

An Assessment of Available Evidence on NCDs and their Risk Factors in Myanmar

Report on Main Findings



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**HelpAge International Myanmar, University of Public Health
and University of Medicine-2**

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Abbreviations

ACDS	Anterior Chamber Depths
AL	Axial Lengths
ANC	Antenatal care
ARIs	Acute Respiratory Infections
ATS	Amphetamine type stimulant
BL	Blindness
BMI	Body Mass Index
CA	Cancer
CCs	Corneal Curvatures
CFR	Case Fatality Rate
CHD	Coronary Heart Disease
CI	Confidence Interval
CIN	Cervical Intraepithelial Neoplasia
CMR	Crude Mortality Rate
CO	Corneal Opacity
COPD	Chronic Obstructive Pulmonary Disease
CP	Cerebral Palsy
CRD	Chronic Respiratory Diseases
CRS	Congenital Rubella Syndrome
CVD	Cardio-vascular disease
CVS	Cardiovascular system
DALY	Disability-Adjusted Life Year
DG	Director General
DM	Diabetes Mellitus
DMFT/dmft	Decayed, Missing, Filled Teeth

DMR	Department of Medical Research
DyDG	Deputy Director General
FGDs	Focus Group Discussions
GI	Glycaemic Index
GP	General Practitioner
HAI	HelpAge International
HDL	High Density Lipoprotein
HIV	Human immune-deficiency virus
HMIS	Health Management Information System
HR-HPV	High risk type Human Papillomavirus
IHD	Ischemic Heart Disease
IMR	Infant Mortality Rate
INGO	International Non-government Organizations
KII	Key Informant Interviews
LBM	Lean Body Mass
LDL	Low Density Lipoprotein
MCH	Maternal and Child Health
MDA	Malondialdehyde
MGH	Mandalay General Hospital
MMA	Myanmar Medical Association
MoHS	Ministry of Health and Sports
MSG	Monosodium glutamate
NCDs	Non Communicable Diseases
NGO	Non-government Organizations
NO	Nuclear opalescence
OOP	Out of Pocket Payments
PAC/S	Primary angle-closure/suspects

PAP	Papanicolaou
PEN	Package of Essential Non-communicable Disease Interventions
PHC	Primary Health Care
PXF	Pseudoexfoliation
QALY	Quality-Adjusted Life Year
QOL	Quality of Life
RE	Refractive Error
REE	Resting Energy Expenditure
RHC	Rural Health Centre
RTA	Road Traffic Accidents
SBP/DP	Systolic Blood Pressure/ Diastolic Blood Pressure
SDG	Sustainable Development Goal
STEPS	STEPwise approach to surveillance
SVI	Severe Visual Impairment
TBA	Traditional Birth Attendant
TT	Trachomatous Trachiasis
UHC	Universal Health Coverage
UM2	University of Medicine 2
U5MR	Under 5 Mortality Rate
UPH	University of Public Health
VCDs	Vitreous Chamber Depths
VI	Visual Impairment
WDF	World Diabetes Fund
WHO	World Health Organisation
WHR	Waist to Hip Ratio
WHS	World Health Survey
WTP	Willingness to Pay

YGH Yangon General Hospital
YLL Years of Life Lost

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Summary

HelpAge International Myanmar is working with the University of Public Health (UPH) and the University of Medicine 2 (UM2) in Myanmar, and Thammasat University of Public Health in Thailand, on a programme to support evidence-based NCD policy and improved NCD services in Myanmar. As part of the programme, HelpAge International and partners commissioned a review of the available evidence on the burden of NCDs and their associated risk factors in Myanmar.

The review encompasses three complementary components: 1) a review of published literature 2000-2015 on NCDs and their risk factors; 2) qualitative interviews with key actors engaged in NCD research in Myanmar; and 3) additional reviews of Myanmar ethical committee inquiries and post-graduate research on NCDs in Myanmar. This report outlines the key findings from the three components including a synthesis of the key outcomes from the literature review and qualitative interviews, and an assessment of the gaps in the evidence against a framework of evidence needs.

The review identifies limitations in the current research on NCDs in terms of quantity and quality. In particular, there is limited evidence on the prevalence of NCDs in Myanmar with only small numbers of studies available in any individual disease category. In addition the evidence on risk factors for NCDs in Myanmar is also limited, although the STEPs study is acknowledged as providing important insights into risk factors for NCDs over time. There are limited studies looking at interventions to address NCDs in the country, and in particular those targeted at the population level. An analysis of the available evidence against key information needs highlights gaps across the evidence base.

A number of implications of the research gaps on policy development/policy makers and priority needs are identified. A series of next steps are proposed to take forward the process of addressing these gaps.

Introduction and Background to the Report

HelpAge International (HAI) Myanmar is working with the University of Public Health (UPH) and the University of Medicine 2 (UM2) in Myanmar, and Thammasat University of Public Health in Thailand in support of the programme “Strengthening public health capacity to respond to Myanmar’s disease transition”. The overall goal of the programme is to contribute to equitable and universal health care through improved support to evidence-based Non-Communicable Disease (NCD) policy and improved NCD health services. As part of the programme, HelpAge International and partners commissioned a review of available evidence on the burden of NCDs and their associated risk factors in Myanmar. The aim of the review was to identify gaps in the current evidence base on NCDs, and to suggest priority actions to address these gaps in support of the longer term design and development of programme and policy interventions to address NCDs in the country.

Myanmar is identified as one of 23 high burden countries with respect to NCDs (Alwan et al, 2010). Data points to a significant burden of NCDs (WHO, 2014a) and to a potential increase in exposure to risk factors associated with key NCDs (Byfield and Moodie, 2013). The WHO 2nd Global Status report on NCDs (WHO, 2014b), estimated 59% of total deaths in Myanmar are due to NCDs, with a 24% probability of dying from one of the 4 main NCDs between the ages of 30 and 70 years. The report also highlights a growing concern with several risk factors for NCDs including hypertension and overweight/obesity. This concern has been strengthened by the results of the national survey of diabetes mellitus and risk factors for non-communicable diseases in Myanmar, published in November 2015, which found that over 90% of participants had at least one risk factor and almost 20% of the study population had 3-5 risk factors (MoHS, 2015). Data from the 2015 Global Burden of Disease report also points to an increase in premature death¹ from causes attributable to NCDs over the period between 1990 and 2010. Four NCDs (stroke, Ischaemic Heart diseases, cirrhosis and congenital anomalies) are in the top 10 causes of Years of Life Lost (YLL) in 2010 (IHME, 2016).

The challenge posed by NCDs has been recognised in-country for some time. A commitment to addressing the burden of NCDs and their risk factors has been outlined in the National Policy on NCD Prevention and Control (available in draft). This policy builds on a number of previous publications and links Myanmar’s actions to wider regional and global efforts (WHO, 2013; WHO, 2011). The new government, elected in November 2015, has further emphasised the need to tackle the burden of NCDs in the country in its Programme for Health Reforms (NHN, 2016). In the Programme, a reduction in the incidence of selected NCDs is identified as a key aspect of the vision

¹ The term premature death/mortality is used here as per IHME definition where “YLL are the estimated number of years lost based on the highest life expectancy in the deceased’s age group”. This report notes HAI policy and recent calls for a reassessment of the use of the term (Lloyd-Sherlock et al, 2016)

for Universal Health Coverage (UHC) and addressing NCDs is also included as an important element within the Package of Essential Health Services.

An up-to-date review of the evidence available on NCDs for decision-making is thus considered timely. It is anticipated that the review will act as an initial step in thinking through the future research requirements on NCDs in Myanmar, and can be built upon in subsequent exercises. It is also hoped that the process will contribute to the identified commitment to develop and implement a “priority national research agenda for prevention and control of NCDs”, as outlined in the national policy.

Purpose of the Report

This report summarises the key findings from the review which encompasses three complementary components: 1) a review of published literature from 2000 to 2015 on NCDs and their risk factors; 2) qualitative interviews with key actors engaged in NCD research in Myanmar; and 3) additional reviews of ethical committee inquiries and post-graduate research on NCDs in Myanmar.

The report is structured in a number of sections covering all aspects of the review. It outlines: the methodology used in the review, a synthesis of the key outcomes from the literature review and qualitative interviews, and an assessment of the gaps in the evidence for NCDs against a framework of key evidence needs. A number of implications of the research gaps on policy development/policy makers are discussed before a series of recommendations for next steps are proposed to take the process forward. The report acts as an initial assessment of the evidence needs which can support subsequent exercises by key actors in Myanmar.

Overview of research methodology

This section outlines the methodology used to address the two main elements of the review: a literature review of published papers and reports on NCDs and their risk factors in the period 2000-2015, and a complementary qualitative study of perceptions of key actors on research activities and challenges to researching on NCDs in Myanmar at the current time. These two elements were supplemented by an additional assessment of research undertaken on NCDs identified through a review of ethical committee submissions and post-graduate research in Myanmar in the period 2010-2015.

Methodology for review of published literature on NCDs and risk factors in Myanmar

The relatively short time-frame for the literature review and its broad scope, precluded the use of a “systematic review” methodology for the review. A number of potential review methodologies were explored before deciding on a “scoping review” as the methodology best meeting the aims and objectives for the review. The “scoping study” methodology outlined by Arksey and O’Malley (2005), closely follows the process for a systematic review, with a number of important differences. These include 1) the broad nature of the issue under study and thus study designs and literature included in the review, and 2) a lack of a formal quality assessment of all studies as part of the review. However given the need to provide an initial analysis of the quantity and quality of the literature in the current review, a simplified quality assessment of selected studies was included in the process. A detailed outline of the methodology for the review is included in annex 1.

The overall objective set for the literature review was: to critically assess the available research evidence on NCDs in Myanmar. The search strategy was based on the overall aim and questions formulated for the review. Key conditions to be covered in the review were identified as all conditions included in the Myanmar Ministry of Health and Sports (MoHS) programme for NCDs. A range of inclusion and exclusion criteria for the search strategy were drawn up and agreed with HAI teams in London and Yangon. These criteria are outlined in annex 1.

The search, conducted between August and November 2015, utilised a range of methods for identifying relevant papers and reports, including use of electronic databases and manual searching of papers. The search covered a range of publication types (published studies, conference proceedings, unpublished research and other reports). The time-period set for the search was 2000-2015 to ensure that a useful historical overview was provided.

The search strategy was based on keywords/free-text words and relevant subject headings related to the aim and research questions. All full text articles in English were included in the search as well as articles in other languages which had an English abstract. A number of databases were searched including: MEDLINE, Pubmed, Web of Knowledge, Global Health, Social Policy and Practice, Embase, and Google Scholar. In addition a number of other sources were searched for additional information not published in journals, such as websites of agencies working in NCD-related issues and relevant conference proceedings. A broad range of papers and reports were included in the search process. In addition in the initial stages, available research on non-communicable diseases and associated risk factors from contexts with direct applicability to Myanmar was included i.e. selected research from other countries in the region. From the initial search strategy and subsequent hand-searching, including print versions of journals accessed in Myanmar, a total of 277 papers and reports were identified, of which 232 directly related to Myanmar. In addition 44 reports were identified from conferences and post-graduate research. An

overview of the main categories of papers and reports identified is provided in table 1 below. A full list of titles identified in the literature review is included in annex 2.

Table 1: Papers and reports identified through literature search by category of paper

Broad category of paper/report	Number
Current status/prevalence of NCDs	79
Risk factors for NCDs	82
Interventions	26
Care	5
Food Science	1
Mechanisms	19
General commentary	6
Burden of disease – Asia general	19
Burden of disease – General	12
Responding to NCDs- general	8
Responding to NCDs- Myanmar	5
Myanmar health system- general	15
Conference proceedings/presentations	26
MSc and doctoral thesis (referenced)	17
Other	1

From these papers and reports a total of 160 articles were identified for potential inclusion in the bibliography of evidence on the prevalence of NCDs and risk factors. However, despite all possible efforts, a number of full papers and reports could not be obtained including some Ministry of Health and Sports (MoHS) publications and statistical reports. A total of 119 full papers and reports were finally located. These documents were subsequently reviewed and a summary of each prepared for collation in the bibliography. The bibliography is available in annex 3.

In addition to the documents identified through the literature review, a review of submissions to the various Ethics Review Committees in Myanmar was undertaken. A total of 166 abstracts were identified for current, recent and planned research on NCDs (including mental health). Of these a total of 156 abstracts were collated. The list of titles identified through this review is included in annex 4.

Methodology for qualitative study on perceptions of key actors

A qualitative study on current research activities and perceptions of key actors on issues and constraints to undertaking research on NCDs in Myanmar was conducted alongside the literature review. A range of key actors, across multiple institutions were identified. The study targeted those working on NCDs and/or with an interest in NCD research in Myanmar, including researchers, programme managers and policy makers from the Ministry of Health and Sports and other institutions. Actors were purposively selected to provide a broad range of opinions spanning the breadth of NCD activity at the current time. A detailed report on the qualitative study is available in annex 5.

Data collection was through key informant interviews with identified actors. A total of 29 interviews were conducted in the period December 2015 to April 2016. The study followed an agreed protocol which was approved by the University of Public Health (UPH) Ethics Committee.

Table 2 provides a breakdown of the organisations/institutions and departments included in the interviews.

The interviews were based on open-ended questions compiled in English in an interview guide. The guide was subsequently translated into Myanmar and pre-tested. A total of seven interviewers from UPH and HelpAge International in Myanmar were recruited and trained to conduct the interviews. All interviews were conducted in Myanmar language. Interviews were transcribed by 5 interviewers. All transcripts were then coded by the lead researcher for insights into actions and perceptions relating to research on NCDs in Myanmar and analysed for key themes. Quotations from the transcripts were translated by the original 5 interviewers and checked by the lead qualitative researcher.

Table 2: Overview of key actor organisations/institutions included in interviews

Organizations/Institutions/Department	M	F	Total
NGOs/Foundations	2	1	3
Medical Universities/Public Health University	3	8	6
Department of Public Health	5	6	11
Other Ministry of Health and Sports (MOHS) departments	2	1	2
International agencies	1	0	1
Total	13	16	29

Synthesis of available evidence on prevalence and risk factors for NCDs in Myanmar identified by study

The following section draws on the outcomes of the literature review together with the main themes and insights gained from an analysis of the data emerging from the interviews, to provide an overview of the available evidence on prevalence of NCDs and risk factors in Myanmar at the current time.

It is clear from the literature review and feedback from key actors that there is an established history of research on NCDs in the country, though there is also acknowledgement that research in this area has lagged behind that conducted in other areas, such as communicable diseases and Maternal and Child Health (MCH).

“Up till now NCD research are fewer than other research.” NGO/Foundation respondent

“NCD burden is increasing [...] in Myanmar. However research is done mostly on communicable diseases and less on NCD.” University respondent

These findings are in line with a previous analysis of health systems research under the Health Research Programme at the Department of Medical Research (DMR) between 2000 and 2009. This review found that just over 50% of the research was attributed to communicable disease issues, and 16% to reproductive health issues, while research on NCDs accounted for just over 6% of the research conducted (Le Le Win et al, 2011).

In the present review, analysis of the published papers/reports by year shows that there has been a steady stream of published papers across all years from 2000 to 2015. The lowest number of papers published was in 2009 with 6 studies, and the highest in 2002 and 2013 with 17 papers each. The breakdown of published sources between Myanmar and international journals shows a

ratio of 1.5:1 in favour of Myanmar journals, indicating that alongside in-country publication of papers there has also been an important stress on international publication.

The following section looks at the breakdown of the studies that were identified in the review in more detail and provides a summary of the evidence with respect to information on a) prevalence of NCDs, and b) risk factors associated with NCDs in Myanmar, 2000-2015.

Summary of evidence on the prevalence of NCDs in Myanmar

Papers and reports identified through the literature review provide important (if limited) evidence on the prevalence of NCDs in Myanmar. Table 3 provides a summary of the available literature including the key study methodologies and findings.

The literature identified includes studies on the “major NCDs” as well as those classified as “other NCDs” in the Myanmar NCD policy. Only limited literature is available in any one disease category. In some cases the available information covers a range of conditions. For example the available studies on cancer include research on a range of different cancer sites, limiting the information on any one site. Furthermore, limited studies are available on diabetes and CVD, and studies cover only selected population groups. There are a number of papers on visual impairment and blindness, but many of the papers are based on a single study conducted in 2005 in one part of the country. Of particular note is the lack of studies on mental health. Most of the studies in this area are qualitative in nature or have a qualitative component to them, and all focus on populations that have suffered from conflict-related trauma, limiting their generalizability to the wider population. Limited studies are also available on accidents, injuries and snake bite, which are recognised by key actors as important issues in the Myanmar context at this time.

Despite the limitations in the evidence available, the information none-the-less presents a picture of an important contribution of NCDs to the disease burden in Myanmar at this time.

Summary of evidence on risk factors for NCDs in Myanmar

The literature review identifies evidence across a range of risk factors associated with NCDs – behavioural, physiological, environmental, socio economic and political determinants. Table 4 presents a summary of the literature identified and findings across the risk factor groupings.

As with the studies on prevalence, the available papers and reports provide a picture of evidence on a broad spectrum of issues but with a limited depth. Studies are available in all four categories of risk factor but with a limited number of studies in any one category.

There are a number of cross-sectional studies looking at behavioural risk factors such as knowledge of NCDs and services and risk factors for NCDs within the population, as well as information on sources of information. There is also some limited evidence from studies looking at compliance with different treatment regimens such as cancer treatment, drug regimens for hypertension and monitoring of blood glucose levels. Several studies look at the prevalence of risk factors such as smoking and drinking in different age groups. There is also some limited information on snacking practices. Finally there is one study looking at knowledge and behaviour on safety from a construction site.

There is also evidence on metabolic/physiological factors, including studies looking at overweight and obesity, hypertension and raised blood glucose levels. The majority of studies are cross-sectional in design. Studies on hypertension have been conducted in several population groups and there is also information on overweight and obesity from a range of age groups. Only very limited information is available on diabetes or CVD, though on the latter issue, a number of reports from the Cardiovascular Disease Project combine information on behavioural risk factors with some limited data on physiological factors.

Studies on environmental factors are limited to a few studies on levels of toxic substances in water or food or exposure to outdoor air pollution. Most studies are cross-sectional in design.

A number of studies are available on social, economic and political risk factors including those assessing risk of catastrophic expenditure as a result of NCDs. There are also a number of studies looking at the impact of conflict on mental health.

Despite the limited number of studies, the available literature presents a picture of multiple risk factors associated with NCDs in the country at this time, and with some suggestion that in some cases, these risks may be increasing.

Summary of research on selected interventions to address NCDs or risk factors in Myanmar

The literature review also identified a number of studies that fall outside the parameters agreed for the bibliography, but provide information of relevance to the current review. These studies include research into a range of interventions to address NCDs and/or their risk factors. In this category are a number of studies looking at the role of traditional medicine in treatment for NCDs. This includes clinical studies in patients diagnosed with diabetes or hypertension. Both antihypertensive as well as a blood glucose lowering effects of traditional medicine formulations were noted in studies but the number of studies and size of study populations are small.

A limited number of studies examining efforts to influence behavioural practices are also included in this section. One education intervention to improve knowledge (and practices) of mothers on air

pollution and respiratory infections, found improved knowledge and behaviours in a relatively short time frame. However, the study is limited to one township. A second study looked at how health education could support changes in dietary practices and cardiovascular risk outcomes, but found no significant changes. A third study looked at the role of aerobic exercise on fitness and body composition and found an improvement in cardiovascular fitness but no statistically significant difference in a number of body composition measures in a small population sample.

Despite these interesting insights, there is very limited information on interventions to address NCDs and in particular those targeted at a population level.

Table 3: Summary of main evidence on prevalence of NCDs in Myanmar 2000-2015

NCD	No of papers	Nature of studies	Overview of available evidence
Cancer	11	Studies in this section have attempted to estimate the incidence and prevalence of cancer in the population in Myanmar using a variety of methodologies - including adapted global incidence rates; hospital based registers and data from screening services. The bulk of studies have been conducted in Yangon. Due to weaknesses in the various methodologies, the data needs to be treated with some caution.	Studies provide estimates of incidence and prevalence on a number of selected cancers. Incidence data includes whole body cancer incidence as well as incidence for a number of cancers e.g. oral cancer. Data is also available on cervical cancer including prevalence of inflammatory smears and pre-cancerous lesions. One review of city and hospital based cancer registers estimated overall whole body cancer incidence at 57.7/100,000 population for the 2002-2007 period with a higher incidence in women than men. Most common cancers in men were identified as: bronchus, lung and liver, and in women as: uterine, cervical, breast and ovarian.
Diabetes	5	Studies in this section include a number of reviews but relatively few studies on the prevalence and profile of diabetes in the population. Where available studies are cross-sectional and limited to Yangon and Mandalay.	A study in middle aged school teachers in Mandalay estimated prevalence of diabetes in this population to be around 16% but limitations with the study population and site make it difficult to generalise the findings. Additional studies suggest an increasing trend in the prevalence of type-2 diabetes, and significant impact of secondary morbidity related to complications of diabetes such as amputations.
Coronary heart disease	1	A single cross-sectional study looking specifically at the prevalence of coronary heart disease in the population. The study used RISK0 criteria to rate the risk of coronary heart disease in a population in Yangon.	Study provides estimate that over 40% of population have moderate or above risk of CHD using the RISK0 criteria in an urban context. Associated factors included a lack of exercise, especially in women and smoking in men. Other recognised risk factors such as hypercholesterolaemia, overweight and hypertension were associated with a higher risk in both men and women.

Sensory organ impairment	13	One large community based cross-sectional study conducted in Meiktila district in 2005 provides much of the data on the prevalence of visual impairment and blindness in the population. The data has been written up in multiple papers. Several other smaller studies (including in institutional settings) provide additional information on visual impairment and blindness. The review did not locate any studies specifically looking at hearing impairment.	Meiktila study provides data on prevalence of visual impairment/blindness in the population. The study found that 42% of the population were visually impaired, 33% were classified as low vision and 8% blind. Study highlights an important problem with uncorrected refractive error and preventable (and treatable) blindness. Nearly 30% of blindness and 20% of visual impairment are due to uncorrected refractive errors. In addition cataract was found to be responsible for over half of the bilateral blindness and 2/3 of the blindness in at least one eye. Glaucoma was found to cause 17% of blindness in at least one eye. A study conducted in all Schools for the Blind in the country suggests that only a fraction of the children who are blind are identified and in school and receiving support.
Mental health	5	There is little data on mental health in the population. All studies identified in this section have been conducted in populations exposed to extreme stresses caused by conflict and/or displacement. The majority of studies are qualitative in nature or contain a qualitative component.	High levels of mental health problems have been identified In conflict-affected populations. While it is not possible to extrapolate from these studies to the wider population, it is likely that mental health is an important issue within the wider population given the general conditions in the country over the last half decade. Further research is needed to establish what this impact may be.
Oral health	3	A limited number of cross-sectional studies have been conducted to assess dental caries prevalence and wider oral health status in the population including 2 studies in schoolchildren and one in the general population.	Studies highlight the challenges for oral health in the country at this time including poor oral hygiene habits in some cases and a lack of access to dental treatment, particularly in rural areas. Studies provide some data on dental caries prevalence in urban and rural populations. One study in Yangon reported that just over 50% of children had dental caries, while a study conducted in villages in a rural area found that 85% of children aged 12 years had no caries.
Snake bite	4	A number of studies in this section have attempted to assess the prevalence of snakebite in the population including through retrospective analysis of data from	Studies show variations in snakebite incidence in different regions with snakebites endemic in areas with high levels of rice growing, putting those working in the fields at considerable risk. Children

		townships across the country as well as several community based surveys in selected townships.	have also been found to be at risk from sleeping on the floor, particularly where there is no net. Smaller studies have confirmed case fatality reaching almost 20% as well as frequent amputations resulting from bites.
Accidents and injuries	2	Two hospital-based studies are available looking specifically at road traffic accidents in urban areas.	The number of studies is too few to provide a general picture of the situation. However studies in Lashio and Pyin Oo Lwin point to the considerable burden of RTAs in overall accidents arriving at hospitals in these towns. The majority of accidents are from motorcycle users though this may reflect the high volume of such vehicles in these particular towns.

