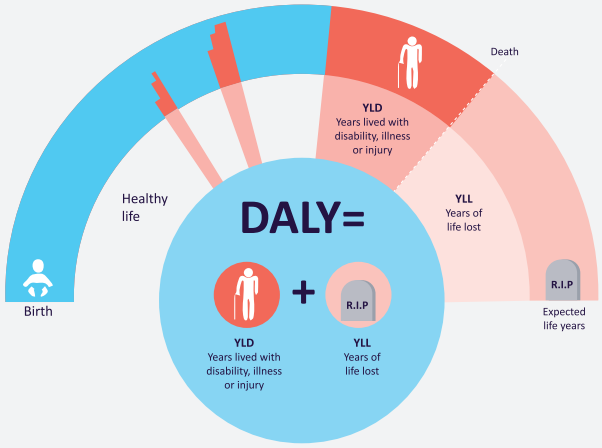

Figure 1: Components of Disability-Adjusted Life Years (DALY)

"This page has been intentionally left blank"

03

Results

3.1 Death

In 2019, a total of 173,746 deaths occurred in Malaysia, of which 99,681 (57.4%) were males and 74,065 (42.6%) were females.

Disease Group

Overall, the five leading causes of death were cardiovascular diseases (38.7%), neoplasms (16.5%), respiratory infections and tuberculosis (12.2%), diabetes and kidney diseases (7.7%), and chronic respiratory diseases (5.8%) [**Figure 2**].

Figure 2: Proportion (%) of deaths, by disease groups and sex, 2019

By sex

Among males, the five leading causes of death were cardiovascular diseases (39.5%), neoplasms (15.5%), respiratory infections and tuberculosis (11.8%), diabetes and kidney diseases (6.7%), and transport injuries (5.9%). Among females, the five leading causes of death were cardiovascular diseases (37.5%), neoplasms (17.9%), respiratory infections and tuberculosis (12.7%), diabetes and kidney diseases (9.1%), and chronic respiratory diseases (5.7%) [**Table 3**].

Table 3: Number and proportion of deaths by disease groups and sex, 2019

DISEASE GROUP	PEOPLE		MALES		FEMALES	
	DEATHS	Proportion (%)	DEATHS	Proportion (%)	DEATHS	Proportion (%)
CARDIOVASCULAR DISEASES	67,173	38.7	39,375	39.5	27,798	37.5
NEOPLASMS	28,659	16.5	15,403	15.5	13,256	17.9
RESPIRATORY INFECTIONS AND TUBERCULOSIS	21,208	12.2	11,798	11.8	9,410	12.7
DIABETES AND KIDNEY DISEASES	13,338	7.7	6,630	6.7	6,708	9.1
CHRONIC RESPIRATORY DISEASES	10,096	5.8	5,873	5.9	4,223	5.7
TRANSPORT INJURIES	7,031	4.0	5,924	5.9	1,108	1.5
DIGESTIVE DISEASES	5,680	3.3	3,640	3.7	2,040	2.8
UNINTENTIONAL INJURIES	2,963	1.7	1,907	1.9	1,056	1.4
ENDOCRINE, METABOLIC, BLOOD AND IMMUNE DISORDERS	2,950	1.7	1,418	1.4	1,532	2.1
NEUROLOGICAL DISORDERS	2,553	1.5	1,407	1.4	1,146	1.5
SKIN AND SUBCUTANEOUS DISEASES	2,360	1.4	1,006	1.0	1,354	1.8
OTHER INFECTIOUS DISEASES	2,248	1.3	1,473	1.5	775	1.0
URINARY DISEASES AND MALE INFERTILITY	1,828	1.1	745	0.7	1,083	1.5
MUSCULOSKELETAL DISORDERS	1,433	0.8	726	0.7	707	1.0
NEONATAL CONDITIONS	1,377	0.8	802	0.8	575	0.8
CONGENITAL BIRTH DEFECTS	1,306	0.8	664	0.7	642	0.9
ENTERIC INFECTIONS	617	0.4	348	0.3	269	0.4
HIV/AIDS AND SEXUALLY TRANSMITTED INFECTIONS	304	0.2	261	0.3	43	0.1
TROPICAL DISEASES	259	0.1	154	0.2	105	0.1
MATERNAL DISORDERS	126	0.1	-	0.0	126	0.2
SELF-HARM AND INTERPERSONAL VIOLENCE	116	0.1	86	0.1	30	0.0
NUTRITIONAL DEFICIENCIES	29	0.0	13	0.0	16	0.0
GYNAECOLOGICAL DISEASES	29	0.0	-	0.0	29	0.0
MENTAL DISORDERS	28	0.0	10	0.0	18	0.0
ORAL DISORDERS	17	0.0	4	0.0	13	0.0
SUBSTANCE USE DISORDERS	11	0.0	11	0.0	-	0.0
SENSE ORGAN DISEASES	7	0.0	3	0.0	4	0.0
TOTAL	173,746	100.0	99,681	100.0	74,065	100.0

Colour legend: GROUP I : Communicable, Maternal, Perinatal and Nutritional Conditions | GROUP II : Noncommunicable Diseases | GROUP III : Injuries

Total deaths Group I: overall 26,168 (15.1%); males 14,849 (14.9%); females 11,318 (15.3%)
Total deaths Group II: overall 137,468 (79.1%); males 76,915 (77.2%); females 60,553 (81.8%)
Total deaths Group III: overall 10,111 (5.8%); males 7,917 (7.9%); females 2,194 (3.0%)

By age groups

Infants and children aged under 5:

Overall, the five leading causes of death were neonatal conditions (36.6%), congenital birth defects (29.4%), respiratory infections and tuberculosis (4.7%), neurological disorders (4.7%), and chronic respiratory diseases (4.2%). Among males, the five leading causes of death were neonatal conditions (38.7%), congenital birth defects (26.5%), neurological disorders (4.9%), chronic respiratory diseases (4.5%) and respiratory infections and tuberculosis (4.0%) [**Figure 3**]. Among females, the five leading causes of death were neonatal conditions (34.0%), congenital birth defects (32.8%), respiratory infections and tuberculosis (5.6%), neurological disorders (4.4%), and chronic respiratory diseases (3.9%) [**Figure 4**].

People aged 5 – 14:

Overall, the five leading causes of death were neoplasms (18.1%), unintentional injuries (14.8%), transport injuries (12.6%), neurological disorders (12.5%), and respiratory infections and tuberculosis (9.6%). Among males, the five leading causes of death were unintentional injuries (19.4%), neoplasms (18.6%), transport injuries (15.1%), neurological disorders (10.6%), and respiratory infections and tuberculosis (8.1%) [**Figure 3**]. Among females, the five leading causes of death were neoplasms (17.4%), neurological disorders (15.3%), respiratory infections and tuberculosis (11.7%), transport injuries (9.1%), and cardiovascular diseases (8.7%) [**Figure 4**].

People aged 15 - 29:

Overall, the five leading causes of death were transport injuries (40.4%), neoplasms (10.9%), respiratory infections and tuberculosis (9.9%), cardiovascular diseases (9.4%), and unintentional injuries (6.3%). Among males, the five leading causes of death were transport injuries (48.3%), cardiovascular diseases (9.2%), neoplasms (8.7%), respiratory infections and tuberculosis (8.4%), and unintentional injuries (6.7%) [**Figure 3**]. Among females, the five leading causes of death were transport injuries (18.2%), neoplasms (17.1%), respiratory infections and tuberculosis (14.0%), cardiovascular diseases (10.0%), and neurological disorders (6.1%) [**Figure 4**].

People aged 30 - 44:

Overall, the five leading causes of death were cardiovascular diseases (33.5%), neoplasms (15.8%), transport injuries (12.0%), respiratory infections and tuberculosis (10.4%), and diabetes and kidney diseases (4.8%). Among males, the five leading causes of death were cardiovascular diseases (37.1%), transport injuries (15.0%), respiratory infections and tuberculosis (10.9%), neoplasms (9.7%), and digestive diseases (4.2%) [**Figure 3**]. Among females, the five leading causes of death

were neoplasms (28.6%), cardiovascular diseases (25.9%), respiratory infections and tuberculosis (9.4%), diabetes and kidney diseases (6.5%), and transport injuries (5.4%) [**Figure 4**].

People aged 45 - 59:

Overall, the five leading causes of death were cardiovascular diseases (41.5%), neoplasms (19.4%), respiratory infections and tuberculosis (9.7%), diabetes and kidney diseases (7.0%), and digestive diseases (4.4%). Among males, the five leading causes of death were cardiovascular diseases (46.8%), neoplasms (14.0%), respiratory infections and tuberculosis (9.8%), diabetes and kidney diseases (6.2%), and digestive diseases (5.0%) [**Figure 3**]. Among females, the five leading causes of death were cardiovascular diseases (31.6%), neoplasms (29.4%), respiratory infections and tuberculosis (9.7%), diabetes and kidney diseases (8.6%), and chronic respiratory diseases (3.4%) [**Figure 4**].

People aged 60 - 69:

Overall, the five leading causes of death were cardiovascular diseases (39.7%), neoplasms (20.9%), respiratory infections and tuberculosis (11.3%), diabetes and kidney diseases (8.5%), and chronic respiratory diseases (4.8%). Among males, the five leading causes of death were cardiovascular diseases (42.5%), neoplasms (18.9%), respiratory infections and tuberculosis (11.1%), diabetes and kidney diseases (7.5%), and chronic respiratory diseases (5.1%) [**Figure 3**]. Among females, the five leading causes of death were cardiovascular diseases (35.2%), neoplasms (24.2%), respiratory infections and tuberculosis (11.7%), diabetes and kidney diseases (10.2%), and chronic respiratory diseases (4.2%) [**Figure 4**].

People aged 70 - 79:

Overall, the five leading causes of death were cardiovascular diseases (40.3%), neoplasms (17.4%), respiratory infections and tuberculosis (13.1%), diabetes and kidney diseases (9.0%), and chronic respiratory diseases (6.9%). Among males, the five leading causes of death were cardiovascular diseases (40.1%), neoplasms (18.4%), respiratory infections and tuberculosis (13.3%), diabetes and kidney diseases (7.8%), and chronic respiratory diseases (7.6%) [**Figure 3**]. Among females, the five leading causes of death were cardiovascular diseases (40.5%), neoplasms (16.1%), respiratory infections and tuberculosis (12.9%), diabetes and kidney diseases (10.6%), and chronic respiratory diseases (6.0%) [**Figure 4**].

People aged 80 and above:

Overall, the five leading causes of death were cardiovascular diseases (44.3%), respiratory infections and tuberculosis (15.9%), neoplasms (11.3%), diabetes and kidney diseases (8.7%), and chronic respiratory diseases (8.7%). Among males, the five leading causes of death were cardiovascular diseases (40.6%), respiratory infections and tuberculosis (16.0%), neoplasms (14.7%), chronic respiratory diseases (9.4%), and diabetes and kidney diseases (8.3%) [**Figure 3**]. Among females, the five leading causes of death were cardiovascular diseases (46.9%), respiratory infections and tuberculosis (15.8%), diabetes and kidney diseases (9.0%), neoplasms (8.8%), and chronic respiratory diseases (8.1%) [**Figure 4**].

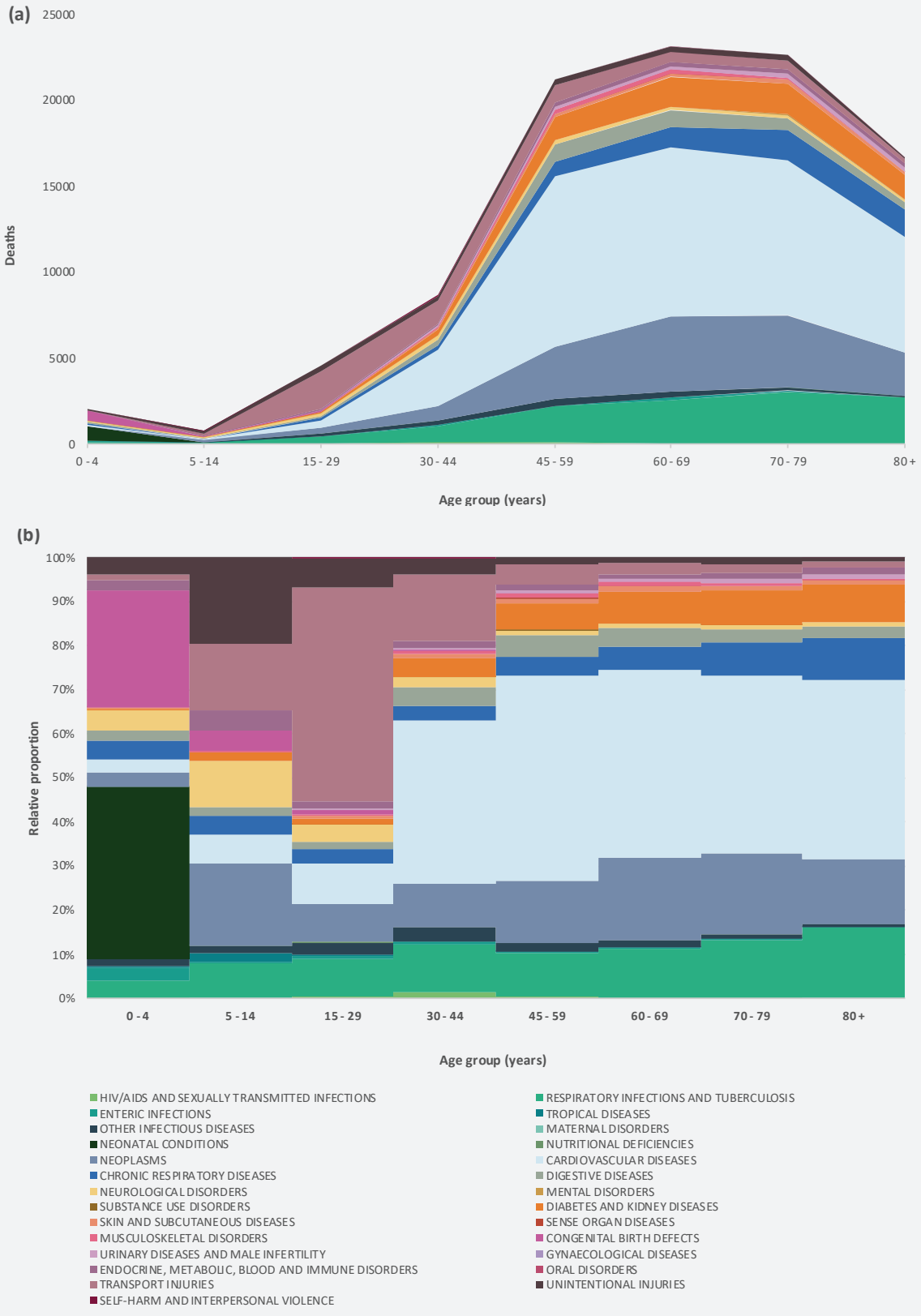

Figure 3: Number (a) and relative proportion (b) of deaths, by disease groups and age, males, 2019

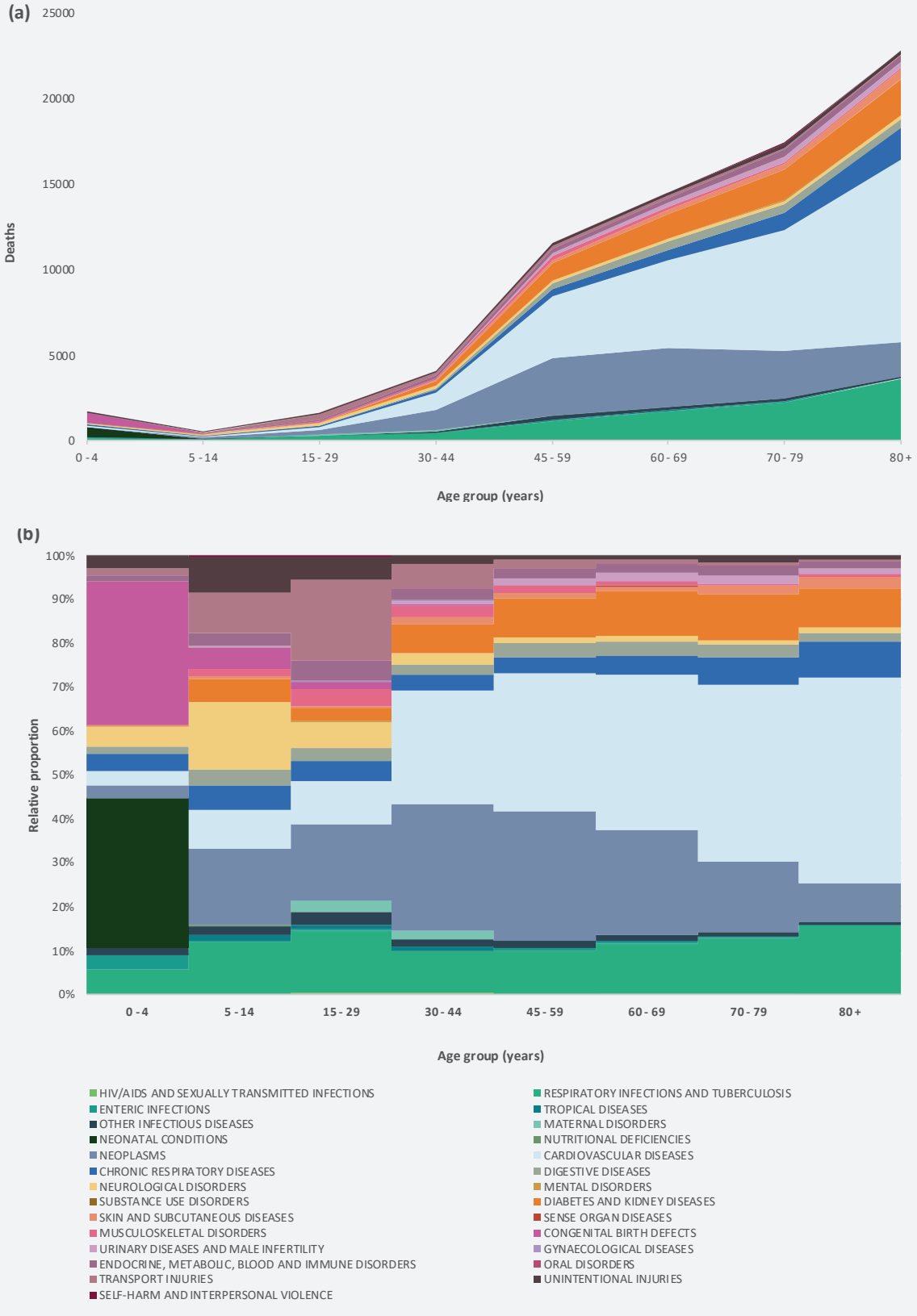

Figure 4: Number (a) and relative proportion (b) of deaths, by disease groups and age, females, 2019

Specific disease

Overall, the five leading causes of death by specific diseases were ischaemic heart disease (20.7%), stroke (13.9%), lower respiratory infections (11.4%), diabetes mellitus (5.0%), and road injuries (4.0%) [**Table 4**].

By sex

Among males, the five leading causes of death by specific diseases were ischaemic heart disease (22.8%), stroke (12.6%), lower respiratory infections (10.8%) road injuries (5.9%), and diabetes mellitus (4.3%). Among females, the five leading causes of death by specific diseases were ischaemic heart disease (17.9%), stroke (15.6%), lower respiratory infections (12.2%), diabetes mellitus (6.0%), and breast cancer (4.0%) [**Table 4**].

Table 4: Leading causes of death by specific diseases and sex, 2019

Rank	People	DEATHS	% of total	Males	DEATHS	% of total	Females	DEATHS	% of total
1	Ischaemic heart disease	35,940	20.7	Ischaemic heart disease	22,678	22.8	Ischaemic heart disease	13,262	17.9
2	Stroke	24,125	13.9	Stroke	12,604	12.6	Stroke	11,521	15.6
3	Lower respiratory infections	19,756	11.4	Lower respiratory infections	10,744	10.8	Lower respiratory infections	9,012	12.2
4	Diabetes mellitus	8,758	5.0	Road injuries	5,924	5.9	Diabetes mellitus	4,464	6.0
5	Road injuries	7,031	4.0	Diabetes mellitus	4,294	4.3	Breast cancer	2,982	4.0
6	Tracheal, bronchus, and lung cancer	5,249	3.0	Tracheal, bronchus, and lung cancer	3,659	3.7	Chronic kidney disease	2,238	3.0
7	Chronic kidney disease	4,570	2.6	Colon and rectum cancer	2,611	2.6	Colon and rectum cancer	1,834	2.5
8	Colon and rectum cancer	4,445	2.6	Chronic kidney disease	2,332	2.3	Tracheal, bronchus, and lung cancer	1,590	2.1
9	Breast cancer	2,989	1.7	Liver cancer	1,834	1.8	Asthma	1,152	1.6
10	Liver cancer	2,704	1.6	Chronic obstructive pulmonary disease	1,386	1.4	Road injuries	1,108	1.5
11	Asthma	2,298	1.3	Prostate cancer	1,200	1.2	Cervical cancer	1,087	1.5
12	Chronic obstructive pulmonary disease	1,846	1.1	Asthma	1,146	1.1	Urinary tract infection and interstitial nephritis	1,062	1.4
13	Urinary tract infection and interstitial nephritis	1,680	1.0	Tuberculosis	1,040	1.0	Liver cancer	870	1.2
14	Tuberculosis	1,428	0.8	Leukaemia	675	0.7	Ovarian cancer	653	0.9
15	Prostate cancer	1,200	0.7	Pancreatic cancer	634	0.6	Chronic obstructive pulmonary disease	460	0.6
16	Leukaemia	1,115	0.6	Urinary tract infection and interstitial nephritis	618	0.6	Pancreatic cancer	440	0.6
17	Cervical cancer	1,087	0.6	Non-Hodgkin lymphoma	569	0.6	Leukaemia	440	0.6
18	Pancreatic cancer	1,074	0.6	Drowning	514	0.5	Tuberculosis	388	0.5
19	Non-Hodgkin lymphoma	894	0.5	Cirrhosis and other chronic liver diseases	491	0.5	Falls	371	0.5
20	Bacterial skin diseases	850	0.5	Bacterial skin diseases	485	0.5	Bacterial skin diseases	365	0.5
	Top 20 diseases	129,039	74.3	Top 20 diseases	75,437	75.7	Top 20 diseases	55,299	74.7
	All other diseases	44,707	25.7	All other diseases	24,244	24.3	All other diseases	18,766	25.3
	Total	173,746	100.0	Total	99,681	100.0	Total	74,065	100.0

Colour legend: >5% | 4-5% | 3-4% | 2-3% | 0-2%

By age groups

Infants and children aged under 5:

Overall, the five leading causes of death by specific diseases were congenital heart anomalies (11.5%), neonatal preterm birth (9.7%), lower respiratory infections (4.7%), birth asphyxia and trauma (4.3%), and neonatal sepsis and other neonatal infections (4.3%). Among males, the five leading causes of death by specific diseases were congenital heart anomalies (11.3%), neonatal preterm birth (10.2%), birth asphyxia and trauma (4.5%), neonatal sepsis and other neonatal infections (4.5%), and lower respiratory infections (3.9%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were congenital heart anomalies (11.7%), neonatal preterm birth (9.1%), lower respiratory infections (5.6%), birth asphyxia and trauma (4.1%), and neonatal sepsis and other neonatal infections (4.1%) [**Figure 6**].

People aged 5 - 14:

Overall, the five leading causes of death by specific diseases were road injuries (12.6%), drowning (10.7%), lower respiratory infections (8.9%), leukaemia (6.2%), and brain and central nervous system cancer (4.2%). Among males, the five leading causes of death by specific diseases were road injuries (15.1%), drowning (14.2%), lower respiratory infections (7.8%), leukaemia (6.4%), and brain and central nervous system cancer (4.5%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were lower respiratory infections (10.5%), road injuries (9.1%), leukaemia (6.0%), drowning (5.7%), and chronic kidney disease (5.0%) [**Figure 6**].

People aged 15 - 29:

Overall, the five leading causes of death by specific diseases were road injuries (40.4%), lower respiratory infections (7.5%), ischaemic heart disease (3.2%), drowning (2.9%), and stroke (2.7%). Among males, the five leading causes of death by specific diseases were road injuries (48.3%), lower respiratory infections (6.7%), drowning (3.6%), ischaemic heart disease (3.5%), and stroke (2.7%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were road injuries (18.2%), lower respiratory infections (9.9%), tuberculosis (4.1%), leukaemia (3.4%), and stroke (2.6%) [**Figure 6**].

People aged 30 - 44:

Overall, the five leading causes of death by specific diseases were ischaemic heart disease (20.8%), road injuries (12.0%), lower respiratory infections (8.4%), stroke (7.1%), and breast cancer (3.2%). Among males, the five leading causes of death by specific diseases were ischaemic heart disease (24.1%), road injuries (15.0%), lower respiratory infections (8.5%), stroke (7.1%), and tuberculosis

(2.3%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were ischaemic heart disease (13.7%), breast cancer (9.9%), lower respiratory infections (8.1%), stroke (7.1%), and road injuries (5.4%) [**Figure 6**].

People aged 45 - 59:

Overall, the five leading causes of death by specific diseases were ischaemic heart disease (26.2%), stroke (10.6%), lower respiratory infections (8.6%), diabetes mellitus (4.6%), and road injuries (3.7%). Among males, the five leading causes of death by specific diseases were ischaemic heart disease (31.8%), stroke (10.2%), lower respiratory infections (8.5%), road injuries (4.7%), and diabetes mellitus (3.9%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were ischaemic heart disease (16.0%), stroke (11.4%), breast cancer (10.0%), lower respiratory infections (8.9%), and diabetes mellitus (5.8%) [**Figure 6**].

People aged 60 - 69:

Overall, the five leading causes of death by specific diseases were ischaemic heart disease (23.5%), stroke (12.0%), lower respiratory infections (10.5%), diabetes mellitus (5.8%), and tracheal, bronchus, and lung cancer (4.1%). Among males, the five leading causes of death by specific diseases were ischaemic heart disease (26.4%), stroke (11.9%), lower respiratory infections (10.1%), diabetes mellitus (5.1%), and tracheal, bronchus, and lung cancer (5.0%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were ischaemic heart disease (18.9%), stroke (12.2%), lower respiratory infections (11.2%), diabetes mellitus (7.0%), and breast cancer (5.4%) [**Figure 6**].

People aged 70 - 79:

Overall, the five leading causes of death by specific diseases were ischaemic heart disease (20.0%), stroke (16.7%), lower respiratory infections (12.6%), diabetes mellitus (6.1%), and tracheal, bronchus, and lung cancer (3.7%). Among males, the five leading causes of death by specific diseases were ischaemic heart disease (20.3%), stroke (16.2%), lower respiratory infections (12.6%), diabetes mellitus (5.2%), and tracheal, bronchus, and lung cancer (4.6%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were ischaemic heart disease (19.6%), stroke (17.2%), lower respiratory infections (12.5%), diabetes mellitus (7.3%), and chronic kidney disease (3.3%) [**Figure 6**].

People aged 80 and above:

Overall, the five leading causes of death by specific diseases were stroke (21.2%), ischaemic heart disease (19.4%), lower respiratory infections (15.5%), diabetes mellitus (5.8%), and chronic kidney disease (3.0%). Among males, the five leading causes of death by specific diseases were stroke (19.5%), ischaemic heart disease (17.8%), lower respiratory infections (15.4%), diabetes mellitus (5.6%), and tracheal, bronchus, and lung cancer (3.9%) [**Figure 5**]. Among females, the five leading causes of death by specific diseases were stroke (22.4%), ischaemic heart disease (20.5%), lower respiratory infections (15.6%), diabetes mellitus (5.9%), and chronic kidney disease (3.1%) [**Figure 6**].

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Congenital heart anomalies (0.24; 11.3%)	Road injuries (0.11; 15.1%)	Road injuries (2.19; 48.3%)	Ischaemic heart disease (2.09; 24.1%)
2nd	Neonatal preterm birth (0.21; 10.2%)	Drowning (0.10; 14.2%)	Lower respiratory infections (0.30; 6.7%)	Road injuries (1.30; 15.0%)
3rd	Birth asphyxia and trauma (0.09; 4.5%)*	Lower respiratory infections (0.06; 7.8%)	Drowning (0.16; 3.6%)	Lower respiratory infections (0.74; 8.5%)
4th	Neonatal sepsis and other neonatal infections (0.09; 4.5%)*	Leukaemia (0.05; 6.4%)	Ischaemic heart disease (0.16; 3.5%)	Stroke (0.62; 7.1%)
5th	Lower respiratory infections (0.08; 3.9%)	Brain and central nervous system cancer (0.03; 4.5%)	Stroke (0.12; 2.7%)	Tuberculosis (0.20; 2.3%)
6th	Diarrhoeal diseases (0.06; 2.9%)	Idiopathic epilepsy (0.02; 2.6%)	Leukaemia (0.10; 2.2%)	Chronic kidney disease (0.19; 2.2%)
7th	Drowning (0.04; 1.9%)	Non-Hodgkin lymphoma (0.02; 2.4%)*	Tuberculosis (0.08; 1.7%)	Diabetes mellitus (0.17; 1.9%)
8th	Neural tube defects (spina bifida & anencephaly) (0.03; 1.3%)	Congenital heart anomalies (0.02; 2.4%)*	Idiopathic epilepsy (0.05; 1.2%)	Colon and rectum cancer (0.13; 1.4%)
9th	Road injuries (0.02; 1.1%)	Stroke (0.01; 1.8%)	Testicular cancer (0.04; 0.8%)*	Tracheal, bronchus, and lung cancer (0.12; 1.4%)*
10th	Leukaemia (0.02; 1.0%)	Ischaemic heart disease (0.01; 1.6%)	Chronic kidney disease (0.04; 0.8%)*	HIV/AIDS (0.12; 1.4%)*

* denotes a tie
(Deaths '000; proportion %)

Figure 5: Leading causes of death by specific diseases and age group, males, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Ischaemic heart disease (6.74; 31.8%)	Ischaemic heart disease (6.10; 26.4%)	Ischaemic heart disease (4.59; 20.3%)	Stroke (3.25; 19.5%)
2nd	Stroke (2.16; 10.2%)	Stroke (2.75; 11.9%)	Stroke (3.68; 16.2%)	Ischaemic heart disease (2.97; 17.8%)
3rd	Lower respiratory infections (1.80; 8.5%)	Lower respiratory infections (2.34; 10.1%)	Lower respiratory infections (2.85; 12.6%)	Lower respiratory infections (2.57; 15.4%)
4th	Road injuries (1.00; 4.7%)	Diabetes mellitus (1.18; 5.1%)	Diabetes mellitus (1.17; 5.2%)	Diabetes mellitus (0.93; 5.6%)
5th	Diabetes mellitus (0.83; 3.9%)	Tracheal, bronchus, and lung cancer (1.16; 5.0%)	Tracheal, bronchus, and lung cancer (1.05; 4.6%)	Tracheal, bronchus, and lung cancer (0.66; 3.9%)
6th	Tracheal, bronchus, and lung cancer (0.66; 3.1%)	Colon and rectum cancer (0.73; 3.2%)	Colon and rectum cancer (0.81; 3.6%)	Chronic kidney disease (0.46; 2.8%)
7th	Liver cancer (0.50; 2.3%)	Liver cancer (0.68; 2.9%)	Chronic kidney disease (0.60; 2.7%)	Asthma (0.45; 2.7%)
8th	Chronic kidney disease (0.48; 2.2%)	Road injuries (0.62; 2.7%)	Chronic obstructive pulmonary disease (0.51; 2.3%)*	Colon and rectum cancer (0.44; 2.6%)
9th	Colon and rectum cancer (0.47; 2.2%)	Chronic kidney disease (0.55; 2.4%)	Prostate cancer (0.51; 2.3%)*	Prostate cancer (0.43; 2.6%)
10th	Tuberculosis (0.27; 1.3%)	Chronic obstructive pulmonary disease (0.34; 1.5%)	Road injuries (0.46; 2.0%)	Chronic obstructive pulmonary disease (0.34; 2.0%)

* denotes a tie
(Deaths '000; proportion %)

Figure 5: Leading causes of death by specific diseases and age group, males, 2019 (cont'd)

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Congenital heart anomalies (0.20; 11.7%)	Lower respiratory infections (0.05; 10.5%)	Road injuries (0.29; 18.2%)	Ischaemic heart disease (0.56; 13.7%)
2nd	Neonatal preterm birth (0.15; 9.1%)	Road injuries (0.05; 9.1%)	Lower respiratory infections (0.16; 9.9%)	Breast cancer (0.41; 9.9%)
3rd	Lower respiratory infections (0.09; 5.6%)	Leukaemia (0.03; 6.0%)	Tuberculosis (0.07; 4.1%)	Lower respiratory infections (0.33; 8.1%)
4th	Birth asphyxia and trauma (0.07; 4.1%)*	Drowning (0.03; 5.7%)	Leukaemia (0.05; 3.4%)	Stroke (0.29; 7.1%)
5th	Neonatal sepsis and other neonatal infections (0.07; 4.1%)*	Chronic kidney disease (0.03; 5.0%)	Stroke (0.04; 2.6%)*	Road injuries (0.22; 5.4%)
6th	Diarrhoeal diseases (0.05; 3.1%)	Brain and central nervous system cancer (0.02; 3.9%)	Ischaemic heart disease (0.04; 2.6%)*	Cervical cancer (0.15; 3.5%)
7th	Road injuries (0.03; 1.9%)	Idiopathic epilepsy (0.02; 3.3%)	Idiopathic epilepsy (0.03; 2.1%)	Diabetes mellitus (0.14; 3.4%)
8th	Neural tube defects (spina bifida & anencephaly) (0.02; 1.4%)	Congenital heart anomalies (0.01; 2.7%)	Diabetes mellitus (0.03; 1.7%)	Chronic kidney disease (0.12; 3.0%)
9th	Drowning (0.02; 1.1%)	Stroke (0.01; 2.3%)	Breast cancer (0.02; 1.2%)	Colon and rectum cancer (0.09; 2.2%)
10th	Leukaemia (0.02; 0.9%)	Dengue (0.01; 1.6%)	Stroke (0.04; 2.6%)	Tracheal, bronchus, and lung cancer (0.07; 1.7%)

* denotes a tie
(Deaths '000; proportion %)

Figure 6: Leading causes of death by specific diseases and age group, females, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Ischaemic heart disease (1.84; 16.0%)	Ischaemic heart disease (2.74; 18.9%)	Ischaemic heart disease (3.41; 19.6%)	Stroke (5.10; 22.4%)
2nd	Stroke (1.31; 11.4%)	Stroke (1.76; 12.2%)	Stroke (2.99; 17.2%)	Ischaemic heart disease (4.67; 20.5%)
3rd	Breast cancer (1.15; 10.0%)	Lower respiratory infections (1.62; 11.2%)	Lower respiratory infections (2.17; 12.5%)	Lower respiratory infections (3.55; 15.6%)
4th	Lower respiratory infections (1.03; 8.9%)	Diabetes mellitus (1.02; 7.0%)	Diabetes mellitus (1.26; 7.3%)	Diabetes mellitus (1.35; 5.9%)
5th	Diabetes mellitus (0.67; 5.8%)	Breast cancer (0.79; 5.4%)	Chronic kidney disease (0.58; 3.3%)	Chronic kidney disease (0.71; 3.1%)
6th	Colon and rectum cancer (0.36; 3.1%)*	Chronic kidney disease (0.45; 3.1%)	Colon and rectum cancer (0.46; 2.7%)	Asthma (0.67; 2.9%)
7th	Cervical cancer (0.36; 3.1%)*	Colon and rectum cancer (0.43; 3.0%)	Tracheal, bronchus, and lung cancer (0.41; 2.4%)	Colon and rectum cancer (0.48; 2.1%)
8th	Chronic kidney disease (0.33; 2.9%)	Tracheal, bronchus, and lung cancer (0.40; 2.8%)	Breast cancer (0.39; 2.2%)	Tracheal, bronchus, and lung cancer (0.39; 1.7%)
9th	Tracheal, bronchus, and lung cancer (0.31; 2.6%)	Cervical cancer (0.30; 2.1%)	Urinary tract infection and interstitial nephritis (0.32; 1.8%)	Urinary tract infection and interstitial nephritis (0.30; 1.3%)
10th	Road injuries (0.22; 1.9%)	Liver cancer (0.27; 1.8%)	Liver cancer (0.28; 1.6%)	Breast cancer (0.23; 1.0%)

* denotes a tie
(Deaths '000; proportion %)

Figure 6: Leading causes of death by specific diseases and age group, females, 2019 (cont'd)

3.2 Years of life lost (YLL)

In 2019, a total of 3,428,560 years of life were lost due to premature mortality in Malaysia, of which 2.03 million (59.1%) were males and 1.40 million (40.9%) were females.