Table 4: Summary of literature on key risk factors for NCDs in Myanmar 2000-2015

Risk factor area	No of studies	Overview of available studies	Summary of available evidence
Behavioural risk factors	23	<p>Studies in this section are predominately cross-sectional in design and the majority have been conducted in Yangon or other urban settings. Studies cover a limited number of NCDs and/or risk factors with a clear emphasis on those associated with the 4 major NCDs – Cancer, CVD, diabetes and COPD. Studies look at knowledge and behaviour related to cancer, diabetes, hypertension and stroke including knowledge of risk factors and control and compliance with treatment regimes. Several studies focus on behaviours related to smoking and alcohol drinking and nutrition, including snacking practices. A number of studies also include selected data on associated physiological risk factors.</p>	<p>Studies provide insights into current knowledge and practice on risk factors; compliance with different NCD regimes and barriers to accessing treatment including financial barriers. Data is also available on sources of information and knowledge on different NCDs and the important role played by friends and family in this respect. Several studies provide estimates of prevalence for key risk factors such as smoking and drinking with estimates of smoking above 30% in adult males in all studies. The limitations of the studies and their small numbers make it difficult to draw any firm conclusions but there is some information that could help develop training for staff, information campaigns for the public as well as policy to support access and compliance.</p>
Key metabolic/ physiological risk factors	21	<p>Studies in this section look at the metabolic and physiological risk factors associated with NCDs in Myanmar. The majority of studies are cross-sectional in design and most are conducted in Yangon. Studies provide information on anthropometry and body composition (BMI and WHR) and their relationships with various NCDs including diabetes, CVD in selected study populations including children, students and the elderly. There are studies providing information on levels of hypertension in populations in different parts of the country and within different population groups in both urban and rural settings. A limited number of studies provide information on aspects such as the</p>	<p>Studies provide information on the prevalence of various risk factors in a range of population groups including several studies estimating the prevalence of hypertension in different groups (range 16%-47%) and overweight and obesity in different age groups i.e. children and students as well as elderly populations. There are also studies linking different risk factors with NCDs, in particular diabetes and CVD. Studies provide a range of prevalence figures, but the nature of the study populations limit their generalisability. Studies also provide insights into the percentage of population who are aware of their symptoms and how this is translated into treatment levels</p>

		coagulation profile in diabetes mellitus and lipid profile in those with rheumatoid arthritis.	and control e.g. only 29-52% of those with hypertension are on treatment.
Environmental	6	A few studies look at environmental risk factors and NCDs. Studies in this area include those assessing the levels of toxic substances in groundwater or food, as well as exposure due to industries (e.g. lead) and air quality and traffic. The majority of studies are cross-sectional in design. Studies are conducted in a limited range of locations.	Studies suggest levels of toxic substances in groundwater, drinking water, food, and air, which may be cause for concern and require follow up.
Social, economic and political risk factors	11	Studies in this section look at key social, economic and political determinants associated with NCDs in Myanmar. Studies include those assessing the financial risk associated with NCDs including catastrophic health expenditure. A number of studies are also available on the impact of conflict and human rights violations on mental health.	A number of studies provide insights into the impact of conflict on mental health. There is also information on the financial impact of NCDs in the population including catastrophic expenditure in households with a person with a chronic illness.

The Scope of NCD and risk factor research to date

The review highlights the scope of research conducted on NCDs and risk factors to date. This covers research on key NCDs – Cancer, Cardiovascular Diseases (CVD), Diabetes and Chronic Obstructive Pulmonary Disease (COPD) as outlined by WHO (2011), but also significant research on a range of “other NCDs” – all of which are included in the country-level NCD policy. Analysis of the studies included in the bibliography indicates a similar number of studies focussing on the 4 “main NCDs” as on “other NCDs”, though there are differences in the breakdown of these studies in terms of provision of data on prevalence and risk factors i.e. the majority of studies looking at prevalence focus on “other NCDs”, while the majority of studies looking at risk factors for NCDs are concerned with factors associated with the 4 main diseases. Because of the limited overall number of studies in each category, the results are in part influenced by factors such as the number of published papers from a single study e.g. a large number of studies resulting from the Meiktila study on visual impairment.

Feedback from the interviews confirms the importance of the inclusion of a wide range of NCDs in the current research agenda. Responses highlight that while a primary focus on the 4 “main NCDs” is important, several additional NCDs warrant research due to their increasing importance in the Myanmar context. NCDs highlighted by key actors for special mention in this regard include accidents and injuries, mental health, and obesity.

“I would like to add accidents and injury in addition to 4 major NCDs. It is becoming quite common these days in Myanmar, almost similar to those of Diabetes and Hypertension.” Department of Public Health respondent

“In my opinion, mental health becomes another important NCD other than four major NCDs nowadays.” University respondent

“For the public health importance, obesity and overweight are underlying cause as well as disease. So it would be better if it is included in the list.” Department of Public Health respondent

To complement the literature review, key actors were also asked about the research on NCD prevalence and risk factors that they had conducted (or been associated with) over the last 5 years. A total of 43 studies were identified by respondents. Of the studies identified, just over 40% focussed on environmental factors such as poisoning and Road Traffic Accidents (RTA), and behavioural factors associated with tobacco. It was noted that WHO provided funding for the research in all these areas.

Studies specifically addressing one of the 4 major NCDs accounted for only 3 studies (1 on CVD and 2 on cancer) out of the total, despite these being key diseases identified by the same

respondents. Similar to the findings from the literature review, very few studies were conducted in any particular disease area. No specific studies on diabetes or COPD were identified in the list. In addition no specific mention is made of studies on mental health despite the importance placed on this issue by key actors in interviews. However it is noted that studies in this area feature prominently in research identified through the review of ethics committee submissions.

Importance of research on NCDs

Despite the limited research on NCDs undertaken in the last 15 years, responses from key actors confirm that the research has made an important contribution to the in-country debate on NCDs. Almost all respondents mentioned the importance of research on NCDs in highlighting the magnitude of the situation and gaps in current implementation. Others noted that the availability of research on NCDs had been helpful historically in accessing funding for NCD projects, while several respondents highlighted the importance of research in bringing the issue of NCDs onto the agenda and specifically in relation to the formation of a dedicated unit in the Ministry of Health and Sports to spearhead action in this area. Finally, research to date is also seen as being useful in helping strengthen treatment guidelines.

“If you ask whether NCD research is helpful for NCD control program, its implementation and funding, I would say 'yes'. 1. We know the magnitude of disease. 2. We know what the needs are and what supports we could provide.” University respondent

“Burden data are very important for strategic information and project planning as well. Department of Public Health respondent

Limitations identified in research on NCDs and risk factors

Despite its importance however, in addition to the overall limited availability of evidence already highlighted, both the literature review and feedback from key actors expose a number of inherent weaknesses with the research conducted to date. These limitations cut across studies on prevalence and risk factors. An exception to the general assessment is the STEPS survey which uses a globally recognised methodology with a nationally representative sample. Limitations identified through the literature review include:

- The limited range of study approaches used. The overwhelming majority of studies are observational cross sectional studies providing useful information on the current burden and context but lacking insights into causal associations and reasons behind certain practices and behaviours.
- The limited sample size or populations covered – the majority of studies are conducted on relatively

small and often specific population groups, limiting the ability to generalise the findings to the wider population. Only a very limited number of studies have used random samples and very few have nationwide coverage.

- The limited geographical coverage of many of the studies – a large percentage of studies is conducted in Yangon or other large urban settings with selective catchment areas, limiting the generalizability of the findings to the wider population.

These findings are reiterated in the responses from key actors. Problems with small sample sizes, limited scale and range of studies undertaken to date and a lack of in-depth studies in particular areas such as qualitative studies, are all highlighted in the interviews. The small size of many of the studies is linked to a lack of finances as well as human resources to support larger scale studies.

“We could only focus in one township in cause of death study. I would like to do this kind of surveillance of mortality in all States and Regions. Only then we could good data for the country. But we could do only pilot study and could not conduct nationwide study. This study is very expensive and we had burden on human resource and time too.” University respondent

More generally the interviews highlight that interest in NCDs by agencies has not always been matched by funding which is perceived as lower than that for other areas such as communicable diseases. In some cases respondents suggested that research undertaken on NCDs has been influenced, in part, by priorities and budgets of funding agencies, limiting the scope of work undertaken.

“At the moment, there is less funds concerning NCD research. If they (funds) come to a country, they give to where the country's prioritization is. One thing is Malaria can be cured within 7 days. Polio and leprosy clearance can be shown but not NCD, which will never get cured. As it is long-term and giving long-term funding is difficult. It is also difficult for doing behaviour change, and as it is not included in country's prioritization and there is no interest and less funding.” MoHS department respondent

“Funding support from WHO depended on their own set budget for certain project. We could get only that amount. According to the available budget, we draw the work plan. We have to use the materials/equipment that meet the criteria with WHO. Some cannot be bought in Myanmar, and in that case WHO had ordered for us.” Department of Public Health respondent

In addition, respondents highlight that certain types of studies on NCDs are particularly limited at this time. These include studies on the economic impact of the burden of NCDs in the country,

needed to support policy decisions, as well as studies providing qualitative insights into behaviours and practices that would help support the design of prevention and control programmes.

“There is limited research on ‘‘In depth’’ and there is no in-depth qualitatively. There is overweight but there is no reason for the cause of overweight. There is no detail root of analysis. We do not know what to do first for implementation.” University respondent

Information from the interviews also highlights the challenges with data collection at this time, in particular weaknesses in the current health management information system (HMIS) and vital registration systems, which limit the ability to obtain accurate data on cause-specific mortality and morbidity. Both the available literature and key actors highlight that many studies are based on hospital/facility data. Not only is this data limited by the fact that it does not reflect the wider community, but the limited geographical coverage of hospitals further limits the catchment populations from which the study samples are drawn. Several respondents also point to the lack of information from private sector facilities. Other key weaknesses highlighted in the literature as well by key actors include the limitations with the current registration of NCDs such as a lack of coordination between existing registers. The need for improved data from communities as well as from private sector and other facilities is noted by several respondents.

“For burden data, we need to think whether we want hospital data or the community data. I think for now we can only access the hospital data which is the iceberg.” Department of Public Health respondent

“We still need some data on burden e.g., diabetes and hypertension prevalence at community level. But we do not know the prevalence of IHD and stroke because we have data only from YGH (Yangon General Hospital) which is not representative for the country. In Yangon, there are other private hospitals and defence hospitals and they do not have such figures. We do not have stroke prevalence data, AMI prevalence data for Yangon Region.” Department of Public Health respondent

While key actors stated that those involved in current research had many of the skills needed to undertake good quality research, it was also noted that there were gaps in the available skill set, in particular in economic analysis and qualitative research methodologies.

“NCD research on socioeconomic aspect is less commonly seen since it needs more technical expertise like health economists.” University respondent

“The least common is the social and economic burden because of technical limitations; I mean there are not sufficient health economic specialists.” University respondent

“We have very limited specialists in the health economics field in our country. During MPH, we had learned health economics as one portion but we cannot specialize in it. I think there are some INGOs that implement health economics but they cannot widely implement like government organization. I think they are working for areas that are interested and donor driven.” University respondent

The need to build local capacity in these areas was highlighted in the interviews. It was noted that technical capacity has been provided by WHO to support research in specific areas in the past, and this was seen as having made a valuable contribution. Some respondents also mentioned the use of international consultants to undertake research but highlighted the limitations of this approach due to the consultants’ lack of understanding of the Myanmar context.

“Some people hired experts and you know those consultant will not know situations on our ground. No matter how much he or she is [an] expert, situations in America will never be the same as situations in Myanmar.” University respondent

Another limitation of the current research process is the perception that there has been limited use made of the research conducted to date. Reasons given for this include that the research is not practical or there has been a lack of communication on the research.

“The research is not useful and not practical due to its weakness. This happened because of not understanding, not accepting, not implementing research results and findings from the implementers, stakeholders.” Department of Public Health respondent

“Only research is not enough to support the control program. We should let the program managers know the findings of the research so that they can use the information in the control program. It is useless if we don’t use the research findings properly. Research is useful only when they are being conducted in collaboration with researcher and program managers or when researchers could provide information to program managers.” University respondent

Assessment of gaps in research against a selected framework of evidence needs

Tackling the NCD burden and risk factors in Myanmar, within available resources, requires sound decisions and the adoption of appropriate policies and strategies. To support this process, decision makers need good evidence. The national policy on NCDs has identified this as a critical area of work with a specific action point to “develop, implement and monitor a priority national research

agenda for prevention and control of NCDs, based on consultation with universities, WHO and other stakeholders”.

The current review has identified a number of limitations with the research on NCDs and risk factors conducted over the last 15 years. To understand the importance of these limitations in terms of gaps in the evidence base and the opportunities to strengthen the role of research in the future, the following section assesses the current evidence in terms of its ability to support decision-makers in taking forward a range of policies and strategies to tackle the NCD burden and risk factors in Myanmar.

The key policy and strategy processes to address the NCD burden and risk factors in Myanmar identified include both national as well as international/global frameworks to which Myanmar is committed. These frameworks collectively influence the approach to addressing NCDs and their risk factors in the country. The current exercise identifies six key policy/strategy processes to this end:

- delivering on the strategic action areas of the Myanmar NCD policy
- identifying and delivering national interventions based on global “best buy” interventions
- setting national targets based on the NCD global monitoring framework
- delivering on key WHO priority areas for NCD research at national level
- delivering on new SDG3 targets (3.4,3.5,3.6,3.9) at the national level
- Delivering on Package of Essential Non-communicable (PEN) Disease Interventions for Primary Health Care (PHC)

The key elements of each of these strategies/policies are outlined in annex 6.

The current assessment proposes that research undertaken in Myanmar should provide the evidence to help decision-makers support the implementation of these strategy and policy processes. However this is a huge priority list and no country is in a position to meet all actions, particularly in the short term. In addition it is not possible to assess the research against each and every priority action or recommendation. The current assessment has therefore sought to identify areas of overlap in the evidence needed to deliver on the frameworks and their targets (though they offer different levels of specificity in terms of evidence). These common areas include:

- Information that provides an assessment of mortality from NCDs and monitoring of mortality over time
- Information that provides an assessment of morbidity from NCDs and monitoring over time
- Information that provides an assessment of current metabolic/physiological risk factors within the population and monitoring of risk factors over time
- Information that allows for decisions to be made on priority interventions to address key risk factors

- Information that provides an assessment of current levels of behavioural risk factors and monitoring of these risk factors over time
- Information that allows for the development of campaigns to address key behavioural risk factors
- Information that allows for an assessment of key health (and other) system responses to NCD prevention and control
- Information that allows for decisions on key health (and other) system responses to address the NCD burden
- Information that allows for an assessment of socio-economic and other underlying drivers that impact on current NCD burden
- Information that allows for an assessment of key environmental factors impacting on NCDs and general health
- Information that allows for decisions on key interventions to address environmental challenges
- Information that allows for monitoring of current changing environmental and other factors impacting on the burden of NCDs

An assessment of the information and data available against these common areas provides a useful starting point on which to assess the gaps in the evidence base in Myanmar, and an opportunity to assess potential priority areas for research in the future. Table 5 provides an initial assessment of the current evidence against these identified information needs.

Table 5: Analysis of evidence against key information needs to support policies and strategies

Key area of potential contribution of evidence	Analysis of current evidence base	Areas identified to address gaps and strengthen research contribution
Outcomes		
Assessment of mortality from NCDs	Non-population based mortality data is available. Estimates of mortality are available (Institute of Health Metrics and Evaluation and WHO) based on available studies. However data has been labelled with a “high degree of uncertainty” due to the limitations of studies on which they are based.	Additional studies needed on mortality across range of NCDs to support improved estimates. Strengthened vital registration and HMIS needed.
Monitoring of mortality over time	As above	As above
Assessment of morbidity from NCDs	Limited studies available on NCD morbidity, often in selective population groups Limitations due to weaknesses in current HMIS/NCD register systems	Additional nationally representative studies needed to assess morbidity across a range of NCDs within the population Strengthened HMIS (including private sector data) needed. Strengthened system of registers established for main NCDs (as proposed by several authors and key actors)
Monitoring of morbidity from NCDs over time	As above	As above

Metabolic/ Physiological risk factors		
Assessment of current metabolic/ physiological risk factors within the population	STEPS study provides useful assessment of major metabolic/physiological risk factors within population. Restricted to main NCDs and their risk factors only.	Information on risk factors associated with other NCDs needed
Monitoring of risk factors over time	STEPS study conducted at regular intervals providing useful monitoring tool. Restricted to factors associated with main NCDs only.	Information on risk factors associated with other NCDs needed
Decisions on key interventions to address key risk factors	Very limited information on interventions to address key risk factors particularly at population level	Additional studies required on all aspects
Behavioural risk factors		
Assessment of current levels of behavioural risk factors	STEPS survey provides some evidence on limited number of behavioural risk factors such as smoking, drinking, consumption of fruit/veg, exercise. Beyond this there is some limited evidence on other behaviours such as health seeking behaviour, compliance on treatment regimens etc.	Additional studies needed on risk factors outside STEPs survey
Monitoring of behaviour risk factors over time	STEPS survey provides opportunity to monitor limited number of behavioural risk factors – smoking, drinking, consumption of fruit and veg, exercise. Lack of data to allow monitoring of other behavioural risks.	Additional information needed to monitor behavioural risks beyond those included in STEPS

Development of campaigns/programmes to address key behavioural risk factors	Limited evidence to underpin campaigns/programmes to address key behavioural risk factors	Additional studies required in all areas
Natioanal system responses		
Assessment of the key health (and other) system challenges to NCD prevention and control	Very limited evidence available on health system challenges with particular relevance to NCD prevention and control. Review did not locate research on system challenges outside the health system at this time	Key area requiring support
Decisions on key health (and other) systems responses to address the NCDs burden	Very limited evidence available on systems responses and limited to health system. Some evidence available on health financing reforms needed to avoid catastrophic expenditure in households with family member with a chronic disease.	Key area requiring support
Underlying drivers		
Assessment of the socio-economic and other underlying drivers that impact on current NCD burden	Review did not find any studies specifically looking at broader socio-economic factors and NCDs (e.g. poverty, urbanisation, globalisation, trade, political leadership etc.).	Key area requiring research –likely to be crucial to addressing NCDS in coming years
Monitoring the socio-economic factors/ or underlying drivers over time	As above.	As above

Assessment of key environmental factors impacting on NCDs and general health	Very limited evidence on a restricted list of environmental factors available	Key area requiring support particularly in light of changing context
Monitoring of current changing environment and associated factors that may impact on the burden of NCDs	As above	As above
Decisions on key interventions to address environmental challenges	Very limited evidence available on which to base decisions	Studies to date point to need for more information

An analysis of the available evidence against these key information needs highlights the widespread limitations of the current evidence base for decision making on NCD policy and strategy. One exception to this general assessment is the important role of the STEPs survey in providing information on risk factors associated with the main NCDs over time. However, because the focus of this study is on the main NCDs, there remains a gap in information on risk factors for NCDs beyond the main conditions. There is some evidence on morbidity from a range of NCDs but it is patchy and limits decisions on a population-wide basis. There are also gaps in evidence for specific conditions which are highlighted by key actors as important in the Myanmar context at this time. One key area is mental health within the population. The very limited studies conducted to date are in populations exposed to particular traumatic events such as conflict and displacement, which while vital for work in these particular populations, limits the evidence available for development of programmes and policies in the wider population. It is noted however that the review of ethics committee submissions, highlights mental health as an important current issue. There is also very limited information for decision making on other issues that are highlighted by respondents such as accidents and injuries and snake bite.

Looking at issues that have been identified as underlying drivers for NCDs such as social determinants of health (e.g. education, socio-economic status) and factors such as globalisation, urbanisation and ageing (WHO, 2013), it is apparent that the evidence base in this respect is very limited but crucial for the future. Research in these areas will require collaboration across a number of sectors and disciplines.

There are implications of widespread gaps for development of policy and programmes to address NCDs in Myanmar and monitoring progress over time. Given the important position that NCDs already play in the overall burden of disease in the country, and the costs of this burden to individuals (both personal and financial) and to the country, there is an identified urgent need to act. Ensuring that there is a programme to develop the evidence base to support this action, is crucial. The analysis highlights three areas where support to the evidence base is needed:

1. Design and implementation of new research studies to address the identified gaps in NCD evidence
2. Strengthening of current systems of information management e.g. HMIS, vital registration, cause of death, registers for NCDs etc. to ensure that the necessary data on NCDs is available for future studies and monitoring
3. Design and development of studies on national systems and wider determinants of health and other underlying drivers, which incorporate NCDs (with the potential for collaboration with others working in these areas).

Decision on where to prioritise research in support of this programme of evidence, especially in the short time, will be essential to ensure that investments in NCD research provide maximum and

timely benefits to the NCD programme. The following section outlines a potential process to support this.

Recommendations for prioritisation of research and next steps

The broad range of information needs exposed by the review presents a challenge in terms of where to prioritise efforts, particularly in the short term. Feedback from key actors provides some indication on where efforts might focus. Areas highlighted by key actors include the need to fill the gaps in specific areas of research including studies on the economic burden of NCDs. Furthermore, additional information on mortality, morbidity and cause of death are seen as vital. In terms of risk factors, key actors highlight the need for additional research on behavioural risk factors associated with the major 4 diseases, but also indicate mental health as an important area of study. Research on overweight and obesity and raised blood pressure and blood glucose levels are highlighted under biological risk factors. Key actors also recognise the need to prioritise research on national systems including (but not limited to) the health system. In particular, key actors highlight the need for more information on marketing practices relating to foods and beverages for children, recognising the importance of addressing the burden of overweight and obesity at an early age.

Building consensus around an agreed programme of research is vital. It is hoped that the current analysis can provide an opportunity to support this discussion through a process of reflection and further development by key actors. A number of steps are suggested to take this forward. These suggestions are presented with the expectation that the final actions will be determined jointly by HelpAge International and partners, and the Ministry of Health and Sports.

Step 1: Roundtable discussion on key findings from the review, including the evidence needs framework, with key actors

Step 2: Development of an agreed framework of key evidence needs with key actors

Step 3: Assessment of current and planned research against agreed framework and prioritisation of research to address key evidence needs with key actors

A roundtable discussion with key actors, some of whom have provided insights into the research, will afford the opportunity to discuss key findings and their significance at this time. This includes the evidence needs framework that has been used to assess gaps in this report. Key actors may wish to consider alternative frameworks to assess gaps and/or to revise aspects in the current framework. Once a framework is agreed, a further assessment of both existing as well as planned research can be made against the framework. An exercise to prioritize the research that can fill the gaps can then also be made. It is envisaged that this process with key actors will provide important insights that can be used in the development of a national research agenda and prioritized research plan, as outlined in the national NCD policy.

Conclusions

Overall, the review has highlighted a range of available evidence on the prevalence of NCDs and risk factors available at this time, but also limitations with this research in terms of quantity and quality. These limitations translate into gaps in the evidence available to support decision making on policies and strategies to address the current NCD burden in Myanmar. These gaps cover the full range of evidence needs. There is an important role for research in helping to address these evidence needs. A process to translate the evidence needs into a programme of prioritised research is now needed. A number of steps to follow-up on the current analysis, and develop a national research agenda and prioritised research plan are outlined to help take forward this critical aspect of health.

Limitations of the review

In considering the findings of the review and the recommendations to take the process forward a number of limitations need to be recognised. In particular, it was not possible to obtain full copies of all papers identified for inclusion in the bibliography which could potentially lead to bias in some of the findings and conclusions. In addition, the bibliography included only those papers relating to the burden of disease and risk factors and therefore a more in-depth analysis of studies in other areas has not been undertaken. Furthermore, the qualitative interviews included key actors who had a particular interest in NCDs, all were government or retired government staff, and thus the findings will reflect their particular interest. Despite these obvious limitations the review provides a useful assessment of the current research on NCDs in Myanmar over the last 15 years.

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Annexes

Annex 1: Methodology for literature review

Protocol for Review of Available Research on Non-Communicable Diseases and Associated Risk Factors in Myanmar

Background to Review Process

A range of review types and methodologies are available with associated strengths and weaknesses (Grant and Booth, 2009; Arksey and O'Malley, 2005; Thomas et al, 2004). The current protocol aims to outline the methodology which will be used to undertake the review of evidence on NCDs in Myanmar. Given the time frame for the review and its broad scope, the methodology does not intend to be a "systematic review". However given the need to support future discussions on the issue of NCDs in-country and the aim to publish the review process and findings, it is recognised that the methodology needs to be rigorous and as systematic as possible. The protocol aims to steer a path between ensuring a systematic process while falling short of the methodology for a "systematic review". While a number of review definitions would cover the aims and objectives of the current review process, overall it is considered to fall most closely within the definition of a "scoping review" and this is considered to be a useful starting point for the process (Grant and Booth, 2009). The "scoping study" methodology outlined by Arksey and O'Malley (2005) closely follows the process for a systematic review, but with a number of important differences. These include 1) the broad nature of the issue under study and thus study designs and literature included in the review, and 2) the lack of a formal quality assessment of all studies as part of the review. However a "scoping review" is intended to provide an analysis of the quantity and quality of the literature (Grant and Booth, 2009) and this will therefore form part of the current review. In addition the process will leave open the option to undertake a quality assessment of relevant primary studies if this is considered useful. A decision on this will be made once the nature of the available research is known.

Review Objective

The objective for the review is:

To critically review the available research evidence, and determine the research gaps, on the burden of non-communicable diseases, and their risk factors, in Myanmar

The review question is formulated as:

What is currently known about the burden of non-communicable diseases, and their associated risk factors in Myanmar, and what gaps in knowledge remain?

To answer this question a number of sub-questions have been identified:

- What is currently known on the morbidity and mortality associated with non-communicable diseases in Myanmar?
- What is currently known on the behavioural risk factors for, non-communicable diseases in Myanmar?
- What is currently known on key metabolic/physiological risk factors associated with non-communicable diseases in Myanmar?
- What is currently known on key environmental risk factors associated with non-communicable diseases in Myanmar?
- What is currently known on the key social, economic and political determinants/risk factors associated with non-communicable diseases in Myanmar?

- What is currently known on interventions to address non-communicable diseases in Myanmar?
- What are the key gaps in knowledge in relation to non-communicable diseases, and their associated risk factors in Myanmar?

Key terms

The definition of “Research” has been taken as:

“Any knowledge with the aim of understanding health challenges and mounting an improved response to them” (WHO, 2011)

The definition of Non-communicable Diseases

There are recognised difficulties relating to the language and definitions used for non-communicable diseases (Hunter et al, 2013). To avoid confusion and ensure coverage of all key health conditions in Myanmar, the current protocol uses the Global Burden of Disease cause categories (with associated ICD codes) listed by WHO (WHO, 2011). This differs from the list used in the Global Burden of Disease study (GDB, 2013) and additionally includes sense organ diseases and oral conditions. Injuries and accidents are treated as a separate category in both the WHO or GDB NCD list and are excluded in the current protocol.

Key conditions which are included in the WHO list and thus the review include:

Malignant neoplasms, other neoplasms, diabetes mellitus, neuropsychiatric conditions, endocrine disorders, sense organ diseases, cardiovascular diseases, respiratory diseases, digestive diseases (includes cirrhosis), genitourinary diseases, skin diseases, musculoskeletal diseases, congenital anomalies, oral conditions

Risk factors are defined as: “any aspect of personal behaviour or lifestyle, an environmental exposure or a hereditary characteristic, that is associated with an increase in the occurrence of a particular disease, injury or other health condition” (CDC, 2006).

Key risk factors will cover those relating to both “upstream” as well as “downstream” factors i.e. at both a population and an individual level

Search strategy and search terms

Search methods for identification of studies

Given the known paucity of data in Myanmar, a broad range of studies will be included in the initial search. In addition available research on non-communicable diseases and associated risk factors from contexts which have *direct application* to Myanmar will also be considered.

Inclusion and exclusion criteria

Inclusion criteria

- Any research which involves NCDs and associated risk factors in Myanmar
- Any research with *direct applicability* to Myanmar context
- All study designs (e.g. RCTs, quasi-experimental studies, observational studies, mixed methods, qualitative) concerned with the key conditions identified and their associated risk factors in Myanmar.
- All studies in the English and/or Myanmar language
- Studies covering all groups within the population
- Studies post-2000
- MSc/ PhD thesis published by a Myanmar university

Exclusion criteria

- Non empirical data
- Non English or Myanmar language studies
- PhD thesis, except published by Myanmar university
- MSc/MPH dissertations, except published by a Myanmar university
- Studies pre- 2000

The search will involve a range of methods for identifying relevant studies. This includes the use of electronic databases as well as manual searching of papers. A range of publication types will be included in the search:

- Published studies
- Conference proceedings and abstracts
- Unpublished research and other reports/documents

All English full text articles will be included in the search. Other language studies with an English abstract will also be included in the initial search. All full text articles in Myanmar language will be included in the search undertaken at country level.

Search strategy

The search strategy will be based on identified keywords/ free-text words and relevant subject headings. Terms will be identified from the review questions and from available papers and other relevant documentation already available and conform to the agreed definitions and conditions identified for the review. No exclusion will be made on population categories.

Relevant truncation or wild card terms were used to cover different spellings and plural terms and different endings on a root. In addition proximity searching was used where relevant.

Search terms will include (but not limited to):

- **those relating to NCDs (collective and individual terms)** e.g. CVDs, cancer, diabetes, etc.
- **those relating to behavioural risk factors** e.g. tobacco use, physical inactivity, unhealthy diet, harmful use of alcohol etc.
- **those relating to physiological risk factors** e.g. raised blood pressure, overweight/obesity, raised blood glucose, raised cholesterol, prematurity , in utero/early life conditions.
- **those relating to environmental risk factors** e.g. air pollution(indoor and outdoor, contaminants etc.
- **those relating to social, economic and political determinants/ risk factors** e.g. poverty, urbanisation, globalisation , trade agreements, foreign investment, political leadership.
- **those related to population-wide and individual health care interventions** e.g. food taxes, marketing restrictions, breastfeeding.
- **those related to outcomes** e.g. morbidity, mortality, disability, YLL, DALYs.
- **those relating to Myanmar (or similar contexts)** e.g. Myanmar, Burma, South Asia, Low-income countries, ASEAN.

Terms will be combined to generate the relevant research strategy (ies).

Electronic databases

A number of databases will be searched using selected search terms. Those identified as being most relevant include:

MEDLINE- PubMed ; Web of Knowledge; Global Health; Cochrane Library; Social policy and practice; Embase; CINAHL Plus; Scopus; Open Grey; Google scholar

Other sources

Google will be searched for relevant NCD - related NGOs and research institutions. Relevant conference proceedings were searched; websites of dedicated research institutions will be searched; websites of agencies working on NCD- related issues will be searched; research news websites

Additional websites providing data sources will also be checked including:

<http://ghdx.healthdata.org/data-sites-we-love>

<http://ghdx.healthdata.org/geography/myanmar>

Collation of studies

All relevant titles were collated into one list and duplicates removed. Mendeley will be used to support the storage of references.

Study selection

- Initial screening of titles and abstracts against pre-determined inclusion criteria
- Screening of full papers as possibly relevant

The international consultant will be solely responsible for study selection and subsequent stages

Data extraction

For all primary studies included in the review, a data extraction exercise will be performed against the criteria as outlined in table 1. The table will be adapted (once the full scope of data is known) for capture of key data from secondary and other data sources.

Table 1: Indicative data extraction table (based on CRD, 2009).

Author/year	Reference	Study characteristics Aim/ purpose of study /type of study/study population	Study methodology	Outcome measures/variables	Key findings/results	Key summary

Quality assessment

A quality assessment is not a required aspect of a “scoping review” or other “literature review” methodologies outside the “systematic review” or “meta-analysis” (Grant and Booth, 2009). However the current analysis is expected to include an assessment of the quantity and quality of the available literature and therefore an assessment of the type of research study designs available

as well as other key factors related to quality, will be documented and assessed as a minimum in the process.

Data synthesis and analysis

Data synthesis will be undertaken through a tabular as well as narrative approach. Selected studies will be collated in a bibliography of papers and reports on prevalence and risk factors of NCDs in Myanmar. Available information will be reviewed against a framework of evidence needs (devised from an analysis of a range of relevant publications) to assess gaps in the current evidence base.

References:

Arksey H and O'Malley L (2005). Scoping studies: towards a methodological framework. *Int. J. of Social Research Methodology*. ISSN 1364-5579.

Centre for Reviews and Dissemination (CRD), (2009) *Systematic Reviews*. CRD's guidance for undertaking reviews in health care. Available at: www.york.ac.uk/inst/crd

Cronin, P et al (2008). Undertaking a literature review: a step-by step approach. *British, J of Nursing*, Vol 17, 1, 38-43

Grant M J and Booth A (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. *Health information and Libraries Journal*, 26, 91-108

Thomas BH et al, (2004). A process for Systematically Reviewing the Literature: Providing the Research Evidence for Public Health Nursing Interventions. *Worldviews on Evidence-Based Nursing*. Third Quarter 2004, 176-184

Annex 2: List of titles identified in literature review

1. Journal articles/reports

Current status

NCDs general

World Health Organisation (2014). Non-communicable Diseases Country Profiles. Myanmar. Available at: http://apps.who.int/iris/bitstream/10665/128038/1/9789241507509_eng.pdf

Health Metrics (2010). GBD Profile Myanmar. Available at: www.healthmetricsandevaluation.org

Wada T et al (2005). Comprehensive geriatric assessment for community-dwelling elderly in Asia compared with those in Japan: VI Maubin in Myanmar. *Geriatrics and Gerontology International*, Vol 5, 4, 276-285.

Life expectancy/Burden of disease

Aung Tun (2007). Global School Based Student Health survey.

Chan MF and Taylor BJ (2012). Impact of Demographic Change, Socioeconomics and Health Care Resources on Life Expectancy in Cambodia, Laos and Myanmar. *Public Health Nursing*, Vol 30,3, 183-192.

Lee TJ et al (2006). Mortality rates in conflict zones in Karen, Karenni and Mon States in Eastern Burma. *Trop. Med. Int. Health*, Vol 11, 7, 1119-27.

Cancer

Aung S (2002). Epidemiology of cancer in Myanmar. *Proceedings of Forum on Cancer in Myanmar, 2002*, 33-60.

Cancer statistics 2008. Yangon Cancer Registry Report. Yangon Cancer Registry, YGH, 2008.

Halbert J and Aye Aye Khaing (2014). Overview of pediatric oncology and hematology in Myanmar. *South Asia Update. South Asian Journal of Cancer*, Vol 3, 1, 78-82.

Htun Naing Oo et al (2011). Oral cancer in Myanmar: a preliminary survey based on hospital based cancer registries. *J Oral Pathology and Medicine*, Vol 40, 20-26.

Mu Mu Shwe et al (2011). Prevalence of cervical cytological abnormalities among attendees at Cervical Cancer screening clinic, DMR (Lower Myanmar). *Myanmar Health Sciences Research Journal*, Vol 23, 3, 153- 158.

Reichart PA and Way TH (2006). Oral cancer and pre-cancer in Myanmar: a short review. *J oral Pathology and Medicine*, Vol 35, 193-6.

Htwe TT (2012). Thyroid malignancy among goitrous thyroid lesions: A review of hospital based studies in Malaysia and Myanmar . *Singapore Medical Journal*, Vol 53,3, 159-163.

Htwe MT et al (2005). Clinico-pathological study of premalignant lesions and conditions. *Myanmar Dental Journal*, 6, 16-22.

Htwe TT and Ko M (2001). Thyroid cancer: a three years retrospective histo-pathological study. *Journal Myanmar Academy Tech.*, Vol 1, 23-30.

Soe Aung et al (2002). Oncological review of colorectal cancer. *Myanmar Medical Journal*, Vol 46, 1-4, 5- 9.

Soe Aung et al (2002). Age pattern of gastrointestinal tract malignancies over 8 year period (1993-2000) at the oncology department, YGH. Myanmar Medical Journal, Vol 46, 1-4.

Soe Aung. Cancer Statistics Year 2000 (Yangon. Mandalay, Taunggyi). Yangon Cancer Registry. Dept. of Radiotherapy and Medical Oncology, Yangon General Hospital, 2000, Yangon..

Soe Aung. Cancer statistics. Yangon Cancer registry, Yangon General Hospital. Preliminary report 1974-2006.

Soe Aung. Cancer statistics. Yangon Cancer registry, Yangon General Hospital. Preliminary report 2003-2005.

Soe Aung. Yangon Cancer registry report 1993-2001. Yangon Cancer Registry. Yangon General Hospital.

Soe Aung. Epidemiological overview of cervical cancer. Yangon Cancer Registry, (1974-2006).

Cardiovascular disease

Aung et al (1993). Prevalence of cardiovascular diseases in rural areas of Hmawbi and urban Yangon city. Asia Pacific Journal of Public Health, 6,4, 188-94.

Ye Tint Lwin et al (2003). Prevalence of coronary Health Disease risk persons in South Dagon Township, Yangon Division. Myanmar Health Sciences Research Journal, Vol 15, 1-3, 16- 20.

Hypertension

Cho Naing and Kyan Aung (2014). Prevalence and risk factors of hypertension in Myanmar: A systematic review and meta-analysis. Medicine, Vol 93, 21, e100.

Han Win et al (2005). Prevalence of hypertension in Pardagyi village, Kyanktan Township. Myanmar Health Sciences Research Journal, Vol 17, 1, 22- 26.

Han Win et al (2006). Prevalence, awareness, correlates, treatment and control of hypertension in a rural community of Waw Township, Bago Division. Myanmar Health Sciences Research Journal, Vol 18, 1, 41- 47.

Khin Myat Tun et al (2010). Prevalence of hypertension and its associated risk factors in Pintaya Township, Southern Shan State. Myanmar Health Sciences Research Journal, Vol 22, 1, 51-57.

Khin Myat Tun et al (2010). Prevalence of hypertension and its associated risk factors in Pintaya Township, Southern Shan State. Myanmar Health Sciences Research Journal, Vol 22, 1, 51- 57.

Ko Ko Zaw et al (2011). Prevalence of Hypertension and its Associated Factors in the Adult Population in Yangon Division, Myanmar. Asia Pacific Journal of Public Health, Vol 23, 4 496-506.

San Shwe et al (2004). Prevalence of hypertension in 2 selected villages of Kayin State, Myanmar. Regional Health Forum, Vol 8, 1, 104- 112.

Diabetes

Khin Phyu Phyu et al (2010). Prevalence and risk factors of diabetes mellitus among middle aged school teachers I Mandalay City. Myanmar Health Sciences Research Journal, Vol 22, 3, 147- 150.

Khin Ye Myint et al (2004). A comparative profile analysis of diabetics from 3 hospitals: Mandalay General Hospital, Sanpya General Hospital and Yangon General Hospital (1992-1998) vs Yangon General Hospital (1999- 2002). Myanmar Medical Journal, Vol 48, 1-4, 19- 22.

Kyaw Kyaw Swe (2005). Diabetic food in orthopaedic practice. Myanmar Medical Journal, Vol 49, 1-4, 39.

Than Than Aye et al (2014). Diabetes mellitus in Myanmar: Socio-cultural challenges and strength. Review article. Journal of Social Health and Diabetes, Vol2, 1, 9- 13.

Rheumatological diseases

Chit Soe et al (2000). Rheumatology in Pathein Practice. Myanmar Medical Journal, Vol 44, 3, 140.

Chit Soe et al (2002). Clinical profile and quality of life in gouty arthritis. Myanmar Medical Journal, Vol 46, 1-4, 38- 40.

Haematological

Ministry of Health (2001). A study of hemaglobin status and food practices of Myanmar women. NayPyiDaw, Myanmar. Ministry of Health.

Multiple

Hla Soe Tint et al (2011). Prevalence and correlation of obesity, hypertension and type 2 diabetes mellitus in selected townships in Upper Myanmar. Myanmar Health Sciences Research Journal, Vol 23, 3, 178-185.

Visual impairment/blindness

Abdul Rahman AM et al (2008). Pseudo-exfoliation in a rural Burmese population: the Meiktila Eye Study. British Journal of Ophthalmology, Vol 92, 1325-1328.

Arnold RW and Arnold AW (2008). Refractive Error in Myanmar. Letter. Ophthalmology, Vol 115, 9, 1642- 1643.

Athanasiov PA et al (2008). Cataract in rural Myanmar: prevalence and risk factors from the Meiktila Eye Study. British Journal of Ophthalmology, Vol 92, 1169-1174.

Athanasiov PA et al (2008). Cataract surgical coverage and self-reported barriers to cataract surgery in a rural Myanmar population. Clinical and Experimental Ophthalmology, Vol 36, 6, 521-525. (Abstract only)

Casson RJ et al (2007). Gonioscopy findings and prevalence of occludable angles in a Burmese population: the Meiktila Eye Study. British Journal of Ophthalmology, Vol 91, 856-859.

Casson RJ et al (2007). Prevalence and causes of visual impairment in rural Myanmar. American Academy of Ophthalmology, Vol 114, 2302-2308.

Casson RJ et al(2007). Prevalence of glaucoma in rural Myanmar: the Meiktila Eye Study. British Journal of Ophthalmology, Vol 91, 710-714.

Durkin SR et al (2008). The prevalence, severity and risk factors for pterygium in central Myanmar: the Meiktila Eye Study. British Journal of Ophthalmology, vol 92, 25-29.

Durkin SR et al (2007). Prevalence of trachoma-related trichiasis and corneal opacity in rural Myanmar: the Meiktila Eye Study. Ophthalmology, 114, 5, e7-e11.

Gupta A et al (2008). Prevalence of Refractive Error in Rural Myanmar. American Academy of Ophthalmology, Vol 115, 26-32.

Kay Thi Myint et al (2012). Ocular and other comorbidities in HIV positive orphans in Myanmar. International Journal of Collaborative Research on Internal medicine and Public Health, Vol 4, 6, 1245-1256.

Limburg H et al (2001). Study report on rapid assessment of cataract surgical services in Hpaan, Union of Myanmar, NayPyiDaw, Myanmar. Ministry of Health, Department of Health, Trachoma control and Prevention of Blindness Programme, 2001.

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Muecke J et al (2009). A survey of visual impairment and blindness in children attending seven schools for the blind in Myanmar. *Ophthalmic Epidemiology*, Vol 16, 6, 370-377.

Myint KY and Chit S (2001). Diabetic eye disease in Myanmar. *J ASEAN Fed Endoc Soc*, 19, 8-13 .

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Tin Tin Hla (2003). A clinical- based survey of blindness in Toungoo. *Myanmar Medical Journal*, Vol 47, 1-2, 23-25.

Warrier S et al (2008). Ocular biometry and determinants of refractive error in rural Myanmar: the Meiktila Eye Study. *British Journal of Ophthalmology*, Vol 92, 1591-1594.

Wu HM et al (2008). Anisometropia in an adult population in rural Myanmar: A Meiktila Eye Study. *Ophthalmic Epidemiology*, Vol 15, 162-166.

Wu HM et al (2007). Association between stature, ocular biometry and refraction in an adult population in rural Myanmar: the Meiktila eye study. *Clin Experiment. Ophthalmol.* 35, 834-839.

Hearing impairment

Machenzie I (2010). Hearing Impairment in Asia – a report of four country survey as provided by the Global Burden of Disease 2010 hearing impairment expert group. Unpublished.

Congenital/genetic disorders

Kyaw Zin Thant et al (2006). Active surveillance for congenital rubella syndrome in Yangon, Myanmar. *Bulletin of the World Health Organisation*, Vol 84, 1, 12- 20.

Aye Aye Khaing (2015). Overview of thalassaemia in Myanmar children. *Myanmar Medical Journal*, Vol 57, 2, 53- 62.

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Than AM et al (2005). High incidence of 3-thalassaemia, haemoglobin E and glucose-6-phosphate dehydrogenase deficiency in populations of malaria endemic Southern Shan State, Myanmar. *International Journal Hemetol*, Vol 82, 2, 119-23.

Chronic pain

Sakakibara T et al (2013). A comparison of chronic pain prevalence in Japan, Thailand and Myanmar. *Pain Physician*, Vol 16, 603-608.

Oral health

Aung Zaw Zaw Phyo et al (2013). Oral health status and oral hygiene habits among children aged 12-13 years in Yangon, Myanmar. *Southeast Asian Journal of Tropical Medicine and Public Health*, Vol 44, 6, 1108- 1114.

Chu CH et al, (2012). Oral health status and behaviours of children in Myanmar – a pilot study in four villages in rural areas. *Oral Health Prev. Dent.*, 365-71.

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Mental health

Akiyama T et al (2013). Mental health status among Burmese adolescent students living in boarding houses in Thailand: a cross-sectional study. *BMC Public Health*, Vol 13: 337.

Cook TL et al (2015). War trauma and torture experiences reported during public health screening of new resettled Karen refugees: a qualitative study. *International Health and Human rights*. Vol 15: 8

Cardozo BL et al (2004). Karenni refugees living in Thai-Burmese border camps: traumatic experiences, mental health outcomes, and social functioning. *Social Science and Medicine*, Vol 58, 2637-2644.

Fellmeth G et al (2015). Pregnant migrant and refugee women's perceptions of mental illness on the Thai-Myanmar border: a qualitative study. *BMC pregnancy and Childbirth*, Vol 15:93.

Lim A G et al (2013). Trauma and mental health of medics in eastern Myanmar's conflict zones: a cross-sectional and mixed methods investigation. *Conflict and Health*, Vol 7, 15.

Lopes Cardozo B et al (2004). Karenni refugees living in Thai-Burmese border camps: traumatic experiences, mental health outcomes, and social functioning. *Soc Sci Med*, 58, 12: 2637-2644.

Shannon PJ et al (2015). Torture, war trauma and mental health symptoms of newly arrived Karen refugees. *J Loss Trauma*, Vol 20, 6.

Snake bite

Aye Aye Myint et al (2007). Poisonous snakebites of Myanmar with special references to the bites and case fatality rate (1998- 2005). *Myanmar Health Sciences Research Journal*, Vol 19, 2, 87- 93.

Aye Aye Myint et al, An epidemiological study of snakebite and venomous snake survey in Myanmar. In: *Management of snakebite and Research*. , WHO/SEARO publication, 2002, 12-16.

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Sann Mya et al (2007). Epidemiological survey of snakebites in Taungdwingyi: incidence, case fatality rate and treatment-seeking behaviour. *Myanmar Medical Journal*, Vol 50, 3.

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Substance abuse

Phyu t et al. Myanmar Study on prevalence of amphetamine-type substance abuse among high school students in Yangon. Unpublished.

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Road accidents

Moe Kyaw Myint et al (2015). Incidence of injury due to road traffic accidents in Lashio Township, Northern Shan State. Myanmar Health Sciences Research Journal, Vol 27, 1, 72- 76.

Risk factors

General

MoH/WHO/WDF (2015). Report on national survey of diabetes mellitus and risk factors for non-communicable diseases in Myanmar (2014). Ministry of Health, November 2015.

Tint Swe Latt et al (2004). Report on WHO STEPwise Approach to NCD surveillance, Yangon Division, Myanmar.

World Health Organisation (2011). Non Communicable Disease Risk Factor Survey Myanmar 2009. Regional Office for South East Asia.

WHO. Non communicable Disease Risk Factor Survey Myanmar. 2009. SEA-Tobacco -40. WHO/SERO. 2011.

Physiological/metabolic

Aye Aye Win et al (2012). Study on presence of macrophages in cervical cancer using immunohistochemistry. Myanmar Health Sciences Research Journal, Vol 24, 1, 25- 29.

Casson RJ et al (2009). Risk factors for early angle-closure disease in a Burmese population: the Meiktila Eye Study. Eye, Vol 23, 933-939.

Han Ni et al (2012). Hepatitis C Virus in Diabetes Mellitus patients. International Journal of collaborative research on internal medicine and public health, Vol 4, 5, 599-606.