Disease groups

Overall, the five leading causes of YLL were cardiovascular diseases (32.6%), neoplasms (16.3%), respiratory infections and tuberculosis (10.6%), transport injuries (7.7%), and diabetes and kidney diseases (6.2%) [**Figure 7**].

Figure 7: Proportion (%) of YLL, by disease groups and sex, 2019

By sex

Among males, the five leading causes of YLL were cardiovascular diseases (34.6%), neoplasms (13.4%), transport injuries (10.9%), respiratory infections and tuberculosis (10.3%), and diabetes and kidney diseases (5.2%). Among females, the five leading causes of YLL were cardiovascular diseases (29.8%), neoplasms (20.4%), respiratory infections and tuberculosis (11.2%), diabetes and kidney diseases (7.7%), and chronic respiratory diseases (4.7%) [**Table 5**].

Table 5: Number and proportion of YLL by disease groups and sex, 2019

DISEASE GROUP	PEOPLE		MALES		FEMALES	
	YLL	Proportion (%)	YLL	Proportion (%)	YLL	Proportion (%)
CARDIOVASCULAR DISEASES	1,118,541	32.6	699,906	34.6	418,635	29.8
NEOPLASMS	558,050	16.3	271,164	13.4	286,886	20.4
RESPIRATORY INFECTIONS AND TUBERCULOSIS	365,059	10.6	208,062	10.3	156,998	11.2
TRANSPORT INJURIES	264,354	7.7	220,914	10.9	43,439	3.1
DIABETES AND KIDNEY DISEASES	213,545	6.2	105,461	5.2	108,084	7.7
CHRONIC RESPIRATORY DISEASES	161,032	4.7	95,189	4.7	65,844	4.7
DIGESTIVE DISEASES	114,284	3.3	74,674	3.7	39,610	2.8
NEONATAL CONDITIONS	102,650	3.0	58,145	2.9	44,505	3.2
CONGENITAL BIRTH DEFECTS	93,051	2.7	45,543	2.2	47,509	3.4
UNINTENTIONAL INJURIES	86,868	2.5	60,591	3.0	26,277	1.9
NEUROLOGICAL DISORDERS	76,632	2.2	42,971	2.1	33,661	2.4
ENDOCRINE, METABOLIC, BLOOD AND IMMUNE DISORDERS	63,826	1.9	31,902	1.6	31,925	2.3
OTHER INFECTIOUS DISEASES	58,316	1.7	38,427	1.9	19,889	1.4
SKIN AND SUBCUTANEOUS DISEASES	38,367	1.1	18,248	0.9	20,118	1.4
MUSCULOSKELETAL DISORDERS	34,133	1.0	14,935	0.7	19,198	1.4
URINARY DISEASES AND MALE INFERTILITY	27,868	0.8	10,800	0.5	17,068	1.2
ENTERIC INFECTIONS	19,278	0.6	10,790	0.5	8,488	0.6
HIV/AIDS AND SEXUALLY TRANSMITTED INFECTIONS	10,751	0.3	8,942	0.4	1,808	0.1
TROPICAL DISEASES	8,964	0.3	5,025	0.2	3,939	0.3
MATERNAL DISORDERS	6,067	0.2	-	0.0	6,067	0.4
SELF-HARM AND INTERPERSONAL VIOLENCE	3,735	0.1	2,844	0.1	892	0.1
NUTRITIONAL DEFICIENCIES	1,037	0.0	429	0.0	608	0.0
GYNAECOLOGICAL DISEASES	800	0.0	-	0.0	800	0.1
MENTAL DISORDERS	689	0.0	271	0.0	418	0.0
SUBSTANCE USE DISORDERS	298	0.0	298	0.0	-	0.0
ORAL DISORDERS	248	0.0	64	0.0	184	0.0
SENSE ORGAN DISEASES	118	0.0	43	0.0	75	0.0
TOTAL	3,428,560	100.0	2,025,637	100.0	1,402,923	100.0

Colour legend: GROUP I : Communicable, Maternal, Perinatal and Nutritional Conditions | GROUP II : Noncommunicable Diseases | GROUP III : Injuries

Total YLL Group I: overall 572,121 (16.7%); males 329,820 (16.3%); females 242,301 (17.3%)
Total YLL Group II: overall 2,501,482 (73.0%); males 1,411,468 (69.7%); females 1,090,014 (77.7%)
Total YLL Group III: overall 354,957 (10.4%); males 284,349 (14.0%); females 70,608 (5.0%)

By age groups

Infants and children aged under 5:

Overall, the five leading causes of YLL were neonatal conditions (36.5%), congenital birth defects (29.5%), respiratory infections and tuberculosis (4.7%), neurological disorders (4.7%), and chronic respiratory diseases (4.2%). Among males, the five leading causes of YLL were neonatal conditions (38.8%), congenital birth defects (26.6%), neurological disorders (4.9%), chronic respiratory diseases (4.5%) and respiratory infections and tuberculosis (4.0%) [**Figure 8**]. Among females, the five leading causes of YLL were neonatal conditions (34.0%), congenital birth defects (32.9%), respiratory infections and tuberculosis (5.6%), neurological disorders (4.4%), and chronic respiratory diseases (3.9%) [**Figure 9**].

People aged 5 – 14:

Overall, the five leading causes of YLL were neoplasms (18.1%), unintentional injuries (14.7%), neurological disorders (12.6%), transport injuries (12.4%), and respiratory infections and tuberculosis (9.6%). Among males, the five leading causes of YLL were unintentional injuries (19.5%), neoplasms (18.6%), transport injuries (14.9%), neurological disorders (10.6%), and respiratory infections and tuberculosis (8.0%) [**Figure 8**]. Among females, the five leading causes of YLL were neoplasms (17.4%), neurological disorders (15.3%), respiratory infections and tuberculosis (11.7%), transport injuries (9.1%), and cardiovascular diseases (8.7%) [**Figure 9**].

People aged 15 - 29:

Overall, the five leading causes of YLL were transport injuries (40.5%), neoplasms (10.9%), respiratory infections and tuberculosis (9.8%), cardiovascular diseases (9.3%), and unintentional injuries (6.3%). Among males, the five leading causes of YLL were transport injuries (48.9%), cardiovascular diseases (9.1%), neoplasms (8.6%), respiratory infections and tuberculosis (8.2%), and unintentional injuries (6.6%) [**Figure 8**]. Among females, the five leading causes of YLL were transport injuries (18.5%), neoplasms (17.0%), respiratory infections and tuberculosis (14.0%), cardiovascular diseases (9.9%), and neurological disorders (6.2%) [**Figure 9**].

People aged 30 - 44:

Overall, the five leading causes of YLL were cardiovascular diseases (32.8%), neoplasms (16.1%), transport injuries (12.1%), respiratory infections and tuberculosis (10.5%), and diabetes and kidney diseases (4.8%). Among males, the five leading causes of YLL were cardiovascular diseases (36.6%), transport injuries (15.5%), respiratory infections and tuberculosis (10.9%), neoplasms (9.6%), and digestive diseases (4.2%) [**Figure 8**]. Among females, the five leading causes of YLL were neoplasms (28.5%), cardiovascular diseases (25.5%), respiratory infections and tuberculosis (9.5%), diabetes and kidney diseases (6.4%), and transport injuries (5.6%) [**Figure 9**].

People aged 45 - 59:

Overall, the five leading causes of YLL were cardiovascular diseases (40.9%), neoplasms (19.8%), respiratory infections and tuberculosis (9.7%), diabetes and kidney diseases (7.0%), and digestive diseases (4.4%). Among males, the five leading causes of YLL were cardiovascular diseases (46.7%), neoplasms (13.8%), respiratory infections and tuberculosis (9.8%), diabetes and kidney diseases (6.1%), and digestive diseases (5.0%) [**Figure 8**]. Among females, the five leading causes of YLL were cardiovascular diseases (31.5%), neoplasms (29.6%), respiratory infections and tuberculosis (9.7%), diabetes and kidney diseases (8.6%), and chronic respiratory diseases (3.4%) [**Figure 9**].

People aged 60 - 69:

Overall, the five leading causes of YLL were cardiovascular diseases (39.5%), neoplasms (21.2%), respiratory infections and tuberculosis (11.3%), diabetes and kidney diseases (8.6%), and chronic respiratory diseases (4.7%). Among males, the five leading causes of YLL were cardiovascular diseases (42.6%), neoplasms (18.9%), respiratory infections and tuberculosis (11.1%), diabetes and kidney diseases (7.5%), and chronic respiratory diseases (5.1%) [**Figure 8**]. Among females, the five leading causes of YLL were cardiovascular diseases (35.1%), neoplasms (24.3%), respiratory infections and tuberculosis (11.7%), diabetes and kidney diseases (10.1%), and chronic respiratory diseases (4.2%) [**Figure 9**].

People aged 70 - 79:

Overall, the five leading causes of YLL were cardiovascular diseases (40.2%), neoplasms (17.4%), respiratory infections and tuberculosis (13.1%), diabetes and kidney diseases (9.1%), and chronic respiratory diseases (6.8%). Among males, the five leading causes of YLL were cardiovascular diseases (40.3%), neoplasms (18.5%), respiratory infections and tuberculosis (13.2%), diabetes and kidney diseases (7.8%), and chronic respiratory diseases (7.5%) [**Figure 8**]. Among females, the five leading causes of YLL were cardiovascular diseases (40.1%), neoplasms (16.2%), respiratory infections and tuberculosis (13.0%), diabetes and kidney diseases (10.6%), and chronic respiratory diseases (5.9%) [**Figure 9**].

People aged 80 and above:

Overall, the five leading causes of YLL were cardiovascular diseases (44.5%), respiratory infections and tuberculosis (15.9%), neoplasms (11.1%), diabetes and kidney diseases (8.8%), and chronic respiratory diseases (8.6%). Among males, the five leading causes of YLL were cardiovascular diseases (40.6%), respiratory infections and tuberculosis (16.0%), neoplasms (14.7%), chronic respiratory diseases (9.4%), and diabetes and kidney diseases (8.3%) [**Figure 8**]. Among females, the five leading causes of YLL were cardiovascular diseases (46.9%), respiratory infections and

tuberculosis (15.8%), diabetes and kidney diseases (9.0%), neoplasms (8.8%), and chronic respiratory diseases (8.1%) [**Figure 9**].

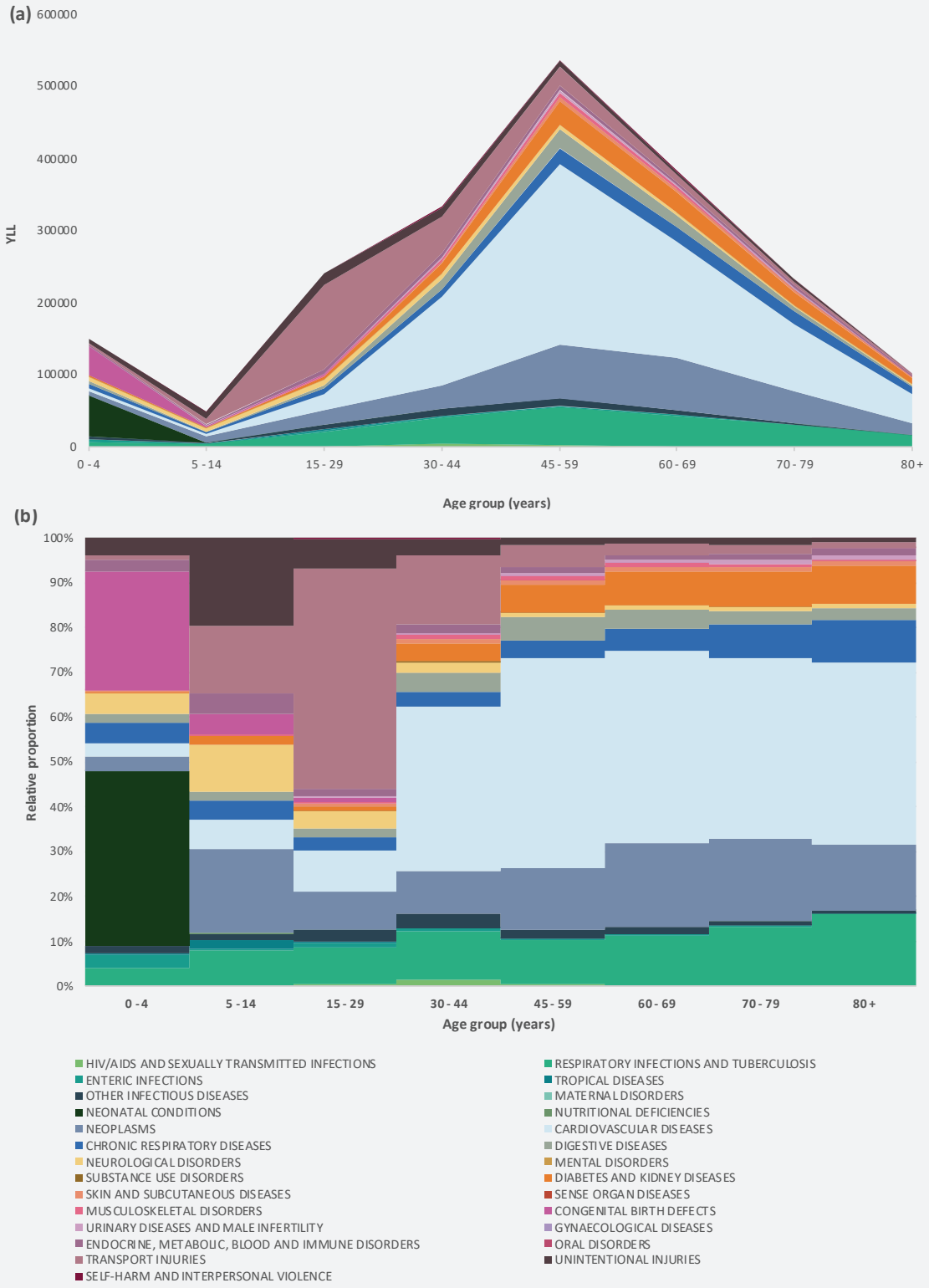

Figure 8: Number (a) and relative proportion (b) of YLL, by disease groups and age, males, 2019

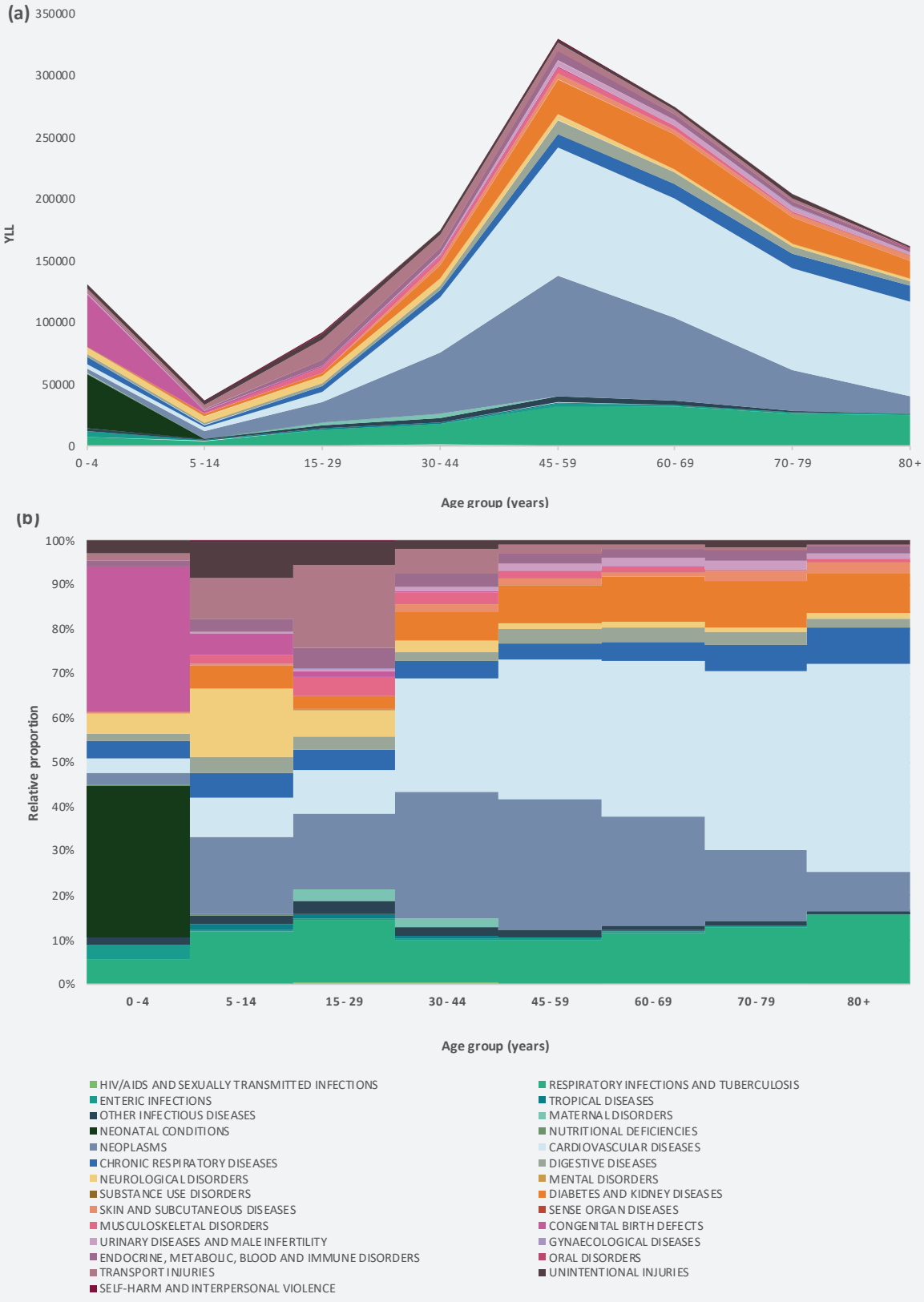

Figure 9: Number (a) and relative proportion (b) of YLL, by disease groups and age, females, 2019

Specific diseases

Overall, the five leading causes of YLL by specific diseases were ischaemic heart disease (18.3%), stroke (10.1%), lower respiratory infections (9.6%), road injuries (7.7%), and diabetes mellitus (3.9%) [**Table 6**].

By sex

Among males, the five leading causes of YLL by specific diseases were ischaemic heart disease (21.0%), road injuries (10.9%), stroke (9.3%), lower respiratory infections (9.0%) and diabetes mellitus (3.2%). Among females, the five leading causes of YLL by specific diseases were ischaemic heart disease (14.5%), stroke (11.2%), lower respiratory infections (10.4%), breast cancer (5.2%), and diabetes mellitus (5.0%) [**Table 6**].

Table 6: Leading causes of YLL by specific diseases and sex, 2019

Rank	People	YLL	% of total	Males	YLL	% of total	Females	YLL	% of total
1	Ischaemic heart disease	628,972	18.3	Ischaemic heart disease	426,109	21.0	Ischaemic heart disease	202,863	14.5
2	Stroke	346,078	10.1	Road injuries	220,914	10.9	Stroke	157,653	11.2
3	Lower respiratory infections	327,976	9.6	Stroke	188,425	9.3	Lower respiratory infections	145,207	10.4
4	Road injuries	264,354	7.7	Lower respiratory infections	182,770	9.0	Breast cancer	73,245	5.2
5	Diabetes mellitus	135,045	3.9	Diabetes mellitus	65,031	3.2	Diabetes mellitus	70,014	5.0
6	Tracheal, bronchus, and lung cancer	82,874	2.4	Tracheal, bronchus, and lung cancer	55,570	2.7	Road injuries	43,439	3.1
7	Chronic kidney disease	78,326	2.3	Colon and rectum cancer	41,430	2.0	Chronic kidney disease	37,947	2.7
8	Breast cancer	73,393	2.1	Chronic kidney disease	40,379	2.0	Colon and rectum cancer	31,619	2.3
9	Colon and rectum cancer	73,048	2.1	Liver cancer	32,179	1.6	Tracheal, bronchus, and lung cancer	27,304	1.9
10	Liver cancer	46,704	1.4	Drowning	25,183	1.2	Cervical cancer	25,714	1.8
11	Congenital heart anomalies	38,790	1.1	Tuberculosis	24,876	1.2	Congenital heart anomalies	18,348	1.3
12	Tuberculosis	36,410	1.1	Congenital heart anomalies	20,443	1.0	Urinary tract infection and interstitial nephritis	16,639	1.2
13	Leukaemia	32,003	0.9	Chronic obstructive pulmonary disease	18,803	0.9	Ovarian cancer	15,385	1.1
14	Asthma	31,569	0.9	Leukaemia	18,608	0.9	Asthma	15,024	1.1
15	Drowning	30,050	0.9	Asthma	16,545	0.8	Liver cancer	14,524	1.0
16	Neonatal preterm birth	27,290	0.8	Neonatal preterm birth	15,370	0.8	Leukaemia	13,395	1.0
17	Cervical cancer	25,714	0.7	Non-Hodgkin lymphoma	12,575	0.6	Neonatal preterm birth	11,920	0.8
18	Urinary tract infection and interstitial nephritis	25,241	0.7	Prostate cancer	12,443	0.6	Tuberculosis	11,535	0.8
19	Chronic obstructive pulmonary disease	25,169	0.7	Cardiomyopathy and myocarditis	11,864	0.6	Diarrhoeal diseases	8,481	0.6
20	Non-Hodgkin lymphoma	20,037	0.6	Brain and central nervous system cancer	11,352	0.6	Brain and central nervous system cancer	7,720	0.6
	Top 20 diseases	2,349,042	68.5	Top 20 diseases	1,440,868	71.1	Top 20 diseases	947,974	67.6
	All other diseases	1,079,518	31.5	All other diseases	584,769	28.9	All other diseases	454,949	32.4
	Total	3,428,560	100.0	Total	2,025,637	100.0	Total	1,402,923	100.0

Colour legend: >5% | 4-5% | 3-4% | 2-3% | 0-2%

By age groups

Infants and children aged under 5:

Overall, the five leading causes of YLL by specific diseases were congenital heart anomalies (11.5%), neonatal preterm birth (9.7%), lower respiratory infections (4.7%), birth asphyxia and trauma (4.3%), and neonatal sepsis and other neonatal infections (4.3%). Among males, the five leading causes of YLL by specific diseases were congenital heart anomalies (11.3%), neonatal preterm birth (10.2%), birth asphyxia and trauma (4.5%), neonatal sepsis and other neonatal infections (4.5%), and lower respiratory infections (3.9%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were congenital heart anomalies (11.7%), neonatal preterm birth (9.1%), lower respiratory infections (5.6%), birth asphyxia and trauma (4.1%), and neonatal sepsis and other neonatal infections (4.1%) [**Figure 11**].

People aged 5 - 14:

Overall, the five leading causes of YLL by specific diseases were road injuries (12.4%), drowning (10.6%), lower respiratory infections (9.0%), leukaemia (6.2%), and brain and central nervous system cancer (4.3%). Among males, the five leading causes of YLL by specific diseases were road injuries (14.9%), drowning (14.2%), lower respiratory infections (7.8%), leukaemia (6.4%), and brain and central nervous system cancer (4.5%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were lower respiratory infections (10.5%), road injuries (9.1%), leukaemia (6.0%), drowning (5.8%), and chronic kidney disease (5.1%) [**Figure 11**].

People aged 15 - 29:

Overall, the five leading causes of YLL by specific diseases were road injuries (40.5%), lower respiratory infections (7.5%), ischaemic heart disease (3.1%), drowning (2.9%), and stroke (2.7%). Among males, the five leading causes of YLL by specific diseases were road injuries (48.9%), lower respiratory infections (6.5%), drowning (3.6%), ischaemic heart disease (3.4%), and stroke (2.7%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were road injuries (18.5%), lower respiratory infections (9.9%), tuberculosis (4.1%), leukaemia (3.4%), and stroke (2.6%) [**Figure 11**].

People aged 30 - 44:

Overall, the five leading causes of YLL by specific diseases were ischaemic heart disease (20.2%), road injuries (12.1%), lower respiratory infections (8.5%), stroke (7.0%), and breast cancer (3.4%). Among males, the five leading causes of YLL by specific diseases were ischaemic heart disease (23.8%), road injuries (15.5%), lower respiratory infections (8.6%), stroke (7.0%), and tuberculosis

(2.3%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were ischaemic heart disease (13.4%), breast cancer (9.8%), lower respiratory infections (8.3%), stroke (7.0%), and road injuries (5.6%) [**Figure 11**].

People aged 45 - 59:

Overall, the five leading causes of YLL by specific diseases were ischaemic heart disease (25.7%), stroke (10.6%), lower respiratory infections (8.6%), diabetes mellitus (4.6%), and breast cancer (3.9%). Among males, the five leading causes of YLL by specific diseases were ischaemic heart disease (31.8%), stroke (10.1%), lower respiratory infections (8.5%), road injuries (4.9%), and diabetes mellitus (3.9%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were ischaemic heart disease (15.9%), stroke (11.4%), breast cancer (10.2%), lower respiratory infections (8.8%), and diabetes mellitus (5.7%) [**Figure 11**].

People aged 60 - 69:

Overall, the five leading causes of YLL by specific diseases were ischaemic heart disease (23.4%), stroke (11.9%), lower respiratory infections (10.5%), diabetes mellitus (5.9%), and tracheal, bronchus, and lung cancer (4.1%). Among males, the five leading causes of YLL by specific diseases were ischaemic heart disease (26.5%), stroke (11.8%), lower respiratory infections (10.1%), diabetes mellitus (5.1%), and tracheal, bronchus, and lung cancer (5.0%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were ischaemic heart disease (19.0%), stroke (12.1%), lower respiratory infections (11.2%), diabetes mellitus (7.0%), and breast cancer (5.6%) [**Figure 11**].

People aged 70 - 79:

Overall, the five leading causes of YLL by specific diseases were ischaemic heart disease (20.0%), stroke (16.5%), lower respiratory infections (12.5%), diabetes mellitus (6.1%), and tracheal, bronchus, and lung cancer (3.6%). Among males, the five leading causes of YLL by specific diseases were ischaemic heart disease (20.5%), stroke (16.2%), lower respiratory infections (12.5%), diabetes mellitus (5.1%), and tracheal, bronchus, and lung cancer (4.6%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were ischaemic heart disease (19.4%), stroke (17.0%), lower respiratory infections (12.6%), diabetes mellitus (7.2%), and chronic kidney disease (3.3%) [**Figure 11**].

People aged 80 and above:

Overall, the five leading causes of YLL by specific diseases were stroke (21.3%), ischaemic heart disease (19.5%), lower respiratory infections (15.5%), diabetes mellitus (5.8%), and chronic kidney disease (3.0%). Among males, the five leading causes of YLL by specific diseases were stroke (19.5%), ischaemic heart disease (17.8%), lower respiratory infections (15.4%), diabetes mellitus (5.6%), and tracheal, bronchus, and lung cancer (3.9%) [**Figure 10**]. Among females, the five leading causes of YLL by specific diseases were stroke (22.4%), ischaemic heart disease (20.5%), lower respiratory infections (15.6%), diabetes mellitus (5.9%), and chronic kidney disease (3.1%) [**Figure 11**].

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Congenital heart anomalies (17.03; 11.3%)	Road injuries (7.21; 14.9%)	Road injuries (117.85; 48.9%)	Ischaemic heart disease (79.16; 23.8%)
2nd	Neonatal preterm birth (15.37; 10.2%)	Drowning (6.87; 14.2%)	Lower respiratory infections (15.76; 6.5%)	Road injuries (51.68; 15.5%)
3rd	Birth asphyxia and trauma (6.82; 4.5%)	Lower respiratory infections (3.75; 7.8%)	Drowning (8.75; 3.6%)	Lower respiratory infections (28.47; 8.6%)
4th	Neonatal sepsis and other neonatal infections (6.81; 4.5%)	Leukaemia (3.09; 6.4%)	Ischaemic heart disease (8.15; 3.4%)	Stroke (23.33; 7.0%)
5th	Lower respiratory infections (5.86; 3.9%)	Brain and central nervous system cancer (2.18; 4.5%)	Stroke (6.45; 2.7%)	Tuberculosis (7.81; 2.3%)
6th	Diarrhoeal diseases (4.37; 2.9%)	Idiopathic epilepsy (1.24; 2.6%)	Leukaemia (5.28; 2.2%)	Chronic kidney disease (7.08; 2.1%)
7th	Drowning (2.85; 1.9%)	Congenital heart anomalies (1.18; 2.4%)*	Tuberculosis (3.95; 1.6%)	Diabetes mellitus (6.28; 1.9%)
8th	Neural tube defects (spina bifida & anencephaly) (1.96; 1.3%)	Non-Hodgkin lymphoma (1.18; 2.4%)*	Idiopathic epilepsy (2.85; 1.2%)	Colon and rectum cancer (4.74; 1.4%)
9th	Road injuries (1.66; 1.1%)	Stroke (0.86; 1.8%)	Testicular cancer (1.91; 0.8%)	Drowning (4.67; 1.4%)
10th	Leukaemia (1.51; 1.0%)	Chronic kidney disease (0.79; 1.6%)	Chronic kidney disease (1.87; 0.8%)	Tracheal, bronchus, and lung cancer (4.59; 1.4%)

* denotes a tie
(YLL '000; proportion %)

Figure 10: Leading causes of YLL by specific diseases and age group, males, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Ischaemic heart disease (170.31; 31.8%)	Ischaemic heart disease (101.56; 26.5%)	Ischaemic heart disease (47.73; 20.5%)	Stroke (19.83; 19.5%)
2nd	Stroke (54.08; 10.1%)	Stroke (45.14; 11.8%)	Stroke (37.58; 16.2%)	Ischaemic heart disease (18.14; 17.8%)
3rd	Lower respiratory infections (45.46; 8.5%)	Lower respiratory infections (38.70; 10.1%)	Lower respiratory infections (29.08; 12.5%)	Lower respiratory infections (15.69; 15.4%)
4th	Road injuries (26.13; 4.9%)	Diabetes mellitus (19.37; 5.1%)	Diabetes mellitus (11.84; 5.1%)	Diabetes mellitus (5.67; 5.6%)
5th	Diabetes mellitus (20.74; 3.9%)	Tracheal, bronchus, and lung cancer (19.11; 5.0%)	Tracheal, bronchus, and lung cancer (10.72; 4.6%)	Tracheal, bronchus, and lung cancer (4.00; 3.9%)
6th	Tracheal, bronchus, and lung cancer (16.48; 3.1%)	Colon and rectum cancer (12.18; 3.2%)	Colon and rectum cancer (8.34; 3.6%)	Chronic kidney disease (2.81; 2.8%)
7th	Liver cancer (12.27; 2.3%)	Liver cancer (11.27; 2.9%)	Chronic kidney disease (6.27; 2.7%)	Asthma (2.73; 2.7%)
8th	Chronic kidney disease (11.92; 2.2%)	Road injuries (10.23; 2.7%)	Chronic obstructive pulmonary disease (5.25; 2.3%)	Colon and rectum cancer (2.70; 2.6%)
9th	Colon and rectum cancer (11.69; 2.2%)	Chronic kidney disease (9.14; 2.4%)	Prostate cancer (5.18; 2.2%)	Prostate cancer (2.61; 2.6%)
10th	Tuberculosis (6.92; 1.3%)	Chronic obstructive pulmonary disease (5.65; 1.5%)	Road injuries (4.81; 2.1%)	Chronic obstructive pulmonary disease (2.04; 2.0%)

* denotes a tie
(YLL '000; proportion %)

Figure 10: Leading causes YLL by specific diseases and age group, males, 2019 (cont'd)

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Congenital heart anomalies (15.32; 11.7%)	Lower respiratory infections (3.82; 10.5%)	Road injuries (16.97; 18.5%)	Ischaemic heart disease (23.40; 13.4%)
2nd	Neonatal preterm birth (11.92; 9.1%)	Road injuries (3.32; 9.1%)	Lower respiratory infections (9.03; 9.9%)	Breast cancer (16.99; 9.8%)
3rd	Lower respiratory infections (7.30; 5.6%)	Leukaemia (2.17; 6.0%)	Tuberculosis (3.75; 4.1%)	Lower respiratory infections (14.42; 8.3%)
4th	Birth asphyxia and trauma (5.34; 4.1%)*	Drowning (2.10; 5.8%)	Leukaemia (3.10; 3.4%)	Stroke (12.17; 7.0%)
5th	Neonatal sepsis and other neonatal infections (5.34; 4.1%)*	Chronic kidney disease (1.84; 5.1%)	Stroke (2.37; 2.6%)	Road injuries (9.72; 5.6%)
6th	Diarrhoeal diseases (4.07; 3.1%)	Brain and central nervous system cancer (1.43; 3.9%)	Ischaemic heart disease (2.23; 2.4%)	Cervical cancer (6.16; 3.5%)
7th	Road injuries (2.47; 1.9%)	Idiopathic epilepsy (1.18; 3.3%)	Idiopathic epilepsy (1.95; 2.1%)	Diabetes mellitus (5.93; 3.4%)
8th	Neural tube defects (spina bifida & anencephaly) (1.78; 1.4%)	Congenital heart anomalies (1.00; 2.7%)	Diabetes mellitus (1.54; 1.7%)	Chronic kidney disease (5.18; 3.0%)
9th	Drowning (1.38; 1.1%)	Stroke (0.84; 2.3%)	Congenital heart anomalies (1.11; 1.2%)	Colon and rectum cancer (3.82; 2.2%)
10th	Leukaemia (1.23; 0.9%)	Dengue (0.56; 1.6%)	Chronic kidney disease (1.09; 1.2%)	Tracheal, bronchus, and lung cancer (2.87; 1.6%)

* denotes a tie
(YLL'000; proportion %)

Figure 11:Leading causes of YLL by specific diseases and age group, females, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Ischaemic heart disease (52.29; 15.9%)	Ischaemic heart disease (52.29; 19.0%)	Ischaemic heart disease (39.41; 19.4%)	Stroke (36.24; 22.4%)
2nd	Stroke (37.43; 11.4%)	Stroke (33.14; 12.1%)	Stroke (34.54; 17.0%)	Ischaemic heart disease (33.16; 20.5%)
3rd	Breast cancer (33.52; 10.2%)	Lower respiratory infections (30.71; 11.2%)	Lower respiratory infections (25.62; 12.6%)	Lower respiratory infections (25.23; 15.6%)
4th	Lower respiratory infections (29.08; 8.8%)	Diabetes mellitus (19.21; 7.0%)	Diabetes mellitus (14.75; 7.2%)	Diabetes mellitus (9.57; 5.9%)
5th	Diabetes mellitus (18.94; 5.7%)	Breast cancer (15.30; 5.6%)	Chronic kidney disease (6.71; 3.3%)	Chronic kidney disease (5.02; 3.1%)
6th	Colon and rectum cancer (10.41; 3.2%)	Chronic kidney disease (8.63; 3.1%)	Colon and rectum cancer (5.38; 2.6%)	Asthma (4.75; 2.9%)
7th	Cervical cancer (10.22; 3.1%)	Colon and rectum cancer (8.07; 2.9%)	Tracheal, bronchus, and lung cancer (4.87; 2.4%)	Colon and rectum cancer (3.43; 2.1%)
8th	Chronic kidney disease (9.33; 2.8%)	Tracheal, bronchus, and lung cancer (7.63; 2.8%)	Breast cancer (4.75; 2.3%)	Tracheal, bronchus, and lung cancer (2.79; 1.7%)
9th	Tracheal, bronchus, and lung cancer (8.57; 2.6%)	Cervical cancer (5.71; 2.1%)	Urinary tract infection and interstitial nephritis (3.77; 1.9%)	Urinary tract infection and interstitial nephritis (2.13; 1.3%)
10th	Road injuries (6.43; 2.0%)	Liver cancer (5.05; 1.8%)	Liver cancer (3.31; 1.6%)	Breast cancer (1.61; 1.0%)

* denotes a tie
(YLL'000; proportion %)

Figure 11: Leading causes of YLL by specific diseases and age group, females, 2019 (cont'd)

3.3 Years lived with disability (YLD)

In 2019, a total of 2,190,082 years lived with disability in Malaysia, of which 1,151,975 (52.6%) were males and 1,038,107 (47.4%) were females.

Disease groups

Overall, the five leading causes of YLD were mental disorders (14.1%), diabetes and kidney diseases (12.9%), cardiovascular diseases (10.6%), chronic respiratory diseases (8.6%), and neurological disorders (6.1%) [**Figure 12**].

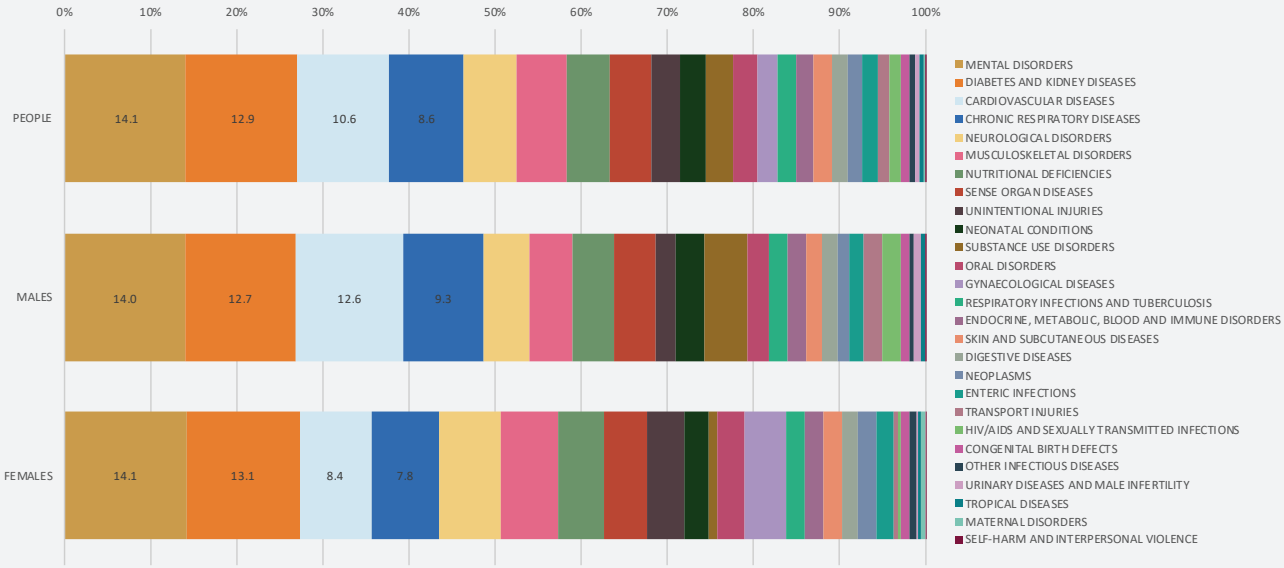

Figure 12: Proportion (%) of YLD, by disease groups and sex, 2019

By sex

Among males, the five leading causes of YLD were mental disorders (14.0%), diabetes and kidney diseases (12.7%), cardiovascular diseases (12.6%), chronic respiratory diseases (8.6%), and neurological disorders (6.1%). Among females, the five leading causes of YLD were mental disorders (14.1%), diabetes and kidney diseases (13.1%), cardiovascular diseases (8.4%), chronic respiratory diseases (7.8%), and neurological disorders (7.1%) [**Table 7**].

Table 7: Number and proportion of YLD by disease groups and sex, 2019

DISEASE GROUP	PEOPLE		MALES		FEMALES	
	YLD	Proportion (%)	YLD	Proportion (%)	YLD	Proportion (%)
MENTAL DISORDERS	308,411	14.1	161,808	14.0	146,603	14.1
DIABETES AND KIDNEY DISEASES	283,090	12.9	146,642	12.7	136,448	13.1
CARDIOVASCULAR DISEASES	233,001	10.6	145,400	12.6	87,601	8.4
CHRONIC RESPIRATORY DISEASES	188,882	8.6	107,505	9.3	81,377	7.8
NEUROLOGICAL DISORDERS	134,465	6.1	61,135	5.3	73,330	7.1
MUSCULOSKELETAL DISORDERS	127,245	5.8	56,971	4.9	70,274	6.8
NUTRITIONAL DEFICIENCIES	110,694	5.1	56,409	4.9	54,285	5.2
SENSE ORGAN DISEASES	107,916	4.9	54,977	4.8	52,939	5.1
UNINTENTIONAL INJURIES	69,853	3.2	26,538	2.3	43,315	4.2
NEONATAL CONDITIONS	68,170	3.1	37,570	3.3	30,600	2.9
SUBSTANCE USE DISORDERS	67,288	3.1	58,135	5.0	9,153	0.9
ORAL DISORDERS	61,668	2.8	28,799	2.5	32,869	3.2
GYNAECOLOGICAL DISEASES	50,533	2.3	-	0.0	50,533	4.9
RESPIRATORY INFECTIONS AND TUBERCULOSIS	49,335	2.3	25,802	2.2	23,533	2.3
ENDOCRINE, METABOLIC, BLOOD AND IMMUNE DISORDERS	45,134	2.1	24,162	2.1	20,972	2.0
SKIN AND SUBCUTANEOUS DISEASES	44,641	2.0	21,359	1.9	23,282	2.2
DIGESTIVE DISEASES	39,781	1.8	20,764	1.8	19,017	1.8
NEOPLASMS	38,877	1.8	16,188	1.4	22,689	2.2
ENTERIC INFECTIONS	37,901	1.7	17,526	1.5	20,375	2.0
TRANSPORT INJURIES	31,354	1.4	25,458	2.2	5,896	0.6
HIV/AIDS AND SEXUALLY TRANSMITTED INFECTIONS	27,330	1.2	24,927	2.2	2,403	0.2
CONGENITAL BIRTH DEFECTS	22,657	1.0	12,238	1.1	10,419	1.0
OTHER INFECTIOUS DISEASES	15,240	0.7	5,959	0.5	9,281	0.9
URINARY DISEASES AND MALE INFERTILITY	10,618	0.5	9,829	0.9	789	0.1
TROPICAL DISEASES	10,120	0.5	5,167	0.4	4,953	0.5
MATERNAL DISORDERS	4,896	0.2	-	0.0	4,896	0.5
SELF-HARM AND INTERPERSONAL VIOLENCE	982	0.0	707	0.1	275	0.0
TOTAL	2,190,082	100.0	1,151,975	100.0	1,038,107	100.0

Colour legend: GROUP I : Communicable, Maternal, Perinatal and Nutritional Conditions | GROUP II : Noncommunicable Diseases | GROUP III : Injuries

Total YLD Group I: overall 323,686 (14.8%); males 173,360 (15.0%); females 150,326 (14.5%)
Total YLD Group II: overall 1,764,207 (80.6%); males 925,912 (80.4%); females 838,295 (80.8%)
Total YLD Group III: overall 102,189 (4.7%); males 52,703 (4.6%); females 49,486 (4.8%)

By age groups

Infants and children aged under 5:

Overall, the five leading causes of YLD were nutritional deficiencies (27.0%), neonatal conditions (24.4%), chronic respiratory diseases (13.9%), neurological disorders (8.3%), and unintentional injuries (7.2%). Among males, the five leading causes of YLD were neonatal conditions (24.9%), nutritional deficiencies (24.1%), chronic respiratory diseases (16.0%), neurological disorders (8.9%),

and unintentional injuries (5.8%) [**Figure 13**]. Among females, the five leading causes of YLD were nutritional deficiencies (30.5%), neonatal conditions (23.8%), chronic respiratory diseases (11.4%), unintentional injuries (9.0%), and neurological disorders (7.5%) [**Figure 14**].

People aged 5 – 14:

Overall, the five leading causes of YLD were neurological disorders (21.4%), chronic respiratory diseases (19.6%), mental disorders (7.0%), enteric infections (6.9%), and nutritional deficiencies (6.8%). Among males, the five leading causes of YLD were chronic respiratory diseases (22.5%), neurological disorders (17.0%), mental disorders (7.2%), enteric infections (6.5%), and unintentional injuries (5.8%) [**Figure 13**]. Among females, the five leading causes of YLD were neurological disorders (25.6%), chronic respiratory diseases (16.8%), nutritional deficiencies (8.2%), enteric infections (7.2%), and mental disorders (6.9%) [**Figure 14**].

People aged 15 - 29:

Overall, the five leading causes of YLD were mental disorders (25.2%), neurological disorders (7.7%), substance use disorders (7.5%), chronic respiratory diseases (5.8%), and enteric infections (5.0%). Among males, the five leading causes of YLD were mental disorders (25.7%), substance use disorders (12.1%), transport injuries (6.6%), neurological disorders (5.9%), and chronic respiratory diseases (5.5%) [**Figure 13**]. Among females, the five leading causes of YLD were mental disorders (24.6%), neurological disorders (9.6%), gynaecological diseases (8.2%), chronic respiratory diseases (6.1%), and enteric infections (5.7%) [**Figure 14**].

People aged 30 - 44:

Overall, the five leading causes of YLD were mental disorders (24.5%), diabetes and kidney diseases (6.4%), cardiovascular diseases (6.1%), musculoskeletal disorders (5.6%), and substance use disorders (5.5%). Among males, the five leading causes of YLD were mental disorders (25.1%), substance use disorders (10.3%), cardiovascular diseases (6.6%), diabetes and kidney diseases (5.8%), HIV/AIDS and sexually transmitted infections (5.4%) [**Figure 13**]. Among females, the five leading causes of YLD were mental disorders (23.8%), gynaecological diseases (11.2%), diabetes and kidney diseases (6.9%), musculoskeletal disorders (6.0%), and cardiovascular diseases (5.7%) [**Figure 14**].

People aged 45 - 59:

Overall, the five leading causes of YLD were diabetes and kidney diseases (20.1%), cardiovascular diseases (14.9%), mental disorders (14.0%), musculoskeletal disorders (8.2%), and sense organ

diseases (5.8%). Among males, the five leading causes of YLD were diabetes and kidney diseases (20.1%), cardiovascular diseases (18.2%), mental disorders (13.5%), musculoskeletal disorders (6.6%), and chronic respiratory diseases (6.3%) [**Figure 13**]. Among females, the five leading causes of YLD were diabetes and kidney diseases (20.1%), mental disorders (14.7%), cardiovascular diseases (11.2%), musculoskeletal disorders (10.0%), and sense organ diseases (6.2%) [**Figure 14**].

People aged 60 - 69:

Overall, the five leading causes of YLD were diabetes and kidney diseases (26.3%), cardiovascular diseases (19.5%), mental disorders (8.6%), chronic respiratory diseases (8.6%), and musculoskeletal disorders (7.6%). Among males, the five leading causes of YLD were diabetes and kidney diseases (25.3%), cardiovascular diseases (23.2%), chronic respiratory diseases (9.7%), mental disorders (8.3%), and sense organ diseases (6.3%) [**Figure 13**]. Among females, the five leading causes of YLD were diabetes and kidney diseases (27.5%), cardiovascular diseases (15.1%), musculoskeletal disorders (10.0%), mental disorders (9.0%), and sense organ diseases (7.5%). [**Figure 14**].

People aged 70 - 79:

Overall, the five leading causes of YLD were diabetes and kidney diseases (25.6%), cardiovascular diseases (21.1%), chronic respiratory diseases (11.7%), sense organ diseases (8.0%), and musculoskeletal disorders (6.5%). Among males, the five leading causes of YLD were cardiovascular diseases (24.4%), diabetes and kidney diseases (24.2%), chronic respiratory diseases (12.8%), sense organ diseases (7.5%), and musculoskeletal disorders (5.2%) [**Figure 13**]. Among females, the five leading causes of YLD were diabetes and kidney diseases (27.4%), cardiovascular diseases (17.4%), chronic respiratory diseases (10.5%), sense organ diseases (8.5%), and musculoskeletal disorders (8.0%) [**Figure 14**].

People aged 80 and above:

Overall, the five leading causes of YLD were diabetes and kidney diseases (23.6%), cardiovascular diseases (18.6%), chronic respiratory diseases (12.6%), neurological disorders (9.9%), and musculoskeletal disorders (8.5%). Among males, the five leading causes of YLD were diabetes and kidney diseases (24.3%), cardiovascular diseases (22.5%), chronic respiratory diseases (12.9%), sense organ diseases (7.6%), and neurological disorders (7.3%) [**Figure 13**]. Among females, the five leading causes of YLD were diabetes and kidney diseases (23.0%), cardiovascular diseases (14.7%), neurological disorders (12.4%), chronic respiratory diseases (12.2%), and musculoskeletal disorders (9.9%) [**Figure 14**].

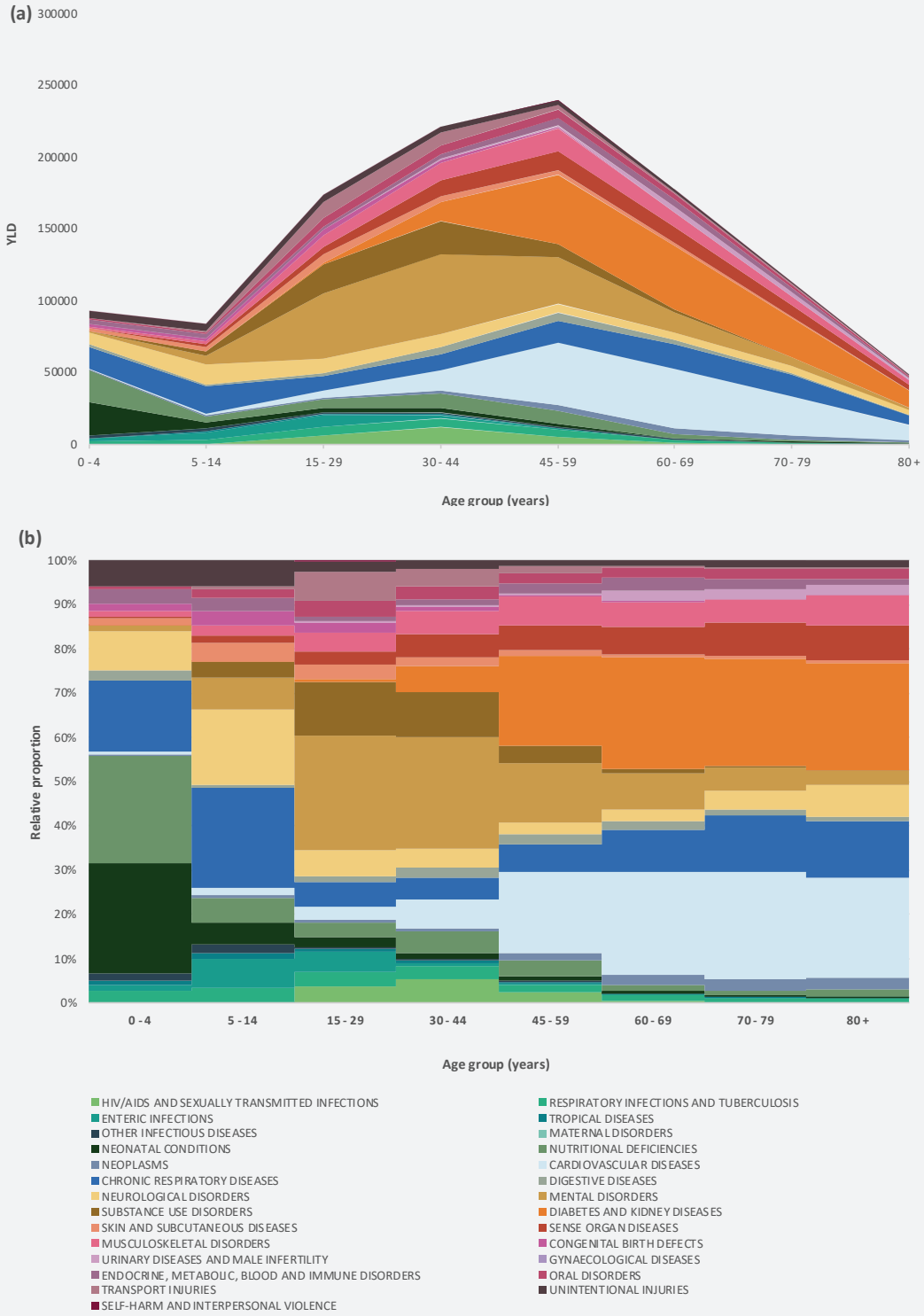

Figure 13: Number (a) and relative proportion (b) of YLD, by disease groups and age, males, 2019

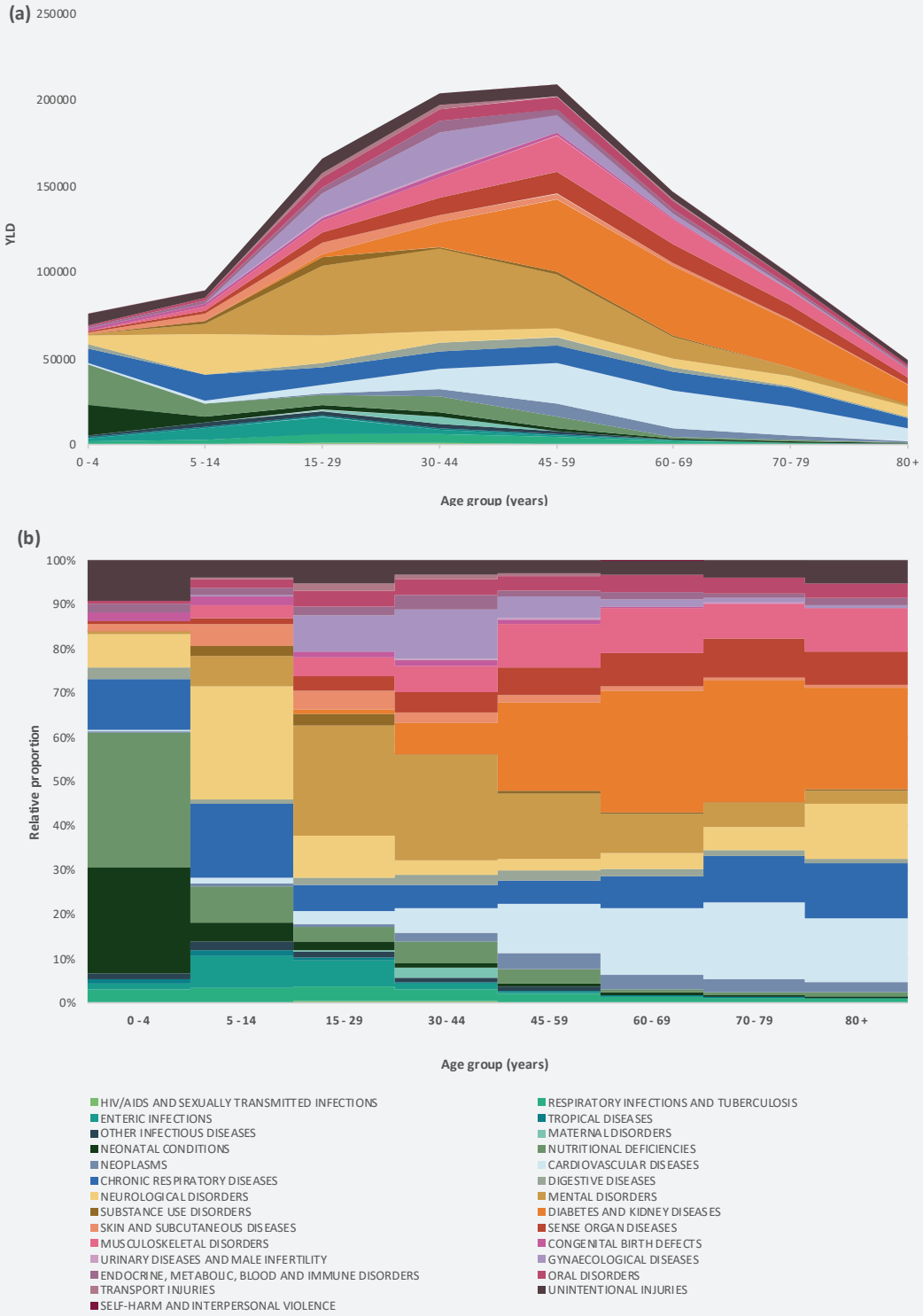

Figure 14: Number (a) and relative proportion (b) of YLD, by disease groups and age, females, 2019

Specific diseases

Overall, the five leading causes of YLD by specific diseases were diabetes mellitus (11.1%), depressive disorders (3.8%), ischaemic heart disease (3.8%), stroke (3.7%), and anxiety disorders (3.4%) [**Table 8**].

By sex

Among males, the five leading causes of YLD by specific diseases were diabetes mellitus (10.9%), ischaemic heart disease (5.4%), stroke (4.4%), drug use disorders (3.8%) and schizophrenia (3.4%). Among females, the five leading causes of YLD by specific diseases were diabetes mellitus (11.2%), depressive disorders (4.4%), anxiety disorders (3.7%), iron deficiency anaemia (3.4%), and asthma (3.3%) [**Table 8**].

Table 8: Leading causes of YLD by specific diseases and sex, 2019

Rank	People	YLD	% of total	Males	YLD	% of total	Females	YLD	% of total
1	Diabetes mellitus	242,088	11.1	Diabetes mellitus	125,354	10.9	Diabetes mellitus	116,734	11.2
2	Depressive disorders	83,422	3.8	Ischaemic heart disease	61,702	5.4	Depressive disorders	45,314	4.4
3	Ischaemic heart disease	82,977	3.8	Stroke	51,132	4.4	Anxiety disorders	38,241	3.7
4	Stroke	80,863	3.7	Drug use disorders	43,387	3.8	Iron deficiency anaemia	35,709	3.4
5	Anxiety disorders	74,465	3.4	Schizophrenia	39,084	3.4	Asthma	34,680	3.3
6	Schizophrenia	71,660	3.3	Depressive disorders	38,108	3.3	Schizophrenia	32,576	3.1
7	Asthma	70,999	3.2	Asthma	36,319	3.2	Stroke	29,731	2.9
8	Iron deficiency anaemia	69,382	3.2	Anxiety disorders	36,224	3.1	Age-related and other hearing loss	28,983	2.8
9	Age-related and other hearing loss	61,866	2.8	Iron deficiency anaemia	33,673	2.9	Ischaemic heart disease	21,275	2.0
10	Drug use disorders	49,626	2.3	Age-related and other hearing loss	32,883	2.9	Diarrhoeal diseases	20,375	2.0
11	Chronic obstructive pulmonary disease	45,949	2.1	Chronic obstructive pulmonary disease	26,229	2.3	Chronic obstructive pulmonary disease	19,720	1.9
12	Osteoarthritis	45,376	2.1	Road injuries	25,458	2.2	Chronic kidney disease	19,701	1.9
13	Chronic kidney disease	40,978	1.9	HIV/AIDS	22,603	2.0	Blindness and vision loss	18,274	1.8
14	Diarrhoeal diseases	37,901	1.7	Chronic kidney disease	21,277	1.8	Protein-energy malnutrition	15,152	1.5
15	Blindness and vision loss	35,333	1.6	Osteoarthritis	19,488	1.7	Upper respiratory infections	14,243	1.4
16	Protein-energy malnutrition	33,122	1.5	Neonatal preterm birth	18,296	1.6	Neonatal preterm birth	13,829	1.3
17	Neonatal preterm birth	32,125	1.5	Protein-energy malnutrition	17,970	1.6	Edentulism	13,560	1.3
18	Road injuries	31,354	1.4	Diarrhoeal diseases	17,526	1.5	Low back disorders	12,776	1.2
19	Upper respiratory infections	28,047	1.3	Blindness and vision loss	17,059	1.5	Bipolar disorder	12,206	1.2
20	Low back disorders	25,258	1.2	Alcohol use disorders	14,748	1.3	Idiopathic epilepsy	11,148	1.1
	Top 20 diseases	1,242,791	56.7	Top 20 diseases	698,520	60.6	Top 20 diseases	554,227	53.4
	All other diseases	947,290	43.3	All other diseases	453,455	39.4	All other diseases	483,880	46.6
	Total	2,190,082	100.0	Total	1,151,975	100.0	Total	1,038,107	100.0

Colour legend: >5% | 4-5% | 3-4% | 2-3% | 0-2%

By age groups

Infants and children aged under 5:

Overall, the five leading causes of YLD by specific diseases were protein-energy malnutrition (19.6%), neonatal preterm birth (16.2%), asthma (9.5%), iron deficiency anaemia (7.4%), and neonatal sepsis and other neonatal infections (4.3%). Among males, the five leading causes of YLD by specific diseases were protein-energy malnutrition (19.3%), neonatal preterm birth (16.7%), asthma (11.8%), iron deficiency anaemia (4.8%), and neonatal sepsis and other neonatal infections (4.5%) [**Figure 15**]. Among females, the five leading causes of YLD by specific diseases were protein-energy malnutrition (19.9%), neonatal preterm birth (15.7%), iron deficiency anaemia (10.7%), asthma (6.7%), and neonatal sepsis and other neonatal infections (4.2%) [**Figure 16**].

People aged 5 - 14:

Overall, the five leading causes of YLD by specific diseases were asthma (12.8%), diarrhoeal diseases (6.9%), iron deficiency anaemia (6.2%), drug use disorders (2.8%), and upper respiratory infections (2.5%). Among males, the five leading causes of YLD by specific diseases were asthma (16.3%), diarrhoeal diseases (6.5%), iron deficiency anaemia (4.3%), drug use disorders (3.6%), and idiopathic epilepsy (2.6%). [**Figure 15**]. Among females, the five leading causes of YLD by specific diseases were asthma (9.5%), iron deficiency anaemia (8.1%), diarrhoeal diseases (7.2%), depressive disorders (2.9%), and anxiety disorders (2.8%) [**Figure 16**].

People aged 15 - 29:

Overall, the five leading causes of YLD by specific diseases were anxiety disorders (8.0%), depressive disorders (6.7%), drug use disorders (5.7%), diarrhoeal diseases (5.0%), and schizophrenia (4.4%). Among males, the five leading causes of YLD by specific diseases were drug use disorders (9.3%), anxiety disorders (7.4%), road injuries (6.6%), depressive disorders (6.2%), and schizophrenia (4.7%) [**Figure 15**]. Among females, the five leading causes of YLL by specific diseases were anxiety disorders (8.7%), depressive disorders (7.3%), diarrhoeal diseases (5.7%), schizophrenia (4.1%), and asthma (2.8%) [**Figure 16**].

People aged 30 - 44:

Overall, the five leading causes of YLD by specific diseases were schizophrenia (7.0%), anxiety disorders (5.7%), depressive disorders (5.7%), diabetes mellitus (4.3%), and iron deficiency anaemia (4.1%). Among males, the five leading causes of YLD by specific diseases were drug use disorders (7.5%), schizophrenia (7.4%), anxiety disorders (5.5%), depressive disorders (5.1%), and HIV/ AIDS (5.0%). [**Figure 15**]. Among females, the five leading causes of YLL by specific diseases

were schizophrenia (6.6%), depressive disorders (6.3%), anxiety disorders (6.0%), diabetes mellitus (4.7%), and iron deficiency anaemia (4.0%) [**Figure 16**].

People aged 45 - 59:

Overall, the five leading causes of YLD by specific diseases were diabetes mellitus (16.9%), ischaemic heart disease (5.8%), stroke (5.3%), depressive disorders (4.3%), and schizophrenia (4.0%). Among males, the five leading causes of YLD by specific diseases were diabetes mellitus (16.7%), ischaemic heart disease (8.5%), stroke (6.4%), schizophrenia (4.1%) and age-related and other hearing loss (3.7%) [**Figure 15**]. Among females, the five leading causes of YLD by specific diseases were diabetes mellitus (17.0%), depressive disorders (5.1%), osteoarthritis (4.5%), age-related and other hearing loss (4.0%), and stroke (4.0%) [**Figure 16**].

People aged 60 - 69:

Overall, the five leading causes of YLD by specific diseases were diabetes mellitus (23.1%), ischaemic heart disease (8.1%), stroke (7.6%), chronic obstructive pulmonary disease (4.4%), and osteoarthritis (4.2%). Among males, the five leading causes of YLD by specific diseases were diabetes mellitus (22.1%), ischaemic heart disease (10.9%), stroke (8.7%), chronic obstructive pulmonary disease (5.1%), and age-related and other hearing loss (3.3%) [**Figure 15**]. Among females, the five leading causes of YLD by specific diseases were diabetes mellitus (24.4%), stroke (6.1%), osteoarthritis (5.3%), ischaemic heart disease (4.8%), and chronic obstructive pulmonary disease (3.5%) [**Figure 16**].

People aged 70 - 79:

Overall, the five leading causes of YLD by specific diseases were diabetes mellitus (23.4%), ischaemic heart disease (8.6%), stroke (8.3%), chronic obstructive pulmonary disease (6.7%), and blindness and vision loss (4.5%). Among males, the five leading causes of YLD by specific diseases were diabetes mellitus (22.2%), ischaemic heart disease (11.1%), stroke (9.3%), chronic obstructive pulmonary disease (6.8%), and blindness and vision loss (4.0%). [**Figure 15**]. Among females, the five leading causes of YLD by specific diseases were diabetes mellitus (24.8%), stroke (7.2%), chronic obstructive pulmonary disease (6.7%), ischaemic heart disease (5.7%), and blindness and vision loss (5.1%). [**Figure 16**].

People aged 80 and above:

Overall, the five leading causes of YLD by specific diseases were diabetes mellitus (22.1%), alzheimer's disease and other dementias (7.7%), chronic obstructive pulmonary disease (7.1%), ischaemic heart disease (6.7%), and stroke (5.6%). Among males, the five leading causes of YLD by specific diseases were diabetes mellitus (22.9%), ischaemic heart disease (9.9%), stroke (6.7%), chronic obstructive pulmonary disease (5.9%), and alzheimer's disease and other dementias (5.2%) [**Figure 15**]. Among females, the five leading causes of YLD by specific diseases were diabetes mellitus (21.3%), alzheimer's disease and other dementias (10.1%), chronic obstructive pulmonary disease (8.2%), blindness and vision loss (5.1%), and atrial fibrillation and flutter (4.8%) [**Figure 16**].