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Khin Swe Thant et al (2013). Helicobacter infection among endoscopy-proved gastritis and peptic ulcer patients from Thingangyun Sampya Hospital, Yangon. *Myanmar Health Sciences Research Journal*, Vol 25, 2, 120- 123.

Khin Ye Myint and Chit Soe (2000). A case control study on the risk factors for diabetes Mellitus: Myanmar. *Myanmar Medical Journal*, Vol 44, 2, 73.

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Mu Mu Shwe et al (2014). Prevalence of High risk Human Papillomavirus (HR-HPV) infection among women with normal and abnormal cervical cytology in Myanmar. *Acta Med Okayama*, Vol 68, 2, 79-87.

Mu Mu Shwe et al (2015). Trend in Human Papillomavirus Genotypes in Cervical Neoplasia observe in a newly developing township In Yangon, Myanmar. *Acta Med Okayama*, Vol 69, 1 51- 58.

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Myat Thandar et al (2003). Body Mass Index (BMI) of Institute of Medicine (1) Entrants. *Myanmar Medical Journal*, Vol 47, 1-2, 37-39.

Nwe Nwe (2013). Assessment of cardiovascular risk in Myanmar. *Regional Health Forum*, Vol 17, 1, 39- 52.

Morbidity, risk factors and knowledge of cardiovascular diseases in 4 townships of Myanmar. Presented by Professor Nwe Nwe at paper reading session.

Okada S et al (2000). High prevalence of hepatitis C in patients with and patients with liver diseases in Myanmar (Burma). *Acta Medica Okayama*, Vol 54, 3, Article 7.

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Win Lai May et al (2014). Nutritional Status of Children with Cerebral Palsy in Cerebral Palsy Clinic, Yangon Children's Hospital. *Myanmar Health Sciences Research Journal*, Vol 26, 1, 22- 27.

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Zaw Myint et al (2009). Relationship between waist-hip ratio and cardiovascular risk factors among people in South Dagon Township. *Myanmar Health Sciences Research Journal*, Vol 21, 1 1-6.

Awareness/ Knowledge / Behaviours

Aung Naing Oo. A study on Tobacco Consumption among the Military personnel in Hmawbe Cantonment. 2006.

Aung Si Mon Myo et al (2014). Factors influencing smoking, alcohol drinking and betel chewing practices among third-year male students at University of Agriculture (Yezin). *Myanmar Health Sciences Research Journal*, Vol 26, 2, 88-93.

Aung Thu et al (2008). Assessment of community's behaviours focussing on knowledge and attitude towards cancer in Hlinethaya Township, Yangon Division in 2006. *Myanmar Health Sciences Research Journal*, Vol 20, 2, 89-94.

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Han Win et al (2007). Smoking in an urban community; prevalence, associated factors and behaviour among adult males in Kyimyintine Township. *Myanmar Health Sciences Research Journal*, Vol 19, 2, 76- 80.

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5. Other

PA-11. Dr Ei Sandar U. Drinking habit of medical doctors in Myanmar 2009.

Annex 3: Available evidence on morbidity and mortality due to non-communicable diseases (NCDs) and their risk factors in Myanmar

Section 1: Current status/prevalence

NCDs multiple

Byfield S and Moodie R, 2013. Addressing the world's biggest killers: Non-communicable disease and the international development agenda. ACFID Research in Development Series, report no. 7. November 2013. Available at: <http://docplayer.net/7179110-Addressing-the-world-s-biggest-killers-non-communicable-diseases-and-the-international-development-agenda.html>

The report provides an overview of the prevalence of NCDs in LMICs, their impact on populations and actions to respond. Case studies on Tonga and Myanmar are reported. The authors outline the current burden of NCDs in Myanmar which is estimated to account for 40% of all deaths. The authors note that recent political and social changes in the country have the potential to increase risk factors relating to NCDs. There is an important opportunity to put in place a range of responses to tackle the growing burden of NCDs and their risk factors at this time, with a role for civil society, alongside government actions.

Hla Soe Tint et al, 2011 Prevalence and correlation of obesity, hypertension and type 2 diabetes mellitus in selected townships of Upper Myanmar, Myanmar Health Sciences Research Journal, 23, 3: 178-185

The authors present a cross sectional community-based study to assess the prevalence and correlation of common NCDs in different population groups in the country (hilly versus plain living). Multistage sampling was used to select 2 townships as study sites with further sampling (random and feasibility) used to select wards and villages within these settings. A total of 3200 people were included in the study. Face to face interviews were conducted alongside measurements of blood pressure, height, weight, urine sugar and blood glucose, taken by trained data collectors. The authors report an overall prevalence (per 1,000 adults over 18 years) for the 3 diseases in these populations as: obesity (77), hypertension (215) and diabetes mellitus (96). The authors note the prevalence of obesity and diabetes mellitus was higher in the plain area and prevalence of hypertension higher in the hilly area. The differences were found to be statistically significant. A higher prevalence of NCDs found in females was also significant. Age was an important factor in increasing levels of diabetes and hypertension, but not in obesity. The authors

also found important associations between obesity and diabetes and hypertension, and between hypertension and diabetes, in these populations. This is an interesting study showing geographical difference in prevalence of NCDs with links to a range of risk factors. However the study is conducted in only 2 townships which may not be representative of other township populations, limiting the generalisability of the findings.

World Health Organisation, 2014. Non communicable diseases country profile, Myanmar. Available at: http://apps.who.int/iris/bitstream/10665/128038/1/9789241507509_eng.pdf

This report presents the Myanmar data from the 2nd global status report on worldwide progress and control of NCDs. The report covers updates on 9 voluntary global targets, and mortality and risk factors relating to NCDs. In Myanmar, NCDs are estimated to account for 59% of total deaths. The probability of dying between ages 30 and 70 years from one of the 4 main NCDs (cancer, CVD, diabetes, chronic respiratory diseases) is 24%. Data also shows that 38% of males and 7% of females currently smoke; 31% of males and 27% females have raised blood pressure, and 2% of males and 6% of females are obese. Myanmar has an operational multi-sectoral national policy, strategy and action plan for several NCDs as well as specific policies, strategies and action plans for key risk factors. The report is a useful snapshot of current status and comparison with other countries.

Cancer

Halbert J and Khaing Aye Aye, 2014. Overview of pediatric oncology and hematology in Myanmar. South Asian Journal of Cancer, 3, 1: 78-82

The authors present a review of paediatric oncology and haematology in Myanmar. As no national population based paediatric cancer registry is available, the authors used global incidence rates to anticipate the number of expected cases of cancer per year in Myanmar, and compared this to the number of diagnosed cases found. The authors report that the available data from Yangon and Mandalay on identified cases was lower than their estimate, suggesting under-diagnosis of cases. The authors draw attention to a number of major challenges for paediatric cancer in Myanmar including high levels of abandonment of treatment. The authors highlight the need for a cancer registry, together with increased funding, a reliable supply of drugs, and quality control. They also suggest that the issue would benefit from the presence of a local children's cancer NGO and a parents' support group to promote the issue.

Htun Naing Oo et al, 2011. Oral cancer in Myanmar: a preliminary survey based on hospital-based cancer registries. Journal Oral Pathol Med, 40: 20-26

In this study, the authors determined the case load for oral cancer in Myanmar and assessed its relative importance to the total cancer case load based on a review of city and hospital based cancer registries between 2002 and 2007. Data was collected from the cancer registry departments of Yangon and Mandalay hospitals, the 2 largest urban centres in the country. The authors calculated an overall whole body cancer incidence of 58/100,000 population for the period 2002-2007. Females were found to have a higher incidence at 61/100,000 than males at 55/100,000. However the authors state that the rates cannot be regarded as true values of incidence. In terms of sites of cancer, bronchus and lung cancer were found to be the most common cancers in males followed by liver cancer, while uterine and cervical cancer, followed by breast and ovary cancer, were found to be the most common sites of cancer in women. Oral cancer was found to be in overall 10th position for females and 6th position for males.

Htwe TT, 2012 Thyroid malignancy among goitrous thyroid lesions: A review of hospital based studies in Malaysia and Myanmar. Singapore Medical Journal, 53, 3: 159-163

The author presents a review of 5 studies looking at the incidence of thyroid cancer in persons with goitrous thyroid swellings. The review includes studies from Malaysia and Myanmar. However only one study relates to Myanmar. This study shows an increasing incidence of thyroid cancer

over the study period 1996-1998, but the finding was not statistically significant. Though published in 2012, the data collection for the study relates to a period predating the current review.

Mu Mu Shwe et al, 2011. Prevalence of cervical cytological abnormalities among attendees at cervical cancer screening clinic, DMR (Lower Myanmar). Myanmar Health Sciences Research Journal, 23, 3: 153- 158

The authors present a laboratory- based study of samples taken from women attending a screening clinic at the Department for Medical Research in Lower Myanmar, between 2008 and 2010. A total of 1814 women attending the clinic were screened. PAP smears were taken and analysed for cervical cytology. Just over half (52%) of women had inflammatory smears and 6% had atypical squamous lesions. Cervical carcinoma was detected in 6 women (0.33%). The results highlight the prevalence of cytological abnormalities in this population. The age group most affected were women 41-60 years. The study used samples taken from women attending the clinic, who may not be representative of women who did not attend, and it is unclear whether the 1814 women screened represent all women attending the clinic. In addition the study population is based on one clinic, limiting the generalisability of the findings.

Mu Mu Shwe et al, 2012. Community based cervical cancer screening in Bago and Indagaw suburban areas. Myanmar Health Sciences Research Journal, 24, 2: 89- 95

The authors present a small community and laboratory-based cross-sectional descriptive study looking at the early detection of cervical cancer. The study used a population of 170 married women aged 15 and 55 years with and without gynaecological symptoms. All participants resided in one of two military communities (Bago and Indagaw). Using community based cervical cytology screening, the authors report that a total of 72% of the women had inflammatory smears and 5% had mild dyskaryosis (pre- cancerous lesions). One person was found to have cancer. Most abnormal cases were found in those aged 36-55 years, and with 3-5 children. The study population are married women and may not be representative of women who are not married. In addition participants were residing in a particular catchment area which may not be representative of other areas, limiting the generalisability of the findings.

Mu Mu Shwe et al, 2013. Genotyping of high-risk type Human Papillomavirus (HR-HPV) in women with cervical cytological abnormalities. Myanmar Health Sciences Research Journal, 25, 1: 1-7

The authors present a laboratory-based cross-sectional descriptive study conducted in 2010-2011 to determine the proportion of high risk human papillomavirus infection and genotypes in women with abnormal cervical cytology. Women were aged 18 and 69 years. Cervical swabs were taken from 96 women with abnormal cytology and 20 women with normal cytology presenting through a screening clinic. HPV DNA testing and genotyping was undertaken on samples. 41% of women tested positive for HR-HPV. The proportion of women with HR-HPV ranged from 5% in those with normal cytology to 100% in those with squamous cell carcinoma. Percentages for a range of abnormal cytologies were also noted (36% of those with inflammatory smear; 60% in those with atypical squamous cells of undetermined significance; 87% of low grade squamous intraepithelial lesion; 50% high grade squamous intraepithelial lesion). The most common HPV genotypes recorded were HPV 16 (60%) and HPV 31 (15%). HPV 18 and HPV 58 were both 12.5% respectively. The authors note that women with abnormal cytology are 10 times more likely to be HR-HPV positive than those with normal cytology, while vaccine preventable HPV genotypes HPV 16 and HPV 18 are common. The study is conducted in a sample obtained from women attending a screening clinic who may not be representative of those not attending. In addition the study is conducted in one clinic in Yangon, limiting the generalisability of the findings.

Mu Mu Shwe et al, 2014. Prevalence of high risk Human Papillomavirus (HR-HPV) infection among women with normal and abnormal cervical cytology in Myanmar. Acta Med Okayama, 68, 2: 79-87

The authors present a cross sectional study of 1771 women attending a cervical cancer screening clinic to determine the proportion of HR-HPV in women with normal and abnormal cervical cytologies. 96 women with abnormal cervical cytology and 20 with normal cytology were randomly chosen for HPV-DNA testing and genotyping. Just under half the women (49%) were found to have inflammatory smears and 5% had atypical squamous cells of undetermined significance. Three cases (0.2%) of cervical cancer were detected. As per their previous study, the authors report that women with abnormal cervical cytology are 10 times more likely to be HR-HPV positive than those with normal cytology. This finding was significant. All women included in the study were attending a screening clinic and may not be representative of those who did not attend. In addition the study is conducted in one clinic in Yangon, limiting the generalisability of the findings.

Mu Mu Shwe et al, 2015. Trend of Human Papillomavirus genotypes in cervical neoplasia observed in a newly developing township in Yangon, Myanmar. Acta Med. Okayama, 69, 1: 51-58

The authors present a cross sectional descriptive study of 108 women aged 20-78 years to determine the prevalence of HPV genotypes in women with cervical neoplasia. All participants in the study were women attending Sanpya General Hospital in Yangon, though details of recruitment are not available. The authors report that the proportion of high risk HPV infection in cervical neoplasia was: Cervical Intraepithelial Neoplasia (CIN) 1- 44%; CIN 2 - 63%, and CIN 3 - 71% ,and squamous cell carcinoma 74%. The authors report a highly significant association between cervical neoplasia and HPV. Most women infected with HPV were aged 40-49 years. The authors discuss the significance of the findings in terms of helping to predict the effectiveness of the current HPV vaccine within the population.

Reichert, PA and Way TH, 2006. Oral Cancer and pre-cancer in Myanmar: a short review. Journal of Oral Pathol. Med. 35: 193-6

The authors present a review of oral cancer in Myanmar utilising data from the Yangon Cancer Registry. Data from 1974 - 2001 was analysed for the study. A total number of 85,298 cases of cancer were recorded over the 27 year period. The authors calculate an average annual incidence rate for oral cancer of 363 per 100,000 populations in the period 1963-1974. The tongue was identified as the most common site of oral cancer making up nearly a third of total cancers (31%). The study provides an indication of the historical status of oral cancer and a baseline for subsequent comparisons.

Soe Aung et al, 2002. Age pattern of gastrointestinal tract malignancies over 8 year period (1993-2000) at the oncology department, Yangon. Myanmar Medical Journal, 46, 1-4: 1-4

The authors present a retrospective study of patients with colorectal and gastric cancers treated at the radiotherapy department of Yangon General Hospital (YGH) to determine the age and sex patterns of the disease. All patients with colorectal and gastric cancer who were treated at YGH over the 8 year period (January 1993-December 2000) were included in the study. Patients were classified by type of malignancy, year of presentation and sex. The authors report that of the total cases, 45% had a malignancy of the stomach, 23% had a malignancy of the colon and 31% had a malignancy of the rectum. The age range for all malignancies was broad (25 - 85 years). The median age for all 3 cancers was around 50 years. When the authors compared the age ranges for the cancers between men and women, only the difference for stomach cancer was found to be significant, though the magnitude of the difference was very small. Unlike an earlier study (conducted in 1996), no significant difference was found between males and female patients with colorectal cancer. The data used in the current study is based on those presenting at one clinic in Yangon, who may not be representative of all patients, limiting the generalisability of the results.

Soe Aung et al, 2002. Oncological review of colorectal cancer. Myanmar Medical Journal, 46, 1-4: 5- 9

The authors undertook a retrospective review of 53 colorectal patients attending the radiotherapy department (and other departments) at Yangon General Hospital in 1991 to explore their survival status and current situation and treatment. No details of the visits to patients are presented. The authors report that the majority of patients had advanced stages of cancer. Patients had received a range of treatments - both radiotherapy and chemotherapy. The cost of treatment was found to be a major barrier to treatment in some patients. The duration of follow-up for patients varied, with an average follow up of 7.8 months. The overall 5 year survival rate was found to be 26% but with large confidence intervals, and therefore needs to be treated with some caution. The authors present this as an exploratory study with further studies needed to follow-up on the issues identified.

Diabetes

Khin Phyu Phyu et al, 2010. Prevalence and risk factors of diabetes mellitus among middle-aged school teachers in Mandalay City. Myanmar Health Sciences Research Journal, 22, 3: 147- 150

The authors present a cross-sectional and laboratory based study to identify the prevalence and risk factors for diabetes. The study used a random sample of 522 school teachers aged 40-60 years in Mandalay city, the 2nd largest urban centre in the country. Females were represented more than 6:1 to males in the sample. The authors estimate the prevalence of diabetes to be 16% in this population and of these, 12% did not know they had the disease. The authors found that the risk of diabetes was significantly associated with age, history of hypertension, obesity, as well as having a diabetic relative. No association was found with smoking, alcohol consumption or exercise in this study. The study provides additional evidence of the importance of diabetes in the Myanmar population. However the particular group for inclusion in the study is not representative of the wider population of adults aged 40-60 years, while the urban city location may not be representative of other areas, thus limiting the generalisability of the results.

Khin Ye Myint et al, 2004. A comparative profile analysis of diabetes from 3 hospitals: Mandalay General Hospital, Sanpya General Hospital and Yangon General Hospital (1992-1998) versus Yangon General Hospital (1999-2002). Myanmar Medical Journal, 48, 1-4: 19-23

The authors present the results of a cross-sectional study to compare the characteristics of diabetic patients attending major hospitals in the country over 2 time periods (1992-1999) and (1999-2002). All patients with diabetes attending Yangon, Sanpya and Mandalay hospitals in the designated time periods were included in the study. The characteristics and history of diabetes in patients was recorded, together with blood sugar levels. Patients from the period 1992 - 1999 were compared with those from 1999-2002. The authors report that the proportion of type 2 diabetes was significantly higher in the 1999-2002 period (97% compared to 94%). This finding was statistically significant. No difference was found in the age distribution of patients in the 2 time periods. The proportion of females was higher in the 1999-2002 period. Complications were seen in over 82% of diabetics in the earlier period compared with 67% in the later period. However the later period covered Yangon only. Because of the differing data sets between the time-periods, some caution needs to be taken in interpreting the results. However the study provides a useful indication of the changing nature of the disease and what this may mean for future support.

Kyaw Kyaw Swe, 2005 Diabetic Foot in Orthopaedic Practice. Myanmar Medical Journal, 49, 1-4: 39-43

The author presents a cross-sectional hospital based descriptive study aimed at assessing the clinical profiles of diabetic foot. The study was based on 42 in-patients at North Okkalapa General Hospital who were admitted between August 2004 and July 2005. A clinical history and examination of patients were undertaken and a record made of any treatment provided. The severity of the diabetic foot was graded. The author reports that the prevalence of diabetic foot in the orthopaedic ward of this hospital was 3.3% in the year under study. Both males and females were affected. Females were represented 2:1 to males. Just over three quarters (76%) of those presenting with diabetic foot had a history of diabetes. A history of trauma was also present in 69% of cases. Neuropathic foot lesion was twice as common as ischaemic foot lesion. The author reports that 64% of cases resulted in some form of amputation. The study provides a useful indication of the importance of complications of diabetes within the population, particularly in light of the high number of amputations and the significant implications of this for patients.

Than Than Aye et al, 2014. Diabetes Mellitus in Myanmar: socio-cultural challenges and strength, Journal Social Health and Diabetes, 2, 1: 9- 13

The authors present a useful review of the major challenges in diabetes care in Myanmar, identifying 4 main challenges: diabetes care and public health seeking behaviour, traditional medicine, lifestyle and diet, and the role of religion and environmental challenges. The authors highlight the problem of ineffective diabetes care at the present time. Financial constraints were identified as an issue for most diabetic patients, while traditional and complementary and alternative medicine may be the only source of health care for both urban and rural poor. The authors report that traditional medicine is the first point of access for 70% of patients. The authors highlight that views held by the population on obesity as a symbol of health may undermine actions to address this risk factor, especially in those who are less well educated. The authors note that religion may have an important role in helping people to cope with the symptoms of disease.

Tint Swe Latt et al, 2015. Myanmar Diabetes Care Model: Bridging the gap between urban and rural health care delivery. Journal of ASEAN Federation of Endocrine Societies, DOI: <http://dx.doi.org/10.15605/jafes.030.02.16>

The authors present a timely review of diabetes and diabetic care in Myanmar. The authors highlight the current burden of diabetes within the population and the need to improve access to care, particularly for those outside the main urban centres. The Myanmar Diabetes Care model is outlined. The model aims to ensure coordinated and effective prevention and management of diabetes in urban and rural areas. It is designed around the specific needs and capabilities of the Myanmar health system, and works across different levels of the system – primary, secondary and tertiary. The authors stress the importance of primary care in ensuring access for the majority of the population residing in rural areas. Community mobilisation at the primary level on healthy practices is also identified as critical to underpin the model.

Coronary heart disease

Ye Tint Lwin et al, 2003. Prevalence of coronary heart disease risk person in south Dagon Township, Yangon, Myanmar. Myanmar Health Sciences Research Journal, 15, 1-3: 16- 21

The authors present a cross sectional study to determine the prevalence of coronary heart disease risk persons. The study is based on a sample of 620 adults living in one township in Yangon. The study population was achieved by random sampling of 12 wards within the township from which 60 subjects from each ward were then sampled by simple random sampling. The authors report

that over 40% of those studied had a moderate or above risk of coronary heart disease using RSKO criteria. The factors most associated with risk included: lack of exercise, especially in women, and smoking in men. Hypercholesterolemia, history of cardiovascular disease (CVD), overweight and hypertension were also associated with risk of Coronary Heart Disease (CHD) in both men and women. The study provides useful information on known risk factors for CHD and their link to CHD in an urban population. However the sample is based on a specific urban context, which may not be representative of other urban areas, limiting the generalisability of the findings.

Visual Impairment/blindness

Abdul-Rahman AM et al, 2008 Pseudoexfoliation in a rural Burmese population: the Meiktila Eye Study. *British Journal of Ophthalmology*, 92: 1325-1328

The authors present findings from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). In this paper, the authors present the findings on the prevalence of pseudoexfoliation (PXF). The prevalence was found to be 3.4% in the eligible population and increased with age. The authors report a slightly higher prevalence in men than women but the difference was not statistically significant. The study is conducted in one division which may not be representative of other Divisions, limiting the ability to generalise the findings.

Athanasiov PA et al, 2008. Cataract in rural Myanmar; prevalence and risk factors from the Meiktila Eye Study. *British Journal of Ophthalmology*, 92: 169-1174

The authors present additional results from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). This paper presents the data on the prevalence and risk factors for cataract in the study population. The study found that 40% of the study population were affected by cataract. A higher prevalence was associated with a lower level of education and lower body mass index. As per other results from the study, these results are a useful insight into the causes of visual impairment. However the study area may not be representative of other Divisions, limiting the ability to generalise the findings beyond the study area.

Casson RJ et al, 2007. Prevalence of glaucoma in rural Myanmar: the Meiktila eye study. *British Journal of Ophthalmology*, 91: 710-714

The authors present additional data from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). In this paper the authors report on the prevalence of glaucoma. The study found that almost 5% of the population were affected by glaucoma in at least one eye. This is a useful marker of the prevalence of glaucoma but as with other results from this study, the study area may not be representative of other Divisions, limiting the ability to generalise the findings.

Casson RJ et al, 2007. Prevalence and causes of visual impairment in rural Myanmar. *Ophthalmology*, 114: 2302-2308

The authors present additional results from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). The authors report that 42% of the population were visually impaired of which 33% were classified with low vision and 8% as blind. These figures were slightly lower when WHO classifications of blindness, low

vision and visual impairment were used. The authors report that cataract was responsible for over half (53%) of the bilateral blindness and 64% of blindness in at least one eye, while glaucoma was the cause of 17% of blindness in at least one eye. As with other results from this study, it is a very useful measure of the prevalence of visual impairment and its causes in the country. However the results are based on a study population from one Division which may not be representative of other Divisions, limiting the ability to generalise the results beyond the study area.