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Protein-energy malnutrition (17.97; 19.3%)	Asthma (13.63; 16.3%)	Drug use disorders (16.14; 9.3%)	Drug use disorders (16.54; 7.5%)
2nd	Neonatal preterm birth (15.49; 16.7%)	Diarrhoeal diseases (5.46; 6.5%)	Anxiety disorders (12.87; 7.4%)	Schizophrenia (16.38; 7.4%)
3rd	Asthma (10.98; 11.8%)	Iron deficiency anaemia (3.58; 4.3%)	Road injuries (11.38; 6.6%)	Anxiety disorders (12.21; 5.5%)
4th	Iron deficiency anaemia (4.45; 4.8%)	Drug use disorders (3.05; 3.6%)	Depressive disorders (10.84; 6.2%)	Depressive disorders (11.31; 5.1%)
5th	Neonatal sepsis and other neonatal infections (4.16; 4.5%)	Idiopathic epilepsy (2.20; 2.6%)	Schizophrenia (8.18; 4.7%)	HIV/AIDS (11.14; 5.0%)
6th	Haemoglobinopathies and haemolytic anaemias (2.15; 2.3%)	Upper respiratory infections (2.16; 2.6%)	Diarrhoeal diseases (7.55; 4.3%)	Iron deficiency anaemia (9.40; 4.2%)
7th	Diarrhoeal diseases (1.30; 1.4%)	Falls (2.09; 2.5%)	HIV/AIDS (5.29; 3.0%)	Diabetes mellitus (8.84; 4.0%)
8th	Lower respiratory infections (1.18; 1.3%)	Autism spectrum disorders (1.87; 2.2%)	Alcohol use disorders (4.88; 2.8%)	Road injuries (8.74; 3.9%)
9th	Upper respiratory infections (1.10; 1.2%)	Depressive disorders (1.70; 2.0%)	Upper respiratory infections (4.04; 2.3%)	Age-related and other hearing loss (8.71; 3.9%)
10th	Idiopathic epilepsy (1.00; 1.1%)	Anxiety disorders (1.57; 1.9%)	Low back disorders (3.99; 2.3%)	Alcohol use disorders (6.21; 2.8%)

(YLD '000; proportion %)

Figure 15: Leading causes of YLD by specific diseases and age group, males, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Diabetes mellitus (40.11; 16.7%)	Diabetes mellitus (39.36; 22.1%)	Diabetes mellitus (25.25; 22.2%)	Diabetes mellitus (11.14; 22.9%)
2nd	Ischaemic heart disease (20.28; 8.5%)	Ischaemic heart disease (19.35; 10.9%)	Ischaemic heart disease (12.57; 11.1%)	Ischaemic heart disease (4.84; 9.9%)
3rd	Stroke (15.23; 6.4%)	Stroke (15.53; 8.7%)	Stroke (10.52; 9.3%)	Stroke (3.29; 6.7%)
4th	Schizophrenia (9.94; 4.1%)	Chronic obstructive pulmonary disease (8.99; 5.1%)	Chronic obstructive pulmonary disease (7.76; 6.8%)	Chronic obstructive pulmonary disease (2.89; 5.9%)
5th	Age-related and other hearing loss (8.93; 3.7%)	Age-related and other hearing loss (5.86; 3.3%)	Blindness and vision loss (4.52; 4.0%)	Alzheimer's disease and other dementias (2.54; 5.2%)
6th	Iron deficiency anaemia (8.56; 3.6%)	Osteoarthritis (5.76; 3.2%)	Age-related and other hearing loss (3.40; 3.0%)	Blindness and vision loss (2.29; 4.7%)
7th	Depressive disorders (8.51; 3.6%)	Chronic kidney disease (5.61; 3.2%)	Osteoarthritis (3.09; 2.7%)	Atrial fibrillation and flutter (1.92; 3.9%)
8th	Chronic kidney disease (8.18; 3.4%)	Blindness and vision loss (4.40; 2.5%)	Alzheimer's disease and other dementias (2.74; 2.4%)	Osteoarthritis (1.26; 2.6%)
9th	Osteoarthritis (7.31; 3.0%)	Anxiety disorders (3.75; 2.1%)	Benign prostate hyperplasia (BPH) (2.62; 2.3%)	Age-related and other hearing loss (1.20; 2.5%)
10th	Drug use disorders (6.40; 2.7%)	Depressive disorders (3.71; 2.1%)	Atrial fibrillation and flutter (2.51; 2.2%)	Benign prostate hyperplasia (BPH) (0.98; 2.0%)

(YLD '000; proportion %)

Figure 15: Leading causes of YLD by specific diseases and age group, males, 2019 (cont'd)

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Protein-energy malnutrition (15.15; 19.9%)	Asthma (8.43; 9.5%)	Anxiety disorders (14.48; 8.7%)	Schizophrenia (13.50; 6.6%)
2nd	Neonatal preterm birth (11.95; 15.7%)	Iron deficiency anaemia (7.19; 8.1%)	Depressive disorders (12.07; 7.3%)	Depressive disorders (12.77; 6.3%)
3rd	Iron deficiency anaemia (8.13; 10.7%)	Diarrhoeal diseases (6.44; 7.2%)	Diarrhoeal diseases (9.50; 5.7%)	Anxiety disorders (12.16; 6.0%)
4th	Asthma (5.12; 6.7%)	Depressive disorders (2.56; 2.9%)	Schizophrenia (6.83; 4.1%)	Diabetes mellitus (9.47; 4.7%)
5th	Neonatal sepsis and other neonatal infections (3.17; 4.2%)	Anxiety disorders (2.45; 2.8%)	Asthma (4.70%; 2.8%)	Iron deficiency anaemia (8.19; 4.0%)
6th	Upper respiratory infections (1.13; 1.5%)	Upper respiratory infections (2.22; 2.5%)	Iron deficiency anaemia (4.49; 2.7%)	Age-related and other hearing loss (7.13; 3.5%)
7th	Fires, heat and hot substances (1.12; 1.5%)	Acne vulgaris (2.18; 2.4%)	Low back disorders (4.47; 2.7%)	Asthma (5.34; 2.6%)
8th	Diarrhoeal diseases (1.11; 1.5%)	Idiopathic epilepsy (1.97; 2.2%)	Age-related and other hearing loss (4.26; 2.6%)	Haemoglobinopathies and haemolytic anaemias (5.32; 2.6%)
9th	Idiopathic epilepsy (0.92; 1.2%)	Drug use disorders (1.86; 2.1%)	Upper respiratory infections (3.98; 2.4%)	Endometriosis (4.92; 2.4%)
10th	Lower respiratory infections (0.82; 1.1%)	Low back disorders (1.41; 1.6%)	Endometriosis (3.40; 2.0%)	Chronic kidney disease (4.60; 2.3%)

(YLD '000; proportion %)

Figure 16: Leading causes of YLD by specific diseases and age group, females, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Diabetes mellitus (35.50; 17.0%)	Diabetes mellitus (35.76; 24.4%)	Diabetes mellitus (24.53; 24.8%)	Diabetes mellitus (10.42; 21.3%)
2nd	Depressive disorders (10.66; 5.1%)	Stroke (9.04; 6.2%)	Stroke (7.07; 7.2%)	Alzheimer's disease and other dementias (4.94; 10.1%)
3rd	Osteoarthritis (9.50; 4.5%)	Osteoarthritis (7.82; 5.3%)	Chronic obstructive pulmonary disease (6.57; 6.7%)	Chronic obstructive pulmonary disease (4.00; 8.2%)
4th	Age-related and other hearing loss (8.45; 4.0%)	Ischaemic heart disease (7.08; 4.8%)	Ischaemic heart disease (5.66; 5.7%)	Blindness and vision loss (2.48; 5.1%)
5th	Stroke (8.40; 4.0%)	Chronic obstructive pulmonary disease (5.16; 3.5%)	Blindness and vision loss (5.01; 5.1%)	Atrial fibrillation and flutter (2.35; 4.8%)
6th	Schizophrenia (8.14; 3.9%)	Age-related and other hearing loss (4.95; 3.4%)	Osteoarthritis (4.29; 4.3%)	Stroke (2.14; 4.4%)
7th	Chronic kidney disease (6.46; 3.1%)	Blindness and vision loss (4.90; 3.3%)	Alzheimer's disease and other dementias (3.31; 3.4%)	Osteoarthritis (1.78; 3.7%)
8th	Iron deficiency anaemia (6.02; 2.9%)	Depressive disorders (4.68; 3.2%)	Edentulism (2.77; 2.8%)	Falls (1.72; 3.5%)
9th	Asthma (5.77; 2.8%)	Chronic kidney disease (4.56; 3.1%)	Atrial fibrillation and flutter (2.74; 2.8%)	Ischaemic heart disease (1.67; 3.4%)
10th	Ischaemic heart disease (5.69; 2.7%)	Edentulism (3.84; 2.6%)	Age-related and other hearing loss (2.67; 2.7%)	Edentulism (1.34; 2.7%)

(YLD '000; proportion %)

Figure 16: Leading causes of YLD by specific diseases and age group, females, 2019 (cont'd)

"This page has been intentionally left blank"

3.4 Disability-adjusted life years (DALY)

In 2019, a total of 5,618,642 years of life were lost due to ill-health in Malaysia, of which 3, 177,612 (56.6%) were males and 2,441,030 (43.4%) were females.

YLL vs YLD

Overall, YLL contributed towards 63.7% of the total burden of disease and injury among males, with the remaining 36.3% contributed by YLD. Among females, YLL contributed towards 57.5% of the total burden of disease and injury, with the remaining 42.5% contributed by YLD [**Figure 17**].

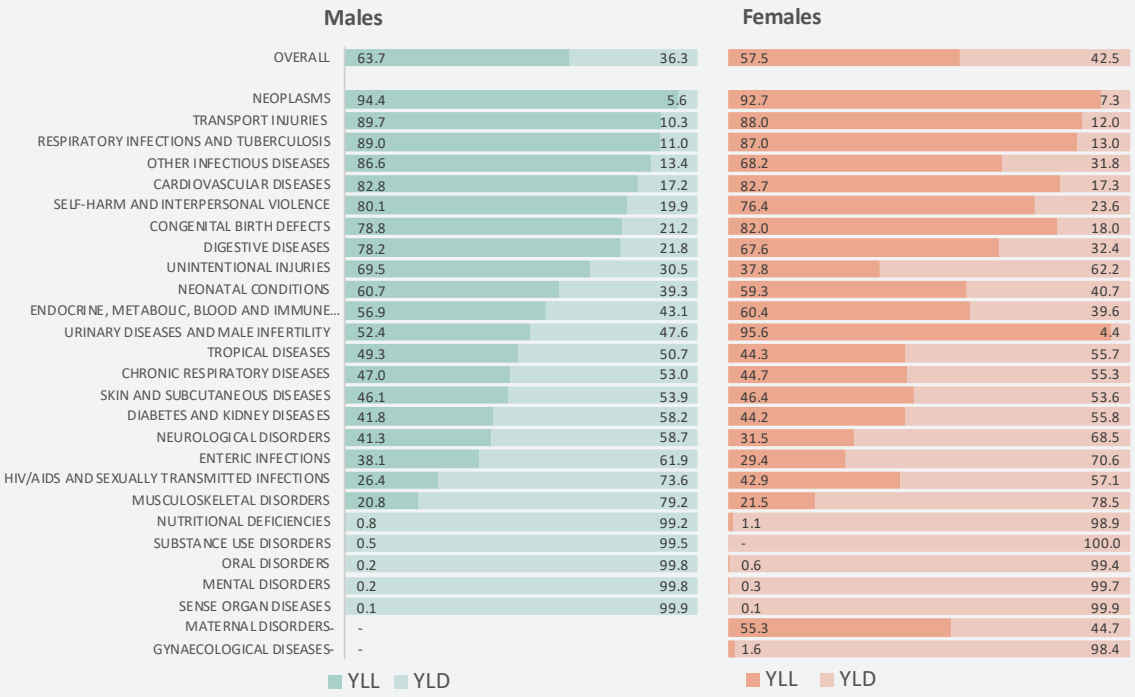

Figure 17: Proportion (%) of DALY by YLL vs YLD for males (a) and females (b), by disease group, 2019

Among males, the burden of neoplasms (94.4%), transport injuries (89.7%), respiratory infections and tuberculosis (89.0%), other infectious diseases (86.6%), and cardiovascular diseases (82.8%) were mainly contributed by fatal burden/ mortality component. Among females, the burden of urinary diseases and male infertility (95.6%), neoplasms (92.7%), transport injuries (88.0%), respiratory infections and tuberculosis (87.0%), and cardiovascular diseases (82.7%) were mainly contributed by fatal burden/ mortality component [**Figure 17**].

Among males, the burden of sense organ diseases (99.9%), mental disorders (99.8%), oral disorders (99.8%), substance use disorders (99.5%), and nutritional deficiencies (99.2%) were mainly contributed by non-fatal burden/ morbidity component. Among females, the burden of substance use disorders (100.0%), sense organ diseases (99.9%), mental disorders (99.7%), oral disorders (99.4%), and nutritional deficiencies (98.9%) were mainly contributed by non-fatal burden/ morbidity component [**Figure 17**]

Disease groups

Overall, the five leading causes of DALY were cardiovascular diseases (24.1%), neoplasms (10.6%), diabetes and kidney diseases (8.8%), respiratory infections and tuberculosis (7.4%), and chronic respiratory diseases (6.2%) [**Figure 18**].

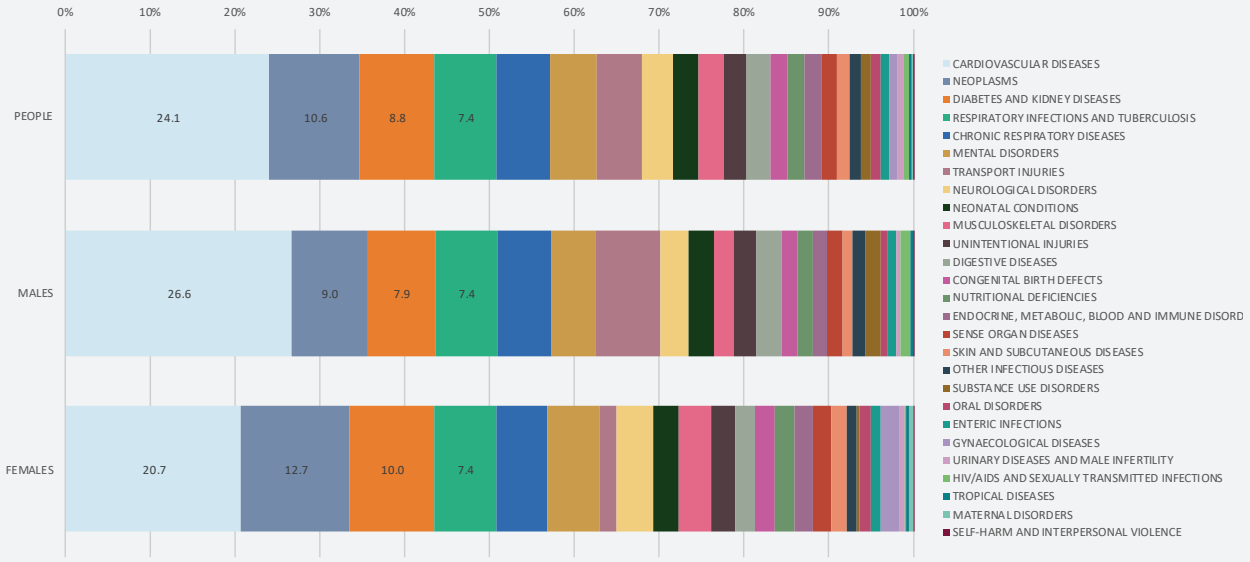

Figure 18: Proportion (%) of DALY, by disease groups and sex, 2019

By sex

Among males, the five leading causes of DALY were cardiovascular diseases (26.6%), neoplasms (9.0%), diabetes and kidney diseases (7.9%), transport injuries (7.8%), and respiratory infections and tuberculosis (7.4%). Among females, the five leading causes of YLL were cardiovascular diseases (20.7%), neoplasms (12.7%), diabetes and kidney diseases (10.0%), respiratory infections and tuberculosis (7.4%), and chronic respiratory diseases (6.0%) [**Table 9**].

Table 9: Number and proportion of DALY by disease groups and sex, 2019

DISEASE GROUP	PEOPLE		MALES		FEMALES	
	DALY	Proportion (%)	DALY	Proportion (%)	DALY	Proportion (%)
CARDIOVASCULAR DISEASES	1,351,542	24.1	845,306	26.6	506,236	20.7
NEOPLASMS	596,927	10.6	287,352	9.0	309,575	12.7
DIABETES AND KIDNEY DISEASES	496,635	8.8	252,103	7.9	244,532	10.0
RESPIRATORY INFECTIONS AND TUBERCULOSIS	414,394	7.4	233,864	7.4	180,531	7.4
CHRONIC RESPIRATORY DISEASES	349,914	6.2	202,694	6.4	147,221	6.0
MENTAL DISORDERS	309,100	5.5	162,079	5.1	147,021	6.0
TRANSPORT INJURIES	295,708	5.3	246,372	7.8	49,335	2.0
NEUROLOGICAL DISORDERS	211,096	3.8	104,105	3.3	106,991	4.4
NEONATAL CONDITIONS	170,820	3.0	95,715	3.0	75,105	3.1
MUSCULOSKELETAL DISORDERS	161,378	2.9	71,906	2.3	89,472	3.7
DIGESTIVE DISEASES	154,065	2.7	95,438	3.0	58,627	2.4
UNINTENTIONAL INJURIES	156,721	2.8	87,129	2.7	69,592	2.9
CONGENITAL BIRTH DEFECTS	115,708	2.1	57,781	1.8	57,928	2.4
NUTRITIONAL DEFICIENCIES	111,731	2.0	56,838	1.8	54,893	2.2
SENSE ORGAN DISEASES	108,034	1.9	55,020	1.7	53,014	2.2
ENDOCRINE, METABOLIC, BLOOD AND IMMUNE DISORDERS	108,960	1.9	56,064	1.8	52,897	2.2
SKIN AND SUBCUTANEOUS DISEASES	83,008	1.5	39,607	1.2	43,400	1.8
OTHER INFECTIOUS DISEASES	73,556	1.3	44,386	1.4	29,170	1.2
SUBSTANCE USE DISORDERS	67,586	1.2	58,433	1.8	9,153	0.4
ORAL DISORDERS	61,916	1.1	28,863	0.9	33,053	1.4
ENTERIC INFECTIONS	57,179	1.0	28,316	0.9	28,863	1.2
GYNAECOLOGICAL DISEASES	51,333	0.9	-	0.0	51,333	2.1
URINARY DISEASES AND MALE INFERTILITY	38,486	0.7	20,629	0.6	17,857	0.7
HIV/AIDS AND SEXUALLY TRANSMITTED INFECTIONS	38,081	0.7	33,869	1.1	4,211	0.2
TROPICAL DISEASES	19,084	0.3	10,192	0.3	8,892	0.4
MATERNAL DISORDERS	10,963	0.2	-	0.0	10,963	0.4
SELF-HARM AND INTERPERSONAL VIOLENCE	4,717	0.1	3,551	0.1	1,167	0.0
TOTAL	5,618,642	100.0	3,177,612	100.0	2,441,030	100.0

Colour legend: GROUP I : Communicable, Maternal, Perinatal and Nutritional Conditions | GROUP II : Noncommunicable Diseases | GROUP III : Injuries

Total DALY Group I: overall 895,807 (15.9%); males 503,180 (15.8%); females 392,627 (16.1%)
Total DALY Group II: overall 4,265,689 (75.9%); males 2,337,380 (73.6%); females 1,928,309 (79.0%)
Total DALY Group III: overall 457,146 (8.1%); males 337,052 (10.6%); females 120,094 (4.9%)

By age groups

Infants and children aged under 5:

Overall, the five leading causes of DALY were neonatal conditions (32.0%), congenital birth defects (19.1%), nutritional deficiencies (10.3%), chronic respiratory diseases (7.9%), and neurological disorders (6.0%). Among males, the five leading causes of DALY were neonatal conditions (33.5%), congenital birth defects (17.0%), nutritional deficiencies (9.3%), chronic respiratory diseases (8.9%) and neurological disorders (6.4%) [**Figure 19**]. Among females, the five leading causes of DALY were neonatal conditions (30.3%), congenital birth defects (21.4%), nutritional deficiencies (11.4%), chronic respiratory diseases (6.7%), and neurological disorders (5.6%) [**Figure 20**].

People aged 5 – 14:

Overall, the five leading causes of DALY were neurological disorders (18.5%), chronic respiratory diseases (14.7%), unintentional injuries (8.0%), neoplasms (6.4%), and respiratory infections and tuberculosis (5.4%). Among males, the five leading causes of DALY were chronic respiratory diseases (15.7%), neurological disorders (14.6%), unintentional injuries (10.8%), neoplasms (7.2%), and transport injuries (5.8%) [**Figure 19**]. Among females, the five leading causes of DALY were neurological disorders (22.6%), chronic respiratory diseases (13.6%), nutritional deficiencies (5.8%), respiratory infections and tuberculosis (5.7%), and neoplasms (5.5%) [**Figure 20**].

People aged 15 - 29:

Overall, the five leading causes of DALY were transport injuries (22.1%), mental disorders (12.8%), respiratory infections and tuberculosis (6.6%), neurological disorders (6.2%), and cardiovascular diseases (6.0%). Among males, the five leading causes of YLD were transport injuries (31.2%), mental disorders (10.8%), cardiovascular diseases (6.4%), respiratory infections and tuberculosis (6.2%), and neoplasms (5.3%) [**Figure 19**]. Among females, the five leading causes of DALY were mental disorders (15.9%), neurological disorders (8.4%), transport injuries (7.6%), respiratory infections and tuberculosis (7.2%), and neoplasms (6.5%) [**Figure 20**].

People aged 30 - 44:

Overall, the five leading causes of DALY were cardiovascular diseases (20.6%), mental disorders (11.2%), neoplasms (9.4%), transport injuries (7.7%), and respiratory infections and tuberculosis (6.9%). Among males, the five leading causes of DALY were cardiovascular diseases (24.6%), transport injuries (10.9%), mental disorders (10.0%), respiratory infections and tuberculosis (7.7%), neoplasms (6.1%) [**Figure 19**]. Among females, the five leading causes of DALY were cardiovascular diseases (14.8%), neoplasms (14.3%), mental disorders (12.8%), diabetes and kidney diseases (6.7%), and gynaecological diseases (6.1%) [**Figure 20**].

People aged 45 - 59:

Overall, the five leading causes of DALY were cardiovascular diseases (32.0%), neoplasms (13.9%), diabetes and kidney diseases (11.5%), respiratory infections and tuberculosis (7.1%), and mental disorders (4.8%). Among males, the five leading causes of DALY were cardiovascular diseases (37.9%), diabetes and kidney diseases (10.4%), neoplasms (10.1%), respiratory infections and tuberculosis (7.4%), and chronic respiratory diseases (4.7%) [**Figure 19**]. Among females, the five leading causes of DALY were cardiovascular diseases (23.6%), neoplasms (19.5%), diabetes and kidney diseases (13.0%), respiratory infections and tuberculosis (6.7%), and mental disorders (5.7%) [**Figure 20**].

People aged 60 - 69:

Overall, the five leading causes of DALY were cardiovascular diseases (32.9%), neoplasms (15.1%), diabetes and kidney diseases (14.4%), respiratory infections and tuberculosis (8.0%), and chronic respiratory diseases (6.0%). Among males, the five leading causes of DALY were cardiovascular diseases (36.5%), neoplasms (13.6%), diabetes and kidney diseases (13.1%), respiratory infections and tuberculosis (8.0%), and chronic respiratory diseases (6.6%) [**Figure 19**]. Among females, the five leading causes of DALY were cardiovascular diseases (28.2%), neoplasms (17.0%), diabetes and kidney diseases (16.2%), respiratory infections and tuberculosis (8.1%), and chronic respiratory diseases (5.2%) [**Figure 20**].

People aged 70 - 79:

Overall, the five leading causes of DALY were cardiovascular diseases (34.0%), diabetes and kidney diseases (14.5%), neoplasms (12.6%), respiratory infections and tuberculosis (9.2%), and chronic respiratory diseases (8.4%). Among males, the five leading causes of DALY were cardiovascular diseases (35.1%), neoplasms (13.3%), diabetes and kidney diseases (13.2%), chronic respiratory diseases (9.3%), and respiratory infections and tuberculosis (9.2%) [**Figure 19**]. Among females, the five leading causes of DALY were cardiovascular diseases (32.7%), diabetes and kidney diseases (16.0%), neoplasms (11.8%), respiratory infections and tuberculosis (9.1%), and chronic respiratory diseases (7.4%) [**Figure 20**].

People aged 80 and above:

Overall, the five leading causes of DALY were cardiovascular diseases (37.5%), diabetes and kidney diseases (12.8%), respiratory infections and tuberculosis (11.8%), chronic respiratory diseases (9.7%), and neoplasms (8.7%). Among males, the five leading causes of DALY were cardiovascular diseases (34.8%), diabetes and kidney diseases (13.5%), respiratory infections and tuberculosis (11.1%), neoplasm (10.8%), and chronic respiratory diseases (10.5%) [**Figure 19**]. Among females,

the five leading causes of DALY were cardiovascular diseases (39.5%), respiratory infections and tuberculosis (12.3%), diabetes and kidney diseases (12.3%), chronic respiratory diseases (9.1%), and neoplasms (7.2%) [**Figure 20**].

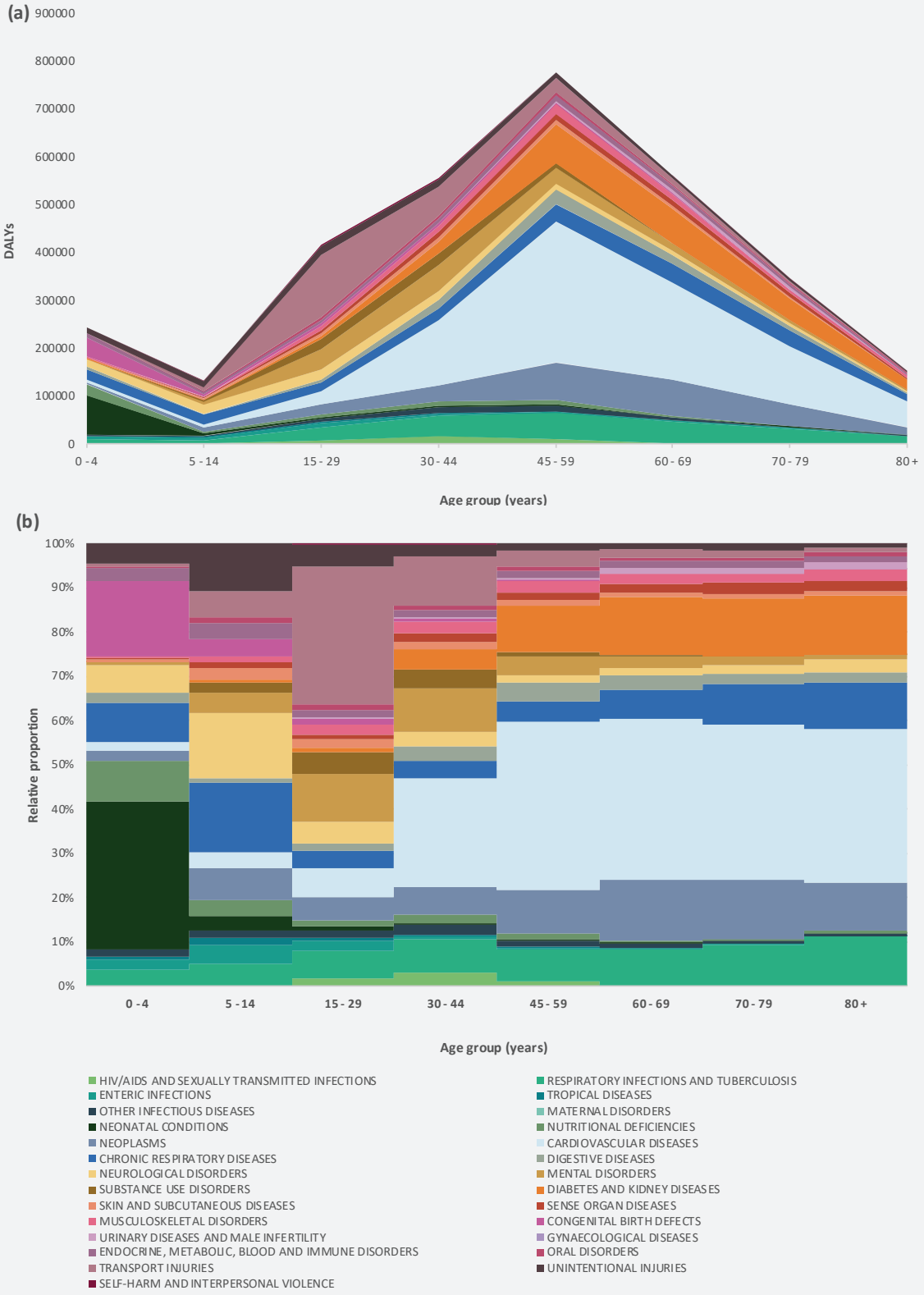

Figure 19: Number (a) and relative proportion (b) of DALY, by disease groups and age, males, 2019

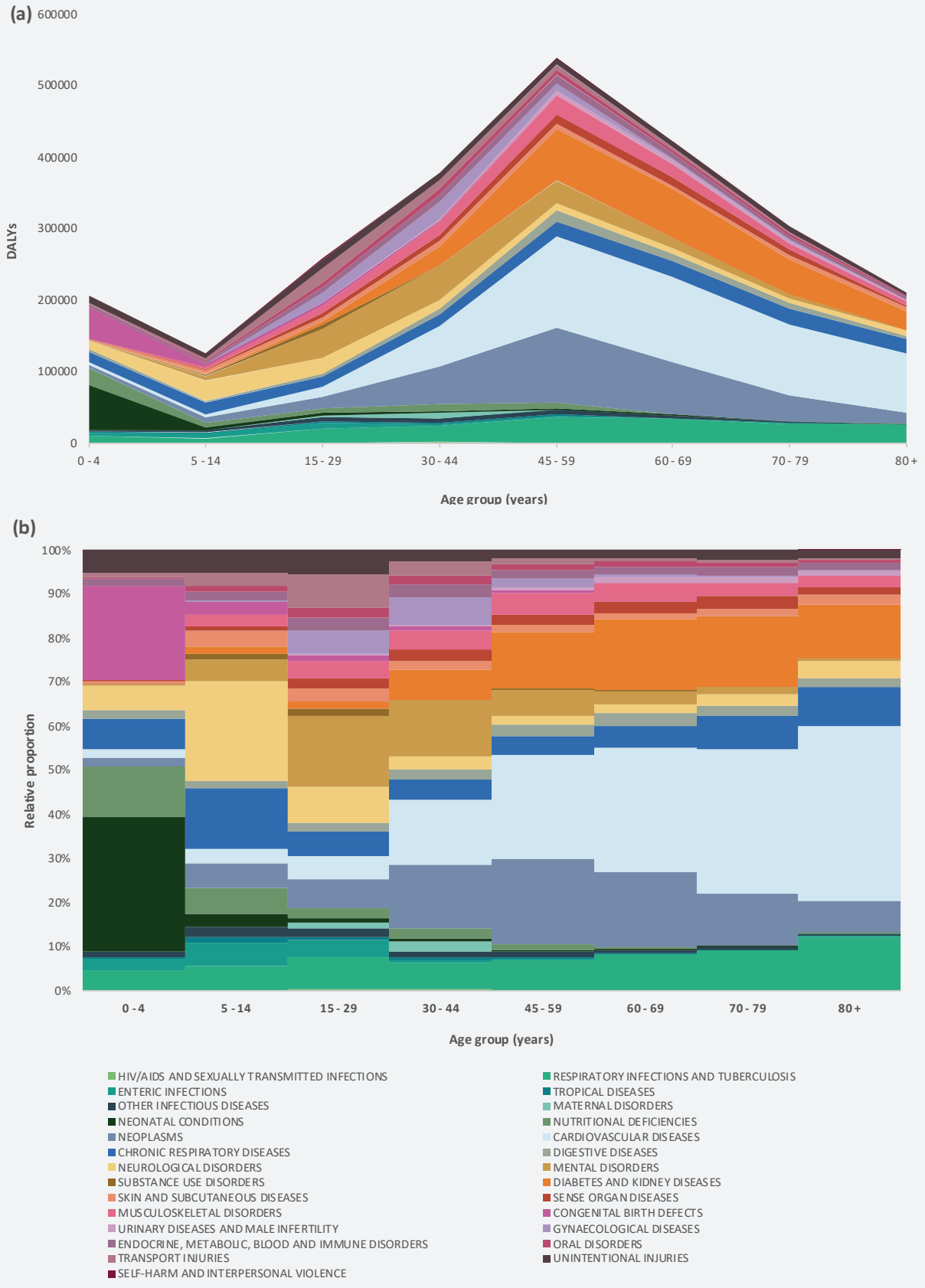

Figure 20: Number (a) and relative proportion (b) of DALY, by disease groups and age, females, 2019

Specific diseases

Overall, the five leading causes of DALY by specific diseases were ischaemic heart disease (12.7%), stroke (7.6%), diabetes mellitus (6.7%), lower respiratory infections (5.9%), and road injuries (5.3%) [**Table 10**].

By sex

Among males, the five leading causes of DALY by specific diseases were ischaemic heart disease (15.4%), road injuries (7.8%), stroke (7.5%), diabetes mellitus (6.0%), and lower respiratory infections (5.8%). Among females, the five leading causes of YLL by specific diseases were ischaemic heart disease (9.2%), stroke (7.7%), diabetes mellitus (7.7%), lower respiratory infections (6.0%), and breast cancer (3.3%) [**Table 10**].

Table 10:Leading causes of DALY by specific diseases and sex, 2019

Rank	People	DALY	% of total	Males	DALY	% of total	Females	DALY	% of total
1	Ischaemic heart disease	711,949	12.7	Ischaemic heart disease	487,811	15.4	Ischaemic heart disease	224,138	9.2
2	Stroke	426,941	7.6	Road injuries	246,372	7.8	Stroke	187,384	7.7
3	Diabetes mellitus	377,133	6.7	Stroke	239,557	7.5	Diabetes mellitus	186,748	7.7
4	Lower respiratory infections	331,596	5.9	Diabetes mellitus	190,385	6.0	Lower respiratory infections	146,858	6.0
5	Road injuries	295,708	5.3	Lower respiratory infections	184,739	5.8	Breast cancer	80,628	3.3
6	Chronic kidney disease	119,304	2.1	Chronic kidney disease	61,656	1.9	Chronic kidney disease	57,648	2.4
7	Asthma	102,568	1.8	Tracheal, bronchus, and lung cancer	57,741	1.8	Asthma	49,704	2.0
8	Tracheal, bronchus, and lung cancer	85,946	1.5	Asthma	52,864	1.7	Road injuries	49,335	2.0
9	Depressive disorders	83,627	1.5	Chronic obstructive pulmonary disease	45,032	1.4	Depressive disorders	45,454	1.9
10	Breast cancer	80,839	1.4	Colon and rectum cancer	44,103	1.4	Anxiety disorders	38,241	1.6
11	Colon and rectum cancer	78,107	1.4	Drug use disorders	43,387	1.4	Iron deficiency anaemia	35,723	1.5
12	Anxiety disorders	74,465	1.3	Schizophrenia	39,290	1.2	Colon and rectum cancer	34,005	1.4
13	Schizophrenia	71,904	1.3	Depressive disorders	38,173	1.2	Schizophrenia	32,614	1.3
14	Chronic obstructive pulmonary disease	71,118	1.3	Anxiety disorders	36,224	1.1	Age-related and other hearing loss	28,983	1.2
15	Iron deficiency anaemia	69,396	1.2	Iron deficiency anaemia	33,673	1.1	Diarrhoeal diseases	28,856	1.2
16	Age-related and other hearing loss	61,866	1.1	Neonatal preterm birth	33,666	1.1	Cervical cancer	28,225	1.2
17	Neonatal preterm birth	59,415	1.1	Age-related and other hearing loss	32,883	1.0	Tracheal, bronchus, and lung cancer	28,205	1.2
18	Diarrhoeal diseases	57,172	1.0	Liver cancer	32,811	1.0	Chronic obstructive pulmonary disease	26,086	1.1
19	Drug use disorders	49,626	0.9	HIV/AIDS	31,494	1.0	Osteoarthritis	25,961	1.1
20	Congenital heart anomalies	49,026	0.9	Tuberculosis	29,299	0.9	Neonatal preterm birth	25,749	1.1
	Top 20 diseases	3,257,706	57.9	Top 20 diseases	1,961,161	61.8	Top 20 diseases	1,360,543	55.8
	All other diseases	2,360,936	42.1	All other diseases	1,216,452	38.2	All other diseases	1,080,487	44.2
	Total	5,618,642	100.0	Total	3,177,612	100.0	Total	2,441,030	100.0

Colour legend: >5% | 4-5% | 3-4% | 2-3% | 0-2%

By age groups

Infants and children aged under 5:

Overall, the five leading causes of DALY by specific diseases were neonatal preterm birth (12.2%), protein-energy malnutrition (7.5%), congenital heart anomalies (7.3%), neonatal sepsis and other neonatal infections (4.3%), and asthma (3.6%). Among males, the five leading causes of DALY by specific diseases were neonatal preterm birth (12.7%), protein-energy malnutrition (7.4%), congenital heart anomalies (7.2%), asthma (4.5%), and neonatal sepsis and other neonatal infections (4.5%) [**Figure 21**]. Among females, the five leading causes of DALY by specific diseases were neonatal preterm birth (11.5%), congenital heart anomalies (7.6%), protein-energy malnutrition (7.5%), neonatal sepsis and other neonatal infections (4.1%), and iron deficiency anaemia (3.9%) [**Figure 22**].

People aged 5 - 14:

Overall, the five leading causes of DALY by specific diseases were asthma (8.9%), diarrhoeal diseases (4.7%), road injuries (4.3%), iron deficiency anaemia (4.2%), and drowning (3.5%). Among males, the five leading causes of DALY by specific diseases were asthma (10.6%), road injuries (5.8%), drowning (5.2%), diarrhoeal diseases (4.2%), and lower respiratory infections (3.0%) [**Figure 21**]. Among females, the five leading causes of DALY by specific diseases were asthma (7.0%), iron deficiency anaemia (5.7%), diarrhoeal diseases (5.2%), lower respiratory infections (3.2%), and road injuries (2.8%) [**Figure 11**].

People aged 15 - 29:

Overall, the five leading causes of DALY by specific diseases were road injuries (22.1%), anxiety disorders (4.1%), lower respiratory infections (3.7%), depressive disorders (3.4%), and drug use disorders (2.9%). Among males, the five leading causes of DALY by specific diseases were road injuries (31.2%), drug use disorders (3.9%), lower respiratory infections (3.8%), anxiety disorders (3.1%), and depressive disorders (2.6%) [**Figure 21**]. Among females, the five leading causes of DALY by specific diseases were road injuries (7.6%), anxiety disorders (5.6%), depressive disorders (4.7%), diarrhoeal diseases (3.8%), and lower respiratory infections (3.5%) [**Figure 22**].

People aged 30 - 44:

Overall, the five leading causes of DALY by specific diseases were ischaemic heart disease (11.6%), road injuries (7.7%), lower respiratory infections (4.6%), stroke (4.6%), and diabetes mellitus (3.3%). Among males, the five leading causes of DALY by specific diseases were ischaemic heart disease (15.1%), road injuries (10.9%), lower respiratory infections (5.2%), stroke (5.1%), and drug use disorders (3.0%) [**Figure 21**]. Among females, the five leading causes of DALY by specific diseases were ischaemic heart disease (6.5%), breast cancer (4.9%), diabetes mellitus (4.1%), lower respiratory infections (3.8%), and stroke (3.8%) [**Figure 22**].

People aged 45 - 59:

Overall, the five leading causes of DALY by specific diseases were ischaemic heart disease (18.9%), diabetes mellitus (8.8%), stroke (8.8%), lower respiratory infections (5.7%), and road injuries (2.8%). Among males, the five leading causes of DALY by specific diseases were ischaemic heart disease (24.6%), stroke (8.9%), diabetes mellitus (7.8%), lower respiratory infections (5.9%), and road injuries (3.8%) [**Figure 21**]. Among females, the five leading causes of DALY by specific diseases were ischaemic heart disease (10.8%), diabetes mellitus (10.1%), stroke (8.5%), breast cancer (6.8%), and lower respiratory infections (5.4%) [**Figure 22**].

People aged 60 - 69:

Overall, the five leading causes of DALY by specific diseases were ischaemic heart disease (18.3%), diabetes mellitus (11.6%), stroke (10.5%), lower respiratory infections (7.1%), and chronic kidney disease (2.8%). Among males, the five leading causes of DALY by specific diseases were ischaemic heart disease (21.6%), stroke (10.8%), diabetes mellitus (10.5%), lower respiratory infections (6.9%), and tracheal, bronchus, and lung cancer (3.5%) [**Figure 21**]. Among females, the five leading causes of YLL by specific diseases were ischaemic heart disease (14.1%), diabetes mellitus (13.0%), stroke (10.0%), lower respiratory infections (7.3%), and breast cancer (4.0%) [**Figure 22**].

People aged 70 - 79:

Overall, the five leading causes of DALY by specific diseases were ischaemic heart disease (16.2%), stroke (13.8%), diabetes mellitus (11.8%), lower respiratory infections (8.5%), and chronic obstructive pulmonary disease (3.3%). Among males, the five leading causes of DALY by specific diseases were ischaemic heart disease (17.4%), stroke (13.9%), diabetes mellitus (10.7%), lower respiratory infections (8.4%), and chronic obstructive pulmonary disease (3.8%) [**Figure 21**]. Among females, the five leading causes of DALY by specific diseases were ischaemic heart disease (14.9%), stroke (13.8%), diabetes mellitus (13.0%), lower respiratory infections (8.5%), and chronic kidney disease (3.0%) [**Figure 22**].

People aged 80 and above:

Overall, the five leading causes of DALY by specific diseases were stroke (17.0%), ischaemic heart disease (16.0%), lower respiratory infections (11.4%), diabetes mellitus (10.2%), and chronic obstructive pulmonary disease (2.8%). Among males, the five leading causes of DALY by specific diseases were stroke (15.4%), ischaemic heart disease (15.3%), diabetes mellitus (11.2%), lower respiratory infections (10.5%), and chronic obstructive pulmonary disease (3.3%) [**Figure 21**]. Among females, the five leading causes of DALY by specific diseases were stroke (18.2%), ischaemic heart disease (16.5%), lower respiratory infections (12.0%), diabetes mellitus (9.5%), and alzheimer's diseases and other dementias (2.8%) [**Figure 22**].

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Neonatal preterm birth (30.86; 12.7%)	Asthma (14.01; 10.6%)	Road injuries (129.24; 31.2%)	Ischaemic heart disease (83.64; 15.1%)
2nd	Protein-energy malnutrition (18.04; 7.4%)	Road injuries (7.68; 5.8%)	Drug use disorders (16.14; 3.9%)	Road injuries (60.42; 10.9%)
3rd	Congenital heart anomalies (17.39; 7.2%)	Drowning (6.87; 5.2%)	Lower respiratory infections (15.84; 3.8%)	Lower respiratory infections (28.57; 5.2%)
4th	Asthma (11.05; 4.5%)	Diarrhoeal diseases (5.58; 4.2%)	Anxiety disorders (12.87; 3.1%)	Stroke (28.26; 5.1%)
5th	Neonatal sepsis and other neonatal infections (10.97; 4.5%)	Lower respiratory infections (3.93; 3.0%)	Depressive disorders (10.89; 2.6%)	Drug use disorders (16.54; 3.0%)
6th	Birth asphyxia and trauma (7.49; 3.1%)	Iron deficiency anaemia (3.58; 2.7%)	Diarrhoeal diseases (9.32; 2.2%)	Schizophrenia (16.46; 3.0%)
7th	Lower respiratory infections (7.04; 2.9%)	Idiopathic epilepsy (3.44; 2.6%)	Drowning (8.75; 2.1%)	HIV/AIDS (15.68; 2.8%)
8th	Diarrhoeal diseases (5.66; 2.3%)	Leukaemia (3.25; 2.5%)	Ischaemic heart disease (8.32; 2.0%)	Diabetes mellitus (15.12; 2.7%)
9th	Iron deficiency anaemia (4.45; 1.8%)	Drug use disorders (3.05; 2.3%)	Schizophrenia (8.18; 2.0%)	Anxiety disorders (12.21; 2.2%)
10th	Drowning (2.86; 1.2%)	Brain and central nervous system cancer (2.25; 1.7%)	Stroke (7.88; 1.9%)	Depressive disorders (11.31; 2.0%)

(DALY '000; proportion %)

Figure 21: Leading causes of DALY by specific diseases and age group, males, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Ischaemic heart disease (190.59; 24.6%)	Ischaemic heart disease (120.91; 21.6%)	Ischaemic heart disease (60.31; 17.4%)	Stroke (23.12; 15.4%)
2nd	Stroke (69.31; 8.9%)	Stroke (60.68; 10.8%)	Stroke (48.10; 13.9%)	Ischaemic heart disease (22.98; 15.3%)
3rd	Diabetes mellitus (60.85; 7.8%)	Diabetes mellitus (58.73; 10.5%)	Diabetes mellitus (35.09; 10.7%)	Diabetes mellitus (16.82; 11.2%)
4th	Lower respiratory infections (45.60; 5.9%)	Lower respiratory infections (38.83; 6.9%)	Lower respiratory infections (28.19; 8.4%)	Lower respiratory infections (15.75; 10.5%)
5th	Road injuries (29.56; 3.8%)	Tracheal, bronchus, and lung cancer (19.80; 3.5%)	Chronic obstructive pulmonary disease (13.00; 3.8%)	Chronic obstructive pulmonary disease (4.94; 3.3%)
6th	Chronic kidney disease (20.10; 2.6%)	Chronic kidney disease (14.75; 2.6%)	Tracheal, bronchus, and lung cancer (11.21; 3.2%)	Tracheal, bronchus, and lung cancer (4.18; 2.8%)
7th	Tracheal, bronchus, and lung cancer (17.04; 2.2%)	Chronic obstructive pulmonary disease (14.64; 2.6%)	Colon and rectum cancer (8.89; 2.6%)	Chronic kidney disease (3.50; 2.3%)
8th	Colon and rectum cancer (12.47; 1.6%)	Colon and rectum cancer (13.02; 2.3%)	Chronic kidney disease (8.50; 2.5%)	Colon and rectum cancer (2.93; 1.9%)
9th	Liver cancer (12.47; 1.6%)	Liver cancer (11.46; 2.0%)	Prostate cancer (5.67; 1.6%)	Asthma (2.90; 1.9%)
10th	Schizophrenia (10.04; 1.3%)	Road injuries (11.14; 2.0%)	Road injuries (5.20; 1.5%)	Prostate cancer (2.89; 1.9%)

(DALY '000; proportion %)

Figure 21: Leading causes of DALY by specific diseases and age group, males, 2019 (cont'd)

Rank	Age group (years) 0 - 4	5 - 14	15 - 29	30 - 44
1st	Neonatal preterm birth (23.87; 11.5%)	Asthma (8.79; 7.0%)	Road injuries (19.62; 7.6%)	Ischaemic heart disease (24.46; 6.5%)
2nd	Congenital heart anomalies (15.65; 7.6%)	Iron deficiency anaemia (7.19; 5.7%)	Anxiety disorders (14.48; 5.6%)	Breast cancer (18.66; 4.9%)
3rd	Protein-energy malnutrition (15.54; 7.5%)	Diarrhoeal diseases (6.51; 5.2%)	Depressive disorders (12.07; 4.7%)	Diabetes mellitus (15.41; 4.1%)
4th	Neonatal sepsis and other neonatal infections (8.51; 4.1%)	Lower respiratory infections (3.98; 3.2%)	Diarrhoeal diseases (9.84; 3.8%)	Lower respiratory infections (14.53; 3.8%)
5th	Iron deficiency anaemia (8.13; 3.9%)	Road injuries (3.51; 2.8%)	Lower respiratory infections (9.12; 3.5%)	Stroke (14.45; 3.8%)
6th	Lower respiratory infections (8.12; 3.9%)	Idiopathic epilepsy (3.16; 2.5%)	Schizophrenia (6.84; 2.7%)	Schizophrenia (13.50; 3.6%)
7th	Birth asphyxia and trauma (5.96; 2.9%)	Depressive disorders (2.56; 2.0%)	Asthma (5.66; 2.2%)	Depressive disorders (12.77; 3.4%)
8th	Diarrhoeal diseases (5.18; 2.5%)	Anxiety disorders (2.45; 2.0%)	Idiopathic epilepsy (4.88; 1.9%)	Anxiety disorders (12.16; 3.2%)
9th	Asthma (5.12; 2.5%)	Leukaemia (2.30; 1.8%)	Iron deficiency anaemia (4.49; 1.7%)	Road injuries (11.67; 3.1%)
10th	Road injuries (2.48; 1.2%)	Upper respiratory infections (2.22; 1.8%)	Low back disorders (4.47; 1.7%)	Chronic kidney disease (9.78; 2.6%)

(DALY '000; proportion %)

Figure 22: Leading causes of DALY by specific diseases and age group, females, 2019

Rank	Age group (years) 45 - 59	60 - 69	70 - 79	80 +
1st	Ischaemic heart disease (57.98; 10.8%)	Ischaemic heart disease (59.37; 14.1%)	Ischaemic heart disease (45.07; 14.9%)	Stroke (38.38; 18.2%)
2nd	Diabetes mellitus (54.44; 10.1%)	Diabetes mellitus (54.98; 13.0%)	Stroke (41.61; 13.8%)	Ischaemic heart disease (34.83; 16.5%)
3rd	Stroke (45.82; 8.5%)	Stroke (42.19; 10.0%)	Diabetes mellitus (39.27; 13.0%)	Lower respiratory infections (25.31; 12.0%)
4th	Breast cancer (36.47; 6.8%)	Lower respiratory infections (30.86; 7.3%)	Lower respiratory infections (25.74; 8.5%)	Diabetes mellitus (19.99; 9.5%)
5th	Lower respiratory infections (29.21; 5.4%)	Breast cancer (16.86; 4.0%)	Chronic kidney disease (9.17; 3.0%)	Alzheimer's disease and other dementias (5.91; 2.8%)
6th	Chronic kidney disease (15.79; 2.9%)	Chronic kidney disease (13.17; 3.1%)	Chronic obstructive pulmonary disease (8.34; 2.8%)	Chronic kidney disease (5.84; 2.8%)
7th	Cervical cancer (11.19; 2.1%)	Colon and rectum cancer (8.69; 2.1%)	Colon and rectum cancer (5.84; 1.9%)	Chronic obstructive pulmonary disease (5.28; 2.5%)
8th	Colon and rectum cancer (11.11; 2.1%)	Tracheal, bronchus, and lung cancer (7.86; 1.9%)	Breast cancer (5.50; 1.8%)	Asthma (5.24; 2.5%)
9th	Depressive disorders (10.76; 2.0%)	Osteoarthritis (7.86; 1.9%)	Tracheal, bronchus, and lung cancer (5.05; 1.7%)	Colon and rectum cancer (3.65; 1.7%)
10th	Osteoarthritis (9.50; 1.8%)	Chronic obstructive pulmonary disease (6.68; 1.6%)	Blindness and vision loss (5.01; 1.7%)	Falls (2.88; 1.4%)

(DALY '000; proportion %)

Figure 22: Leading causes of DALY by specific diseases and age group, females, 2019 (cont'd)

04

Discussion

The objective of this study is to enhance the existing list of diseases by aligning it with national health priorities and ensuring its relevance to the current health landscape. Through extensive discussions with stakeholders and subject matter experts, a comprehensive examination was conducted utilizing the GBD list, which initially comprised 369 diseases. A curated finalization of 162 diseases has been identified and incorporated into this report. This updated list is designed to better reflect the prevailing health concerns and priorities within the national context.

The present analysis has confirmed the significance of revising the disease list via comprehensive population health assessment. Our result indicated the growing importance of non-communicable diseases in Malaysia.

In 2019, Malaysians experienced a total loss of 5.6 million years of healthy life, measured as DALY. This burden was comprised of 61% from YLL and 39% from YLD. Overall, males experienced a greater burden than females, with 56.6% of total burden in males and 43.4% in females. A similar trend was observed between 2000 and 2017, largely because males faced a higher fatal burden.

The top five disease groups contributing to this burden were cardiovascular diseases, neoplasm, diabetes and kidney diseases, respiratory infections and tuberculosis, and chronic respiratory diseases, these disease groups accounted for 57.1% of the total burden. Cardiovascular disease as a disease group contributed the most burden for both males and females, with the highest impact observed in adults aged 30 and above. Among people aged 15-29 years, the distribution of disease burden varied by gender. Substance use disorders contributed the most burden among males, while mental disorders led among females.

The five diseases causing the most burden in 2019 were ischaemic heart disease (12.7%), stroke (7.6%), diabetes mellitus (6.7%), lower respiratory infections (5.9%) and road injuries (5.3%). Ischaemic heart disease remained the leading cause of DALY. It ranked first for both sexes, particularly

affecting those aged 30 and older. Road injuries were the second-highest cause of burden among males and the leading cause for those aged 15-29 years for both sexes. For females, diabetes was the second highest burden overall and particularly prevalent among those aged 45-69. In addition, breast cancer was the fifth leading cause of burden and ranked second among women aged 30-44 years. In younger population, neonatal preterm birth and asthma were the highest contributors to DALY for infants and children aged under 5 and children aged 5-14, respectively.

Ischaemic heart disease has remained the leading cause of disease burden in Malaysia since 2012, reflecting a global trend in which cardiovascular disease is a major contributor to mortality and morbidity in both developed and developing nations. Other non-communicable diseases, such as stroke and diabetes mellitus, have also significantly contributed to the overall disease burden. Interestingly, road injuries showed a decline in ranking, dropping to fifth place in 2019. This represents a significant shift compared to previous MBOD reports. In 2009, road injuries were the top cause of burden, but gradually dropped to second place in 2012 and fourth place in 2015.

Similarly, these five diseases (ischaemic heart disease, stroke, lower respiratory infections, road injuries and diabetes mellitus) contributed the most fatal burden, these diseases contributed about half of total YLL. Ischaemic heart disease was the leading cause of fatal burden in 2000 for both sexes and remained the top cause among individuals aged 30 to 79. Additionally, premature deaths due to road injuries have declined since 2015. While road injuries maintained the second leading cause of death among males and ranked first leading cause among those aged 5 to 29. Among females, breast cancer ranked the fourth leading cause of death overall and the second leading cause among those aged 30 to 44.

The non-fatal burden estimates have placed mental disorders as the leading disease group since 2000. The five diseases contributing most to the non-fatal burden were diabetes mellitus, depressive disorders, ischaemic heart disease, stroke and anxiety disorders. In 2019, the leading specific causes of non-fatal burden among males were diabetes mellitus, ischaemic heart disease and stroke. Among females, the leading specific cause was diabetes mellitus, followed by depressive disorders and anxiety disorders. Diabetes mellitus remains the main cause of non-fatal burden for both sexes, particularly for individuals aged 45 years and above. This burden has continued to rise and has remained at the top since 2009. Among females, depressive disorders ranked fourth in 2009 but increased to second place in 2019, marking a significant rise over the years. It also ranked second among females aged 15 to 59 years in 2019.

This study demonstrates several strengths that enhance its overall quality and relevance. The expansion of the disease list ensures a more comprehensive assessment of health conditions, providing a detailed representation of the overall health burden. The revised disease list tailored to the local context alongside the GBD classification provides more accurate estimates of the burden of disease. The inclusion of locally relevant diseases ensures that Malaysia-specific health challenges, such as tropical diseases, are accurately reflected, while using the GBD framework ensure consistency with global estimation practices. This study allows for precise estimates that are both locally actionable and globally comparable, enabling more effective policy decisions and resource allocation.

The method of mortality estimation has been significantly improved, particularly in the redistribution and estimation of NMCD. By refining these processes, the accuracy of mortality estimates has been enhanced, especially for deaths that were underreported or inaccurately classified. There are heterogeneous disease codes, such as ICD-10 for MCD and DOSM codes for NMCD. By harmonising the disease list codes from these different data sources according to the ICD-10 during the redistribution of NMCD, the accuracy of mortality estimates is further improved, strengthening the overall assessment of disease burden in Malaysia.

In order to optimize the local data utilized in this study, discussions were conducted with experts to assess data availability and improve its quality. The datasets utilized include notification data for infectious disease and hospital in-patient records. The execution of National Health Surveys has been instrumental in significantly enhancing local prevalence estimates for various diseases. Additionally, specialised registries such as Cancer Registry, have play a pivotal role in contributing essential insights, enabling a comprehensive understanding of the burden associated with these diseases in Malaysia. The integration of these diverse data sources allows for a comprehensive and well-informed analysis of the health landscape in Malaysia.

One of the key limitations of this study is the lack of local population-based epidemiological data on mental disorders and musculoskeletal disorders. For example, depression and schizophrenia are among the leading causes of non-fatal burden of diseases in Malaysia, but up to date there is no recent and reliable sources of information on the prevalence and severity distribution of these mental disorders. Similarly, for musculoskeletal disorders, such as back and neck pain, no recent population-based studies on the prevalence of back and neck pain have been carried out. These constraints warrant an urgent need to gather data and information via nationwide surveys on symptoms of mental and musculoskeletal disorders.

Another key limitation of this study is the lack of up-to-date and comprehensive local data, particularly regarding disease prevalence. In some cases, the absence of recent, nationally representative studies means that the data on disease prevalence may be inconsistent or derived from small-scale studies. This can limit the ability to fully capture the true burden of specific conditions and diseases in Malaysia. While the study has made efforts to use global datasets or DisMod-II to produce prevalence estimates, gaps in locally specific data can impact the accuracy of non-fatal burden estimates for certain diseases. This limitation highlights the need for ongoing, large-scale national studies to improve the accuracy and relevance of future assessments.

05

Conclusion

This study provides a comprehensive assessment of Malaysia's burden of disease and injury in 2019, revealing several critical findings. Non-communicable diseases dominated the burden, with ischaemic heart disease as the leading cause of both YLL and overall DALY. Diabetes was a major contributor to YLD, particularly among older adults. Mental health disorders, including depression and anxiety, also added substantially to the non-fatal burden, especially among females.

Communicable diseases, such as lower respiratory infections, remained prominent, particularly affecting children and the elderly, while injuries—especially road injuries—were the top contributors to DALY among young males. The study underscores the urgent need for targeted public health interventions across these diseases.

The integration of improved mortality estimation techniques and diverse data sources strengthens the accuracy of these findings, ensuring they are actionable and policy-relevant. However, the lack of robust population-level data limits the precision of some non-fatal burden estimates. Addressing these data gaps through national-level studies will be essential for refining future assessments and guiding more effective health strategies.

References

1. Mathers CD. History of global burden of disease assessment at the World Health Organization. Archives of Public Health. 2020 Aug 24;78(1).
2. Choi J, Ki M, Kwon HJ, Park B, Bae S, Oh CM, et al. Health indicators related to disease, death, and reproduction. Journal of Preventive Medicine and Public Health. 2019 Jan 1;52(1):14–20.
3. Mathers C, Stevens G, Ho J, Ma Fat D, Retno Mahanani W, Andreev K, et al. WHO methods and data sources for global burden of disease estimates 2000-2011. [Internet]. 2000. Available from: https://www.who.int/docs/default-source/gho-documents/global-health-estimates/ghe2019_daly-methods.pdf
4. Murray CJL, Salomon JA, Mathers CD, Lopez AD. Summary measures of population health: Concepts, ethics, measurement and applications. World Health Organization. 2002.
5. Murray CJL. Quantifying the burden of disease: the technical basis for disability-adjusted life years. Bulletin of the World Health Organization. 1994;72(3):429–445.
6. Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet. 2020 Oct;396(10258):1204–22.
7. Institute For Public Health. Malaysian Burden of Disease and Injury Study 2009-2014. 2017.
8. Institute For Public Health. Malaysian Burden of Disease and Injury Study 2015 - 2017. 2015.
9. Vos T et. al. Methods appendix to GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet 2020; 396: 1204–22. 2020.
10. Mathers CD, Vos T, Lopez AD, Salomon J, Ezzati M. National burden of disease studies: A practical guide. Edition 2.0. Global Program on Evidence for Health Policy. Geneva: World Health Organization. 2001.
11. Institute for Public Health. A study on determination of cause of deaths in Malaysia. 2016.
12. Ganapathy SS, Yi Yi K, Omar MA, Anuar MFM, Jeevananthan C, Rao C. Validation of verbal autopsy: Determination of cause of deaths in Malaysia 2013. BMC Public Health. 2017 Aug 11;17(1): 1-8.
13. World Health Organization. International statistical classification of diseases and related health problems. 10th revision, 5th edition. Volume I Tabular list. 2016.
14. Institute of Health Metrics and Evaluation. Protocol for the global burden of diseases, injuries, and risk factors study (GBD). 2018.
15. Institute for Health Metrics and Evaluation. GBD 2021 data and tools overview [Internet]. 2024. Available from: www.ghdx.healthdata.org
16. Burstein R, Fleming T, Haagsma J, Salomon JA, Vos T, Murray CJL. Estimating distributions of health state severity for the global burden of disease study. Population Health Metrics. 2015 Nov 18;13(1).
17. Vos T, Allen C, Arora M, Barber RM, Bhutta ZA, Brown A, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet. 2016 Oct; 388(10053): 1545–602.

18. Shepard DS, Undurraga EA, Lees RS, Halasa Y, Lum LCS, Ng CW. Use of multiple data sources to estimate the economic cost of dengue illness in Malaysia. American Journal of Tropical Medicine and Hygiene. 2012 Nov;87(5):796–805.
19. Nazihah MN, Ilyana Syafiqa MM. Health and social protection: Continuing universal health coverage [Internet]. 2016. Khazanah Research Institute. Available from: https://www.krinstitute.org/Discussion_Papers-@-Health_and_Social_Protection-;_Continuing_Universal_Health_Coverage.aspx
20. Calvert C, Thomas SL, Ronsmans C, Wagner KS, Adler AJ, Filippi V. Identifying regional variation in the prevalence of postpartum haemorrhage: A systematic review and meta-analysis. PLoS One. 2012 Jul 23;7(7).
21. Institute for Public Health. National Health and Morbidity Survey (NHMS) 2023: Non-communicable diseases and healthcare demand: technical report. 2024.
22. Adler AJ, Ronsmans C, Calvert C, Filippi V. Estimating the prevalence of obstetric fistula: A systematic review and meta-analysis. BMC Pregnancy and Childbirth. 2013 Dec 30;13.
23. De Pauw R., Gorasso V., Scohy A., Van den Borre L., and Devleesschauwer B., Belgian National Burden of Disease Study. Guidelines for the calculation of disability-adjusted life years in Belgium. Brussels, Belgium: Sciensano. [Internet]. 2023. Available from: https://burden.sciensano.be
24. Loh LC, Rashid A, Sholehah S, Gnatiuc L, Patel JH, Burney P. Low prevalence of obstructive lung disease in a suburban population of Malaysia: A BOLD collaborative study. Respirology. 2016 Aug 1;21(6):1055–61.
25. Hilmi I, Jaya F, Chua A, Heng WC, Singh H, Goh KL. A first study on the incidence and prevalence of IBD in Malaysia--results from the Kinta Valley IBD Epidemiology Study. Journal of Crohn's and Colitis. 2015 May 1;9(5):404–9.
26. Cheong PPB, Siang NY, Sidhu J, Kok M. Epidemiology of inflammatory bowel disease in Southern Peninsular Malaysia. Medical Journal of Malaysia [Internet]. 2018 Apr 1 [cited 2024 Nov 22];73(2):86–9. Available from: https://europepmc.org/article/med/29703871
27. Have MT, Tuithof M, Dorsselaer SV, Kleinjan M, Penninx BWJH, Batelaan NM, et al. Duration of anxiety disorder and its associated risk indicators: Results of a longitudinal study of the general population. Depression and anxiety. 2021 Mar 1;38(3):328–36.
28. Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia. 2020. National Health and Morbidity Survey (NHMS) 2019: Vol I: NCDs- Non-communicable Diseases: Risk Factors and other health problems.
29. Ismail R, Manaf MRA, Hassan MR, Nawi AM, Ibrahim N, Lyndon N, et al. Prevalence of drug and substance use among Malaysian youth: A nationwide survey. International Journal of Environmental Research and Public Health. 2022 Apr 1;19(8).
30. Saminathan TA, Hooi LS, Mohd Yusoff MF, Ong LM, Bavanandan S, Rodzlan Hasani WS, et al. Prevalence of chronic kidney disease and its associated factors in Malaysia; Findings from a nationwide population-based cross-sectional study. BMC Nephrology. 2020 Aug 14;21(1).
31. Hadi HA, Tarmizi AI, Khalid KA, Gajdács M, Aslam A, Jamshed S. The epidemiology and global burden of atopic dermatitis: A narrative review. Life 11. 2021.
32. Barbarot S, Auziere S, Gadkari A, Girolomoni G, Puig L, Simpson EL, et al. Epidemiology of atopic dermatitis in adults: Results from an international survey. Allergy. 2018 Jun 1;73(6):1284–93.

33. AlQassimi S, AlBrashdi S, Galadari H, Hashim MJ. Global burden of psoriasis – comparison of regional and global epidemiology, 1990 to 2017. International Journal of Dermatology. 2020 May 1;59(5):566–71.
34. Affandi AM, Khan I, Saaya NN. Epidemiology and clinical features of adult patients with psoriasis in Malaysia: 10-year review from the Malaysian psoriasis registry (2007-2016). Dermatology Research and Practice. 2018 Apr 23;2018.
35. Australian Institute of Health and Welfare. Australian Burden of Disease Study-Methods and supplementary material 2018. AIHW, Australian Government. 2021.
36. Karimkhani C, Colombara D V., Drucker AM, Norton SA, Hay R, Engelman D, et al. The global burden of scabies: a cross-sectional analysis from the Global Burden of Disease Study 2015. The Lancet Infectious Diseases. 2017 Dec 1;17(12):1247–54.
37. Zayyid M, Saadah S, Adil R, Rohela AR, Jamaiah M. Prevalence of scabies and head lice among children in a welfare home in Pulau Pinang, Malaysia. Tropical Biomedicine. 2010; 27(3): 442-446.
38. Muthupalaniappen L, Tan HC, Puah JWD, Apipi M, Sohaimi AE, Mahat NF, et al. Acne prevalence, severity and risk factors among medical students in Malaysia. Clinica Terapeutica. 2014; 165(4): 187–92.
39. Villasante Fricke AC, Miteva M. Epidemiology and burden of alopecia areata: A systematic review. Clinical, Cosmetic and Investigational Dermatology. 2015. 8: 397–403.
40. Yakupu A, Aimaier R, Yuan B, Chen B, Cheng J, Zhao Y, et al. The burden of skin and subcutaneous diseases: findings from the global burden of disease study 2019. Frontiers in Public Health. 2023;11.
41. Chew FLM, Salowi MA, Mustari Z, Husni MA, Hussein E, Adnan TH, et al. Estimates of visual impairment and its causes from the national eye survey in Malaysia (NESII). PLoS ONE. 2018; 13(6): e0198799.
42. Veerapen K, Wigley RD, Valkenburg H. Musculoskeletal pain in Malaysia: a COPCORD survey. The Journal of Rheumatology. 2007 Jan 1; 34(1).
43. Malaysian National Inflammatory Arthritis Registry (MyNIAR). NIAR & MARBLE Rheumatoid Arthritis (Apr 2009 - Aug 2019). 2020.
44. Hoy D, Brooks P, Blyth F, Buchbinder R. The epidemiology of low back pain. Best Practice and Research Clinical Rheumatology. 2010; 24: 769–81.
45. Stynes S, Konstantinou K, Dunn KM. Classification of patients with low back-related leg pain: A systematic review. BMC Musculoskeletal Disorders. 2016; 17: 226.
46. NHS Health Scotland. The Scottish burden of disease study, 2016 Overview Report. Public Health Information for Scotland. 2018.
47. Abebe MS, Afework M, Abaynew Y. Primary and secondary infertility in Africa: systematic review with meta-analysis. Fertile Research and Practice. 2020 Dec;6(1).
48. Oral Health Division, Ministry of Health Malaysia. National health and morbidity survey 2017: National oral health survey of schoolchildren 2017 (NHMS 2017: NOHSS 2017). Volume II Oral health status of 12-year-old schoolchildren. 2017.
49. Jaafar A, Sinor MZ, Saddki N, Hasan R. Edentulism and factors associated with community dwelling elderly in Pasir Puteh, Kelantan, Malaysia. International Medical Journal. 2020 Aug 1;27(4): 469.

50. James SL, Lucchesi LR, Bisignano C, Castle CD, Dingels ZV., Fox JT, et al. Morbidity and mortality from road injuries: results from the Global Burden of Disease Study 2017. Injury Prevention. 2020 Oct 1; 26: I46-T56.
51. Mohanty SK, Kumar V, Jaffar Hussain AP, Bhuvan V. Epidemiological analysis of drowning deaths: A 10 year study. Journal of Indian Academy of Forensic Medicine. 2016; 38(4): 465–70.