Casson RJ et al, 2007. Gonioscopy findings and prevalence of occludable angles in a Burmese population: the Meiktila Eye Study. British Journal of Ophthalmology, 91: 856-859

The authors present additional data from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). In this study the authors present on the prevalence of pre-glaucomatous angle closure disease as a secondary objective of the main study. Primary Angle Closure Suspects (PACS) in at least one eye was found to be nearly 6%, and Primary Angle Closure (PAC) in at least one eye to be 1.5%, in the study population. Women were found to have a higher prevalence than men for PACS over 50 years and for PAC over 70 years. However as with other findings from the Meiktila study, the study area may not be representative of other Divisions, limiting the ability to generalise the findings.

Durkin S R et al, 2007. Prevalence of Trachoma-related Trichiasis and corneal opacity in rural Myanmar. American Academy of Ophthalmology, Vol 114: e7-e11

The authors present additional results from the Meiktila study (a population based cross sectional ophthalmic survey in a population living in central Myanmar). This study presents on the prevalence of trachomatous trichiasis and corneal opacity as a secondary objective to the main study objective. Trachoma was graded as trachomatous trichiasis (TT) or Corneal Opacity (CO) according to WHO grading system. The authors report that the population prevalence for either TT or CO was 2.57% (95% CI 1.67-3.42%). There were no significant gender differences. The prevalence of blindness due to trachoma was 3.5% (95% CI 1.1-8.9%) and trachoma accounted for 0.91% (95% CI 0.27-2.4%) of low vision. Factors significantly associated with trachoma related trichiasis or CO included age; education level: number of children in household (where ≤ 3 children was associated with reduced odds ratio); number of persons in household (where persons < 5 was associated with reduced odds ratio). Multivariate analysis showed that age remained significant when gender, education, number of children and number in household were accounted for; while education remained significant when age, gender, number of children and number in household were accounted for. The study provides important insights into the scale of visual impairment and causes in the population, but as with other results from the Meiktila study, the study area may not be representative of other Divisions, limiting the ability to generalise the findings.

Durkin SR et al, 2008. The prevalence, severity and risk factors for pterygium in central Myanmar: the Meiktila Eye Study. British Journal of Ophthalmology, 92: 25-29

The authors present additional data from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). In this paper the authors present the findings of the study related to pterygium. The authors' report 20% of population was affected by pterygium in either eye and 8% in both eyes. There was no difference in prevalence between men and women but the authors note a significant relationship with age. The generalisability of the findings are subject to the same limitations as other results from the Meiktila study.

Gupta A et al, 2008. Prevalence of refractive error in rural Myanmar. *Ophthalmology*, 115: 26-32

The authors present the results of a randomised population based cross sectional study to assess the prevalence of refractive error (RE) in the population. The study populations was 2076 people 40 years and above from Meiktila district in central Myanmar (the Meiktila study). The authors report that 43% of population had refractive error of -1.0 and above and 6.5% had a refractive error of -6.0 and above. Uncorrected refractive error accounted for 29% of blindness and 19% of low vision found. The prevalence of RE was significantly associated with age but this association was lost when the presence of cataract was included. The authors note that despite the prevalence of RE within the population, only 3 participants presented with glasses. The results provide a useful indication of the prevalence of RE in this population. However as with other results from the Meiktila study, the study area in one Division may not be representative of other Divisions, limiting the ability to generalise the findings.

Muecke J et al, 2009. A survey of visual impairment and blindness in children attending seven schools for the blind in Myanmar. *Ophthalmic epidemiology*, 16, 6: 370-377

The authors present the results of a cross sectional survey of all 7 schools for the blind in Myanmar to assess the level of visual impairment and blindness and characteristics of the children attending the schools. A total of 208 children between the ages of 11 and 16 years were examined and their demographic and health data recorded. The vast majority of children (96%) in the schools were blind and just over half (54%) had been visually impaired since birth. A family history of eye disease was found in 14% of children. The majority of the children who were blind were male (60%). Most (93%) of the children had no associated physical or mental health issues. The authors point to the fact that the study population represents only a small fraction of children who are blind, which may be as high as 25,000. There may also be social bias in terms of the balance of males to females found in the schools. Overall 44% of children had potentially avoidable causes of visual loss. The commonest preventable cause was measles (17%) and treatable causes were cataract (11%) and glaucoma (5%). The authors highlight the level of potential avoidable blindness in children in Myanmar and the importance of national measles immunisation programmes.

Nemet AY et al, 2009. Causes of blindness in rural Myanmar (Burma): Mount Popa Taung-Kalat blindness prevention project. *Clinical Ophthalmology*, 3: 413-421

The authors present a review of clinical records from one hospital eye department in a rural area of Myanmar to assess causes of blindness. The authors report that 41% of those attending were found to have some form of visual impairment (VI) and 33% had bilateral VI or severe visual impairment (SVI) or blindness (BL). Cataract was the major cause of blindness in over half of those attending (54%). As the review is of records of those attending the hospital there is no way of knowing how representative they are of the population who may have some form of visual impairment, but do not attend.

Tin Tin Hla, 2003. A clinical-based survey of blindness in Toungoo. *Myanmar Medical Journal*, Vol 47,1-2: 23-39

The author presents a clinic-based survey over a 10 month period to assess causes of blindness in patients attending an eye clinic. New patients attending the eye clinic were examined and their history of vision problems assessed. 63% of patients were unilaterally blind and 37% of patients were bilaterally blind. Cataract was the major cause of unilateral blindness (77% of patients), followed by glaucoma (9%). Cataract was also responsible for nearly all the bilateral blindness found (95%) with glaucoma in second place at 3.6%. The study provides a further indication of the

importance of cataract as a cause of blindness. However the population presenting at the clinic may not be representative of those who do not attend. In addition the study is conducted in one clinic which may not be representative of populations presenting at other clinics, limiting the generalisability of the findings.

Warrier S et al, 2008. Ocular biometry and determinants of refractive error in rural Myanmar: the Meiktila Eye Study. *British Journal of Ophthalmology*, 92: 1591-1594

The authors present additional data from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). In this paper the authors describe the ocular biometry and determinants of refractive error in the population. The authors report that men had longer axial lengths (ALs), Anterior chamber depths (ACDs), Vitreous chamber depths (VCDs) and steeper corneal curvatures (CCs) than women, all of which were significant. There was no significant difference in lens thickness (LT), nuclear opalescence (NO) or refraction between men and women. NO was the dominant predictor of refractive error. The study provides useful insights into the biometric components and determinants of myopia in a rural population. The generalisability of the findings are subject to the same limitations as other results from the Meiktila study.

Wu H M et al, 2008. Anisometropia in an adult population in rural Myanmar: the Meiktila eye study. *Ophthalmic Epidemiology*, 15: 162-166

The authors present additional data from the Meiktila study (a randomised population based cross-sectional study of 2076 villagers 40 years and above in Meiktila division). In this study the authors report on the prevalence and risk factors for anisometropia. The prevalence of anisometropia was 18% in those aged 40-59 years in the study and increased to nearly half the population (49%) in those aged 70 years and above. There was no difference between men and women in terms of prevalence or severity. The generalisability of the findings are subject to the same limitations as other results from the Meiktila study.

Congenital/genetic

Aye Aye Khaing, 2015 Overview of thalassaemia in Myanmar children. *Myanmar Medical Journal*, 57, 2: 53- 62

The author presents a useful review of a number of studies on thalassaemia in children in Myanmar. The author reports that Myanmar presents a picture of complex thalassaemia genotypes. There is no national thalassaemia registry currently available and the author highlights the importance of such a register to help address the high incidence of thalassaemia in the country.

Kyaw Zin Thant et al, 2006. Active surveillance for congenital rubella syndrome in Yangon, Myanmar. *Bulletin of the WHO*, 84: 12-20

The authors present the findings of an active surveillance study of congenital rubella syndrome (CRS) among children 0-17 months conducted in 13 hospitals and 2 private clinics in Yangon. The authors report a total of 81 children with suspected CRS. There were 18 laboratory confirmed cases of which 11 met the definition of a clinically confirmed case. The authors calculate the annual incidence per 1000 live births as 0.4 suspected cases and 0.1 laboratory-confirmed cases. The authors report that this incidence is similar to rates of CRS seen in Canada and Norway before the introduction of rubella vaccine. The study provides a very useful indication of the burden of

CRS where no routine surveillance exists, though caution is needed in generalising the results to a wider population given the focus on Yangon for data collection.

Rheumatological disease

Chit Soe et al, 2000. Rheumatology in Patheingyi practice. Myanmar Medical Journal, 44, 3: 140 - 145

The authors present a prospective descriptive study to record the spectrum of rheumatological disease in the country. The study is based on a population of 162 patients attending a private specialist clinic in Patheingyi. Patients with rheumatological diseases were recruited into the study between December 1998 and July 1999 and the nature of disease was recorded. The authors report that rheumatological arthritis and osteoarthritis were the most prevalent rheumatological diseases seen in this population, with a male to female ratio of 1:4. The study presents an indication of the nature of rheumatological disease but caution is needed in interpreting the findings from one specialist clinic.

Chit Soe et al, 2002. Clinical profile and quality of life in gouty arthritis. Myanmar Medical Journal, 46, 1-4: 38- 40

The authors present a cross sectional descriptive study providing an assessment of the clinical profile of patients with gout. Patients attending the rheumatology clinic at Patheingyi General Hospital between 1999 and 2000 with oligoarthritis were invited to take part in the study. A total of 21 patients were matched with 42 controls. The authors report that the male to female ratio was 3.2:1 with a mean age of 55 years. Just over half (52%) of the gout patients were obese but this was similar to those in the control group. Just over half (57%) of patients had hypertension; 20% had blood urea, and half (52%) had morning stiffness. Roughly 10% of events of gout were precipitated by exercise; the same percentage by infection; 62% by food, 15% by beer, and a third (33%) by drinking spirits and just under 20% by smoking. Both males and females had visual analogue pain scores suggestive of "moderate pain" while Mean Myanmar Quality of Life (MQOL) scores were reported as 0.6 for male patients and 0.7 for female patients against a base 0-4. The study presents some interesting insights into the clinical profile and quality of life of patients with gout. The authors discuss the findings in relation to other countries. However given the small sample size and their selection through one clinic some care is needed in interpreting the findings.

Chronic pain

Sakakibara T et al, 2013. A comparison of chronic pain prevalence in Japan, Thailand and Myanmar. Pain Physician, 16: 603-608

The authors present a cross sectional study comparing chronic pain in hospital staff across 3 countries in Asia: Japan, Thailand and Myanmar. For the Myanmar study a total of 405 staff from a hospital in NayPyiTay (NPT) completed an anonymous questionnaire on chronic pain. The authors report that Myanmar had significantly lower rates of reported pain (6%) compared to Japan (18%) and Thailand (20%). Three quarters of those reporting pain had not seen a doctor. Staff used relaxation therapy as a common means of dealing with the pain. The study presents interesting insights into the prevalence of chronic pain and its management across countries. However given the particular nature of the subjects included in the study, and the subjective nature of the assessment of the condition, some caution is needed in interpreting the results.

Oral health

Aung Zaw Zaw Phyto et al, 2013 Oral health status and oral hygiene habits among children aged 12-13 years in Yangon, Myanmar. Southeast Asian journal of Tropical Medicine and Public Health, 44, 6: 1108- 1114

The authors present a cross-sectional study to assess the oral hygiene status of schoolchildren. The results are based on a sample of 220 schoolchildren aged 12-13 years from 2 schools in Yangon region (one rural; one urban). The authors report that just over half the children (51%) had dental caries. The mean DMFT was higher among children attending the urban school. No significant association was found between oral hygiene habits and dental caries in this study. The schools are both within Yangon region, and no details are provided on how selected, and care is therefore needed in interpreting the results.

Chun Hung Chu et al, 2012. Oral health status and behaviours of children in Myanmar - a pilot study in four villages in rural areas. Oral Health Prev Dent, 10: 365-371

The authors present a cross sectional study aimed at describing the tooth status, periodontal status, oral hygiene and snacking habits of children. Children aged 5 and 12 years were chosen to represent the status of children's primary and permanent dentition respectively. The study used a convenience sampling protocol to select 95 children living in 4 villages in a hilly rural area of Shan state. The study team assessed the oral health status and dietary and oral health related habits of the children. The authors report that nearly all children aged 5 years (95%) and just under half of children aged 12 years (40%) had never brushed their teeth. The use of a toothbrush was rare. Snacking was uncommon in both age groups. Three quarters of children age 5 years had no caries experience and the mean dmft was 0.9. All dental caries were untreated. 85% of 12 year olds had no caries. The mean DMFT in this age group was 0.2. The mean dmft score in this age group was 2.0. All caries in this group were untreated. No statistically significant association was found between caries experience and tooth-brushing frequency. The study provides some interesting insights into oral health in children at different stages of dental development and the lack of access to dental treatment. However the study was conducted in a hilly rural area using a convenience sample and introducing bias, and some caution is needed in interpreting the results.

Ogawa H et al, 2003. A pilot study of dental caries status in relation to knowledge, attitudes and practices in oral health in Myanmar. Journal of Public Health, 15, 2: 111-117

The authors present a cross sectional community based study to determine the dental caries prevalence in the population. The results are based on a random sample of 739 individuals across a number of age groups, from one township. The authors report that the prevalence of decayed teeth was higher in rural subjects, but the prevalence of filled teeth was higher in urban subjects. In addition the results showed some association between knowledge of prevention of caries and periodontal disease and DMFT scores. Almost all subjects cleaned their teeth at least once per day. The study is a useful insight into oral health practices as well as access to dental treatment within the population. However the study population was drawn from only one township which may not be representative of other townships, limiting the generalisability of the results.

Mental health

Akiyama T et al, 2013. Mental health status among Burmese adolescent students living in boarding houses in Thailand; a cross-sectional study. BMC Public Health, 13:337

This study looks at the mental health status of Myanmar students residing in Thailand. The authors present a cross-sectional study of students aged 12-18 years residing in 16 boarding houses in Thailand. The authors report that both men and women had suffered a traumatic event and more than half had seen someone in danger. Nearly 70% of respondents had seen someone physically abused. Women had higher levels of depression and anxiety than men as presented by their health status scores, though the number of traumatic events was not significantly different between men and women. The study is useful in understanding the mental health impact of conflict. However only 55% of those approached responded introducing significant bias and some care is needed in interpreting the results.

Cardozo BL et al, 2004 Karenni refugees living in Thai-Burmese border camps: traumatic experiences, mental health outcomes, and social functioning. *Social Science and Medicine*, 58: 2637-2644

The authors present a population based study to assess psychosocial issues and the prevalence of mental illness related to traumatic experiences in a Karenni refugee population living in camps. Households were randomly selected in 3 camps, based on camp population numbers. A questionnaire was applied to each selected household to collect data on demographic characteristics and symptoms of mental illness. The authors report that culture specific symptoms were common. Nearly half the respondents (41%) had depression and a similar number had anxiety (42%). More than a quarter (27%) of respondents reported that their quality of life was "miserable" or "very miserable". The authors report that common coping strategies employed by refugees included "talking to family", "sleeping" and "thinking about home". The most common trauma events in the last 10 years included loss of property and possessions, and "hiding in the jungle". Reduced social functioning was correlated with older age and an inadequate level of food. The study presents important information on the mental health status in a specific population group, exposed to trauma.

Cook TL et al, 2015. War trauma and torture experiences reported during public health screening of newly resettled Karen refugees: a qualitative study. *BMC International Health and Human Rights*, 15:8

The authors present a qualitative study to assess the trauma experiences in Karen refugees. A total of 179 Karen refugees participating in a public screening programme were interviewed for this study. The authors report that nearly all those interviewed (85%) had experience of a life-threatening war trauma. Nearly 30 different types of war trauma were recorded by the researchers. The study provides valuable insights into the trauma faced by this particular population. However only those participating in the screening were interviewed and may not represent those who did not attend, limiting the generalisability of the findings to the wider refugee population.

Fellmeth G et al, 2015 Pregnant migrant and refugee women's perceptions of mental illness on the Thai-Myanmar border: a qualitative study. *BMC Pregnancy and Childbirth*, 15:93

The authors present a small qualitative study on the perceptions of mental illness in women. The study is based on a population of 92 pregnant migrant and pregnant refugee women, and 24 ANC staff, who agreed to take part in focus group discussions. The authors note that similar content and themes emerged from all 3 groups, presenting "a common cultural understanding" of mental illness, and thus opportunities to treat and manage. The authors note that the study is one of only a few studies on mental health conducted in Myanmar.

Lim A G et al, 2013. Trauma and mental health of medics in eastern Myanmar's conflict zones: a cross-sectional and mixed methods investigation. Conflict and Health, 7:15

The authors present a mixed methods study to examine the mental health experiences of medics working in conflict-affected populations. The study is based on 74 mobile medics serving in eastern Myanmar. The study combines information from mental health screening tools and qualitative interviews. Findings from the screening tools show fairly low scores for mental health symptoms (depression and anxiety), while interviews outline a number of hardships relating to the work of medics including security issues, violence and threats. The authors report that religious activities are a common coping strategy while a small number of medics use alcohol and other narcotic substances. The study provides insights into the challenges facing community medics, and their coping strategies in these contexts. The authors note a number of limitations with the study, as well as the miss-match between screening scores and interview findings. The study serves as an initial basis for further research, particularly in relation to the potential need to adapt tools for the specific context.

Snake bite

Aye Aye Myint et al, 2007. Poisonous snakebites of Myanmar with special references to the bites and case fatality rate (1998-2005). Myanmar Health Sciences Research Journal, 19, 2: 87-93

The authors present a retrospective analysis of data from the Department of Health Planning on numbers of snake bites and case fatality rate (CFR) across 320 townships in all States and Divisions in the country. The authors report that the incidence of bites and case fatality rates (CFRs) showed considerable variation between States and Divisions. The study found that snakebites are endemic in rice growing Divisions. While the average CFR is less than 9% in the period studied, some townships reported higher CFRs. This is a useful study to provide an overview of the prevalence of snakebite in the country and the variations between areas.

May Mya Win et al, 2000. Cobra bite in Sanpya Hospital, Thingangyun. Myanmar Medical Journal, 44: 7- 9

The authors present a descriptive retrospective and cross-sectional study to assess the conditions in which cobra bites occur and their treatment. The findings are based on 10 patients attending Thingangyun Sanpya hospital between May 1999 and January 2000 who had a confirmed cobra bite. A history of each case was taken covering when the bite occurred, treatment provided and final outcome. No details of the case history approach are provided by the authors. Patients were aged between 5 and 38 years of age; 8 out of 10 were male. The majority of patients were from one part of the township. 40% of patients were bitten while sleeping on the floor and the majority (60%) of those bitten were pre-school and school-age children. All 10 patients received anti-venom. 40% required some form of surgical intervention including amputation, and one patient died. The authors provide some practical advice on reducing the risk of a bite including sleeping above the floor and with a net.

Sann Mya et al, 2007. Epidemiological survey of snakebites in Taungdwinggyi: incidence, case fatality rate and treatment seeking behaviour. Myanmar Medical Journal, 50, 3: 3-9

The authors present a community based survey of the incidence, case fatality and treatment seeking behaviour in snakebite victims to determine the true incidence and magnitude of the problem. The study population was based on one township with the highest recorded incidence of snake-bite in the country. Data was collected through house-to-house visits by a midwife between February and May 2002. A structured questionnaire was used to record snake bites that occurred

in the preceding 4 years (1999-2002), together with the circumstances of the bite, mortality, treatment seeking behaviour, first aid and prophylaxis, using a structured questionnaire. The total number of snakebites recorded over the 4 years was 746 and the authors calculate a yearly incidence of snakebite from 1999 to 2002 of 76, 92, 116, and 72/100,000 respectively. The case fatality was 19% (range 13-23%). Bites were recorded throughout the year with high incidence and case fatality in April, June, August and October. The male to female ratio of bites was 2.5:1. The majority of victims were farmers (84%) and the majority of bites took place during day hours. Age specific morbidity and mortality was highest in the group 21-30 years. The majority of bites were on the lower limbs (80%). 94% of the bites were from poisonous snakes with the remainder from non-poisonous species. The majority of poisonous bites (84%) were due to Russell's viper. The study provides a useful indication of the magnitude of snakebite in this township and may be useful in interpreting the figures available in other townships.

Tun Pe et al, 2005. Incidence, case fatality rate and treatment-seeking behaviour of the snakebite victims from 2 townships of Myanmar. Myanmar Health Sciences Research Journal, 17, 2: 72-80

The author presents the findings of a large community based house- to-house survey in 2 townships to assess the incidence and magnitude of snake bite. The total population covered by the survey was 480,020. The authors report that the total number of snake bites recorded was 1381, which the authors convert to an incidence rate between 72 and 116/100,000 over the 4 years. The average case fatality rate (CFR) was 18%. The findings indicate that most of the victims were bitten while farming and on the lower limbs. The highest age specific morbidity and mortality was found in the age group 21-30 years. This is a useful study highlighting the magnitude of the issue of snakebite and the risks of particular activities. While the study is large, it is conducted in only 2 townships which may not be representative of other townships, limiting its generalisability beyond the particular township populations.

Substance abuse

Williams CT et al, 2011. Crossing Over: Drug Network Characteristics and injection risk along the China-Myanmar Border. AIDS Behaviour, 15: 1011-1016

The authors present a cross sectional study of male clients attending a methadone clinic on the Myanmar-China border aimed at examining the pre-treatment correlates of China-Myanmar border-crossing and injection risk among clients. The authors report that HIV status was not associated with injecting in Myanmar. However the study found a positive association between HIV positive status and injection-related border crossing between China and Myanmar. Full time workers were likely to go to Myanmar to inject drugs than to inject in China. Data was collected only from those attending clinics who may not be representative of those not attending. In addition information was self-reported with the potential for recall bias, so care is needed in interpreting the results. However the study provides some useful insights into border-crossing drug use and equipment sharing.

Road accidents

Myo Kyaw Myint et al, 2015. Incidence of injury due to road traffic accidents in Lashio township, Northern Shan State. Myanmar Health Sciences Research Journal, 27, 1: 72- 76

The authors present the findings of a hospital based cross-sectional descriptive study to assess the incidence of injury due to road traffic accidents (RTA). The study was conducted over one year in Lashio General Hospital. All road traffic injured patients were registered. The authors report that a

total of 1462 patients were assessed. Road traffic accidents (RTA) accounted for nearly half (45%) of the total number of injury-related incidents in the hospital. The majority of patients were motorcycle users while 13% were car users. This is an important study providing some indication of the impact of RTA on injuries in an urban centre. However the study is conducted in one urban centre which may not be representative of other urban areas, limiting the generalisability of the results.

Moe Kyaw Myint et al, 2015. Clinical profile of road traffic injury. Myanmar Health Sciences Research Journal, 27,2: 100-106

The authors present a hospital based longitudinal study to assess the incidence of road traffic accidents (RTAs) and outcomes. The study was conducted between July 2010 and June 2011 in Pyin Oo Lwin General Hospital. All patients admitted to the hospital with a road traffic accident injury (whether alive or dead) were included in the study. Each case was followed from admission to discharge or death. Data was collected from injured patients on nature of injury and how acquired. A total of 1619 injury patients were admitted to the hospital within the study period. Of these 65% of patients were admitted for an injury caused by RTA. 72% of injury patients were male. Nearly half the injuries (48%) were to the head. The majority of RTA patients (66%) were motorcycle users and 19% were motor car users. The authors discuss the importance of busy holiday periods for accidents, and the need for education on safety and the use of helmets in motorcycle users. The study provides some useful insights in the important contribution of RTAs to overall accident figures. However the study is conducted in one town which may not be representative of other urban areas, limiting the generalisability of the finding

Section 2: Risk factors

Multiple risk factors

Aung Soe Htet, 2014. The prevalence of selected risk factors for non-communicable diseases among 25-74 year old urban citizens of Yangon Region, Myanmar. Thesis as part of MPhil Degree, University of Oslo, Norway

The author presents a timely study looking at the current risk factors - physiological and behavioural- for non-communicable diseases in an urban population in Myanmar. The study used a modified STEPwise approach to obtain a random sample of adults aged 25-74 years from the Yangon region. A high prevalence of physiological risk factors among the population in both males and females was found, including overweight and obesity. WHO BMI cut offs for Asia were used (overweight as 23-27.5 and obesity as >27.5), and hypertension was defined as SBP \geq 140 mmHg and/or DBP \geq 90mm Hg. Overall 44% of participants were overweight or obese, while hypertension was found in 48% of this population (with no gender difference) and increased with increasing age. Levels of diabetes were found to be 18% and also increased with age. The study found evidence of corresponding modifiable behavioural risk factors such as levels of smoking and drinking alcohol and consumption of fruits and vegetables. Factors known to influence risk such as smoking and drinking were higher in younger age groups with implications for the future prevalence of NCDs. The study was conducted in 6 urban townships in the Yangon region (estimated to include 10% of the population), and may not be representative of other areas of the country, limiting generalisation of the findings beyond the Yangon region.

Cardiovascular disease project, (2013) Cardiovascular Survey in Myanmar (2013): knowledge, attitude, risk factors and morbidities. Ministry of Health, Myanmar, August 2013

This is a report from the Cardiovascular Disease Project on a household cross-sectional study to assess knowledge, attitudes, risk factors and morbidities of CVDs in adults aged 40 years and above, living in 4 selected townships in lower Myanmar. A multi-stage cluster sampling approach was used to recruit 600 participants (150 from each township). Data collection was through face-to-face interviews and physical examinations with selected participants. The study found approximately 1/3 of participants were aware of the risk factors for CVD with no major difference between men and women on knowledge of most risk factors, except for a few e.g. heavy-drinking, high blood pressure and family history. In these cases men were more likely to know of the risks than women. A similar picture was found for knowledge of preventive behaviours. The study recorded information on a number of risks including alcohol drinking, obesity, hypertension, diabetes, and total raised blood cholesterol with levels of 8%, 18%, 52%, 13% and 66% respectively for all ages and both sexes combined. The study provides useful information on knowledge of risk factors from a sample across 4 townships. However these townships may not be representative of other areas of the country, limiting the generalisability of the findings.

Ministry of Health/WHO/ WDF (2015). Report on national survey of diabetes mellitus and risk factors for non-communicable diseases in Myanmar (2014). Ministry of Health, Myanmar, 2015

This is a report of a population-based survey of risk factors for non-communicable diseases in adults aged 25-64 years in Myanmar. The study uses a multi-stage random sample design conforming to the WHO Step-wise approach to surveillance of non-communicable diseases (STEPS) methodology. The study covers 52 townships in the country with an estimated study population of 9360 respondents. The study provides information on a range of key risk factors relating to the 4 main NCDs – diabetes, cardiovascular disease, cancer and chronic respiratory diseases. Risk factors include tobacco use, alcohol consumption, diet, physical activity, cancer

screening, physiological and biological measurements. The study found that over 90% of participants had at least one risk factor and nearly 20% had 3-5 risk factors. The study provides valuable information at a national level on key risk factors related to the 4 main NCDs. However a limitation is that it does not provide information on risk factors for other NCDs of public health importance in Myanmar.

WHO regional office, 2009. Non-communicable disease risk factor survey Myanmar 2009

This is a report of a nationally representative household survey conducted in 2009 based on the STEPS methodology. The study provides internationally comparable data on risk factors for chronic diseases and major NCD risk factors in Myanmar. The study used a multi-stage cluster sampling methodology to select 7450 households across 50 townships. Those aged 15-64 years were eligible for inclusion. One household member was selected for interview and physical measurement. The results point to risk factors in terms of diet, alcohol consumption, smoking, overweight and obesity and access to services for treatment, for large numbers within the population. The study provides a useful baseline on which to assess future progress on tackling risk factors for major NCDs. A limitation is that it is not specifically tailored to Myanmar and thus does not cover the full list of classified NCDs in the country.

Physiological risk factors

Casson RJ et al, 2009. Risk factors for early angle-closure disease in a Burmese population: the Meiktila Eye Study. *Eye*, 23: 933-939

The authors present the results from a randomised population-based cross-sectional study conducted in Meiktila Division (the Meiktila study). The study population comprised of 2076 villagers 40 years and above residing in the division. This study was part of a wider study. Sufficient data was available on 2050 participants to diagnose occludable angles in at least one eye. The authors report that those with occludable angles had shorter Axial Lengths (ALs) and anterior chamber depths (ACDs) and thicker lenses than those without occludable angles. Increased age and decreasing AL, decreasing ACD and nuclear cataract were found to be significant predictors of early angle-closure disease (AD) in this population. The authors note that this the first time that cataract has been described as an independent risk factor for AD and that the presence of nuclear cataract should signal the possibility of AD in the population.

Cho Naing and Kyan Aung, 2014. Prevalence and risk factors of hypertension in Myanmar: A systematic review and meta-analysis. *Medicine*, Vol 93, 21: e100

The authors present a synthesis review and meta-analysis of observational studies (cohort and cross-sectional) carried out in Myanmar on the prevalence, awareness, and control of hypertension. All studies included in the review had more than 100 participants. The total number of persons covered by the studies was just under 21,000. A random sampling method was used in 6 out of 7 studies, but only one study was national. The studies covered different age ranges as well as settings (i.e. urban and rural). Using a definition of hypertension as SBP/DBP \geq 140/90, the authors report an overall prevalence of hypertension in Myanmar of 22%, (CI 14-31%), similar in men (22%) and women (23%), which increased with age. A weak but significant association was found between hypertension and alcohol drinking and smoking. Just over half of those with hypertension (53%) were aware of their status and 32% were on hypertensive drugs. However hypertension was found to be controlled in only 11% of the subjects included in the studies. The review provides a valuable assessment of current status as well as awareness of status and treatment. However the wide range of study settings, age of participants, and the range of

prevalence found between studies (5.1-34%) means that some care is needed in interpreting the results.

Han Win et al, 2005. Prevalence of hypertension in Pardagyi village, Kyauktan Township. Myanmar Health Sciences Research Journal, 17, 1: 22-26

The authors report a small cross-sectional community study to determine the prevalence of hypertension within the population. The study was conducted in one village in Yangon division. A total of 394 persons aged 25-59 years were included in the study. The study is reported in 2005 but data collection was conducted in 1998. The authors report an overall prevalence of hypertension in this population of 16%. Hypertension was associated with higher age, being a current smoker, being overweight and with self-reported diabetes. There was no association with gender. Within this population, 75% of those with hypertension were aware of their condition but just over half (51%) were on treatment. The authors report that women were more aware and more likely to be on treatment, than men. The study population is drawn from one village, and no details are provided on how subjects were chosen, so some care is needed in interpreting the findings.

Han Win et al, 2006. Prevalence, awareness, correlates, treatment and control of hypertension in a rural community of Waw Township, Babo Divison. Myanmar Health Sciences Research Journal, 18, 1: 41- 47

The authors present a cross-sectional community study to determine the prevalence of hypertension and the degree of awareness on the condition within the population. The study was conducted in 2004 and based in one village in Waw Township. A random sample of 644 subjects from a total of 987 eligible subjects aged 20 years and above, in the village, was chosen for inclusion in the study. The authors report an overall prevalence of hypertension (defined as SBP \geq 140 and DBP \geq 90) of 29%, which was similar in both sexes. The prevalence of hypertension increased significantly with age. The authors noted a greater awareness of hypertension in females and those with a higher educational status. 44% of those who were hypertensive were aware of their condition and 29% were on treatment. However, only 17% of those with the condition were considered to be controlled. While the study uses a random sample, it is conducted in one village in one township, limiting the generalisability of the results to a wider population.

Khin Myat Tun et al, 2010. Prevalence of hypertension and its associated risk factors in Pintaya Township, Southern Shan State. Myanmar Health Sciences Research Journal, 22, 1: 51- 57

The authors present a cross sectional community-based study with a nested case-control component aimed at determining the prevalence of hypertension and associated risk factors in one township (Pintaya). The study population was drawn from both urban and rural parts of the township (221 urban; 201 rural) for the community aspect of study. 50 cases and 105 controls were then recruited for the nested case control element. Recruitment followed pre-set inclusion and exclusion criteria and face to face interviews utilised a pre-tested questionnaire. Anthropometric measurements and biochemical tests on cases and controls used standard procedures. The authors report an overall prevalence of hypertension (defined as SBP \geq 140 and DPB \geq 90) of 47% and pre-hypertension of 27%. Women were more likely to be hypertensive than men (50% compared to 42%) and the prevalence of hypertension increased with age. Factors associated with hypertension included family history; a BMI of 25 and above, and a Waist-to-hip ratio (WHR) of 0.8 and above. The authors found that several factors including smoking, alcohol drinking, salt intake, MSG intake, total and HDL cholesterol were not associated with hypertension in this population.

The population was drawn from urban and rural areas of one township in the country, but may not be representative of other townships, limiting its generalisability.

Khin Ye Myint and Chit Soe, 2000. A case control study on the risk factors for diabetes mellitus: Myanmar. Myanmar Medical Journal, 44, 2:73- 77

The authors present a prospective case control study to assess risk factors for diabetes. 475 cases of diabetes mellitus attending 3 medical institutes in Myanmar were matched with 2 controls for sex and age ± 5 years. The study was conducted between 1991 and 1998. The authors report several factors associated with a higher risk of developing diabetes, including: BMI of 25 and above associated with 2.85 times higher risk of developing diabetes; urban life 3.13 times higher risk; no exercise 2.3 times higher risks and family history 4.4 times higher risk. Different dietary make-ups were also associated with different levels of risk, with a diet high in fat associated with the highest risk. The authors found that migration to an urban area also increased risk, while ethnicity was also associated with higher risk. Alcohol and smoking were not associated with higher risk of developing diabetes in this study. The authors note that their findings are generally in line with previous studies except the lack of association with cigarette smoking which they suggest may be due to the fact that they did not differentiate between different types of smoking. The study provides useful information on modifiable risk factors. However only those attending medical institutes are included in the study, and may not be representative of those not attending, and therefore some care is needed in interpreting the results.

Ko Ko Zaw et al, 2011. Prevalence of hypertension and its associated factors in the adult population in Yangon division, Myanmar. Asia Pacific Journal of Public Health, 23, 4: 496-506

The authors present a cross-sectional community based study to determine the prevalence of hypertension and associated risk factors in the population. A total of 4616 people aged 20 years and above living in Yangon were included in the study. Though the study is published in 2011, the data is from 2003. Using a definition of hypertension as SBP ≥ 140 and DPB ≥ 90 , the authors report an overall prevalence of hypertension of 34% and of pre-hypertension of 29% in the study population. Hypertension was significantly associated with older age, physical inactivity, alcohol consumption, obesity and raised cholesterol levels. The results showed that just under half were unaware of their condition, while less than one third were on treatment, and only 11% had their condition controlled. The study sample is large and selected through multi-stage random sampling. However it is drawn from urban townships in Yangon division which may not be representative of other areas of Yangon division or other urban townships, limiting its generalisability. In addition data from 2003 may not reflect the current situation.

Kyae Mhon Htwe et al, 2014. Oxidative stress marker and antioxidant status in patients with type 2 diabetes mellitus. Myanmar Health Sciences Research Journal, 26, 1: 28- 34

The authors report on a study to assess the oxidative stress markers and antioxidant status of patients with type 2 diabetes. The study population was 30 female patients 35-50 years of age with type 2 diabetes attending a diabetic clinic in Mandalay General Hospital. Patients were matched with 30 healthy controls. The authors report that patients with type 2 diabetes mellitus had significantly higher plasma MDA levels than controls. Plasma ascorbic acid level in type 2 diabetes mellitus was also found to be significantly lower than that of controls. Only those attending the clinic were included in the study and may not be representative of those not attending. In addition the study was conducted in a large urban centre which may not be representative of other areas. However the authors point to the fact that antioxidant therapy may be

beneficial in combatting the progression of free radicals. Further studies are needed to explore this issue.

Moe Myint and Theingi Thwin, 2008. Risk factors for overweight and obese middle school children in Dagon Township, Yangon division. Myanmar Health Sciences Research Journal, 20, 3: 186- 190

The authors report on a school based cross-sectional study to assess prevalence of overweight and obesity and associated risk factors in school children. Multi-stage sampling was used to select the study population of 300 middle school children from Yangon. The BMI for age percentile was calculated for all children and assessed against a range of family and social characteristics. The authors report that 14% of children were classified as overweight and a further 9% as obese. A family history of obesity and low maternal education were associated with overweight and obesity. Children who ate snacks and fast food rather than rice and curry for lunch were also more likely to be overweight or obese. Children who were overweight or obese were more likely to play at home less than 3 days per week and for less than 60 minutes compared with children of normal weight. The study provides a useful insight into potential risk factors for overweight and obesity in school-age children. However the study is conducted in Yangon which may not be representative of other urban areas, limiting the generalisability of the findings.

Myat Mon Oo et al, 2015. Coagulation profile in Type 2 Diabetes Mellitus patients attending the diabetic clinic, Yangon General Hospital (YGH). Myanmar Health Sciences Research Journal, 27, 1: 13- 19

The authors present the findings of a cross sectional study of 187 subjects with type 2 diabetes mellitus attending the outpatients department of YGH to assess their coagulation profile. The subjects were aged 23-79 years. The authors report that the results showed that coagulation measures were not significantly different between age groups. High fibrinogen concentration was found in 55% of subjects and significantly higher in females compared to males. Plasminogen activator inhibitor-1 (PAI-1) was higher in 64% in patients with increased fibrinogen and there was a positive correlation between fibrinogen concentration and PAI-1 in this study. The results for Prothrombin time (PT), Activated Partial Thromboplastin Time (APTT) and PAI-1 showed no significant differences between the 2 groups of fibrinogen concentration. Thrombin time (TT) values were significantly different in those with higher HbA1c (glycated haemoglobin) levels. The authors discuss the potential use of these findings in supporting more effective treatment for those at risk of thrombotic complications. However the study population is based on those attending the hospital who may not be representative of those not attending. It is also heavily weighted towards women (143 women versus 44 men) which may bias the results, suggesting care is needed in interpreting the results.

Myat Thandar et al, 2003. Body Mass index of Institute of Medicine (1) entrants. Myanmar Medical Journal, 47, (1-2): 37-39

The authors present a cross-sectional study conducted on medical students to assess baseline BMI data. Two batches of medical students entering the Institute of Medicine were used as the study population. Height and Weight were measured as part of their entrance medical examination and BMI was calculated. The authors report that over 50% of the female students and 46% of male students were underweight. 13% of male and 6% of female students were overweight and 2% and 0.6% were obese respectively. The study presents a useful baseline on which to judge future data. However the selective nature of the population means that it cannot be taken as representative of the wider population in this age range.

Nilar Win et al, 2012. A study of lipid profile in rheumatoid arthritis. Myanmar health Sciences Research Journal, 24, 1: 20- 24

The authors report on a study comparing the lipid profile of 40 patients attending a rheumatology clinic, who were age with sex-matched with healthy volunteers. The authors report that all lipid measures (triglyceride, LDL, HDL), except total cholesterol levels were significantly different between patients and healthy volunteers. The authors link the conclusions to possible opportunities to lower cardiovascular risk in those with rheumatoid arthritis. However the study population is small and based on those attending the clinic who may not be representative of those who do not attend, and therefore some care needs to be taken in interpreting the results.

Nwe Nwe, 2013. Assessment of cardiovascular risk in Myanmar. Regional Health Forum, 17, 1: 39- 52

The author presents a community based survey to assess the 10 year risk for fatal and non-fatal CVD events. The study was conducted on 611 persons aged 25 years and over, residing in 4 townships in Lower, Central and Upper Myanmar. Standard measurement procedures were followed for the collection of anthropometry and blood pressure data. Blood was collected and tested for random sugar, total cholesterol and triglyceride levels using point of care diagnostic strips. Information was used to grade individuals on their cardiovascular risk using the WHO/International Society of Hypertension (ISH) risk prediction charts. The mean age of subjects was 52 years with an age range 27 to 88 years. Nearly three quarters of the subjects were women. 19% were current smokers. 46% were found to have a BMI over 25 (classified as obese in this study). 39% had high cholesterol. 25% had a high triglyceride level. 10% had diabetes. 57% were hypertensive. Obesity, cholesterol and sugar levels were found to be higher in women but smoking and hypertension were higher in men. The study highlights the prevalence of known risk factors for CVD as well as the prevalence of a number of conditions that impair health in their own right, signalling the current importance of NCDs in the population. The study population is taken from different parts of the country, but no details are provided on how the locations were selected. In addition the majority of the subjects were women, introducing an element of bias in the results

Sanda Kyaw et al, 2014 Body Mass Index of medical students in University of Medicine (Mandalay). Myanmar Health Sciences Research Journal, 26, 3: 176- 190

The authors present a cross-sectional study of 2nd year medical students attending the University of Medicine Mandalay, to assess the distribution of BMI in this population. A total of 610 students took part in the study (377 males and 233 females). Height and weight were measured and BMI calculated for each student. The authors report that a total of 10% of students were underweight, while a similar percentage were overweight. Nearly 3% of students were obese. A higher proportion of male students were underweight and overweight than their female counterparts. The results are significantly higher than a similar study conducted 10 years earlier which may be suggestive of a trend. However the study of medical students may not be representative of other students in Yangon and beyond, limiting the generalisability of the results beyond the particular study population.

San Shwe et al, 2004. Prevalence of hypertension in 2 selected villages of Kayin State, Myanmar. Regional Health Forum, 8, 1: 104-112

The authors present the results of a cross-sectional study to determine the prevalence of hypertension in those aged 15 years and above and explore the association with dietary habits and waist to hip ratio. The study was conducted in 2 villages close to a city, in Kayin state. A total of

753 participants were recruited from selected villages of which 108 were randomly selected to provide blood samples. The authors report that the overall prevalence of hypertension in the study population was 22% but differed between villages (17% to 27%), and may be due to the different ethnic backgrounds in the villages. The authors report a higher prevalence of hypertension in women. 2% of all respondents reported a previous history of stroke. The authors suggest that the lack of association between hypertension and several factors such as BMI, serum cholesterol and dietary habits in the study, may be due to a small sample size and sampling bias, and caution is needed in interpreting the findings.

Tun Pe et al, 2002. Venom ophthalmia following spitting of venom into the eyes by spitting cobra (*Naja mandalayensis*) in Myanmar. Myanmar Health Sciences Research Journal, 14, 1-3: 42- 44

The authors report on a small retrospective study assessing the clinical features and outcomes of eight cases of venom ophthalmia. No details are provided on how the cases were identified. The authors note that venom ophthalmia had not been previously reported and the study highlights the occupational hazard for snake handlers. The authors suggest that education on safety precautions and first aid are needed to ensure the safety of snake handlers and the wider public.

Ye Tint Lwin et al, 2004. Body composition of Myanmar elderly people from home for the aged (Hninsigone), Yangon. Myanmar Health Sciences Research Journal, 16, 1-3: 1- 5

The authors present the findings of a preliminary cross-sectional descriptive study of body composition of persons living in a purposively selected care home in Yangon. The study population was 154 persons aged 70-103 years. Anthropometric and body composition assessments were conducted and BMI was compared with results from middle aged persons from another study. The authors' report that in the study population 42% had a BMI less than 18.5 and 22% had a BMI less than 17. In addition 6% of females had a BMI over 25. The authors suggest that given the number in the study population with a BMI less than 18.5 (cut-off for chronic energy malnutrition) that this signals either a potential public health problem or the cut-off is not valid for this particular population. The authors recommend further studies.

Ye Tint Lwin et al, 2005. Energy expenditure of Myanmar elderly people from home for the aged (Hninsigone), Yangon. Myanmar Health Sciences Research Journal, 17, 3: 126- 129

The authors report the findings of a small cross-sectional descriptive study to assess the energy expenditure in an older population. The study population was made up of 25 people living in a home for the elderly in Yangon. BMI, body composition, resting energy expenditure and total energy expenditure were measured in each person. Participants were found to divide their day between lying/sleeping and sitting activities with some walking. When the results of the group were compared to a middle-age population in Myanmar, then all factors - body weight, fat free mass, resting energy level and total energy expenditure - were lower in the older age group. When compared with a sample of older males and females in the UK, then the Myanmar population was found to have a lower body weight, fat free mass, resting energy expenditure and total energy expenditure. The authors suggest that the energy requirement for the study population was low but was above the current WHO figure of 1.5 times resting energy expenditure, suggesting that the WHO figure may be an underestimate of requirements in this population. However given the small and purposively selected sample some care is needed in interpreting the findings.

Ye Tint Lwin et al, 2006. Body composition and resting energy expenditure of adolescents in Yangon, Myanmar. Myanmar Health Sciences Research Journal, 18, 2: 73-77

The authors present a cross-sectional descriptive study to assess body composition and energy expenditure in school aged children. The study population consisted of 312 children aged 12-14 years in Yangon, chosen through multi-stage sampling. 5 townships were randomly selected from

Yangon which was purposively selected as the study site. One school from each township was then chosen and children were randomly selected for inclusion. The authors report that the mean body fat percentage of females was significantly higher than that of males across all age groups. No significant difference was found in other variables (Height, Weight, LBM, BMI). The percentage of stunted children was found to be low in this population when compared with children from 5 selected countries, including India, Indonesia and Vietnam, though figures for underweight and severe underweight, were similar. Resting Energy Expenditure (REE) was found to be similar to the predicted Basal Metabolic Rate (BMR) based on weight for age for this population, but lower than WHO based NCHS standard. The study provides some interesting comparisons of Myanmar children with other countries and global standards. However the study population is based on children from Yangon who may not be representative of children in other areas of the country, limiting the generalisability of the findings beyond the Yangon area.

Zaw Myint et al, 2004. Waist-hip ratio to identify the cardio-vascular risk factors among people in the South Dagon Township. Myanmar Health Sciences Research Journal, 16, 1-3: 6-10

The authors present the findings of a cross sectional community study to identify cardiovascular risk factors in a population in one township in Yangon. A total of 623 men and women aged 40-60 years living in the township were included in the study. The authors report that 40% of men had a waist-hip-ratio above the cut off for higher health risks. Men with a waist-hip-ratio of 0.95 to 1.00 had an odds ratio of 2.2 for at least one cardiovascular risk factor while women with a waist-hip-ratio of 0.92-0.97 had an odds ratio of 1.5. However the study used random sampling to select wards and subjects in only one township within Yangon, limiting the generalisation of findings beyond this township.

Zaw Myint et al, 2009 Relationship between waist-hip ratio and cardiovascular risk factors among people in South Dagon Township. Myanmar Health Sciences Research Journal, 21, 1: 1-6

The authors present a follow up to their 2004 study. Sera from participants in the earlier study was randomly selected to determine the relationship between total cholesterol and HDL cholesterol levels and waist-hip-ratio (WHR). The mean values of total cholesterol concentration were significantly raised with increased WHR in both men and women. The prevalence of low HDL cholesterol and ratio of total to HDL cholesterol were high in both men and women. The authors suggest that a WHR ≥ 0.95 could identify men aged 40-60 years at increased risk of high total cholesterol, while for women with a WHR ≥ 0.92 could identify women with low HDL cholesterol levels. However the study population is based in Yangon and may not be representative of other areas, limiting the generalisation of the findings beyond the specific Yangon township.

Behavioural risk factors

Aung Si Mon Myo et al, 2014. Factors influencing smoking, alcohol drinking and betel chewing practices among 3rd year male students at University of Agriculture (Yezin). Myanmar Health Sciences Research Journal, 26, 2: 88- 92

The authors present a school-based cross sectional descriptive study aimed at assessing the smoking, drinking and betel chewing practices and the factors influencing these practices, in a young male student population. All 3rd year male students aged 18 -40 years attending an agricultural university in NayPyiTay, designated a smoking, alcohol and betel-chewing-free campus, were enrolled in the study. Face-to-face interviews were conducted between April and November 2012 to collect data from students using a pre-tested questionnaire. Information on general characteristics, perceptions and practices relating to smoking, alcohol drinking and betel chewing was collected. Overall 44% of students were current smokers, 34% were betel chewers and 37% drank alcohol. Approximately one third of each group were single practice only. The majority of those practicing these habits started between the age of 16 and 20 years. The study

found a significant association with both parental smoking and parental drinking and student practices and for peer smoking, drinking and betel chewing. Although females made up 61% of the total 3rd year population they were not included in this study. In addition, students at this university may not be representative of students in other universities or the wider population in this age group, limiting the generalisability of the findings beyond the particular study population.