Appendices

Appendix 1
Diseases Expert Team

Infectious diseases, respiratory infections, and respiratory diseases

Dr Asmah Razali
Sektor Kawalan TB dan Kusta
Bahagian Kawalan Penyakit
Kementerian Kesihatan Malaysia

Dr Chai Phing Tze
Sektor Kawalan HIV, STI dan Hep C
Bahagian Kawalan Penyakit
Kementerian Kesihatan Malaysia

Dr Mohd Ihsani Mahmood
Sektor Survelan Penyakit
Bahagian Kawalan Penyakit
Kementerian Kesihatan Malaysia

Dr Irfan Ali Hyder Ali
Jabatan Respiratori
Hospital Pulau Pinang

Dr Jenarun Jelip @ Jailip
Sektor Kawalan Penyakit Bawaan Vektor
Bahagian Kawalan Penyakit
Kementerian Kesihatan Malaysia

Dato' Dr Suresh Kumar Chidambaram
Jabatan Perubatan
Hospital Sungai Buloh
Sungai Buloh, Selangor

Maternal and gynaecological conditions

Dr Norliza Rusli
Jabatan Obstetrik & Ginekologi
Hospital Sultanah Nora Ismail
Batu Pahat, Johor

Dr Tuty Aridzan Irdawati Mohsinon
Cawangan Kesihatan Keluarga
Bahagian Pembangunan Kesihatan Keluarga
Kementerian Kesihatan Malaysia

Neonatal conditions, congenital anomalies, and nutritional deficiency

Dr Ang Ee Lee
Jabatan Pediatrik
Hospital Tengku Ampuan Rahimah
Klang

Dr Rozita Ab Rahman
Cawangan Kesihatan Keluarga
Bahagian Pembangunan Kesihatan Keluarga
Kementerian Kesihatan Malaysia

Puan Teh Wai Siew
Cawangan Perancangan & Dasar Pemakanan - Seksyen Survelan Pemakanan
Bahagian Pemakanan
Kementerian Kesihatan Malaysia

Malignant neoplasms and benign neoplasm

Dr Feisul Idzwan Mustapha
Jabatan Kesihatan Negeri Perak

Dr Nor Saleha Ibrahim Tamin
Sektor Kawalan dan Pencegahan Penyakit CVD/ Diabetes/ Kanser
Bahagian Kawalan Penyakit
Kementerian Kesihatan Malaysia

Dr Siti Norbayah Yusof
Unit Registri Kanser Kebangsaan
Institut Kanser Negara

Diabetes mellitus, endocrine, blood & immune disorders, and cardiovascular & circulatory diseases

Datuk Dr Abdul Kahar Abdul Ghapar
Jabatan Kardiologi
Hospital Sultan Idris Shah
Serdang, Selangor

Dr Feisul Idzwan Mustapha
Jabatan Kesihatan Negeri Perak

Datuk Dr Zanariah Hussein
Jabatan Perubatan Am
Hospital Putrajaya

Digestive diseases, genito urinary diseases, and kidney diseases

Dato Dr Ong Loke Meng
Jabatan Perubatan Am
Hospital Pulau Pinang

Ybhg Dato' Dr Rohan Malek Dato' Dr Johan Thambu
Jabatan Urologi
Hospital Selayang

Datuk Dr Hjh Rosaida Hj Md Said
Jabatan Perubatan Am
Hospital Sultan Idris Shah Serdang

Dr Sunita V. Bavanandam
Jabatan Nefrologi
Hospital Kuala Lumpur

Dr Zalwani Zainuddin
Jabatan Perubatan
Hospital Sultanah Bahiyah

Mental & behavioural disorders, and neurological conditions

Dr Noor Raihan Khamal
Sektor Intervensi Krisis Kesihatan Mental
Pusat Kecemerlangan Kesihatan Mental Kebangsaan (NCEMH)
Kementerian Kesihatan Malaysia

Dr Norli Abdul Jabbar
Sektor Latihan dan Pendidikan
Pusat Kecemerlangan Kesihatan Mental Kebangsaan (NCEMH)
Kementerian Kesihatan Malaysia

Dr Nur Sakinah Ahmad
Sektor Promosi Kesihatan Mental dan Pencegahan Penyakit Mental
Pusat Kecemerlangan Kesihatan Mental Kebangsaan (NCEMH)
Kementerian Kesihatan Malaysia

Dr Salina Abdul Aziz
Jabatan Psikiatri
Hospital Kuala Lumpur

Skin diseases and musculoskeletal diseases

Dr Liza Mohd Isa
Unit Rheumatologi
Hospital Putrajaya

Dr Mollyza Mohd Zain
Jabatan Perubatan
Hospital Selayang

Dr Suganthi Thevarajah
Jabatan Dermatologi
Hospital Kuala Lumpur

Sense organ diseases and oral conditions

Dr Nurulasmak Mohamed
Cawangan Epidemiologi & Penyelidikan Kesihatan Pergigian
Program Kesihatan Pergigian
Kementerian Kesihatan Malaysia

Dr Mohamad Zambri Ibrahim
Jabatan Otorinolaringologi
Hospital Tuanku Fauziah

Dr Mohd Aziz Salowi
Jabatan Oftalmologi
Hospital Selayang

Dr Muhammad Nasri Abu Bakar
Jabatan Otorinolaringologi
Hospital Sultan Ismail Petra

Injuries

Deputi Superitenden Polis (DSP) Aizarifa Adun
Bahagian Risikan/ Operasi/ Rekod (D4)
Jabatan Siasatan Jenayah
Polis Diraja Malaysia

Dr Nuraidah Mohd Marzuki
Seksyen Pusat Informatik Kesihatan (PIK)
Bahagian Perancangan
Kementerian Kesihatan Malaysia

Dr Nurashikin Ibrahim
Pusat Kecemerlangan Kesihatan Mental Kebangsaan (NCEMH)
Kementerian Kesihatan Malaysia

Dr Sa'adon Ibrahim
Jabatan Ortopedik
Hospital Sultan Ismail
Johor Bahru

Appendix 2
MBOD list of diseases, conditions and injuries by ICD-10 code

Cause	ICD-10 Code
Group I: Communicable, maternal, neonatal, and nutritional diseases	
A. HIV/AIDS and sexually transmitted infections	**A50-A58, A60-A64, B20-B24**
HIV/AIDS	B20-B24
Syphilis	A50-A53
Other sexually transmitted infections	A54-A58, A60-A63
B. Respiratory infections and tuberculosis	**A15-A19, B90, H65-H66, J00-J22, U07**
Tuberculosis	A15-A19, B90
Lower respiratory infections	J09-J22
Upper respiratory infections	J00-J06
Otitis media	H65-H66
COVID-19	U07
C. Enteric infections	**A00-A09**
Diarrhoeal diseases	A00, A02-A04, A06-A09
Typhoid and paratyphoid	A01
Other intestinal infectious diseases	A05
D. Tropical diseases	**A68-A69, A75-A79, A90-A96, A98, B33, B50-B57, B60, B65-B67, B69-B72, B74-B75, B77, B83**
Malaria	B50-B54

Dengue	A90-A91
Rabies	A82
Other tropical diseases	A68-A69, A75-A79, A92-A96, A98, B33, B55-B57, B60, B65-B67, B69-B72, B74-B75, B77, B83
E. Other infectious diseases	**A20-A39, A42-A49, A65-A67, A70-A74, A80-A81, A83-A89, A97, A99, B00-B06, B09, B25-B32, B34, B37-B49, B58-B59, B61-B64, B68, B73, B76, B78-B82, B84-B85, B87-B89, B92-B99, G00-G03, G14, I00**
Meningitis	G00-G03
Diphtheria	A36
Whooping cough	A37
Tetanus	A33-A35
Polio	A80
Measles	B05
Viral hepatitis	B15-B19
Other unspecified infectious diseases	A20-A32, A38-A39, A42-A49, A65-A67, A70-A74, A81, A83-A89, A97, A99, B00-B04, B06, B09, B25-B32, B34, B37-B49, B58-B59, B61-B64, B68, B73, B76, B78-B82, B84-B85, B87-B89, B92-B99, G14, I00
F. Maternal disorders	**C58, O00-O99**
Maternal haemorrhage	O20, O44-O46, O62, O67, O72
Maternal sepsis and other maternal infections	O23, O85-O86, O91
Maternal hypertensive disorders	O10-O11, O13-O16
Maternal obstructed labour and uterine rupture	O32-O33, O64-O66, O71
Maternal abortion and miscarriage	O01-O08
Ectopic pregnancy	O00
Indirect maternal disorders	O24-O25, O98-O99
Late maternal deaths	O96-097

Other maternal disorders	C58, O12, O21-O22, O26, O28-O31, O34-O36, O40-O43, O47-048, O60-O61, O63, O68-O70, O73-O77, O80-O84, O87-O90, O92, O94-O95
G. Neonatal conditions	**P00-P96, R95**
Neonatal preterm birth	P05, P07
Birth asphyxia and trauma	P03, P10-P15, P20-P22, P24-P26
Neonatal sepsis and other neonatal infections	P35-P39
Haemolytic disease and other neonatal jaundice	P58-P59
Sudden infant death syndrome	R95
Other neonatal disorders	P00-P02, P04, P08, P23, P27-P29, P50-P57, P60-P94, P96
H. Nutritional deficiencies	**D50-D53, E00-E02, E40-E64**
Protein-energy malnutrition	E40-E46
Iron deficiency anaemia	D50-D53
Iodine deficiency	E00-E02
Other nutritional deficiencies	E50-E64

Group II: Non-communicable diseases

I. Neoplasms	**C00-C57, C59-C97, D00-D24, D27-D48**
Lip and oral cavity cancer	C00-C08
Nasopharynx cancer	C11
Other pharynx cancer	C09-C10, C12-C13
Oesophageal cancer	C15
Stomach cancer	C16
Colon and rectum cancer	C18-C21
Liver cancer	C22

Gallbladder and biliary tract cancer	C23-C24
Pancreatic cancer	C25
Larynx cancer	C32
Tracheal, bronchus, and lung cancer	C33-C34
Malignant skin melanoma	C43
Non-melanoma skin cancer	C44
Breast cancer	C50
Cervical cancer	C53-C54
Uterine cancer	C55
Ovarian cancer	C56
Prostate cancer	C61
Testicular cancer	C62
Kidney cancer	C64-C65
Bladder cancer	C67
Brain and central nervous system cancer	C70-C72
Thyroid cancer	C73
Mesothelioma	C45
Hodgkin lymphoma	C81
Non-Hodgkin lymphoma	C82-C85
Multiple myeloma	C88-C90
Leukemia	C91-C95
Other malignant neoplasms	C14, C17, C26-C31, C37-C41, C46-C49, C51-C52, C57, C60, C63, C66, C68-C69, C74-C79, C86-C87, C96-C97
Other neoplasms	D00-D24, D27-D48
J. Cardiovascular diseases	**G45-G46, I01-I11, I15-I25, I27-I45, I47-I51, I60-I83, I86-I99**
Rheumatic heart disease	I01-I09
Ischaemic heart disease	I20-I25

Stroke	G45-G46, I60-I69
Hypertensive heart disease	I11
Non-rheumatic valvular heart disease	I34-I37
Cardiomyopathy and myocarditis	I40-I43
Atrial fibrillation and flutter	I48
Aortic aneurysm	I71
Peripheral artery disease	I73
Endocarditis	I33, I38-I39
Other cardiovascular and circulatory diseases	I27-I28, I30-I32, I44-I45, I47, I49-I51, I72, I74-I83, I86-I99
K. Chronic respiratory diseases	**D86, J30-J95, J98-J99**
Chronic obstructive pulmonary disease	J41-J44
Asthma	J45-J46
Interstitial lung disease and pulmonary sarcoidosis	D86, J84
Other chronic respiratory diseases	J30-J40, J47-J83, J85-J95, J98-J99
L. Digestive diseases	**I84-I85, K20-K92**
Upper digestive system diseases	K21, K25-K27
Appendicitis	K35-K37
Cirrhosis and other chronic liver diseases	K70, K74
Paralytic ileus and intestinal obstruction	K56
Inguinal, femoral, and abdominal hernia	K40-K42
Inflammatory bowel disease	K50-K52
Vascular intestinal disorders	K55
Gallbladder and biliary diseases	K80-K83
Pancreatitis	K85-K86
Other digestive diseases	I84-I85, K20, K22, K28-K31, K38, K43-K46, K57-K66, K71-K73, K75-K77, K87-K92

M. Neurological disorders	**F00-F03, G04-G13, G20-G44, G47-G99**
Alzheimer's disease and other dementias	F00-F03, G30-G32
Parkinson's disease	G20-G22
Idiopathic epilepsy	G40-G41
Multiple sclerosis	G35
Other neurological disorders	G04-G13, G23-G26, G36-G37, G43-G44, G47-G99
N. Mental disorders	**F04-F09, F20-F99**
Schizophrenia	F20-F29
Depressive disorders	F32-F33
Bipolar disorder	F30-F31
Anxiety disorders	F40-F44
Autism spectrum disorders	F84
Attention-deficit/ hyperactivity disorder	F90
Other mental disorders	F04-F09, F34-F39, F45-F83, F85-F89, F91-F98
O. Substance use disorders	**F10-F19**
Alcohol use disorders	F10
Drug use disorders	F11-F19
P. Diabetes and kidney diseases	**E10-E14, I12-I13, N00-N08, N18-N19, Q61-Q62**
Diabetes mellitus	E10-E14
Chronic kidney disease	I12-I13, N02-N08, N18-N19, Q61-Q62
Acute glomerulonephritis	N00-N01
Q. Skin and subcutaneous diseases	**B07-B08, B35-B36, B86, L00-L99**
Dermatitis	L20-L25

Psoriasis	L40-L41
Bacterial skin diseases	L00-L08, L88, L97-L98
Scabies	B86
Fungal skin diseases	B35-B36
Viral skin diseases	B07-B08
Acne vulgaris	L70
Alopecia areata	L63
Other skin and subcutaneous diseases	L10-L14, L26-L30, L42-L62, L64-L68, L71-L87, L89-L96, L99
R. Sense organ diseases	**H00-H61, H68-H95**
Blindness and vision loss	H25-H28, H31-H36, H40, H46-H54
Age-related and other hearing loss	H90-H91
Other sense organ diseases	H00-H21, H30, H43-H45, H55-H61, H68-H83, H92-H95
S. Musculoskeletal disorders	**M00-M99**
Rheumatoid arthritis	M05-M06
Osteoarthritis	M15-M19
Low back disorders	M51
Cervical disc disorders	M50
Other musculoskeletal disorders	M00-M03, M07-M14, M20-M49, M53-M99
T. Congenital birth defects	**Q00-Q60, Q63-Q99**
Down syndrome	Q90
Congenital heart anomalies	Q20-Q28
Turner syndrome	Q96
Klinefelter syndrome	Q98
Other chromosomal abnormalities	Q91-Q95, Q97, Q99
Orofacial clefts	Q35-Q37

Neural tube defects (spina bifida & anencephaly)	Q00, Q05
Other congenital birth defects	Q01-Q04, Q06-Q18, Q30-Q34, Q38-Q60, Q63-Q89
U. Urinary diseases and male infertility	**N10-N16, N20-N53**
Urinary tract infection and interstitial nephritis	N10-N16, N39
Benign prostate hyperplasia	N40
Urolithiasis	N20-N23
Male infertility	N46
Other urinary diseases	N25-N38, N41-N45, N47-N53
V. Gynaecological diseases	**D25-D26, E28, N60-N99**
Uterine fibroids	D25-D26
Polycystic ovarian syndrome	E28
Endometriosis	N80
Other gynaecological disorders	N60-N79, N81-N99
W. Endocrine, metabolic, blood, and immune disorders	**D55-D64, D66-D89, E03-E07, E15-E27, E29-E35, E65-E90**
Haemoglobinopathies and haemolytic anaemias	D55-D61, D64
Other endocrine, metabolic, blood, and immune disorders	D62-D63, D66-D85, D87-D89, E03-E07, E15-E27, E29-E35, E65-E90
X. Oral disorders	**K00-K14**
Caries of deciduous teeth/ permanent teeth	K02
Periodontal diseases	K05
Edentulism	K06
Other oral disorders	K00-K01, K03-K04, K07-K14

Group III: Injuries

Y. Transport injuries	**V01-V89, V99, Y85-Y86**
Road injuries	V01-V89, V99, Y85-Y86
Z. Unintentional injuries	**V90-V98, W00-W99, X00-X59, Y40-Y84, Y88**
Poisonings	X40-X49
Falls	W00-W19
Fire, heat and hot substances	X00-X19
Drowning	W65-W74
Other unintentional injuries	V90-V98, W20-W64, W75-W99, X20-X39, X50-X59, Y40-Y84, Y88
AA. Self-harm and interpersonal violence	**X60-Y09, Y35-Y36**
Self-harm	X60-X84
Interpersonal violence	X85-Y09, Y35-Y36

Appendix 3
Summaries of disease categories by NMCD

Disease categories	DOSM code	ICD-10 code
01- Infectious diseases		
Cholera	001	A00
Typhoid	002	A01
Food poisoning	003	A05
Dysentery/ diarrhea	004	A09
Tuberculosis	005	A18
Plague	006	A20
Anthrax	007	A22
Leprosy	008	A30
Tetanus	009	A33
Diphtheria	010	A36
Whooping cough	011	A37
Septicaemia	012	A41
Syphilis	013	A50
Gonorrhoea	014	A54
Chancroid	015	A57
Relapsing fever	016	A68
Typhus	017	A75
Acute poliomyelitis	018	A80
Rabies	019	A82
Viral encephalitis	020	A83
Dengue fever	021	A90
Dengue haemorrhagic fever	022	A91
Chikungunya	023	A92
Yellow fever	024	A95

Ebola	025	A98
Chicken pox	026	B01
Shingles	027	B02
Measles/ rubella	028	B05
Hand, foot and mouth disease	029	B08
Hepatitis a, b and c	030	B19
Aids/ HIV	031	B24
Mumps	032	B26
Tinea	033	B35
Candidiasis	034	B37
Malaria	035	B54
Filariasis	036	B74
Worm infestation	037	B83
Scabies	038	B86
Other infections	039	B99
02- Cancer		
Cancer of lip, oral cavity and pharynx		
Tongue cancer	100	C02
Gum cancer	101	C03
Mouth cancer	102	C06
Salivary gland cancer	103	C08
Tonsil cancer	104	C09
Throat cancer	105	C14
Cancer of digestive organs		
Esophagus cancer	110	C15
Stomach cancer	111	C16
Intestine cancer	111	C16
Rectum cancer	112	C19
Liver cancer	113	C20
Gallblader cancer	114	C22
Pancreas cancer	115	C25
Spleen cancer	116	C26

Other digestive system cancers	119	C26
Cancer of respiratory and intrathoracic organs		
Larynx cancer	120	C32
Respiratory tract cancer	121	C33
Lung cancer	122	C34
Heart cancer	123	C38
Other respiratory tract cancers	124	C39
Cancer of bone and articular cartilage		
Bone cancer	125	C41
Cancer of skin		
Skin cancer	126	C44
Cancer of mesothelial and soft tissue		
Nerve cancer	127	C46
Other connective & soft tissue cancer	128	C49
Cancer of breast		
Breast cancer	130	C50
Cancer of female reproductive organs		
Vulva cancer	131	C51
Vaginal cancer	132	C52
Cervix cancer	133	C53
Uterus cancer	134	C55
Ovary cancer	135	C56
Other female reproductive organ cancers	139	C57
Cancer of male reproductive organs		
Penis cancer	140	C60
Prostate cancer	141	C61
Testis cancer	142	C62
Other male reproductive organ cancers	144	C63
Cancer of urinary tract system		
Kidney cancer	145	C64
Urinary bladder cancer	146	C67
Other urinary tract system cancers	149	C68

Cancer of eye, brain and other parts of central nervous system		
Eye cancer	150	C69
Brain cancer	151	C71
Other central nervous system cancers	154	C72
Cancer of thyroid and endocrine glands		
Thyroid cancer	155	C73
Other endocrine gland cancers	159	C75
Cancer of ill-defined, secondary and unspecified sites		
Unspecified sites cancer	160	C76
Secondary cancer of other sites	161	C79
Cancer - primary site not mentioned	162	C80
Cancer of lymphoid, haematopoietic and related tissue		
Lymphoma	165	C85
Leukaemia	166	C95
Other lymphoid, haematopoietic and related tissue cancers	169	C96
Neoplasms of uncertain or unknown behaviour		
All types of neoplasms	170	D48
03- Diseases of the blood and blood-forming organs		
Thalassemia	200	D56
Anaemia	201	D64
Other diseases of the blood and blood-forming organs	204	D75
04- Endocrine, nutritional and metabolic diseases		
Thyroid	205	E07
Diabetes	206	E14
Dehydration	207	E86
Other endocrine, nutritional and metabolic diseases	209	E87
05- Mental and behavioural disorders		
Dementia	210	F03
Alcoholism	211	F10
Drug addiction	212	F19
Schizophrenia	213	F20
Affective disorder	214	F31

Reaction to severe stress and adjustment disorder	215	F43
Mental and behavioural disorders associated with puerperium	216	F53
Mental retardation	217	F79
Other mental and behavioural disorders	219	F99
06- Diseases of the nervous system		
Meningitis and encephalitis	220	G03
Parkinson	221	G20
Alzheimer's disease	222	G30
Epilepsy	223	G41
Paralysis	224	G83
Hydrocephalus	225	G91
Other disorders of brain	226	G93
Nerve diseases	227	G98
Other nervous system disease	229	G99
09- Diseases of the circulatory system		
Hypertension	230	I10
Heart attack	231	I21
Chronic ischaemic heart disease	232	I25
Heart failure	233	I50
Other heart diseases	234	I51
Brain haemorrhage	235	I62
Stroke	236	I64
Haemorrhoids	237	I84
Hypotension	238	I95
Other circulatory system diseases	239	I99
10- Diseases of the respiratory system		
Pneumonia	240	J18
Asthma	241	J45
Pulmonary oedema	242	J81
Difficulty in breathing (neonatal death 28 - 364 days)	243	J21
Lung disease	244	J98
Other respiratory system diseases	249	J98

11- Diseases of the digestive system		
Ulcer	250	K12
Gastric ulcer	251	K27
Appendix	252	K37
Hernia	253	K46
Intestine disease	254	K63
Liver disease	255	K73
Cholelithiasis	256	K87
Gastrointestinal haemorrhage	257	K92
Other digestive system diseases	259	K92
12- Diseases of the skin and subcutaneous tissue		
Skin infection	260	L99
13- Diseases of the musculoskeletal system and connective tissue		
Gout	261	M10
Joint pain	262	M25
Back pain	263	M54
Bone pain	264	M89
Other musculoskeletal system and connective tissue diseases	269	M79
14- Diseases of the genitourinary system		
Renal failure	270	N19
Renal calculi	271	N20
Other kidney disease	272	N28
Other genitourinary system diseases	274	N39
15- Maternal death related to pregnancy, childbirth and the puerperium		
Maternal death	275	O75
16- Certain conditions originating in the perinatal period		
Premature	276	P07
Birth asphyxia	277	P21
Others	279	P96

17- Congenital malformations, deformations and chromosomal abnormalities		
Congenital heart disease	280	Q24
Down's syndrome	281	Q90
Other congenital malformations and chromosomal abnormalities	284	Q38
18- Symptoms, signs and abnormal findings		
Symptoms and signs involving the circulatory and respiratory systems		
Other causes involving the circulatory and respiratory system	285	R09
Symptoms and signs involving the digestive system and abdomen		
Abdominal pain	286	R10
Jaundice	287	R17
Ascites	288	R18
Other causes involving digestive system and abdomen	289	R19
Symptoms and signs involving the skin and subcutaneous tissue		
Other causes involving skin and subcutaneous tissue	290	R23
Symptoms and signs involving the urinary system		
Other causes involving urinary system	291	R39
Symptoms and signs involving the cognition, perception, emotional state and behaviour		
Other causes involving cognition, emotional state and behaviour	292	R46
General symptoms and signs		
Fever	293	R50
Old age (65 years and above)	294	R54
Others general symptoms and signs	298	R69
Other ill-defined and unspecified causes of mortality	299	R99
20- External causes of morbidity and mortality		
Transport accidents		
Road accidents	300	V89
Railway accidents	301	V81
Water accidents	302	V94
Air accidents	303	V97
Other transport accidents	304	V99

Other accidents		
Falls	305	W19
Struck by object	306	W20
Contact with animal	307	W59
Drowning	308	W74
Milk aspiration	309	W79
Aspiration of food	310	W79
Electrocution	311	W87
Burn	312	X09
Forces of nature	313	X39
Lightning strike	314	X33
Accident at work place	315	X59
Other accidents	319	X58
Accidental poisoning by and exposure to noxious substances		
Poisoning	320	X49
Intentional self-harm		
Suicide	322	X84
Assault		
Homicide	323	Y09

*Code for Uncertified Causes of Death, Version 3, Department of Statistics Malaysia 2012

Appendix 4
Disability weights for disease sequelae

Causes List	Sequelae	Disability weight
Group I: Communicable, maternal, neonatal, and nutritional diseases		
A. HIV/AIDS and sexually transmitted infections		
HIV/AIDS	*Symptomatic HIV*	0.274
	AIDS with antiretroviral treatment	0.078
	AIDS without antiretroviral treatment	0.582
Syphilis	*Mild early syphilis*	0.006
	Adult tertiary syphilis	0.203
B. Respiratory infections and Tuberculosis		
Tuberculosis	*Tuberculosis, not HIV infected*	0.333
	Tuberculosis, HIV infected	0.408
Lower respiratory infections	*Moderate*	0.051
	Severe	0.133
Upper respiratory infections	*Mild upper respiratory infections*	0.006
	Moderate/severe upper respiratory infections	0.051
Otitis media	*Acute otitis media*	0.013
	Vertigo due to chronic otitis media	0.179
	Severe infectious complications due to chronic otitis media	0.013
	Mild hearing loss due to chronic otitis media	0.01
	Moderate hearing loss due to chronic otitis media	0.027
C. Enteric infections		
Diarrhoeal diseases	*Mild*	0.074
	Moderate	0.188
	Severe	0.247
Typhoid and paratyphoid	*Typhoid: Moderate*	0.051
	Typhoid: Severe	0.133
	Typhoid: Gastrointestinal bleeding	0.325
	Typhoid: Abdominal pain and distention (includes intestinal perforation)	0.324
	Paratyphoid: Mild	0.006
	Paratyphoid: Moderate	0.051
	Paratyphoid: Severe	0.133
	Paratyphoid: Abdominal pain & distention due to paratyphoid	0.114

D. Tropical diseases		
Malaria	*Mild*	0.006
	Moderate	0.051
	Severe	0.133
Dengue	*Moderate*	0.051
	Severe	0.133
	Post-dengue chronic fatigue syndrome	0.219
Rabies	*Severe*	0.133
E. Other infectious diseases		
Meningitis	*Acute meningitis (infectious disease: acute episode: severe)*	0.133
	Long-term sequelae—hearing deficit	0.167
	Long-term sequelae—vision deficit	0.314
	Long-term sequelae—mental deficit	0.383
	Long-term sequelae—psychomotor deficit	0.542
Diphtheria	*Moderate diphtheria*	0.051
	Severe diphtheria	0.133
Whooping cough	*Moderate*	0.051
Tetanus	*Severe*	0.133
Polio	*Poliomyelitis—lameness*	0.369
Measles	*Moderate*	0.051
	Severe	0.133
Viral hepatitis	*Moderate*	0.051
	Severe	0.133
F. Maternal disorders		
Maternal Haemorrhage	*Maternal haemorrhage (< 1L blood lost)*	0.114
	Maternal haemorrhage (≥ 1L blood lost)	0.324
	Anaemia due to maternal haemorrhage	0.027
Maternal Sepsis and other maternal infections	*Puerperal sepsis, severe*	0.133
	Infertility due to puerperal sepsis, secondary	0.005
	Other maternal infections, moderate	0.051
Maternal Hypertensive Disorders	*Other hypertensive disorders of pregnancy*	0.049
	Severe pre-eclampsia	0.174
	Long term sequelae of severe pre-eclampsia	0.067
	Eclampsia	0.602
	Long term sequelae of eclampsias	0.067
Maternal obstructed labour and uterine rupture	*Obstructed labour, acute event*	0.324
	Vesicovaginal fistula	0.342
	Rectovaginal fistula	0.501
Maternal abortion and miscarriage	*Maternal abortive outcome*	0.114
Ectopic pregnancy	*Moderate abdominopelvic problem*	0.114

Indirect maternal disorders	-	-
Late maternal deaths	-	-
Maternal deaths aggravated by HIV/ AIDS	-	-
Other maternal disorders	-	-
G. Neonatal conditions		
Neonatal preterm birth	*Mild motor impairment*	0.01
	Mild Motor plus cognitive impairments	0.031
	Moderate motor impairment	0.061
	Moderate Motor impairment with epilepsy	0.308
	Moderate Motor impairment with blindness	0.236
	Moderate Motor impairment with blindness and epilepsy	0.437
	Moderate Motor impairment plus cognitive impairment with blindness	0.351
	Moderate Motor impairment plus cognitive impairment with epilepsy	0.413
	Moderate Motor impairment plus cognitive impairment with blindness and epilepsy	0.522
	Severe motor impairment	0.402
	Severe Motor impairment with epilepsy	0.732
	Severe Motor impairment with blindness	0.512
	Severe Motor impairment with blindness and epilepsy	0.782
	Severe Motor impairment plus cognitive impairment with blindness	0.625
	Severe Motor impairment plus cognitive impairment with epilepsy	0.795
	Severe Motor impairment plus cognitive impairment with blindness and epilepsy	0.833
	Mild Retinopathy of Prematurity	0.003
	Moderate Retinopathy of Prematurity	0.031
	Severe Retinopathy of Prematurity	0.184
	Retinopathy of Prematurity with Blindness	0.187

Birth asphyxia and trauma	*Mild Motor impairment*	0.010
	Mild Motor plus cognitive impairments	0.031
	Moderate motor impairment	0.061
	Moderate motor impairment with epilepsy	0.308
	Moderate motor impairment with blindness	0.236
	Moderate motor plus cognitive impairment with epilepsy	0.413
	Moderate motor plus cognitive impairment with blindness	0.351
	Moderate motor plus cognitive impairment with blindness and epilepsy	0.522
	Moderate motor impairment with blindness and epilepsy	0.437
	Severe motor impairment	0.402
	Severe motor impairment with epilepsy	0.732
	Severe motor impairment with blindness	0.512
	Severe motor plus cognitive impairment with epilepsy	0.795
	Severe motor plus cognitive impairment with blindness	0.625
	Severe motor plus cognitive impairment with blindness and epilepsy	0.832
	Severe motor impairment with blindness and epilepsy	0.781
	Distance vision blindness	0.187
Neonatal sepsis and other neonatal infections	*Mild motor impairment*	0.01
	Mild motor plus cognitive impairments	0.031
	Moderate motor impairment	0.061
	Moderate motor impairment with blindness	0.236
	Moderate motor plus cognitive impairment with blindness	0.351
	Moderate motor impairment with epilepsy	0.308
	Moderate motor impairment with blindness and epilepsy	0.437
	Moderate motor plus cognitive impairment with epilepsy	0.413
	Moderate motor plus cognitive impairment with blindness and epilepsy	0.522
	Severe motor impairment	0.402
	Severe motor impairment with blindness	0.512
	Severe motor impairment with epilepsy	0.732
	Severe motor impairment with blindness and epilepsy	0.781
	Severe motor plus cognitive impairment with blindness	0.625
	Severe motor plus cognitive impairment with epilepsy	0.795
	Severe motor plus cognitive impairment with blindness and epilepsy	0.832

Hemolytic disease and other neonatal jaundice	*Extreme hyperbilirubinemia due to hemolytic disease and other neonatal jaundice, without kernicterus*	0.324
	Moderate motor impairment	0.061
	Severe motor impairment	0.402
	Moderate motor impairment with blindness	0.236
	Moderate motor impairment with epilepsy	0.308
	Moderate motor impairment with blindness and epilepsy	0.437
	Moderate motor plus cognitive impairment with blindness	0.351
	Moderate motor plus cognitive impairment with epilepsy	0.413
	Moderate motor plus cognitive impairment with blindness and epilepsy	0.522
	Severe motor impairment with blindness	0.512
	Severe motor impairment with epilepsy	0.732
	Severe motor impairment with blindness and epilepsy	0.781
	Severe motor plus cognitive impairment with blindness	0.625
	Severe motor plus cognitive impairment with epilepsy	0.795
	Severe motor plus cognitive impairment with blindness and epilepsy	0.832
H. Nutritional deficiencies		
Protein-Energy Malnutrition	*Kwashiokor*	0.051
	Severe wasting	0.128
	Kwashiokor + severe wasting	0.172
Iron deficiency anaemia	*Mild*	0.004
	Moderate	0.052
	Severe	0.149
Iodine Deficiency	*Goitre without symptoms*	0.011
	Visible goiter with profound intellectual disability due to iodine deficiency	0.342
Other nutritional deficiency	-	-
Group II: Non-communicable diseases		
I. Neoplasms		
Lip and oral cavity cancer	*Diagnosis and primary therapy*	0.288
	Metastatic phase	0.451
	Terminal phase	0.540
	Controlled phase	0.049
Nasopharynx cancer	”	
Other pharynx cancer	”	
Oesophageal cancer	”	
Stomach cancer	”	
Gallbladder and biliary tract cancer	”	

Pancreatic cancer	”	
Tracheal, bronchus, and lung cancer	”	
Malignant skin melanoma	”	
Cervical cancer	”	
Uterine cancer	”	
Ovarian cancer	”	
Testicular cancer	”	
Kidney cancer	”	
Brain and central nervous system cancer	”	
Thyroid cancer	”	
Mesothelioma	”	
Hodgkin lymphoma	”	
Multiple myeloma	”	
Liver cancer	Severity as above we applied to all Liver cancer including Hepatitis B, Hepatitis C, Alcohol use, NASH, other causes and Hepatoblastoma	
Leukaemia	Severity as above we applied to all Leukaemia including Acute lymphoid leukaemia, Chronic lymphoid, Acute myeloid leukaemia, Chronic myeloid leukaemia and Other leukaemia	
Other malignant neoplasms	Severity as above we applied to all Other malignant including soft tissue and other, malignant bone tumors, Retinoblastoma, Other eye cancers, and Neuroblastoma and Other peripheral nervous cell tumors	
Colon and rectum cancer	*Diagnosis and primary therapy*	0.288
	Metastatic phase	0.451
	Stoma (beyond 10 years)	0.095
	Terminal phase	0.540
	Controlled phase-without stoma	0.049
	Controlled phase-stoma	0.139
Larynx cancer	*Diagnosis and primary therapy*	0.288
	Metastatic phase	0.451
	Terminal phase	0.540
	Laryngectomy (beyond 10 years)	0.051
	Controlled phase-without laryngectomy	0.049
	Controlled phase- laryngectomy	0.139
Non-melanoma skin cancer	Squamous cell carcinoma- mild disfigurement	0.011
	Squamous cell carcinoma- moderate disfigurement	0.067
	Squamous cell carcinoma- severe disfigurement	0.576
	Basal cell carcinoma- disfigurement	0.011

Breast cancer	*Diagnosis and primary therapy*	0.288
	Metastatic phase	0.451
	Mastectomy (beyond 10 years)	0.036
	Terminal phase	0.540
	Controlled phase-without mastectomy	0.049
	Controlled phase- mastectomy	0.083
Prostate cancer	*Diagnosis and primary therapy*	0.288
	Metastatic phase	0.451
	Terminal phase	0.540
	Controlled phase-without impotence or incontinence	0.049
	Controlled phase-with impotence	0.065
	Controlled phase-with incontinence	0.181
Bladder cancer	*Diagnosis and primary therapy*	0.288
	Metastatic phase	0.451
	Terminal phase	0.540
	Controlled phase-without incontinence	0.049
	Controlled phase-with incontinence	0.181
Non-Hodgkin lymphoma / Burkitt lymphoma	*Diagnosis and primary therapy*	0.288
	Metastatic phase	0.451
	Terminal phase	0.540
	Controlled phase	0.049
Other neoplasms	*Myelodysplastic, myeloproliferative, and other hematopoietic neoplasm*	0.049
	Benign and in situ intestinal neoplasms	0.000
	Benign and in situ cervical and uterine neoplasms	0.000
	Other benign and in situ neoplasms	0.000
J. Cardiovascular diseases		
Rheumatic heart disease	*Rheumatic heart disease, without heart failure*	0.049
	Rheumatic heart disease, with heart failure	0.093
Ischaemic heart disease	*Acute myocardial infarction (AMI)*	0.099
	Angina Pectoris	0.073
	Heart failure due to ischaemic heart disease	0.093
Stroke	*Ischemic stroke*	0.204
	Intracerebral haemorrhage	0.204
	Subarachnoid haemorrhage	0.204
Hypertensive heart disease	*Mild heart failure due to hypertensive heart disease*	0.041
	Moderate heart failure due to hypertensive heart disease	0.072
	Severe heart failure due to hypertensive heart disease	0.179
	Controlled, medically managed heart failure due to hypertensive heart disease	0.049

Non-rheumatic valvular heart disease	*Non-rheumatic calcific aortic valve disease*	0.093
	Non-rheumatic degenerative mitral valve disease	0.093
	Other non-rheumatic valve diseases	0.093
Cardiomyopathy and myocarditis	*Acute myocarditis*	0.051
	Heart failure due to myocarditis	0.093
	Alcoholic cardiomyopathy	0.093
	Other cardiomyopathy	0.093
Atrial fibrillation and flutter	*Symptomatic atrial fibrillation and flutter*	0.224
Aortic aneurysm	-	-
Peripheral artery disease	*Symptomatic claudication due to peripheral vascular disease*	0.014
Endocarditis	*Acute Moderate Endocarditis*	0.051
	Acute Severe Endocarditis	0.133
	Mild heart failure due to endocarditis	0.041
	Moderate heart failure due to endocarditis	0.072
	Severe heart failure due to endocarditis	0.179
	Treated heart failure due to endocarditis	0.049
Other cardiovascular and circulatory diseases		
K. Chronic respiratory diseases		
Chronic obstructive pulmonary disease	*Asymptomatic*	0.000
	Mild	0.019
	Moderate	0.225
	Severe	0.408
Asthma	*Asthma, no symptoms*	0.000
	Asthma, controlled	0.015
	Asthma, partially controlled	0.036
	Asthma, uncontrolled	0.133
Interstitial lung disease and pulmonary sarcoidosis	*Asymptomatic*	0.000
	Mild	0.019
	Moderate	0.225
	Severe	0.408
L. Digestive diseases		
Upper digestive system diseases	*Peptic Ulcer: Asymptomatic*	0.000
	Peptic Ulcer: Symptomatic: Mild	0.011
	Symptomatic:Moderate	0.114
	Mild/moderate GERD, asymptomatic days	0.000
	Mild/moderate GERD, symptomatic days	0.027
	Severe GERD, asymptomatic days	0.000
	Severe GERD, symptomatic days	0.114
Appendicitis	*Severe*	0.324

Cirrhosis and other chronic liver diseases	*Decompensated cirrhosis of the liver and mild anemia*	0.181
	Decompensate cirrhosis of the liver and moderate anemia	0.220
	Decompensated cirrhosis of the liver and severe anemia	0.300
Paralytic ileus and intestinal obstruction	*Severe*	0.324
Inguinal, femoral, and abdominal hernia	*Symptomatic*	0.011
Inflammatory bowel disease	*Ulcerative Colitis*	0.231
	Crohn's Disease	0.231
Vascular intestinal disorders	*Severe*	0.324
Gallbladder and biliary diseases	*Symptomatic*	0.114
Pancreatitis	*Severe*	0.324
Other digestive diseases		
M. Neurological disorders		
Alzheimer's disease and other dementias	*Mild*	0.069
	Moderate	0.377
	Severe	0.449
Parkinson's disease	*Mild*	0.010
	Moderate	0.267
	Severe	0.575
Idiopathic epilepsy	*Treated without fits*	0.049
	Less severe	0.263
	Severe	0.552
Multiple sclerosis	*Mild*	0.183
	Moderate	0.463
	Severe	0.719
Other neurological disorders	-	-
N. Mental disorders		
Schizophrenia	*Acute state*	0.778
	Residual state	0.588
Depressive disorders	*Mild*	0.145
	Moderate	0.396
	Severe	0.658
Bipolar disorder	*Residual state*	0.032
	Moderate	0.396
	Manic	0.492