Aung Thu et al, 2008. Assessment of community's behaviours focussing on knowledge and attitude towards cancer in Hlinethay Township, Yangon Division in 2006. Myanmar Health Sciences Research Journal, 20, 2: 89-94

The authors report on a cross sectional community based study in Hlinethaya Township Yangon to assess community knowledge, opinion and attitudes towards cancer. 400 randomly selected subjects were interviewed on knowledge of signs and symptoms, sites of cancer, diagnostic method, treatment, and risk of cancer. The authors report that all respondents had some knowledge of cancer. One third of respondents had a person with cancer in the family or relative. Breast, cervix and stomach were the most commonly cited sites of cancer; while smoking, alcohol and betel chewing were the most common risk factors mentioned. Health centres and neighbours were sources of information on cancer. Knowledge of cancer was not associated with age, sex or income but was associated with education. Though the sample was randomly selected, over 70% were female which could bias the results. In addition the study is based in one township in Yangon, limiting the generalisation of the findings beyond the particular study township.

Cardiovascular Disease Project, 2015. Care-seeking behaviours and detection of target organ involvement among hypertensive patients in Yangon Division (2014-2015), Ministry of Health

This is a report from the Cardiovascular Disease Project on a facility-based cross-sectional study to assess knowledge, attitudes and practices related to hypertension. The study sample was based on adults with known hypertension seeking care from cardiovascular clinics in public health facilities in 12 townships in Yangon region. Respondents were recruited consecutively into the study within these clinics. Data was collected through face to face interviews and measurements. The study found that 60% of the population were familiar with ways to control blood pressure, while stroke and heart attacks were found to be well-known complications of hypertension. The study found low levels of risk factors such as adding salt to food or the consumption of processed food as well as levels of current smoking or drinking (assessed over the past year). However more than 50% of respondents were overweight or obese (BMI \geq 25) and had a high total blood cholesterol. Women were more likely to be overweight, have a high total blood cholesterol and increased waist circumstances than men. In addition hypertension was associated with diabetes in about 1/3 of the respondents. Blood cholesterol was controlled in about 30% of respondents and these were more likely to be women. The study estimated that about 1/4 of respondents had a 10 year risk for CVD judged "very high". This a useful study but the sample is based on those seeking care who may not be representative of those who do not seek care. In addition all facilities are in Yangon further limiting the generalisability of the findings.

Cardiovascular Disease Project, 2010 CVD risk factors survey at 4 townships (Tharkayta, Leiway, Maha Aung Myay, Singu), Ministry of Health.

This is a report from the Cardiovascular Disease project on a community- based intervention and survey on CVD risks in 4 townships in upper Myanmar. Townships included those from the Delta as well as hilly regions of the country. A total of 611 participants were included in the study but no specific details are provided on how study participants were selected. The report provides information on levels of behavioural and biological risk factors within the populations studied. These include levels of current smoking at nearly 19% and levels of current drinking (more than 7 units per week) at nearly 10%. In addition 60% of respondents were found to be taking no exercise but nearly 85% were eating 5 servings or more of fruit and vegetables per day. The study found that over 45% of the study population had a BMI over 25, while nearly 58% of the sample (both

sexes combined) were hypertensive. This study provides additional useful information on risk factors within the population. However details on how the study populations were selected is not provided. In addition the sample is from 4 townships only, which may not be representative of other townships, limiting the generalisability of the findings.

Chit Soe et al, 2000. Medical audit on awareness of hypoglycemia and glyceemic control in diabetic patients. Myanmar Medical Journal, 44:26-27

The authors present a cross sectional study (medical audit) of diabetic patients attending Pathein General Hospital and Shin-Pa_Ku specialist clinic in Pathein between April and November 1998. Patients attending clinics were included in the study but no details of selection criteria are provided beyond the exclusion of first-time diagnosed diabetic patients. 61 patients were included on awareness and 66 on glyceemic control. Patients were asked questions against a preformed questionnaire, though no details are provided. The authors report that 49% of patients had been informed of the potential for hypoglycaemia from drug therapy by a medical professional. Of these 36% had been made aware of symptoms of hypoglycaemia and how to treat it. Only 43% of patients knew to take a rapidly absorbable form of carbohydrate on presentation of symptoms. 18% of patients reported that they had suffered from at least one episode of hypoglycaemia in the previous 12 months. More than three quarters (77%) of patients were aware of the importance of monitoring glycaemia using a urine test but the frequency of testing per month was only 11.42 tests/month and 8.52 tests/month in males and females respectively. Only one patient tested at least once per day. The results provide important insights into the challenge of glycaemic control in the population. However patients are drawn from a particular area and only those patients attending the clinic are included in the study and may not be representative of those not attending, limiting the generalisability of the results beyond the particular study population.

Han Win et al, 2007. Smoking in an urban community: prevalence, associated factors and behaviour among adult males in Kyimyanintine Township. Myanmar Health Sciences Research Journal, 19, 2: 76-80

The authors present a cross-sectional survey to estimate the prevalence of smoking and associated risk factors in males aged 15 years and over. The study population consisted of 486 adults from 2 randomly selected wards in one township. The authors report that just under half the population (46%) were current smokers. The majority of those who smoked had started before 20 years of age. Parental smoking and peer smoking were associated with current smoking. In addition those with no education, or primary education only, were more likely to smoke than those with a university education. Most of those who smoked wanted to quit smoking, and the majority had tried to quit in the past. The study provides some interesting insights into smoking behaviour. However the study is conducted in one township, which may not be representative of other areas of the country, limiting the generalisability of the findings.

Han Win et al, 2013. Quality of life and compliance among type-2 diabetes patients attending the diabetic clinic at North Okkalapa General Hospital. Myanmar Health Sciences Research Journal, 25, 3: 178-182

The authors present a cross sectional descriptive study to explore the quality of life of patients with diabetes and the relationship to compliance. The study population comprised of 150 type 2 diabetes patients attending a diabetic clinic at North Okkalapa General Hospital. The authors report that most patients had a moderate Health Related Quality of Life (HRQOL) level in every domain. The social relationships domain had the highest number of low scores. Compliance with medication, diet and good glycaemic control were associated with better quality of life (QOL). The authors stress the importance of compliance in supporting a better quality of life in this population.

Kaung Myat Kyaw and Phyo Phyo Thu, 2011. Stroke in Myanmar: attitudes and treatment. *International Journal of Stroke*, 6: 241-243

The authors present a cross-sectional study of the knowledge of stroke in doctors working in teaching and non-teaching hospitals in Yangon. 122 doctors completed the survey. The authors report that results showed a reasonable knowledge of stroke and its risk factors in doctors. The authors note that while hypertension was well recognised as a risk factor, the awareness of smoking was not at a similarly high level. The authors noted some differences in the use of evidence-based guidelines between those graduating before and after 2000. However the doctors were drawn from Yangon hospitals only and it is not known how representative they are of doctors outside Yangon. The authors note the importance of strengthening standard stroke care and stroke prevention practices.

Le Le Win et al, 2008. An exploratory study on willingness to change smoking practice of urban males, Dagon Township, Yangon Division. *Myanmar Health Sciences Research Journal*, 20, 2: 81- 84

The authors report a longitudinal cohort study to explore the willingness of urban males to change smoking practice. The study was based in Dagon Township in Yangon. 39 male adult current smokers (15-25 years) completed a self-administered questionnaire in May, June and August to explore smoking practice. The authors report that most respondents (73%) attempted to quit smoking and reduce the number of cigarettes or charoot rolls between first and second follow up. However at the follow-up the majority (63%) were still smoking. By the final follow up, 87% had tried to quit or reduce their smoking. At this stage 59% were still smoking. Meeting with friends and depression were given as reasons for not quitting. 9% of respondents reported that they stopped smoking for health reasons. 32% in the final group reported that they intended to quit in the future. The study provides useful insights into smoking practice. However the study population is chosen from one area of the city which may not be representative of the wider Yangon adult male population or wider population of male adults, limiting the generalisability of the results.

Mon Mon Tin-Oo et al, 2013. Awareness of the effects of smoking on oral health among dental patients at the Defence Service General Hospital, Myanmar. *International Medical Journal*, 20, 2: 239-242

The authors present a cross-sectional study to investigate the awareness of the effects of smoking on oral health. The study population was 424 patients aged 15 years and above attending the dental clinic of the Defence Service General Hospital in Yangon. A self-administered questionnaire was used to assess awareness of the effects of smoking on oral health. 38% of those who responded were smokers. The authors report that smoking status was associated with age. Just over half (53%) of those aged 15-24 reported smoking compared to 20% in those above 45 years. A higher number of non-smokers were aware that smoking can cause tooth loss and is a risk factor for oral cancer. Level of education and age were significantly associated with mean oral health awareness score. The study is a useful insight into knowledge of the damaging effects of smoking. However the population sample is drawn from a specific population group who may not be representative of the wider population in Yangon or beyond, limiting the generalisability of the findings.

Muecke et al, 2008. Awareness of diabetic eye disease among general practitioners and diabetic patients in Yangon, Myanmar. *Clinical and Experimental Ophthalmology*, 36: 265-273

The authors present a cross-sectional study of 100 general practitioners (GPs) and 480 diabetic patients in Yangon to assess their respective understanding of ophthalmic care and complications. GPs in Yangon were randomly selected from the Myanmar Medical Association register. Each GP was then asked to give the questionnaire to the 1st 5 diabetic patients who attended their practice. The authors report that just under half (49%) of GPs did not examine the fundus of patients' eye

despite the majority (98%) being aware that diabetes is a risk factor. Most (90%) patients felt that they should visit an ophthalmologist on a regular basis but just over half (57%) had done so. The study presents important insights into the risks of eye complications with diabetes and their recognition and treatment. However the study site is limited to Yangon which may not be representative of the wider population, limiting generalisation of the findings.

Mya Ohnmar et al, 2011. Dietary habit of type 2 diabetes mellitus patients attending diabetes clinics in Yangon. Myanmar Health Sciences Research Journal, 23, 3: 139-144

The authors report on a cross sectional descriptive study of food habits of patients attending a diabetic clinic in Yangon. Those included in the study were newly diagnosed within the last 2 months but further details of their selection is not given. The study provides detailed insights into the diets of those recently diagnosed with diabetes and the source of their information on diabetes and healthy eating. The authors report that information about diabetes came from physicians in 27% of cases and from GPs in 21% of cases. Another 21% acquired their information from pamphlets. However only those patients attending the clinic are included in the study and may not be representative of those not attending. Most respondents identified sweetened food as something that should be reduced. The authors suggest the need for information to correct food taboos and promote low GI diets in diabetic patients.

Myint Tun et al, 2008. Awareness of tobacco-related health information among military community in Taikkyi Cantonment, 2008. Myanmar Health Sciences Research Journal, 20, 2: 165- 170

The authors report a cross sectional study to explore the awareness of smoking-related health information. The study was conducted in a military community in one cantonment area of Yangon Division. 300 participants were chosen through systematic sampling. 298 face- to- face interviews were conducted using a pre-tested questionnaire. 30% of those interviewed were current smokers while 11% were ex-smokers. 42% were current betel chewers while 3% were ex-chewers. The majority of respondents (99%) had knowledge of health information materials related to tobacco from more than one source. TV (97%) and radio (36%) were common sources of health information. Printed materials were reported by three quarters respondents. Only 1.4% of respondents said they had received information from health workers. All respondents had received information on the health effects of smoking and avoidance of smoking. Nearly all respondents applied this information to their own situation while some also used the information to encourage others to avoid the practice. Most respondents (94%) said that their preferred medium for information was TV while 65% mentioned posters and 53% pamphlets. Only a few mentioned face-to- face sessions with health workers as a preferred means to receive information. This is an interesting study on health related knowledge preferences. However the very distinct nature of the population sample means that it may not be representative of the wider population, limiting the generalisability of the findings.

Myo Ko Ko Kyaw et al, 2015. Knowledge, attitude and practice on safety measures against occupational hazards among construction workers at Bayint Naung Bridge construction site in Yangon Region. Myanmar Medical Journal, 57, 2: 28-32

The authors report a cross sectional study to assess the knowledge, attitudes and practice on safety measures in construction workers. The sample consisted of 184 randomly selected construction workers on the Bayint Naung Bridge in Yangon region. Face-to-face interviews were conducted with the workers and responses translated into knowledge, attitude and practice scores. The authors report that only a very small percentage (4.3%) of respondents had good knowledge of safety measures on occupational hazards. All respondents showed a favourable attitude to safety and 78% had good practice. Educational status, type of work, type of worker, and attending skills-training were all found to have a statistically significant influence on knowledge. The study found no association between socio-demographic characteristics and practice of respondents. There was no statistically significant association between knowledge and practice of respondents on safety

measures against occupational hazards. The study is limited to workers in Yangon who may not be representative of workers in other areas. However the study presents very timely information on the safety aspects of construction work, which is important in the current construction boom in Yangon and other urban areas.

Myo Myo Mon et al, 2007. Women's awareness of common female cancers in selected peri-urban townships. Myanmar Health Sciences Research Journal, 19, 2: 69- 75

The authors present a cross sectional study in 4 townships in Yangon to estimate the perceived magnitude of female cancer and community awareness of female cancer. A sample of 400 women was randomly selected from within the townships and interviewed using a structured questionnaire about their perceptions and awareness of female cancers. The authors report that most women interviewed (99.3%) were aware of breast cancer while 70% were aware of cervical cancer. Most women (88%) thought that survival was most likely with breast cancer. Most women received their information on cancer from lay persons such as relatives or friends (91%) while only 29% mentioned health staff as a source of information. The study provides some useful insights into current awareness. However only 4 townships are included in the study which may not be representative of other townships in Yangon or beyond, limiting the generalisability of the findings.

Phyu Phyu Aung et al, 2005. Food and beverage consumption behaviour in Mandalay and Pathein: a qualitative study. Myanmar Health Sciences Research Journal, 17, 2: 109- 115

The authors present a community based descriptive household survey in 2 urban centres to determine food and beverage consumption in the population. The study population consisted of 838 subjects from Mandalay and Pathein, chosen through a process of multi-stage random sampling. Face to face interviews were conducted by trained data collectors with the meal planner/housewife from selected households using a structured questionnaire. The study provides insights into common eating and cooking practices including: intake of snack foods; use of palm and groundnut oil; number of meals per day; breastfeeding and bottle feeding practices, as well as food taboos. The study is limited to 2 urban centres which may not be representative of other areas, limiting the generalising of findings beyond the study areas. However as the authors suggest, the study serves as a useful baseline for further studies on food practices in the population.

Phyu Phyu Aung et al, 2005. Nutritive values of popular snacks. Myanmar Health Sciences Research Journal, 17, 3: 130-136

The authors present a cross sectional study to identify and determine the nutritive values of common snacks and the factors determining their consumption among students. A total of 1207 1st year students attending the Institute of Medicine in Yangon were purposively selected for the study. The Institute of Medicine was randomly chosen from a range of universities and institutes in Yangon. Food and beverage consumption behaviour was determined through Focus Group Discussions (FGDs) and a pre-tested self-administered structured questionnaire covering type of snacks consumed, frequency of consumption, places of purchase, perceptions on advertised snacks, amount of monthly funds and expenses. The authors report that Myanmar traditional snacks were the most popular snack at breakfast. At midday both traditional and popular snacks were equally consumed. Among popular snacks, potato chips are the most energy dense. However the highest calorific content of a Myanmar traditional snack is 3 times that of a popular snack. Most students were found to consider the health benefits of consuming snacks as well as price in making their choices. Advertisement of snacks was the lowest factor in determining consumption in students but three quarters of students were in the habit of eating advertised snacks. 16% of students said they preferred "westernised" food to Myanmar food because of the attractive packaging and 10% thought it was more hygienic. The authors report that students found money for snacks through a variety of means. The study provides useful insights in the snack habits in this age group. However the study population of students in Yangon may not be representative of students outside Yangon, or the population in this age group who are not

students, and the results cannot be taken as representative of the wider population in this age group.

Sandar Kyi et al, 2008. Treatment compliance and knowledge of hypertensive patients in Hlinethaya Township, Yangon Division. Myanmar Health Sciences Research Journal, 20: 17-21

The authors present a cross sectional descriptive study in Hlinethaya township Yangon to determine treatment compliance in hypertensive patients and assess knowledge of the disease. Multi-stage sampling was used to select 133 subjects who had been hypertensive for 6 months or more for inclusion in the study. Subjects were interviewed and data collected on family and behaviour characteristics and knowledge of hypertension. In addition blood pressure was measured. Treatment compliance was taken as blood pressure $\leq 140/90$ mmHg. The authors report that the mean duration of hypertension was 4 years. Just under half (47%) of respondents had a family history of hypertension and 17% had another chronic disease such as diabetes mellitus or Ischaemic Heart Disease. Three quarters reported that they took treatment for hypertension. Of these 29% were considered to be compliant. Compliance was better in those aged less than 45 years. A higher compliance was seen in those who were taking drugs as prescribed by their doctor compared to those who did not follow their doctor's advice. 62% believed that there was a cure for hypertension and 60% thought that it was possible to stop taking drugs once control was achieved. 44% of subjects were unaware of the complications of hypertension. The study provides important insights into treatment compliance for hypertension. However the study is based in a population in Yangon which may not be representative of populations outside Yangon. In addition the study population was heavily weighted towards females (105 females to 28 males) which could introduce bias in the results, and care is needed in interpreting the findings.

Sandhi Wynn Nyunt et al, 2010 Self-efficacy, self-care behaviours and glycaemic control among type-2 diabetes patients attending 2 private clinics in Yangon, Myanmar. Southeast Asian J Med Public Health, 41, 4: 943-951

The authors present a cross sectional descriptive study to determine the prevalence of glycaemic control and associated factors in patients with type2 diabetes. The study population was 266 patients attending 2 private diabetes clinics in Yangon. Patients were selected for participation in the study if they were aged over 35 years, diagnosed with diabetes for ≥ 1 year and receiving anti-hyperglycaemic medication for at least 6 months. A questionnaire was used to collect data on baseline characteristics, self-care behaviours and self-efficacy. Glycaemic control was judged from clinic records and based on HbA1c levels \leq or $\geq 7\%$. The authors report that 27% of subjects had good glycaemic control ($\leq 7\%$). 62% of patients had high self-efficacy and 31% had good self-care behaviour. Glycaemic control was significantly associated with age ≥ 60 years, taking one oral hyperglycaemic agent (OHA); BMI ≥ 23 and a high self-efficacy score. When self-efficacy was excluded, glycaemic control was significantly associated with age ≥ 60 years, taking one OHA and self-care for physical exercise. The authors highlight the low levels of glycaemic control in the study population and the need to raise patient self-efficacy and self-care. However the study population is limited to those attending private clinics in Yangon who may not be representative of those not attending, or the wider population of diabetic patients. The authors note the limitation in terms of generalisability of the findings, as well as the potential bias in self-reported data.

Than Than Aye et al, 2010. Compliance with chemotherapy among female breast cancer patients in Medical Oncology Unit, Yangon General Hospital, Myanmar Health Sciences Research Journal, 22, 3: 190- 191

The authors present a cross sectional study to explore the magnitude and reasons for non-compliance in a group of patients with breast cancer. 174 females with breast cancer attending the oncology unit at Yangon hospital were recruited into the study using consecutive sampling.

Subjects were interviewed using a pre-tested questionnaire and their medical records examined. The authors report that overall non-adherence with chemotherapy was 12% and found across all ages and stages of disease. The main reason for default was financial constraints (62%) followed by side effects (29%). The majority of non-compliance was in the age range 37-58 years. The study provides some valuable insights into the problems with non-compliance. However only patients attending the clinic were included in the study and may not be representative of those not attending. In addition the study is based in Yangon which may not be representative of other areas of the country, limiting the generalisability of the findings.

Wai Wai Han et al, 2011. Knowledge on cervical cancer and opinion towards screening service using attendees at Cervical Cancer Screening Clinic, Department of Medical Research (DMR) (Lower Myanmar). Myanmar Health Sciences Research Journal, 23, 3:168- 173

The authors present a cross sectional descriptive study aimed at exploring knowledge of cervical cancer and opinions on screening services. 151 women aged 21-65 years attending the Cervical Cancer Screening Clinic at the DMR were interviewed using a pre-tested semi-structured questionnaire to assess their knowledge of cervical cancer. A self-administered questionnaire was used to assess opinions on the screening service. The authors report that most women (62%) had low knowledge (below mean score) of cancer, or risk factors and benefits of screening. Nearly three quarters (74%) could mention at least one risk factor for cervical cancer but only 10% identified human papillomavirus (HPV) as a major risk factor. All respondents were positive about the screening service though 15% stated that days of clinic were not convenient and 10% that waiting times were longer than expected. 24% stated that they were not given information on the process of taking PAP smears. The study presents a useful insight into knowledge of cancer and perceptions of screening services. However the study was conducted in those attending the screening service, who may not be representative of those not attending this clinic. In addition the study is based in a clinic in Yangon which may not be representative of other areas, limiting the generalisability of the results.

Win Lai May et al, 2014. Nutritional status of children with cerebral palsy in cerebral palsy clinic, Yangon Children's hospital. Myanmar Health Sciences Research Journal, 26, 1:22- 27

The authors present a cross sectional descriptive study to determine the association between different clinical factors and under-nutrition in children with Cerebral Palsy (CP). Children aged 1 month to 12 years attending the Cerebral Palsy clinic in Yangon between May 2010 and June 2011, with all forms of Cerebral Palsy, were included in the study. Data was collected from caretakers through a face-to-face interview using a pre-tested structured questionnaire. Measurement of body weight and height or length of the children was taken together with an examination of the type of CP and level of motor impairment. Cerebral palsy was graded using the Gross Motor Function Classification System (GMFCS). The authors report that nearly 80% of the children in the study were found to have malnutrition. Among these, just over half (54%) were wasted and just over half (52%) were stunted. The children suffered from a range of problems including seizures (20%) and recurrent pneumonia (25%). One or more feeding problems was found in 84% of children with choking the most common problem (26%). Children with malnutrition were found to be significantly older than children without malnutrition. The authors found no association between malnutrition and gender or medical problems. In children 18 months and older, under-nutrition was found to be significantly associated with dependence on care-givers. Children with poor gross motor function were more malnourished than the less severe group but this finding was not statistically significant. The study provides useful insights into the particular needs of children with cerebral palsy, and in particular children dependent on care-givers.

Win Myint Oo et al, 2015. Alcohol consumption among adult males in urban areas of Thanlyin Township, Yangon Region, Myanmar. International Journal of Research and Medical Science, 3, 11: 3192-3196

The authors present a cross-sectional study in one township in Yangon region to determine the prevalence and risk factors of alcohol consumption among adult males. Multi-stage random sampling was used to select 380 adult males. Face to face interviews were conducted to gain information on household income and alcohol use. The authors report that respondents were aged between 20 and 60-plus years. 30% of those interviewed were classified as "ever drinkers". 44% were classified as "ever smokers" and 47% as "ever users" for betel chewing. Alcohol consumption was found to decrease with age and the finding was significant, but increased with educational status (not significant). The authors found that monthly household income, occupation and marital status were not related to alcohol consumption. There was a significant association between alcohol consumption and other risk factors such as smoking and betel chewing. The proportion of those drinking was found to be lower than in other countries in the region and globally. However the study is conducted in one township only in Yangon and the authors acknowledged that the study area may not be representative of other areas, limiting the generalisability of the findings.

Environmental risk factors

Bacquart T et al, 2015. Multiple inorganic toxic substances contaminating the groundwater of Myingyan Township, Myanmar: Arsenic, Manganese, fluoride, iron and uranium. Science of the Total Environment, 517: 232-245

The authors report on a cross sectional study to assess the contamination of drinking water in one township in central Myanmar. Systematic random samples of drinking water were collected from 18 household drinking wells in both urban and village areas in Myingyan Township and 2 locations in the Ayuyarwaddy River. The authors report that the concentrations of arsenic, manganese, fluoride, iron and uranium were found to be above the reference value for health in 11 – 33% of wells in each case. All wells were found to have at least one toxic substance at levels considered unsafe. The results present an insight into the potential long-term risks associated with household drinking wells at this time. Further studies are needed to assess whether the results are representative of other areas of the country.