Anxiety disorders	*Mild*	0.03
	Moderate	0.133
	Severe	0.523
Autism spectrum disorders (ASD)	*ASD without intellectual disability (ID)*	0.143
	ASD with borderline ID	0.152
	ASD with mild ID	0.179
	ASD with moderate ID	0.228
	ASD with severe ID	0.279
	ASD with profound ID	0.313
Attention-deficit/ hyperactivity disorder	*Symtomatic*	0.045
Other mental disorders		
O. Substance use disorders		
Alcohol use disorders	*Very mild alcohol dependence*	0.123
	Mild alcohol dependence	0.235
	Moderate alcohol dependence	0.373
	Severe alcohol dependence	0.570
	Mild fetal alcohol syndrome	0.016
	Moderate fetal alcohol syndrome	0.056
	Severe fetal alcohol syndrome	0.179
Drug use disorders	*Mild opioid dependence*	0.335
	Severe opioid dependence	0.697
	Mild cocaine dependence	0.116
	Severe cocaine dependence	0.479
	Mild amphetamine dependence	0.079
	Severe amphetamine dependence	0.486
	Mild cannabis dependence	0.039
	Severe cannabis dependence	0.266
	Other drug use disorders	0.116
P. Diabetes and kidney diseases		
Diabetes mellitus	*Uncomplicated Diabetes Mellitus*	0.049
	Retinopathy	0.008
	Neuropathy	0.299
Chronic kidney disease	*Chronic Kidney Disease stage III*	0.051
	Chronic Kidney Disease stage IV	0.150
	Chronic Kidney Disease stage V	0.590
	End-stage renal disease, on dialysis	0.571
	End-stage renal disease, with kidney transplant	0.024
Acute glomerulonephritis	*Moderate*	0.051

Q. Skin and subcutaneous diseases		
Dermatitis	*Mild atopic dermatitis*	0.027
	Moderate atopic dermatitis	0.188
	Severe atopic dermatitis	0.576
	Mild contact dermatitis	0.027
	Moderate contact dermatitis	0.188
	Symptomatic seborrhoeic dermatitis	0.027
Psoriasis	*Mild*	0.027
	Moderate	0.188
	Severe	0.576
Bacterial skin diseases	*Mild cellulitis*	0.006
	Moderate cellulitis	0.051
	Severe cellulitis	0.133
	Impetigo, pyoderma	0.006
	Abscesses and other bacterial skin diseases, pyoderma	0.006
Scabies	*Disfigurement, level 1 with itch/pain*	0.027
Fungal skin diseases	*Infectious disease, acute episode, mild*	0.006
Viral skin diseases	*Mild viral warts*	0.006
	Severe viral warts	0.067
	Mild molluscum contagiosum	0.006
	Severe molluscum contagiosum	0.067
Acne vulgaris	*Mild*	0.011
	Moderate	0.067
	Severe	0.405
Alopecia areata	*Mild*	0.011
	Severe	0.067
Other skin and subcutaneous diseases	*Symptomatic*	0.011
R. Sense organ diseases		
Blindness and vision loss	*Moderate*	0.031
	Severe	0.184
	Blindness	0.187

Age-related and other hearing loss	*Mild*	0.01
	Moderate	0.027
	Moderately severe	0.092
	Severe	0.158
	Profound	0.204
	Complete	0.215
	Mild, with ringing	0.021
	Moderate, with ringing	0.074
	Moderately severe, with ringing	0.167
	Severe, with ringing	0.261
	Profound, with ringing	0.277
	Complete, with ringing	0.316
Other sense organ diseases		
S. Musculoskeletal disorders		
Rheumatoid Arthritis	*Mild*	0.117
	Moderate	0.317
	Severe	0.581
Osteoarthritis	*Mild*	0.023
	Moderate	0.079
	Severe	0.165
Low back disorders	*Mild low back pain without leg pain*	0.020
	Moderate low back pain without leg pain	0.054
	Severe low back pain without leg pain	0.272
	Most severe low back pain without leg pain	0.372
	Mild low back pain with leg pain	0.020
	Moderate low back pain with leg pain	0.054
	Severe low back pain with leg pain	0.325
	Most severe low back pain with leg pain	0.384
Cervical disc disorders	*Mild*	0.052
	Moderate	0.112
	Severe	0.226
	Most severe	0.300
T. Congenital birth defects		
Down syndrome	*Mild dementia*	0.069
	Moderate dementia	0.377
	Severe dementia	0.449
	Borderline intellectual disability	0.011
	Mild intellectual disability	0.043
	Moderate intellectual disability	0.100
	Severe intellectual disability	0.160

	Profound intellectual disability	0.200
	Isolated congenital heart disease	0.061
	Asymptomatic	0.000
	Borderline intellectual disability with congenital heart disease	0.011
	Mild intellectual disability with congenital heart disease	0.043
	Moderate intellectual disability with congenital heart disease	0.100
	Severe intellectual disability with congenital heart disease	0.160
	Profound intellectual disability with congenital heart disease	0.200
	Congenital heart disease and mild dementia	0.069
	Congenital heart disease and moderate dementia	0.377
	Congenital heart disease and severe dementia	0.449
	Borderline intellectual disability, mild dementia, and congenital heart disease	0.079
	Mild intellectual disability, mild dementia, and congenital heart disease	0.109
	Moderate intellectual disability, mild dementia, and congenital heart disease	0.162
	Severe intellectual disability, mild dementia, and congenital heart disease	0.218
	Profound intellectual disability, mild dementia, and congenital heart disease	0.255
	Borderline intellectual disability, moderate dementia, and congenital heart disease	0.384
	Mild intellectual disability, moderate dementia, and congenital heart disease	0.403
	Moderate intellectual disability, moderate dementia, and congenital heart disease	0.438
	Severe intellectual disability, moderate dementia, and congenital heart disease	0.475
	Profound intellectual disability, moderate dementia, and congenital heart disease	0.499
	Borderline intellectual disability, severe dementia, and congenital heart disease	0.455
	Mild intellectual disability, severe dementia, and congenital heart disease	0.472
	Moderate intellectual disability, severe dementia, and congenital heart disease	0.503
	Severe intellectual disability, severe dementia, and congenital heart disease	0.535
	Profound intellectual disability, severe dementia, and congenital heart disease	0.557
	Borderline intellectual disability and mild dementia	0.079
	Mild intellectual disability and mild dementia	0.109
	Moderate intellectual disability and mild dementia	0.162
	Severe intellectual disability and mild dementia	0.218

	Profound intellectual disability and mild dementia	0.255
	Borderline intellectual disability and moderate dementia	0.384
	Mild intellectual disability and moderate dementia	0.403
	Moderate intellectual disability and moderate dementia	0.438
	Severe intellectual disability and moderate dementia	0.475
	Profound intellectual disability and moderate dementia	0.499
	Borderline intellectual disability and severe dementia	0.455
	Mild intellectual disability and severe dementia	0.472
	Moderate intellectual disability and severe dementia	0.503
	Severe intellectual disability and severe dementia	0.535
	Profound intellectual disability and severe dementia	0.557
Congenital heart anomalies	*Congenital heart disease without heart failure or intellectual disability due to critical malformations of great vessels, congenital valvular heart disease and patent ductus arteriosus*	0.061
	Congenital heart disease and borderline intellectual disability due to critical malformations of great vessels, congenital valvular heart disease and patent ductus arteriosus	0.011
	Congenital heart disease and mild intellectual disability due to critical malformations of great vessels, congenital valvular heart disease and patent ductus arteriosus	0.043
	Congenital heart disease and moderate intellectual disability due to critical malformations of great vessels, congenital valvular heart disease and patent ductus arteriosus	0.100
	Congenital heart disease and severe intellectual disability due to critical malformations of great vessels, congenital valvular heart disease and patent ductus arteriosus	0.160
	Congenital heart disease and profound intellectual disability due to critical malformations of great vessels, congenital valvular heart disease and patent ductus arteriosus	0.200
	Congenital heart disease without intellectual disability or heart failure due to other congenital cardiovascular anomalies	0.061
	Congenital heart disease and borderline intellectual disability due to other congenital cardiovascular anomalies	0.011
	Congenital heart disease and mild intellectual disability due to other congenital cardiovascular anomalies	0.043
	Congenital heart disease and moderate intellectual disability due to other congenital cardiovascular anomalies	0.100
	Congenital heart disease and severe intellectual disability due to other congenital cardiovascular anomalies	0.160
	Congenital heart disease and profound intellectual disability due to other congenital cardiovascular anomalies	0.200
	Congenital heart disease due to severe congenital heart anomalies excluding single ventricle heart defects	0.061
	Congenital heart disease and borderline intellectual disability due to severe congenital heart anomalies excluding single ventricle heart defects	0.011

	Congenital heart disease and mild intellectual disability due to severe congenital heart anomalies excluding single ventricle heart defect	0.043
	Congenital heart disease and moderate intellectual disability due to severe congenital heart anomalies excluding single ventricle heart defects	0.100
	Congenital heart disease and severe intellectual disability due to severe congenital heart anomalies excluding single ventricle heart defects	0.160
	Congenital heart disease and profound intellectual disability due to severe congenital heart anomalies excluding single ventricle heart defects	0.200
	Congenital heart disease due to single ventricle and single ventricle pathway heart defects	0.061
	Congenital heart disease and borderline intellectual disability due to single ventricle and single ventricle pathway heart defects	0.011
	Congenital heart disease and mild intellectual disability due to single ventricle and single ventricle pathway heart defects	0.043
	Congenital heart disease and moderate intellectual disability due to single ventricle and single ventricle pathway heart defects	0.100
	Congenital heart disease and severe intellectual disability due to single ventricle and single ventricle pathway heart defects	0.160
	Congenital heart disease and profound intellectual disability due to single ventricle and single ventricle pathway heart defects	0.200
	Congenital heart disease due to ventricular septal defect and atrial septal defect	0.061
	Congenital heart disease and borderline intellectual disability due to ventricular septal defect and atrial septal defect	0.011
	Congenital heart disease and mild intellectual disability due to ventricular septal defect and atrial septal defect	0.043
	Congenital heart disease and moderate intellectual disability due to ventricular septal defect and atrial septal defect	0.100
	Congenital heart disease and severe intellectual disability due to ventricular septal defect and atrial septal defect	0.160
	Congenital heart disease and profound intellectual disability due to ventricular septal defect and atrial septal defect	0.200
Other chromosomal abnormalities	-	-
Orofacial clefts	*Asymptomatic*	0.000
	Disfigurement level 1	0.011
	Disfigurement level 2	0.067
	Disfigurement level 2 and speech problems	0.158

Neural tube defects	*Mild motor impairment*	0.010
	Moderate motor impairment	0.061
	Severe motor impairment	0.402
	Mild motor impairment and borderline intellectual disability	0.021
	Mild motor impairment and mild intellectual disability	0.031
	Mild motor impairment and moderate intellectual disability	0.109
	Mild motor impairment and severe intellectual disability	0.169
	Mild motor impairment and profound intellectual disability	0.208
	Moderate motor impairment and borderline intellectual disability	0.071
	Moderate motor impairment and mild intellectual disability	0.101
	Moderate motor impairment and moderate intellectual disability	0.203
	Moderate motor impairment and severe intellectual disability	0.211
	Moderate motor impairment and profound intellectual disability	0.249
	Severe motor impairment and borderline intellectual disability	0.408
	Severe motor impairment and mild intellectual disability	0.427
	Severe motor impairment and moderate intellectual disability	0.461
	Severe motor impairment and severe intellectual disability	0.496
	Severe motor impairment and profound intellectual disability	0.519
	Mild motor impairment and incontinence	0.148
	Moderate motor impairment and incontinence	0.191
	Severe motor impairment and incontinence	0.402
	Mild motor impairment, borderline intellectual disability and incontinence	0.157
	Mild motor impairment, mild intellectual disability and incontinence	0.184
	Mild motor impairment, moderate intellectual disability and incontinence	0.233
	Mild motor impairment, severe intellectual disability and incontinence	0.284
	Mild motor impairment, profound intellectual disability and incontinence	0.318
	Moderate motor impairment, borderline intellectual disability and incontinence	0.200
	Moderate motor impairment, mild intellectual disability and incontinence	0.272
	Moderate motor impairment, moderate intellectual disability and incontinence	0.272
	Moderate motor impairment, severe intellectual disability and incontinence	0.320
	Moderate motor impairment, profound intellectual disability and incontinence	0.352
	Severe motor impairment, borderline intellectual disability and incontinence	0.489

	Severe motor impairment, mild intellectual disability and incontinence	0.505
	Severe motor impairment, moderate intellectual disability and incontinence	0.534
	Severe motor impairment, severe intellectual disability and incontinence	0.564
	profound motor impairment, profound intellectual disability and incontinence	0.584
	Severe motor and cognitive impairment due to anencephaly	0.542
Turner syndrome	*Asymptomatic*	0.000
	Primary infertility	0.008
	Congenital heart disease	0.072
	Congenital heart disease with infertility	0.079
Klinefelter syndrome	*Asymptomatic*	0.000
	Primary infertility	0.008
	Borderline intellectual disability	0.011
	Borderline intellectual disability with infertility syndrome	0.019
	Mild intellectual disability	0.043
	Mild intellectual disability with infertility	0.051
Other congenital birth defects		
U. Urinary diseases and Male infertility		
Urinary tract infection and interstitial nephritis	*Mild UTI*	0.006
	Moderate UTI	0.051
Benign prostate hyperplasia (BPH)	*Asymptomatic*	0.000
	Symptomatic	0.067
Urolithiasis	*Acute Urolithiasis*	0.114
Male infertility	*Primary Infertility*	0.008
	Secondary Infertility	0.005
Other urinary diseases		
V. Gynaecological diseases		
Uterine fibroids	*Mild abdominal pain due to uterine fibroids, without anemia*	0.011
	Mild abdominal pain due to uterine fibroids, with anemia	0.028
Polycystic ovarian syndrome	*Hyperandrogenism/Hirsutism (Disfigurement, level 1)*	0.011
	Primary infertility due to PCOS	0.008
	Secondary infertility due to PCOS	0.005
Endometriosis	*Infertility, primary*	0.008
	Infertility, secondary	0.005
	Abdominopelvic problem, mild	0.011
	Abdominopelvic problem, moderate	0.114
	Abdominopelvic problem, severe	0.324

Other gynecological diseases	-	-
W. Endocrine, metabolic, blood, and immune disorders		
Hemoglobinopathies and hemolytic anemias	-	-
Other endocrine, metabolic, blood, and immune disorders	*Asymptomatic*	0.019
	Mild	0.145
	Moderate	0.159
	Severe	
X. Oral disorders		
Caries of deciduous teeth/permanent teeth	*Symptomatic caries*	0.010
Periodotal diseases	*Periodontitis*	0.007
Edentulism	*Severe tooth loss*	0.067
Other oral disorders		
Group III: Injuries		
Y. Transport injuries		
Road Injuries	*Amputation of finger(s), excluding thumb: long term, with treatment*	0.005
	Amputation of thumb: long term	0.011
	Amputation of one arm: long term, with or without treatment	0.118
	Amputation of both arms: long term, with treatment	0.123
	Amputation of both arms: long term, without treatment	0.383
	Amputation of toe	0.006
	Amputation of one leg: long term, with treatment	0.039
	Amputation of one leg: long term, without treatment	0.173
	Amputation of both legs: long term, with treatment	0.088
	Amputation of both legs: long term, without treatment	0.443
	Crush injury: short or long term, with or without treatment	0.132
	Dislocation of hip: long term, with or without treatment	0.016
	Dislocation of knee: long term, with or without treatment	0.113
	Dislocation of shoulder: long term, with or without treatment	0.062
	Other injuries of muscle and tendon (includes sprains, strains, and dislocations other than shoulder, knee, or hip)	0.008
	Injured nerves: short term	0.100
	Injured nerves: long term	0.113
	Injury to eyes: short term	0.054
	Severe traumatic brain injury: short term, with or without treatment	0.110
	Concussion	0.214
	Traumatic brain injury: long-term consequences, minor, with or without treatment	0.094

	Traumatic brain injury: long-term consequences, moderate, with or without treatment	0.224
	Traumatic brain injury: long-term consequences, severe,with or without treatment	0.231
	Open wound: short term, with or without treatment	0.006
	Severe chest injury: long term, with or without treatment	0.047
	Severe chest injury: short term, with or without treatment	0.369
	Spinal cord lesion below neck: treated	0.296
	Spinal cord lesion below neck: untreated	0.623
	Spinal cord lesion at neck: treated	0.589
	Spinal cord lesion at neck: untreated	0.732
	Fracture of clavicle, scapula, or humerus: short or long term, with or without treatment	0.035
	Fracture of face bone: short or long term, with or without treatment	0.067
	Fracture of foot bones: short term, with or without treatment	0.026
	Fracture of foot bones: long term, without treatment	0.026
	Fracture of hand: short term, with or without treatment	0.01
	Fracture of hand: long term, without treatment	0.014
	Fracture of neck of femur: short term, with or without treatment	0.258
	Fracture of neck of femur: long term, with treatment	0.058
	Fracture of neck of femur: long term, without treatment	0.402
	Fracture other than neck of femur: short term, with or without treatment	0.111
	Fracture other than neck of femur: long term, without treatment	0.042
	Fracture of patella, tibia or fibula, or ankle: short term,with or without treatment	0.050
	Fracture of patella, tibia or fibula, or ankle: long term, with or without treatment	0.055
	Fracture of pelvis: long term	0.279
	Fracture of pelvis: short term	0.182
	Fracture of radius or ulna: short term, with or without treatment	0.028
	Fracture of radius or ulna: long term, without treatment	0.043
	Fracture of skull: short or long term, with or without treatment	0.071
	Fracture of sternum or fracture of one or two ribs: short term, with or without treatment	0.103
	Fracture of vertebral column: short or long term, with or without treatment	0.111
	Fractures: treated, long term	0.005
Z. Unintentional injuries		
Poisonings	*Poisoning: short term, with or without treatment*	0.163
Falls	Refer Road injuries	

Fires, Heat and Hot Substances	*Burns of <20% total surface area without lower airway burns: short term, with or without treatment*	0.141
	Burns of <20% total surface area or <10% total surface area if head or necks, or hands or wrist involved: long term, with or without treatment	0.016
	Burns of ≥20% total surface area: short term, with or without treatment	0.314
	Burns of ≥20% total surface area or ≥10% total surface area if head or neck, or hands or wrist involved: long term, with treatment	0.135
	Burns of ≥20% total surface area or ≥10% total surface area if head or neck, or hands or wrist involved: long term, without treatment	0.455
	Lower airway burns: with or without treatment	0.376
Drowning	*Drowning and non-fatal submersion: short or long term, with or without treatment*	0.247
Other Unintentional Injuries	Refer Road injuries	
AA. Self-harm and interpersonal violence		
Self-harm	Refer Road injuries	
Interpersonal Violence	Refer Road injuries	

Appendix 5
Overview of disease and injury models & methods

Each disease and injury were calculated using a specific model and method to estimate morbidity (non-fatal burden or YLD). This section provides details on the methods used to calculate prevalence estimates and data sources based on severity for each disease[16]. Disease weights used for each disease sequelae were obtained from GBD 2019[6],[17] as listed in the **Appendix 4**.

Group I: Communicable, maternal, neonatal, and nutritional diseases

A HIV/ AIDS and Sexually transmitted infections

HIV/AIDS

Modelled prevalence estimates produced by the HIV/STI/Hepatitis C Section, Disease Control Division, MOH were used to calculate the burden of HIV/AIDS. HIV/AIDS is divided into three severity levels: symptomatic HIV (37.5%), AIDS with antiretroviral therapy (30.5%), and AIDS without antiretroviral therapy (32.0%). We derived this severity distribution based on the estimated proportion of people living with HIV (PLHIV) with initial CD4 cell count of <350 cells/mm3, as well as the estimated proportion of PLHIV on antiretroviral therapy in Malaysia. The GBD 2019 disability weights were used.

Syphilis

Incidence data for syphilis were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Case numbers from eNotifikasi were inflated to account for underreporting, based on reported estimates that only 10% of symptomatic patients attended clinics and only 20% of these clinic attendees were reported to the MOH. For the sequelae of mild early syphilis, we applied a duration of short-term health loss of 5 weeks. Based on a recent study, we assumed that 8% of all reported cases of syphilis represented adult tertiary syphilis; hence, the corresponding disability weight and proportion was applied to those aged 15 years and above. The GBD 2019 disability weights were used.

Other sexually transmitted infections

Estimation of YLD for other sexually transmitted infections was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

B Respiratory infections and tuberculosis

Tuberculosis

Incidence data for tuberculosis were obtained from eNotifikasi, a notifiable communicable disease surveillance system, via the TB and Leprosy Control Section (Disease Control Division, MOH) who also provided data on TB/HIV co-infection. Case numbers from eNotifikasi were inflated to account for underreporting, based on experts' estimates that approximately 8% of cases are not reported within the Klang Valley. We assumed an average health loss duration of 8 months for each case, and used disability weights from GBD 2019.

Lower respiratory infections

To estimate the incidence of lower respiratory infections (LRIs), nationwide hospital discharge data from the HMIS was used. We assumed that hospitalised cases represented severe cases, thus an overall number of LRI incidents was estimated based on the GBD 2019 severity distribution of 85% moderate and 15% severe cases. The GBD 2019 disability weights were used.

Upper respiratory infections

Data from the NHMS 2022: Maternal and Child Health, a nationally representative population health survey, was used to estimate the incidence of upper respiratory infections (URI) over a 2-week period in children <5 years nationwide. Adjustment factors were then applied to estimate incidence over a 2-week period in other age-sex specific groups based on 2019 population data, and then inflated to attain the estimated annual incidence of URI. The severity distribution from GBD 2019 was used (56% mild and 44% moderate cases) and an average duration of 5 days was assumed for each case. The GBD 2019 disability weights were used.

Otitis media

Prevalence rates for acute and chronic otitis media were obtained from the National Hearing and Ear Disorders Survey 2005 and applied to the 2019 population to attain estimates for the year 2019. We followed the assumptions in GBD 2019 —that all acute otitis media cases would experience ear pain, and that all chronic otitis media cases experience either mild or moderate hearing loss with 2.9% experiencing vertigo and 0.05% severe infectious complications. An average duration of 1 week was assumed for each episode of acute otitis media and 3 months for chronic otitis media. The GBD 2019 disability weights were used.

C Enteric infections

Diarrhoeal diseases

Incidence data for diarrhoeal diseases were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Case numbers from eNotifikasi were inflated in an attempt to estimate the true community incidence. The adjustment factor was derived from the NHMS 2006, a nationally representative population health survey which estimated an annual incidence of self-reported acute diarrhoea of 13.5 million episodes nationwide. We assumed an average duration of 7 days for each episode, and used the GBD 2019 severity distribution of 64.8% mild, 28.9% moderate, and 6.9% severe cases. Disability weights for each severity level were also based on GBD 2019.

Typhoid and paratyphoid

Incidence data for typhoid and paratyphoid fevers were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. We used separate severity distributions for typhoid and paratyphoid from GBD 2019. Typhoid is split into four sequelae: moderate (35.0%), severe (47.75%), severe abdominal pain and distention (17.0%), and intestinal bleeding (0.25%). Similarly, paratyphoid is split into four sequelae: mild (28.5%), moderate (52.25%), severe (14.25%), and abdominal pain and distention (5.0%). We assumed the duration of illness was 14 days for mild or moderate sequelae, and 28 days severe or complicated sequelae. The GBD 2019 disability weights were used.

Other intestinal infectious diseases

Estimation of YLD for Other intestinal infectious diseases was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

D Tropical diseases

Malaria

Incidence data for malaria were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Notifications in eNotifikasi were considered to be a reasonably accurate estimate of the incidence of malaria in Malaysia. Based on previous MBOD reports, we assumed a severity distribution comprising 15%, 68%, and 17% of mild, moderate, and severe cases respectively. We applied an average duration of short-term health loss of 4 weeks. The GBD 2019 disability weights were used.

Dengue

Incidence data for dengue were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Dengue case numbers from eNotifikasi were inflated to adjust for under-reporting, based on the overall expansion factor of 3.79 estimated by Shepard et al18. We used the severity distribution from GBD 2019 of 94.5% moderate and 5.5% severe cases, assuming a duration of 6 and 14 days for moderate and severe cases respectively. We also assumed that 8.4% of symptomatic infections will result in post-acute chronic fatigue with an average duration of 6 months. The GBD 2019 disability weights were used.

Rabies

We did not calculate YLD for rabies as all notified rabies cases in 2019 were fatal (i.e., the DALYs for rabies consisted solely of YLL only).

Other tropical diseases

In view of no reliable source of data to estimate the prevalence of other tropical diseases as well as no death was assigned to this category, we used the YLD as reported by the IHME.

E Other infectious diseases

Meningitis

To estimate the incidence of meningitis, nationwide hospital discharge data from the HMIS was used. As per previous MBOD studies, we assumed that the discharge data only captured approximately 70% of overall nationwide admissions for meningitis, and thus the case numbers were inflated accordingly. We assumed that hospitalised cases represented severe cases of acute meningitis. We estimated long-term sequelae based on Saha et al. (2009) who reported long-term hearing, vision, mental, and psychomotor deficits in 18%, 4%, 41%, and 35% of a cohort of pneumococcal meningitis cases in Bangladesh. Each long-term sequelae were matched to a corresponding health state and disability weight from the WHO's Global Health Estimates GHE 2019.

Diphtheria

Incidence data for diphtheria were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Notifications in eNotifikasi were considered to be a reasonably accurate estimate of the incidence of diphtheria in Malaysia. As per GBD 2019, 70% of cases were presumed moderate, and the remaining 30% severe. We applied an average duration of short-term health loss of 2 weeks. The GBD 2019 disability weights were used.

Whooping cough

Incidence data for whooping cough (pertussis) were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Notifications in eNotifikasi were considered to be a reasonably accurate estimate of the incidence of whooping cough in Malaysia. As per GBD 2019, each estimated pertussis case was considered to be a moderate episode of acute infectious disease, with the corresponding disability weight of 0.051 and average duration of 7 weeks.

Tetanus

Incidence data for tetanus were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Notifications in eNotifikasi were considered to be a reasonably accurate estimate of the incidence of tetanus in Malaysia. As per GBD 2019, all tetanus cases were considered to be severe, acute infections with the corresponding disability weight of 0.133 and average duration of 2 weeks.

Polio

Incidence data for polio were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Notifications in eNotifikasi were considered to be a reasonably accurate estimate of the incidence of polio in Malaysia. As per GBD 1990, all polio cases were assigned a disability weight of 0.369.

Measles

Incidence data for measles were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. Notifications in eNotifikasi were considered to be a reasonably accurate estimate of the incidence of measles in Malaysia. As per GBD 2019, 50% of cases were presumed moderate, and the other 50% severe. We applied an average duration of short-term health loss of 3 weeks. The GBD 2019 disability weights were used.

Viral hepatitis

Incidence data for viral hepatitis were obtained from eNotifikasi, a notifiable communicable disease surveillance system maintained by the Disease Control Division, MOH. We used the GBD 2019 severity distribution for hepatitis B as a proxy for all viral hepatitis infections as the sequelae were identical, assuming that all notified cases were symptomatic (73% moderate and 27% severe cases). Case numbers from eNotifikasi were inflated to account for underreporting, based on reported estimates that only 10.5% of those living with hepatitis B virus infection were diagnosed. The GBD 2019 disability weights were used.

Other unspecified infectious diseases

Estimation of YLD for other unspecified infectious diseases was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

F Maternal disorders

Maternal haemorrhage

The sequelaes for maternal haemorrhage was split according to GBD 2019; maternal haemorrhage with less than one litre blood loss, maternal haemorrhage with one litre or more blood loss, and anaemia due to maternal haemorrhage[6]. Data for maternal haemorrhage was retrieved from HMIS, and adjusted to include hospital admissions from both public and private sectors in Malaysia. Total hospital admissions in 2019 consist of 70.4% from public hospitals compared to 29.6% from private hospitals[19]. To calculate the nonfatal burden, the proportions applied for maternal haemorrhage with less than one litre blood loss was 98% with 7 days duration. For maternal haemorrhage with one litre or more blood loss, it was 2% with 14 days duration[6,20]. To calculate anaemia due to maternal haemorrhage, we used prevalence data on anaemia in pregnancy from NHMS 2022: Maternal and Child Health[21] and applied to total number of live births in Malaysia, 2019 from DOSM. Proportions applied for anaemia impairment was 58% (mild), 39% (moderate), and 3% (severe), according to IHME GBD data for Malaysia on anaemia due to maternal haemorrhage. The final nonfatal burden was calculated by applying disability weights from GBD 2019.

Maternal sepsis and other maternal infections

Similar to GBD 2019, the nonfatal burden for maternal sepsis and other maternal infections were estimated separately[6]. Both data sources were retrieved from the HMIS and were adjusted to include the number of hospital admissions from both public and private sectors. According to Khazanah Research Institute, 70.4% of total hospital admissions were in public hospitals compared to 29.6% in private hospitals in general for the year 2019[19]. For both data, the incidence output was applied to a duration of 7 days and 30 days to get the prevalence estimates. For puerperal sepsis, 9% were assumed to develop secondary infertility due to puerperal sepsis. The sequelae were later applied to GBD 2019 disability weigth to get the final nonfatal burden.

Maternal hypertensive disorders

The prevalence of Hypertensive Disorders of Pregnancy (HDoP) was obtained from NHMS 2022. The rate was applied to numbers of live births in Malaysia, 2019. We follow previous MBOD methods, assuming 2% of HDoP leads to severe pre-eclampsia and 62% of severe pre-eclampsia will develop long-term sequela. For eclampsia, the incidence was drawn from HMIS data. We assumed that 70.4% of total hospital admissions were in public hospitals compared to 29.6% in private hospitals in general (Khazanah Research Institute), and data was adjusted to include both public and private sectors in

Malaysia[19]. We follow GBD 2019's proportion of long-term sequelae of eclampsia (11%). The disability weights from GBD 2019 were used.

Maternal obstructed labour and uterine rupture

In 2019, 70.4% of total hospital admissions were in public hospitals compared to 29.6% in private hospitals in general[19]. For maternal obstructed labour and uterine rupture, data from HMIS was used after adjusting it to include all hospital admissions in Malaysia. We assume obstetric fistula occurs in 0.29 per 1000 live births[22].Proportions for each fistula impairment follow GBD 2019; vesicovaginal fistula (90.8%) and rectovaginal fistula (9.2%). The prevalence was calculated assuming incident cases have acute disability that persist for an average of five days duration (GBD 2019). Disability weights from GBD 2019 were used.

Maternal abortion and miscarriage

Data from the HMIS was retrieved and adjusted to include private hospital admissions[19]. Our data were still very low as compared to the IHME's estimates for Malaysia (around 95 thousand cases) due to the expected under-reporting of abortions in Malaysia. Moreover, the Reproductive Rights Advocacy Alliance Malaysia (RRAAM) estimated 100, 000 abortions were sought out yearly in Malaysia. Because of these reasons, we re-adjusted the data to fit the estimations. The prevalence was calculated assuming incident cases have acute disability that persist for an average duration of three days (GBD 2019). Disability weight from GBD 2019 was used.

Ectopic pregnancy

In 2019, 70.4% of total hospital admissions were in public hospitals compared to 29.6% in private hospitals in general[19]. For ectopic pregnancy, data from HMIS on ectopic pregnancy was used after adjusting it to include all hospital admissions in Malaysia. The prevalence was calculated assuming incident cases have acute disability that persist for an average of three days (GBD 2019). Disability weight from GBD 2019 was used.

Other maternal disorder

Estimation of YLD for other maternal disorders was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

G Neonatal conditions

Neonatal preterm birth

The prevalence for Neonatal preterm birth in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data under 1 year of MBOD 2019. The sequelae, severity proportion, disability weights and combined disability weights from GBD 2019 was used. The sequelae for neonatal preterm birth were of following groups: mild, moderate and severe motor impairment, mild motor plus cognitive impairments, moderate/severe motor impairment and epilepsy, moderate/severe motor impairment and blindness, moderate/severe motor impairment, blindness and epilepsy, moderate/severe motor impairment with cognitive impairment and blindness, moderate/severe motor impairment with cognitive impairment and epilepsy, moderate/severe motor impairment with cognitive impairment, blindness and epilepsy, mild, moderate and severe retinopathy of prematurity and, retinopathy of prematurity with blindness.

Birth asphyxia and trauma

The prevalence for Birth asphyxia and trauma in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data under 1 year of MBOD 2019. The sequelae, severity proportion, disability weights and combined disability weights from GBD 2019 was used. The sequelae for birth asphyxia and trauma were of following groups: mild, moderate and severe motor impairment, mild motor plus cognitive impairments, moderate/severe motor impairment and epilepsy, moderate/severe motor impairment and blindness, moderate/severe motor impairment, blindness and epilepsy, moderate/severe motor impairment with cognitive impairment and blindness, moderate/severe motor impairment with cognitive impairment and epilepsy, moderate/severe motor impairment with cognitive impairment, blindness and epilepsy, and distance vision blindness.

Neonatal sepsis and other neonatal infections

The prevalence for Neonatal sepsis and other neonatal infections in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data under 1 year of MBOD 2019. The sequelae, severity proportion, disability weights and combined disability weights from GBD 2019 was used. The sequelae for neonatal sepsis and other neonatal infections were of following groups: mild, moderate and severe motor impairment, mild motor plus cognitive impairments, moderate/severe motor impairment and epilepsy, moderate/severe motor impairment and blindness, moderate/severe motor impairment, blindness and epilepsy, moderate/severe motor impairment with cognitive impairment and blindness, moderate/severe motor impairment with cognitive impairment and epilepsy, and moderate/severe motor impairment with cognitive impairment, blindness and epilepsy.

Hemolytic disease and other neonatal jaundice

The prevalence for Hemolytic disease and other neonatal jaundice in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data under 1 year of MBOD 2019. The sequelae, severity proportion, disability weights and combined disability weights from GBD 2019 was used. The sequelae for hemolytic disease and other neonatal jaundice were of following groups: Extreme hyperbilirubinemia due to hemolytic disease and other neonatal jaundice, without kernicterus, moderate and severe motor impairment, moderate/severe motor impairment and epilepsy, moderate/severe motor impairment and blindness, moderate/severe motor impairment, blindness and epilepsy, moderate/severe motor impairment with cognitive impairment and blindness, moderate/severe motor impairment with cognitive impairment and epilepsy, and moderate/severe motor impairment with cognitive impairment, blindness and epilepsy.

Other neonatal disorders

Estimation of YLD for other neonatal disorders was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

H Nutritional deficiencies

Protein-energy malnutrition

The prevalence for Protein Energy Malnutrition was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, duration of 1 year and mortality rate. The disability weights from GBD 2019 were used.

Iron deficiency anaemia

The prevalence and severity of Iron deficiency anaemia were determined by data obtained in the NHMS 2019. The disability weights from GBD 2019 were used.

Iodine deficiency

The prevalence of Iodine deficiency disorder was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, incidence and mortality of 0. The disability weights from GBD 2019 were used.

Other nutritional deficiencies

Estimation of YLD for other nutritional deficiencies was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

Group II: Non-communicable diseases

I Neoplasms

The prevalence for neoplasms was obtained from incidence and 5-year prevalence estimates reported by Global Cancer Observatory, International Agency for Research of Cancer for Malaysia. The neoplasms were grouped by the ICD-10 codes, and country-year specific data was obtained. We used DisMod II to derive better estimates, by using inputs of prevalence, incidence and mortality rate. The number of cases for stage III and stage IV cancer, as reported in the Malaysia National Cancer Report 2012-2016, were used as the number of terminal cases of cancer. Where data was not available, literature review was used to determine the percentage of terminal cases. The disability weights from GBD 2019 were used.

Estimation of YLD for other neoplasms was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

J Cardiovascular diseases

Rheumatic heart disease

DisMod II was used to produce better estimates for Malaysia using the following inputs: Prevalence of rheumatic heart disease retrieved from IHME's GBD data for Malaysia, mortality estimates from MBOD 2019 and remission was set to be 0.2. Incidence data from HMIS was not used as the hospital admission data on rheumatic heart disease was very low and was believed to not truly reflect the prevalence of the disease in Malaysia. The prevalence output of rheumatic heart disease was split into two sequelaes; rheumatic heart disease without heart failure (98%) and rheumatic heart disease with heart failure (2%). Proportions for each heart failure impairment are; mild heart failure due to rheumatic heart disease (19%), moderate heart failure due to rheumatic heart disease (12%), severe heart failure due to rheumatic heart disease (33%), controlled medically managed heart failure due to rheumatic heart disease (37%). Disability weights from GBD 2019 were applied for each sequelaes to get the final nonfatal burden.

Ischaemic heart disease

There have been no substantive changes in the modelling strategy for myocardial infarction, angina pectoris and heart failure following myocardial infarction due to ischaemic heart disease from the previous MBOD studies. The starting point for this condition was assumed to be acute myocardial

infarction (AMI) or angina pectoris. Although these two conditions relate to the same disease process, we model them independently due to insufficient data to do otherwise. The incidence of AMI was obtained from HMIS data. The incidence of angina pectoris was estimated to be 1.5 times that of AMI. We assumed that angina pectoris has recurring symptoms until death, with possible remission from treatment and that AMI results in one of the following: death, heart failure, new or continuing angina pectoris, or recovery with no residual disability. We used DisMod II to derive prevalence estimates, by using inputs of incidence, remission rates as in the previous MBOD study and mortality rates. We assume 50% receive treatment of AMI and that 15% get heart failure following AMI. The disability weights from GBD 2019 were used to get the composite disability weights for all sequelaes. We updated the severity distributions for angina pectoris according to the Belgian Burden of Disease Study 202323 whereas severity distributions for heart failure were derived from IHME's GBD data for Malaysia on heart failure due to ischaemic heart disease.

Stroke

DisMod II was used to produce better estimates for Malaysia with the following inputs; incidence of stroke from HMIS, mortality estimates from MBOD 2019 and remission was set to zero. Severity distributions which were taken from Belgian Burden of Disease Study 2023, with the following proportion; asymptomatic (19%), mild (25%), moderate (15%), moderate plus cognition problems (20%), severe (10%), severe plus cognition problems (12%). Composite disability weights were used on all sequelaes, taken from GBD 2019 chronic stroke disability weights. We also updated the disease according to its causes using the following proportions; ischaemic stroke (57%), intracranial haemorrhage (36%), and subarachnoid haemorrhage (7%).

Hypertensive heart disease

DisMod II was used to produce better estimates for Malaysia using the following inputs: Prevalence of hypertensive heart disease retrieved from IHME's GBD data for Malaysia, mortality estimates from MBOD 2019 and remission was set to 0 for all ages. Incidence data from HMIS was not used as the hospital admission data on hypertensive heart disease was very low and was believed to not truly reflect the prevalence of the disease in Malaysia. Proportion of heart failure due to hypertensive heart disease was 100%, as all deaths due to these causes involve heart failure (GBD 2019). Following methods describe in GBD 2019, the final prevalence estimates of heart failure due to hypertensive heart disease was split into four sequelaes with the following proportions: mild heart failure due to hypertensive heart disease (0.19), moderate heart failure due to hypertensive heart disease (0.12), severe heart failure due to hypertensive heart disease (0.33), controlled medically managed heart failure due to hypertensive heart disease (0.37). Disability weights from GBD 2019 were applied for each sequelaes to get the final nonfatal burden.

Non-rheumatic valvular heart disease

We used DisMod II to derive better estimates for Malaysia using the following inputs; incidence of non-rheumatic valvular heart disease from HMIS, mortality estimates from MBOD 2019 and remission was set to zero. The prevalence output was split into three causes; non-rheumatic calcific aortic valve

disease (16%), non-rheumatic degenerative mitral valve disease (83%), and other non-rheumatic valve diseases (1%). The proportions for each cause with heart failures were 12%, 9%, and 100% respectively. Heart failure impairment severity splits were calculated with the following proportions; mild heart failure (19%), moderate heart failure (12%), severe heart failure (32%), controlled medically managed heart failure (37%). Disability weights from GBD 2019 were applied for each sequelaes to get the final nonfatal burden. Composite disability weights were used for the heart failure impairments.

Cardiomyopathy and myocarditis

We used DisMod II to derive better estimates for Malaysia using the following inputs; incidence of cardiomyopathy and myocarditis from HMIS, mortality estimates from MBOD 2019 and remission was set to zero. The prevalence output was split into three causes; myocarditis (7%), alcoholic cardiomyopathy (1%), and other cardiomyopathy (91%). Myocarditis was further split into acute myocarditis (53%) and heart failure due to myocarditis (47%). For heart failure due to alcoholic cardiomyopathy and other cardiomyopathy, the proportion was set to 100%, as all deaths due to these causes involve heart failure (GBD 2019). Heart failure impairment severity splits were calculated with the following proportions; mild heart failure (19%), moderate heart failure (12%), severe heart failure (32%), controlled medically managed heart failure (37%). Disability weights from GBD 2019 were applied for each sequelaes to get the final nonfatal burden. Composite disability weights were used for the heart failure impairments.

Atrial fibrillation and flutter

DisMod II was used to estimate the prevalence of atrial fibrillation and flutter using the following inputs; incidence of atrial fibrillation and flutter retrieved from HMIS, remission was set to 0, and mortality estimates from MBOD 2019. We assume that all hospital admissions are due to symptomatic cases that warrant hospital admission, which results in a proportion of 1.0 (100%) for the sequelae symptomatic atrial fibrillation and flutter. The output was applied to GBD 2019's disability weight to get the final nonfatal burden.

Peripheral arterial disease

We did not use inpatient hospital data, as peripheral arterial disease is expected to be rare in inpatient data but common in outpatient data as it is a condition usually managed on an outpatient basis, except for specific surgical interventions. We used DisMod II to produce better prevalence estimates for Malaysia using the following inputs; prevalence of peripheral arterial disease retrieved from IHME's GBD data for Malaysia, mortality estimates (MBOD 2019), and remission was set to zero for all ages. Prevalence output was applied to the proportion of (symptomatic) claudication due to peripheral arterial disease (0.33), and subsequently disability weight from GBD 2019 to get the final nonfatal burden.

Endocarditis

DisMod II was used to estimate the prevalence of endocarditis using the following inputs; incidence of endocarditis retrieved from HMIS, remission was set to 12 (GBD 2019) and mortality data from MBOD estimates for 2019. The output was split into sequelaes with the following proportions; acute moderate endocarditis (0.05), acute severe endocarditis (0.03), mild heart failure due to endocarditis (0.16), moderate heart failure due to endocarditis (0.10), severe heart failure due to endocarditis (0.27), treated heart failure due to endocarditis (0.31). Disability weights used were from GBD 2019.

Other cardiovascular and circulatory diseases

Estimation of YLD for other cardiovascular and circulatory diseases was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

K Chronic respiratory diseases

Chronic obstructive pulmonary disease (COPD)

Prevalence for COPD was based on data from the Malaysian arm of the Burden of Obstructive Lung Disease (BOLD) Study[24], which was applied to the 2019 estimated population to obtain 2019 prevalence estimates. Nationwide hospital discharge data with COPD-related diagnoses in 2019 obtained from the HMIS were used to determine age group- and sex-specific prevalence estimates. Severity distributions were based on the Scottish Burden of Disease Study 2016, and disability weights from GBD 2019 were used.

Asthma

Prevalence for asthma was based on data from the NHMS 2011, which was applied to the 2019 estimated population to obtain 2019 prevalence estimates. Nationwide hospital discharge data with asthma-related diagnoses in 2019 obtained from the HMIS were used to derive age group- and sex-specific prevalence estimates. Severity distributions were based on the ASCOPE study in Malaysia, in which 28% reported no symptoms in the last four weeks and the remainder were split into different levels of asthma control to be consistent with sequelae listed in GBD 2019. The disability weights from GBD 2019 were used.

Interstitial lung disease and pulmonary sarcoidosis

Prevalence estimates for interstitial lung disease and pulmonary sarcoidosis were based on nationwide hospital discharge data in 2019 obtained from the HMIS. Assuming that hospitalised cases represented severe disease, we derived prevalence estimates for the other health states by

extrapolating these numbers based on the severity distribution from GBD 2013 (asymptomatic 23.9%, mild 55.0%, moderate 16.0%, and severe 5,1%). The disability weights from GBD 2019 were used.

Other chronic respiratory diseases

Estimation of YLD for other chronic respiratory diseases was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

L Digestive diseases

Upper digestive system diseases

The prevalence for upper digestive system diseases in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better prevalence estimates, by using inputs of prevalence, remission of 0.5 and mortality rate referring to calculation from mortality data of MBOD 2019. The upper digestive system diseases comprise of peptic ulcer disease and gastro-esophageal reflux disease (GERD). We assumed that the proportion for peptic ulcer disease is 5.9%, and GERD is 66.2%. We assumed that the proportion of the severity for symptomatic peptic ulcer is 50% mild, 33% moderate. The sequelae and disability weights from GBD 2019 were used.

Appendicitis

The prevalence for appendicitis in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better prevalence estimates, by using inputs of prevalence, duration of 2 weeks and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 were used.

Cirrhosis and other chronic liver diseases

The prevalence for cirrhosis and other chronic liver diseases in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data of MBOD 2019. We assumed that decompensated cirrhosis of the liver occurred in 0.16% of male and 0.10% of female, with 29.2% complicated with anemia whereby severity of anemia is 50% mild, 33% moderate, and 17% severe. The sequelae and disability weights from GBD 2019 were used.

Paralytic ileus and intestinal obstruction

The prevalence for paralytic ileus and intestinal obstruction in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better prevalence estimates, by using

inputs of prevalence, duration of 2 weeks and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 were used.

Inguinal, femoral, and abdominal hernia

The prevalence of inguinal, femoral and abdominal hernia in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, duration of 5 weeks and mortality data. The disability weights from GBD 2019 were used.

Inflammatory bowel diseases

The prevalence of inflammatory bowel diseases in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, zero remission and mortality data. The disability weights from GBD 2019 were used, while the proportion of 68.6% and 31.4% for Ulcerative Colitis and Crohn's Disease respectively, based on two local studies25,26.

Vascular intestinal disorders

The prevalence of vascular intestinal disorder in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 2, duration of 4 weeks and mortality data. The disability weights from GBD 2019 were used.

Gallbladder and biliary diseases

The prevalence of gallbladder biliary diseases in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 8, duration of 6 weeks and mortality data. The disability weights from GBD 2019 were used.

Pancreatitis

The prevalence of pancreatitis in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 8, duration of 6 weeks and mortality data. The disability weights from GBD 2019 were used.

Other digestive diseases

Estimation of YLD for other digestive diseases was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

M Neurological disorders

Alzheimer's disease and other dementias

There is a lack of data in Malaysia for neurological disorders. The prevalence of Alzheimer's disease and other dementias was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates by using inputs of prevalence, zero remission, and RR mortality of 1.6. The disability weights from GBD 2019 were used. The severity distribution was taken from GBD 2015: age <70 (79% mild, 17% moderate, 4% severe), age 70-79 (71% mild, 19% moderate, 9% severe) and age 80+ (61% mild, 26% moderate, 12% severe).

Parkinson's disease

The prevalence of Parkinson's disease was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, zero remission and COD mortality rate in Malaysia, 2019. The proportions (53% mild, 33% moderate and 12% severe) and disability weights from GBD 2019 were used.

Idiopathic epilepsy

The prevalence of Idiopathic epilepsy was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 0.25 (aged up to 60) and 0.05 (aged >60) and COD mortality rate in Malaysia, 2019. The disability weights from GBD 2019 were used. The proportions were taken from Belgium National BOD Study (31.1% severe, 21.5% less severe, 47.3% epilepsy treated without fits)[23].

Multiple sclerosis

The prevalence of multiple sclerosis was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 0 and mortality rate of 0. The proportions (38% mild, 28% moderate, and 12% severe) and disability weights from GBD 2019 were used.

Other neurological disorders

Estimation of YLD for other neurological disorders was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

N Mental disorders

Schizophrenia

There is a lack of data in Malaysia for mental disorders. The prevalence of Schizophrenia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, zero remission and COD mortality rate in Malaysia 2019. The proportion and disability weight from GBD 2019 were used. We used a proportion of severity levels as in GBD2019: 63% acute and 37% residual state.

Depressive disorders

The prevalence of depressive disorders was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 1.45 and COD mortality rate 2019. Since the duration period of 0.65 years was obtained from GBD 2019, the incidence of schizophrenia was used for YLD calculation. The proportion and disability weight from GBD 2019 were used. We used a proportion of severity levels as in GBD2019: 59% mild, 17% moderate, and 10% severe.

Bipolar disorder

The prevalence of bipolar disorders was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 0.05 and COD mortality rate 2019. The proportion and disability weight from GBD 2019 were used. We used a proportion of severity levels as in GBD2019: 18.7% manic, 31.7% depressive, and 49.5% residual.

Anxiety disorders

The prevalence of anxiety disorders was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 0.2 and RR mortality of 1. Since the duration period of 0.422 years was obtained in the previous study by Ten Have et al27, the incidence of schizophrenia was used for YLD calculation.The proportion and disability weight from GBD 2019 were used. We used a proportion of severity levels as in GBD2019: 39.3% mild, 19.1% moderate and 12.7% severe.

Autism spectrum disorders

The prevalence of autism spectrum disorders was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, zero remission and mortality. The proportion and disability weight from GBD 2019 were used. We used proportion of severity levels as in GBD2019: ASD with 1) no ID, 42.8%; 2) borderline ID, 18.7%; 3) mild ID,18.0%; 4) moderate ID,13.3% 5) severe ID,5.7%; and 6) profound ID, 1.4%.

Attention-deficit/hyperactivity disorder

The prevalence of Attention-deficit/hyperactivity disorder was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, zero remission and mortality. The adjusted proportion of 28% with disability and disability weight from GBD 2019 were used.

Other mental disorders

In view of no reliable source of data to estimate the prevalence of other mental disorders as well as no death was assigned to this category, we used the YLD as reported by the IHME.

O Substance use disorders

Alcohol use disorders

YLDs for alcohol use disorders were alcohol dependence and fetal alcohol syndrome. The prevalence of alcohol dependence was obtained from the NHMS 201928. The proportion and disability weight from GBD 2019 were used: 58.6% very mild 58.6%, 3.8% mild, 3.3% moderate, and 2.4% severe. Incidence of fetal alcohol syndrome was obtained from HMIS data which captures hospital discharge data. We assumed that 70% of hospital data was into government hospitals and data was blown up to include the private and other hospitals in Malaysia. We used DisMod II to derive better prevalence estimates, by using inputs of incidence, remission of 0 and Malaysian COD mortality data 2019. The disability weights from GBD 2019 were used and the proportion of fetal alcohol syndrome were 22.2% mild, 24.7% modetare, and 25.1% severe[16].

Drug use disorders

YLDs for drug use disorders were opioid, cocaine, amphetamine, cannabis and others. The prevalence of drug use disorders was obtained from the NHMS 2017 (aged 13-17 years) and NHMS 201928 (aged 18 years and above). The proportions of each drug use disorder were obtained from literature: 7% opioid, 13% cocaine, 18% amphetamine, 21% cannabis, and 40% other drugs29. The proportion and disability weight from GBD 2019 were used: opioid (37% mild, 47% severe), cocaine (25% mild, 25% severe), amphetamine (19% mild, 26% severe), cannabis (36% mild, 6% severe).

P Diabetes and kidney diseases

Diabetes mellitus

We used DisMod II to generate prevalence estimates for diabetes mellitus using the following inputs; Incidence was set to 0 (for age 0 to 1) and 0.1 (for age 1+), prevalence estimates were taken from NHMS 2019[28], remission of 0 (for age 0 to 14) and 0.01 (for age 15+), and mortality data derived

from DOSM. The nonfatal burden for diabetes was calculated for each sequela (uncomplicated, retinopathy, neuropathy, and nephropathy) using proportions and disability weights from the previous MBOD studies.

Chronic kidney disease

We used DisMod II to generate prevalence estimates for chronic kidney diseases by gender and age. Inputs used for were as follow; Prevalence rates of CKD (Stage I to V) obtained from a Malaysian national CKD study in 2018[30], remission was set to 0 for all ages, CKD mortality rates estimated from MBOD 2019. Due to limited information resources, CKD was split into five sequelaes (CKD Stage III, Stage IV, Stage V, Stage V on dialysis, and Stage V with kidney transplant). Proportion for Stage III (6.48%) and Stage IV and V (0.33%) were based on the 2018 national CKD study. Proportion for Stage V (96.2% on dialysis and 4% with kidney transplant) were calculated from the National Renal Registry 2019. Disability weights used were from GBD 2019.

Acute glomerulonephritis

We used DisMod II to estimate the prevalence for acute glomerulonephritis by gender and age. Inputs used were as follows; prevalence from IHME, remission of 3 weeks, and mortality rates estimated from Malaysian Burden of Diseases study, 2019. Disability weights used were from GBD 2019.

Q Skin and subcutaneous diseases

Dermatitis

There is inappropriate data souce for Dermatitis in Malaysia[31]. We estimate burden separately for atopic dermatitis, contact dermatitis, and seborrhoeic dermatitis using incidence data from IHME. We used the disease weight as in GBD 2019. Since the skin disease are an acute episode (instead of chronic conditions), we assumed the duration of illness for 2 months (2/12). According to Barbarot et al. (2024) the distribution for atopic dermatitis were 23.6% mild, 74% moderate and 2.4% severe[32]. Severity was based on previous study with 50% mild and 8% moderate for contact dermatitis; and 45% asymptomatic or 55% symptomatic for seborrhoeic dermatitis.

Psoriasis

Data from the Malaysian Psoriasis Registry (MPR) were used to generate the severity proportion for psoriasis. The severity was assessed using the psoriasis area and severity index (PASI) score[33]. Mild disease was defined as PASI < 3 and moderate as PASI score 3 – 10. Severe psoriasis was defined as PASI ≥ 10 [34]. PASI was only collected from 2020 onwards for all patients, prior to that it was done for patients receiving biological treatment only. According to the MPR data, the distribution of severity for male was 31% mild, 55% moderate and 14% severe; while the severity distributions for female were 37% mild, 51% moderate and 12% severe. According to Australia Burden of Disease Study, psoriasis duration was 12 months[35]. We used the input of incidence from IHME. DW was obtained from GBD2019.

Bacterial skin diseases

Bacterial skin diseases were contributed mainly from the cellulitis and pyoderma. Both data were obtained from IHME incidence. The proportion of severity for Cellulitis were adapted from the Belgian context of 50% mild, 30% moderate and 20% severe. According to GBD2019, the duration for cellulitis was 1 month (1/12). For Pyoderma, all impetigo and abscesses were calculated using the DW and duration of 6 weeks from GBD 2019 (6/52).

Scabies

There is no available data source for scabies in Malaysia. Using DisMod, we generate incidence for age group 0-4 years using the input of prevalence from Zayyid 2010, remission of 2.5 from GBD2019 and zero mortality. According to Zayyid 2010, the prevalence of scabies was 24% in age group 4 - 6 years, 44% in age group 7 - 9 years and 46% in age group 10 - 12 years old[36,37]. The ratio was applied to the others age group incidence from IHME. In Australian Burden of Disease Study 2018, the duration of scabies was 4.5 months (4.5/12)[35]. DW was obtained from GBD2019.

Fungal skin diseases

There is no available data source for Fungal skin diseases in Malaysia. The IHME data for Malaysia was used as the incidence input. We used the disease weight as in GBD 2019. Since the viral skin disease are an acute episode (instead of chronic conditions), we assumed the duration of illness for 2 month (2/12). Other skin diseases were distributed according to previous MBOD: 55% mild and 45% asymptomatic.

Viral skin diseases

There is no available data source for Viral skin diseases in Malaysia. The IHME data for Malaysia was used as the incidence input. We used the disease weight as in GBD 2019. Since the viral skin disease are an acute episode (instead of chronic conditions), we assumed the duration of illness for 2 month (2/12).

Acne vulgaris

There is no available data source for acne vulgaris in Malaysia. We used Dismod to derive better estimates of incidence, by using input of incidence from IHME, remission of 0.38 from GBD2019 and zero mortality. Severity distribution were according to Muthupalaniappen, L. et al, 2014: 55.7% with clear complexion, 35.0% mild, 7.7% moderate and 1.6% severe[38]. According to Australian Burden of Disease Study 2018, acne vulgaris was chronic conditions and its duration was applied for the whole year (12 months). According to GBD2019, zero incidence was set for ages between 0 and 6, and 61 and 100.

Alopecia areata

There is no available data source for alopecia areata (AA) in Malaysia. We use incidence estimates from IHME data for Malaysia. According to a systematic review, episodes of AA last less than six months in the majority of patients. Thus, we considered the duration as five months (5/12); referring to minimum duration of three months[39]. Severity distribution was also obtained from the similar study; 62% mild and 38% severe. DW was obtained from GBD2019.

Other skin and subcutaneous diseases

There is no available data source for Other skin and subcutaneous diseases in Malaysia. The IHME data for Malaysia was used as the incidence input. We used the disease weight as in GBD 2019. Since the Other skin and subcutaneous diseases are an acute episode (instead of chronic conditions), we assumed the duration of illness for 2 month (2/12)[35,40].

R Sense organ diseases

Blindness and vision loss

YLDs for blindness and vision loss were glaucoma, cataract, age-related macular degeneration and refraction disorders. The prevalence of glaucoma, cataract, age-related macular degeneration and refraction disorders was obtained from the National Eye Survey II (aged 50 years and above). These figures were then extrapolated across various age groups in accordance with prevalence estimates from IHME. We used DisMod II to derive better estimates, utilising inputs of prevalence, zero mortality, zero remission for glaucoma and age-related macular degeneration, and remission of 1 for cataract and refractive disorders. The proportions of the severity for each disease were sourced from NES II: glaucoma (42% moderate, 17% severe, 41% blindness), cataract (74% moderate, 12% severe, 14% blindness), age-related macular degeneration (80% moderate, 20% severe), and refraction disorder (97% moderate, 3% severe)[41]. Disability weights from GBD 2019 were used.

Age-related and other hearing loss

There is a lack of data in Malaysia for age-related and other hearing loss. The prevalence of age-related and other hearing loss was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates for prevalence of mild, moderate severe, and profound hearing loss, by using inputs of prevalence, zero remission and mortality. The disability weight from GBD 2019 and proportion from Belgian National Burden of Disease (De Pauw et al, 2023) were used: hearing loss (71.7% mild, 15.9% moderate, 4.6% moderately severe, 0.7% severe, 0.7% profound, and 0.7% complete) and hearing loss with ringing (4.4% mild, 1% moderate, 0.3% moderately severe, less than 0.1% severe, profound and complete).

Other sense organ diseases

In view of no reliable source of data to estimate the prevalence of other sense organ disorders, as well as the very few deaths assigned to this category, we used the YLD as reported by the IHME.

S Musculoskeletal disorders

Rheumatoid arthritis

There is a registry of rheumatoid arthritis in Malaysia, Malaysian National Inflammatory Arthritis Registry (MyNIAR). However, we decided not to use the registry as it only captures data from MOH hospital with rheumatology service[42]. It may also under reporting due to no data from private and university hospitals. The situation also applied to the inpatient discharged data from the Health Informatic Centre, Planning Division. According to MyNIAR, there are no cases under 10 years old in Malaysia[43]. DisMod model was used using the input of prevalence estimate from IHME, remission of 0.002 for ages up to 65 and 0.05 for ages 65+ (GBD 2019) and mortality rate of zero. We used the proportion of severity levels as in GBD 2019: 48.8% mild, 37.6% moderate and 12.2% severe.

Osteoarthritis

There is no registry for osteoarthritis in Malaysia. Prevalence estimates for osteoarthritis was obtained from IHME data for Malaysia. DisMod model was used using input of prevalence estimates from IHME, zero remission and zero mortality. We used proportion of severity levels as in GBD 2019: 74.3% mild, 24.3% moderate and 1.1% severe. GBD 2019 assumption was no incidence or prevalence of OA before the age of 30 years.

Low back disorders

There is no registry or reliable sources for low back pain (LBP) in Malaysia. Based on the National Institute of Neurological Disorders and Stroke, the duration of LBP is estimated to reach 6 months (0.5 years)[44,45]. We used DisMod to derive better estimates, by using input of prevalence estimates from IHME, duration of 0.5 and zero mortality. GBD 2019 assumption was no incidence or prevalence of low back pain before the age of 5 years. The severity distribution and proportion of LBP with leg pain were from GBD 2019. The severity distribution of LBP without leg pain was 41% mild, 35 % moderate, 10% severe and 14% most severe, while for the LBP with leg pain was 27% mild, 36% moderate, 14% severe and 23% most severe. The proportion of LBP cases with leg pain were divided according to the age group as follow: 5-14 years (10%), 15-29 years (23%), 30-44 years (33%), 45-59 years (36%), 60-69 years (37%), 70-79 years (36%) and 80 years and above (26%).

Cervical disc disorders

There is no registry or reliable sources for neck pain in Malaysia. Based on the National Institute of Neurological Disorders and Stroke, the duration of neck pain is estimated to reach 6 months (0.5 years). Due to the short duration, the calculation of YLD for neck pain was based on the number of incidence cases instead of prevalence cases (ie: YLD = Incidence x Duration x DW). We used DisMod to derive better estimates, by using input of prevalence estimates from IHME, zero remission and zero mortality. We used DW and proportion from the GBD2019: 67% mild, 12% moderate, 6% severe and 15% most severe. GBD 2019 assumption was no incidence or prevalence of neck pain before the age of 5 years.

Other musculoskeletal disorders

There is no reliable data source to estimate the prevalence or incidence of Other musculoskeletal diseases. We applied the YLD/YLL ratio by age group from the previous study to the YLL for Malaysia to estimate the YLD.

T Congenital birth defects

Down syndrome

The prevalence for Down Syndrome in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 was used. The proportion for each sequela was according to the Scottish Burden of Disease Study 2016[46].

Congenital heart anomalies

The prevalence for congenital heart disease in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality data. We assumed that heart failure occurred in 6% of children with congenital heart disease and 25% in adults, with 58.2% mild heart failure, 36.3% moderate heart failure and 5.5% severe heart failure (GBD 2015). The proportion of severity for each type of congenital heart disease with each disabling sequela was according to GBD 2017 congenital heart disease. The disability weights from GBD 2019 were used.

Turner syndrome

The prevalence for turner syndrome in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 was used. The proportion for each sequela was according to

the Scottish Burden of Disease Study 2016[46]. Because turner syndrome only affects females, YLDs were calculated for females only.

Klinefelter syndrome

The prevalence for klinefelter syndrome in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 was used. The proportion for each sequela was according to the Scottish Burden of Disease Study, 2016. Because klinefelter syndrome only affects males, YLDs were calculated for males only.

Other chromosomal abnormalities

Estimation of YLD for other chromosomal abnormalities was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

Orofacial cleft

The prevalence for orofacial clefts in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, remission and mortality rate referring to calculation from mortality data of MBOD 2019. Remission was set to zero for the first three months of life. A maximum remission of 0.8 was set for ages three months to two years. Remission was bounded from 0 to 0.07 for ages 2 to 5 years, 0 to 0.004 for ages 5 to 20 years, then bounded from 0 to 0.002 for ages 20 to 50 years and set at 0 for ages 50 years+ (GBD 2015). The sequelae and disability weights from GBD 2019 was used. The proportion for each sequela was according to the Scottish Burden of Disease Study 2016[46].

Neural tube defects (spina bifida & anencephaly)

The prevalence for neural tube defects (spina bifida & anencephaly) in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive prevalence estimates, by using inputs of prevalence, zero remission and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 was used. The proportion for each sequela was according to the Scottish Burden of Disease Study 2016[46].

Other congenital birth defects

Estimation of YLD for other congenital birth defects was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

U Urinary diseases and male infertility

Urinary tract infection and interstitial nephritis

The prevalence for Urinary tract infection and interstitial nephritis in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better prevalence estimates, by using inputs of prevalence, duration of 1 week and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 were used. We used a proportion of severity levels as in GBD 2019: 36.2% mild, 63.8% moderate.

Benign prostate hyperplasia

The prevalence for benign prostate hyperplasia in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better prevalence estimates, by using inputs of prevalence, remission of 0 for age 0-40 years old & 0.1 remission for age after 40, and mortality rate referring to calculation from mortality data of MBOD 2019. The sequelae and disability weights from GBD 2019 were used. We used the proportion of severity levels as in GBD 2019: 67.3% asymptomatic, 32.7% symptomatic. Because benign prostate hyperplasia only affects males, YLDs were calculated for males only.

Urolithiasis

The prevalence of urolithiasis in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, duration of 2 weeks and mortality data. The disability weights from GBD 2019 were used.

Male infertility

The prevalence of male infertility in Malaysia was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, duration of 0 weeks and mortality data. The disability weights from GBD 2017 were used, while the severity split was based on study by Abebe et al[47].

Other urinary diseases

Estimation of YLD for other urinary diseases was based on the YLD/YLL ratio as reported in the IHME GBD for Malaysia. YLD/YLL ratio was calculated based on IHME GBD data for Malaysia. The YLD/YLL ratio by age group was then applied to the YLL for Malaysia to estimate the YLD.

V Gynaecological disorders

Uterine fibroid

DisMod II was used to estimate the prevalence of uterine fibroid using the following inputs; prevalence of uterine fibroid (IHME), remission of 0.6 and mortality data from MBOD estimates for 2019. Proportion of mild abdominal pain due to uterine fibroid was assumed to be 0.5[23],and IHME's GBD data for Malaysia were used to calculate the proportion for uterine fibroid with anaemia (0.05). Disability weight used for mild abdominal pain without anaemia was from GBD 2019, while a composite disability weight was calculated for mild abdominal pain with anaemia using the following proportions; mild anaemia (0.56), moderate anaemia (0.41) and severe anaemia (0.03).

Polycystic ovarian syndrome

Prevalence for Polycystic Ovarian Syndrome (PCOS) was estimated using DisMod II with the following inputs; prevalence of PCOS retrieved from IHME GBD data for Malaysia, remission entered was 0.1 for age 10 until age 54 (GBD 2019), and mortality estimates from MBOD 2019. Proportion for hyperandrogenism/hirsutism with disfigurement level 1 (0.85), primary infertility (0.03), and secondary infertility (0.15) due to PCOS were calculated based on IHME's GBD data for PCOS as well as infertility due to PCOS in Malaysia. Disability weights used were from GBD 2019.

Endometriosis

DisMod II was used to estimate the prevalence of endometriosis using the following inputs; prevalence of endometriosis (IHME GBD data for Malaysia), remission of 0.2 (age 15-49) and mortality data from MBOD estimates for 2019. The output was split into sequelaes with the following proportions; primary infertility due to endometriosis (0.01), secondary infertility due to endometriosis (0.05), mild (0.06), moderate (0.52) and severe (0.12) abdominal pain due to endometriosis. Disability weights used were from GBD 2019.

Other gynaecological disorders

In view of no reliable source of data to estimate the prevalence of other mental disorders as well as no death was assigned to this category, we used the YLD as reported by the IHME.

W Endocrine, metabolic, blood, and immune disorders

Haemoglobinopathies and haemolytic anaemias

Haemoglobinopathies and haemolytic anaemia span four GBD causes: thalassaemia, sickle cell disorders, G6PD deficiency, and other haemoglobinopathies and haemolytic anaemias. The nonfatal burden estimation was based on the YLD/YLL ratio from IHME GBD data for Malaysia. The final YLD for Malaysia was calculated by applying the ratio to Malaysia's 2019 YLL.

Other endocrine, metabolic, blood, and immune disorders

The nonfatal burden for other endocrine, metabolic, blood, and immune disorders was estimated using previous MBOD data from 2009 to 2014. A linear regression was used to estimate the value for 2019.

X Oral disorders

Caries of deciduous teeth/ permanent teeth

The prevalence of caries of deciduous / permanent teeth was obtained from the National Oral Survey 2015 (5-year-old) and 2017 (12-year-old)[48]. These figures were then extrapolated across various age groups in accordance with prevalence estimates from IHME. We used DisMod II to derive better estimates for prevalence of caries of deciduous and permanent teeth, by using inputs of prevalence, zero remission and mortality. The proportion of dental pain with untreated caries was 48.4% and average duration of seeking care from GBD 2017 (27.6 days for deciduous and 55.2 days for permanent teeth) and disability weight from GBD 2019 were used.

Periodontal diseases

The prevalence of periodontal diseases was obtained from NOHSA 2017. We used DisMod II to derive better estimates, by using inputs of prevalence, zero remission and mortality. The proportion of 17.8% from NOHSA and the disability weight from GBD 2019 were used.

Edentulism

There is a lack of data in Malaysia for Edentulism. The prevalence of edentulism was obtained from prevalence estimates reported by the IHME. We used DisMod II to derive better estimates, by using inputs of prevalence, remission of 0 and no mortality. The disability weights from GBD 2019 and 22.9% untreated edentulism were used[49].

Other oral disorders

In view of no reliable source of data to estimate the prevalence of other oral disorders, we used the YLD as reported by the IHME.

Group III: Injuries

Disability from injuries were only accounted for only those people with serious injury and admitted to hospital. Our assumption is that out-patient or not admitted cases were only minor injury and did not contribute to significant disability. Data were obtained from Royal Malaysia Police and in-patient

discharged data from the Health Informatic Centre, Planning Division, MOH. However, both data were underestimated. Data for transport injuries were obtained from IHME[50].

Data were classified according to their nature of injury (their physical injury sequelae) or the cause of injury based on the previous MBOD study. All these injuries were also categorised into long-term injury (injury lasting longer than one year/ lifelong disability) or short-term injury (injury lasting less than one year) with their respective duration, also from previous study. We assume that serious injury such as spinal cord lesion, head injuries, amputation, burns and fractured femurs will experience life-long disability[51]. Duration for life-long injuries were derived from the DisMod while the duration for the short-term disability was derived from the GBD study; according to the previous study. DW for the severity split sequelae was obtained from the GBD2019.

MINISTRY OF HEALTH MALAYSIA
INSTITUTE FOR PUBLIC HEALTH

Centre for Burden of Disease Research
Institute for Public Health
National Institutes of Health (NIH)
Ministry of Health
Seksyen U13 Setia Alam
40170 Shah Alam, Selangor Malaysia
Tel : +603- 3362 7800
Fax : +603- 3362 7801

ISBN 978-629-7768-02-1