Khin Mi Mi Lay et al, 2013. Measurement of air quality in PyinOoLwin Township in March 2011. Myanmar Health Sciences Research Journal, 25, 1: 36- 40

The authors report a cross-sectional study conducted in one township to determine air quality. Samples were collected from 3 sites within the township over a 5 day period. The authors report that measures for particular matter (PM10) were found to be higher than WHO guidelines in 2 sites. All other measures (TSPM, NO₂, SO₂) were at acceptable levels. All 4 measures were at acceptable levels in one site. The authors note that the results were lower than those from a survey conducted in an urban area of Yangon in 2007/2008. The study is conducted in a small town and may under-represent the air quality in larger urban centres of the country. However further studies are needed to assess whether the results are representative of other areas.

May Mya Win et al, 2000. Cobra bite in Sanpya hospital, Thingangyun. Myanmar Medical Journal, 44: 7- 9

The authors present a small descriptive retrospective and cross-sectional study to assess the conditions in which cobra bite occurs and methods of medication. Histories were taken of 10 patients at Sanpya hospital between May 1999 and January 2000. The authors report that 60% of bites were to the hand and 40% to the leg. 60% of those bitten were pre-school or school age children. 40% of those bitten were sleeping on the floor without a net when they were bitten. All

10 patients received anti-venom. The average time between bite and treatment was 1 hour 15 minutes. The study provides important information on the risks of snake bite in the home. There are no details on how patients were chosen beyond the snake bite and only those who attended the clinic were included, limiting the generalisability of the results beyond the study population.

May Su Nwe et al, 2010. Relationship between blood arsenic level, blood pressure and creatinine clearance in subjects living in Kyaungone Township, Ayeywady Division. Myanmar Health Sciences Research Journal, 22, 3: 170- 176

The authors present a cross sectional comparative study of the relationship between blood arsenic levels and arterial blood pressure and creatinine clearance in one village. The study population consisted of 70 men aged between 18-50 years living in the village. Participants were divided into 2 groups based on their arsenic levels. The authors report a positive correlation between duration of arsenic exposure and blood arsenic levels, though the evidence did not point to arsenic in water being correlated with blood levels. Those with higher levels of arsenic were found to have higher systolic and diastolic blood pressure and lower 2-hour creatinine clearance than those with lower levels of arsenic. The authors suggest that long-term exposure to arsenic is associated with an increased risk of hypertension and renal insufficiency. However the study was conducted in one village only and points to the need to undertake studies in other areas to assess whether the risks are similar.

Phyu Phyu Aung et al, 2005. Effect of chronic lead exposure on children of Yangon, Myanmar (1): blood lead and urinary coproporphyrin profiles. Myanmar Health Sciences Research Journal, 18, 2: 84- 88

The authors present a cross-sectional study in 3 townships in Yangon to assess the blood lead and urinary coproporphyrin levels in a population of children. The study areas were chosen as they were known to have industries using lead including battery factories and lead smelting. Children of workers engaged in these industries were identified. All children aged 1-12 years were recruited into the study. Blood lead and urinary coproporphyrin were measured in all children and compared with non-exposed children from the same townships. The authors report that exposed children were found to have significantly higher blood lead levels than those not exposed. Higher urinary coproporphyrin levels were also found in the children but only in those aged less than 3 years and above 6 years. The study presents important findings on the risks to health in children living in Yangon in areas with these industries. Further studies are needed to assess whether this is the case in other areas.

Theingi Thwin et al, 2014. Intake of nitrites and nitrates from processed meats by primary school children. Myanmar Health Sciences Research Journal, 26, 1: 16- 21

The authors present a descriptive study to assess risk of intake of nitrates and nitrites from processed meat in children, over a period of one year. The study population was 378 primary school children aged 8-10 years. Yangon was chosen as the study site because of the availability of processed meat products. One school was randomly chosen, though details of how the children were selected is not provided. Based on a 6-day diary, the authors calculated the mean exposure to nitrate and nitrite (mm/kg body weight per day). The authors report that just under half (43%) of the children did not eat processed meat products. However 28% of children ate processed meat products more than 3 days out of 6. The authors report that nearly 6% of children had a higher intake of nitrite than the Acceptable Daily Intake (ADI), but no child had an intake of nitrate higher than the ADI. Yangon was purposively chosen as the study site and may not represent populations beyond Yangon. However the study points to a potential public health concern that warrants follow up.

Social, economic and political determinants

Khin Wai et al, 2012. Utilisation pattern of traditional medicine in rural community in PyinOoLwin and Naungcho townships. Myanmar Health Sciences Research Journal, 24, 1: 54-59

The authors present a community based cross sectional descriptive study in rural areas of PyinOoLwin and Naungcho townships to determine the utilisation, diagnosis and treatment patterns of traditional medicine users in rural communities. 5 households from 15 villages in each township were selected by multi-stage sampling. All individuals in selected households were interviewed. Face to face interviews were conducted using a pre-tested structured questionnaire. The authors report that a traditional drug shop was available in 90% of villages. 18% of respondents did not use any type of medicine in the 12 months prior to the study. 48% of respondents reported that they had used “Western” and traditional medicine in the 12 months prior to the study. Traditional medicine only was used by 14% of all respondents and 21% of respondents used only “Western” medicine in this period. Symptoms related to gastrointestinal and biliary systems were most frequently treated with traditional medicine and accounted for 27% of total use. The study presents important insights into the use of traditional medicine. However it is limited by its sample from only 2 townships and therefore additional studies are needed to determine whether these findings are representative of the wider population.

Lee et al, 2006 Mortality rates in conflict zones in Karen, Karenni, and Mon states in eastern Burma. Tropical Medicine and International Health, 11, 7: 1119-1127

The authors present two retrospective household surveys conducted in 2002 and 2003 in nine administrative areas in eastern Myanmar to assess population based mortality estimates for conflict zones. The total estimated population in the areas was 125,000. Two-stage random sampling was used to select households in villages in each year. Interviews were conducted to collate vital data in both years. Infant mortality rate (IMR), under 5 mortality rate (U5MR), age specific U5MR and crude mortality rate (CMR) were calculated for both years. The authors report that high mortality rates were found in both years (IMR 135/122 per 1000 live births; U5MR 291/276 per 1000 live births; CMR 25/21 per 1000 persons per year, in 2002/2003 respectively). The main cause of death in both years was malaria at 45% and 41% in 2002 and 2003 respectively. Diarrhoea and landmines and other violent acts were also important causes of death as well as pregnancy related deaths in women. The study provides useful insights into the health status of populations in areas affected by conflict.

Moon Fai Chan et al, 2012. Impact of demographic change, socioeconomics, and health care resources on life expectancy in Cambodia, Laos and Myanmar. Public Health Nursing, 30, 3: 183-192

The authors present the findings of an ecological study covering 29 years (1980-2008) to examine the factors impacting directly and indirectly on life expectancy in 3 south East Asian countries, including Myanmar. The study examined socioeconomic status, demographic changes and availability of health care resources. The authors report that in Myanmar life expectancy was directly correlated with socio-economic status and health care resources. Socio economic status was also found to indirectly affect life expectancy through demographic and health care resources. The study provides a useful comparison against other countries at this stage as well as a useful basis for comparison with future figures.

Mullany LC et al, 2007. Population-based survey methods to quantify associations between human rights violations and health outcomes among internally displaced persons in eastern Burma. *Journal of Epidemiology and Community Health*, 61: 908-914

The authors present a retrospective household survey among internally displaced persons in eastern Myanmar to determine the association between mortality and morbidity and house-hold level experience of human right violations in a 12 month period. 100 village based clusters were selected according to population size, across 8 administrative areas in eastern Myanmar. A total population of 9853 was included in the study across 1834 households. Age and sex, and details of illness episodes and deaths, were recorded for all members in selected households. Mid Upper Arm Circumference (MUAC) in children under 5 years was measured and a rapid test for malaria was conducted on household survey respondents. An assessment of household exposure to specific human rights violations during the preceding 12 months was undertaken. The authors report an Infant Mortality Rate (IMR) of 89/1000 live births (CI 49-129) and under 5 mortality rate (U5MR) of 218 (CI 135-301). The most common cause of death in children and adults was malaria (overall 42%) while diarrhoea accounted for 22% of deaths and ARIs for 12%. 11% of rapid tests for parasitaemia were found to be positive. Moderate and severe malnutrition were found in 2.6% and 1.6% of children respectively. Landmine injuries were found to be just over 13 per 10,000 population per year. Just over half (52%) of respondents reported one or more HRVs during the previous 12 month period. 33% of households reported forced labour while 25% reported theft or destruction of food supply and 9% reported forced displacement. The risk of death in children under 5 years, and overall mortality risk was higher among families with multiple exposures to HRVs than those reporting one or no violations. The study provides insights into the severe health risks in internally displaced populations. However confidence intervals are wide for a number of risks and thus care is needed in interpreting the results.

Ohnmar et al, 2005. Household income, health and education in a rural area of Myanmar. *Southeast Asian Journal of Tropical Medicine and public health*, 36, 2: 529-533

The authors present a community-based cross sectional survey conducted in 2002 in a rural area to assess data on education and health, stratified by social factors. A total of 805 households were randomly selected for inclusion in the study. Household members (mothers, children aged 12 years and all those 16 years and above) were interviewed on various aspects of health, social and income characteristics. The authors report that 60% of houses in the study area were made of bamboo. Higher income groups were more likely to have a wooden or brick-based house (55%). Those in the lower income groups had fewer numbers of people who reported their health as "very good". In addition the percentage of recent acute medical conditions, longer-term disability and poor visual acuity were higher the lower income groups. Lower income groups also had a higher rate of births per 1000 population and a higher rate of deaths per 1000 population (1.3 and 1.2 times respectively) than higher income groups. Overall 86% of babies were delivered at home. Women in lower income groups were most likely to deliver with a Traditional Birth Attendant (TBA) (60%). Overall literacy rates were 1.7% in males and 10.4 % in females in those 15 years and above. In the children 5-9 years of age 14% had never been enrolled in school and enrolment was lower in those in more rural areas. The study is conducted in one rural area only and may not be representative of other rural areas situated at a greater distance from a major urban area, limiting generalisability of the findings.

Soe Htet et al, 2014. Economic burden of chronic conditions among households in Myanmar: the case of angina and asthma. *Health Policy and Planning*: 1-11

The authors present a study of household out of pocket (OOP) spending in relation to chronic disease. World Health survey (WHS) data from 2002-2003 was used to sample households (using a stratified random sampling procedure) who reported a member with asthma or angina. Data was collected on OOP spending related to inpatient and other care. Analysis of OOP in households affected by asthma and angina was compared to matched controls. The authors report that both

households which reported a member with asthma or angina incurred higher OOP expenditure than their matched controls and both had examples of catastrophic expenditure due to the condition. Expenditure on drugs was an important factor in the higher expenditure in both cases. The study is useful in showing the impact of chronic disease on household OOP. The study looks at only 2 chronic conditions and therefore further studies are needed to test whether the findings extend to other chronic diseases.

Soe Htet et al, 2015. Financial risk from ill-health in Myanmar: Evidence and policy implications. *Asia Pacific Journal of Public Health*, 27, 4: 418-428

The authors present on a cross sectional study of out of pocket (OOP) spending in households. Data from the World Health Survey conducted in 2002-2003 was used to select a study population of 6054 households. Sampling of households was based on random, stratified procedures. The sampling frame for the study covered 90% of population. OOP for households in relation to illness in the 12 months preceding survey was analysed. The authors report that 41% of households incurred catastrophic spending with 5% borrowing or selling assets to finance health care. Catastrophic spending was positively associated with households having an elderly member or children under 5 years and with larger households. Health care use was positively correlated with households with a person with chronic illness (as well as pregnancy women, larger sized). The study presents valuable insights into OOP in households. Given the sampling frame covers 90% of the population the study can be considered to provide a reasonable estimate of the issue at national level in the period 2002/2003. However it is also important to understand the characteristics of the remaining 10% as well as changes since the WHS was conducted.

Soe Moe et al, 2012. Health seeking behaviour of elderly in Myanmar. *International journal of collaborative research on internal medicine and public health*, 4, 8: 1538-1544

The authors present a cross sectional study to identify the health status and health seeking behaviour in older persons aged 60 years and above and the relationship between health seeking behaviour and socio-demographic characteristics. Two townships were randomly selected from Lower and Upper Myanmar. Village tracts were randomly selected in both townships. Interviews were conducted until the agreed sample obtained. Face-to-face interviews were conducted using a pretested and pre-coded questionnaire. A total of 729 individual were included in the study. The authors report that 35% of males perceived themselves to be in “good health” while 23% perceived themselves to be in “poor health”. 34% of females reported they were in “good health” and 24% in “poor health”. Disease morbidity over the preceding year showed no difference between the sexes, though females had a slightly higher morbidity at the time of the interviews. The majority of persons used the Rural Health Centre (RHC) followed by private practitioners in the previous 12 months when seeking care. There was a significant difference in health seeking behaviour between Upper and Lower Myanmar populations. Health seeking behaviour was not associated with gender, ethnicity or religion. However both income and education level were significantly associated with health seeking behaviour i.e. 7% compared to 15% of older persons classified below/above the poverty line sought treatment for a current illness while 9% compared to 27% of those with a lower education status/middle or higher education, sought treatment. The study provides important insights into health seeking behaviours. The townships were randomly chosen but represent only a very small percentage of the total number of townships in the country, limiting the generalisability of the results beyond the study townships.

UNODC, 2010. Myanmar Situation Assessment on Amphetamine-type stimulants, Global SMART programme. December 2010

The report outlines the role of Myanmar in the production of Amphetamine-type stimulants (ATS), including methamphetamine pills in the East and South East Asia region. Opium and heroin are the most common drugs in use in Myanmar, followed by ATS, specifically methamphetamine pills. Drug seizures in 16 out of 17 administrative regions in 2009 suggest nationwide availability of ATS. The report finds that no comprehensive household or school-based surveys on drug use have

been undertaken but data suggests that methamphetamine use is increasing while that of opium and heroin is stable or decreasing.

Win Myint Oo et al, 2015. Catastrophic expenditures for health care in Myanmar. Myanmar Medical Journal, 57, 2: 7-13

The authors present results of a study to determine estimates of catastrophic expenditure for health care and the relationship between catastrophic health care expenditure and annual household income/expenditure. The study was part of a wider cross-sectional study on perceptions and acceptance of health insurance. The study utilised a multi-stage random sample. 437 households were recruited across 6 regions and states. Information on expenditure and income was collected by face-to-face interviews with heads of household. Annual income and expenditure was classified into high and low groups based on median values. The authors note that there was variation in sample sizes between areas as only those willing to provide information were recruited. 37% of households were considered to have catastrophic health care expenditure when based on a threshold of 10% of total expenditure. 33% of households were considered to have catastrophic health care expenditure when based on the threshold of 40% non-food expenditure. The authors note a significant decreasing trend within quintile groups for both income and expenditure. Households residing in rural areas and those with a family member hospitalised in the preceding year were more likely to show catastrophic health expenditure than their urban and non-hospitalised comparisons. The study provides important insights into the high levels of catastrophic spending within the population. However the sample is based on those willing to provide information who may not be representative of those not willing to provide information, and introducing bias. Care is needed therefore in interpreting the results from this population.

Win Myint Oo et al, 2015. Awareness and acceptance on health insurance, and willingness to pay: a community based study in Myanmar. Advance Tropical Medicine and Public Health International, 5, 3:44-51

The authors present a cross sectional study to determine community awareness and acceptance of health insurance and willingness-to-pay in Myanmar. Households were selected by multi-stage random sampling covering 27 townships. Heads of household were invited to participate in a face-to-face interview. Contingent valuation method (CVM) was used to assess willingness to pay (WTP). Initially 8% reported willingness to accept health insurance, rising to nearly 80% once an explanation of the concept was provided. Initial reasons for lack of willingness included poverty (42%), considered unnecessary (18%) and good health (12%). Those with a higher education status were more likely to accept health insurance (when univariate and multivariate analysis applied). Those from rural areas were also more likely to accept insurance (when multivariate analysis applied). The average WTP was 19,767 Kyats per person per year (equivalent to approximately US\$20 at the time of study). The study provides important insights into awareness and acceptance of health insurance in this population.

Annex 4: List of current, recent & planned research related to NCD and mental health through National Ethics Review Committees

UM1- University of Medicine (1), Yangon

UM2- University of Medicine (2), Yangon

UMM- University of Medicine, Mandalay

UPH- University of Public Health

DSMA- Defence Services of Medical Academy

Breakdown by NCD area

Mental Health	-	33 (1)
Non Communicable Disease	-	7
Injury & Road Traffic Accident	-	19 (2)
Respiratory Diseases	-	20 (2)
Cardiovascular Diseases	-	28 (3)
Diabetes	-	14 (1)
Cancer	-	28 (2)
Smoking and Alcohol Drinking	-	16
Snake bites	-	1
Total	-	166

Mental health

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Depression in family caregivers of dementia patients	Thit Thit Htun	Thesis, M.Med.Sc (Mental Health)	2014	UMM
2	Prevalence and Risk Factors of Insomnia in a community in Mandalay	Htet Myat Soe	Thesis, M.Med.Sc (Mental Health)	2014	UMM
3	Prevalence and associated factors for aggression among psychiatric inpatients at mental health hospital, Mandalay	Ohn Mar Kyi	Thesis, M.Med.Sc (Mental Health)	2014	UMM
4	Prevalence and associated factors of delirium tremens	Htin Kyaw Oo	Thesis,	2014	UMM

	in alcohol dependent patients		M.Med.Sc (Mental Health)		
5	Prevalence and associated factors of heroin used among current methadone maintenance patients.	Thura Lin	Thesis, M.Med.Sc (Mental Health)	2014	UMM
6	Suicidal Ideation in Schizophrenia	Nang Hla Yon	Thesis, M.Med.Sc (Mental Health)	2014	UMM
7	Correlation between the physical findings and urine analysis in drug abusers	Win Thida Kyaw	Thesis, M.Med.Sc (Medical Jurisprudence)	2013	UMM
8	Symptom- triggered Vs tapering regimen of diazepam in alcohol detoxification	Su Su Win	Thesis, M.Med.Sc (Mental Health)	2012	UMM
9	Prevalence and risk factors of diazepam abuse in methadone maintained patients	Soe Moe Aung	Thesis, M.Med.Sc (Mental Health)	2012	UMM
10	Prevalence and Risk factors for anxiety and depression among grade XI students	Anawar Yee Nyo	Thesis, M.Med.Sc (Mental Health)	2011	UMM
11	Effectiveness of Methadone maintenance treatment on social adjustment in heroin dependent Male	Bo Bo Nyan	Thesis, M.Med.Sc (Mental Health)	2011	UMM
12	The Effect of Vipassana Meditation on Anxiety and stress	Kyaw San Htay	Thesis, M.Med.Sc (Mental Health)	2011	UMM
13	Factors influencing alcohol induced psychotic disorder	Kyi Min Tun	Thesis, M.Med.Sc	2015	UM2

	among patients with alcohol use disorder.		(Mental Health)		
14	Frequent admission of schizophrenic patients at Mental Health Hospital, YGN	Myat Thu Zar	Thesis, M.Med.Sc (Mental Health)	2014	UM2
15	Depression among family caregivers of stroke patients	Zin Wai Wai Soe	Thesis, M.Med.Sc (Mental Health)	2014	UM2
16	Factors associated with depression in patients with epilepsy at the North Okkalapa General Hospital and the Yangon General Hospital	Thida Win	Thesis, M.Med.Sc (Mental Health)	2013	UM2
17	Obsessive –compulsive symptoms in Schizophrenia	Nan Sandar Htun	Thesis, M.Med.Sc (Mental Health)	2015	UM1
18	Effectiveness of health education on knowledge, attitude and practice towards Illicit drugs among high school students	Bo Bo Zaw	Thesis, M.Med.Sc (Mental Health)	2015	UM1
19	Relation between anxiety, depression and family support among elderly people in kyauk- Tann Township	Thiri Lay Swe	Thesis, M.Med.Sc (Mental Health)	2015	UM1
20	Depressive Symptoms in patients with amphetamine use disorder	Nyein Nandar Aung	Thesis, M.Med.Sc	2015	UM1

			(Mental Health)		
21	Association between severity of alcohol, withdrawal state and serum sodium, potassium and magnesium level in alcohol dependent patients attending Yangon mental health hospital	Le Le Khaing	Thesis, M.Med.Sc (Mental Health)	2012	UM1
22	Factors associated with burden on family caregivers of chronic schizophrenic patients attending out-patients department of Yangon Mental Health Hospital	Aye Chan Maung Maung	Thesis, M.Med.Sc (Mental Health)	2012	UM1
23	Knowledge, attitude and practice towards mental health among dental students	Htun Sandar Linn	Thesis, M.Med.Sc (Mental Health)	2011	UM1
24	Comparative study of quality of life among schizophrenics with predominant positive symptom and negative symptom	Nan Yu Yu Lwin	Thesis, M.Med.Sc (Mental Health)	2011	UM1
25	Knowledge, attitude and practice towards mental health among urban and rural basic health staff in northern district of Ygn Division	Khin Zaw	Thesis, M.Med.Sc (Mental Health)	2010	UM1
26	Knowledge, attitude and practice on epilepsy among school teachers in Thingankyun Township	Swe Mar Myint Lwin	Thesis, M.Med.Sc (Mental Health)	2014	UPH

27	Knowledge and perception on amphetamines use among the adolescents (Grade 9 and 10 Students) in Hpa-An Township	Tun Zayar Min	Thesis, M.Med.Sc (Mental Health)	2013	UPH
28	Family burden of drug users and alcohol dependents patients admitted in Mental Health Hospital, Yangon	Kyaw Zay Yar Moe	Thesis, M.Med.Sc (Mental Health) DSMA	2013	DMR
29	Life events and depression in alcohol dependent patients admitted to mental health hospital, Yangon	Myo Min Thu	Thesis, M.Med.Sc (Mental Health) DSMA	2013	DMR
30	Suicidal Ideation among patients with Bipolar mood disorder of Mental health hospital, Yangon	Hlaing Htet Aung	Thesis, M.Med.Sc (Mental Health) DSMA	2013	DMR
31	A study of knowledge, attitude and practice towards mental health among nursing students at Military Institute of Nursing and Paramedical Sciences	Min Thurein Htet	Thesis, M.Med.Sc (Mental Health) DSMA	2011	DMR
32	A study on knowledge, attitude and practice of parents upon mental health of their children under 15 year of age at three infantry units from Mingalardon cantonment area	Yan Naing Min	Thesis, M.Med.Sc (Mental Health) DSMA	2011	DMR
33	Anxiety and depression in family caregivers of chronic schizophrenic	Pyei Zaw Oo	Thesis, M.Med.Sc	2010	DMR

	patients attending Yangon Mental Health Hospital.		(Mental Health) DSMA		
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Non Communicable Diseases

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Epidemiology study of non-communicable diseases in No(1) Military Hospital (700 Bedded) Pyin Oo Lwin (2004-2013)	Wunna	Thesis, M.Med.Sc (Public Health) DSMA	2014	UPH
2	Awareness and utilization of pentavalent immunization among infants and mother in Thaketa Township	Shwe Sin Nwee	Thesis, M.Med.Sc (Public Health)	2013	UPH
3	Knowledge, practice and coverage of immunization among mothers of under two years children in rural area of Kawa Township	Thant Htoo Aung	Thesis, M.Med.Sc (Public Health) DSMA	2013	UPH
4	Effectiveness of a community based prevention programme on Major Non Communicable disease in Mingalardon Township, Yangon Region	Soe Tun	Dissertation Ph.D (Public Health)	2013	UPH
5	Knowledge, attitude and Practice on cardiovascular disease, diabetes mellitus and obesity among the workers of a selected small scale industry in South Dagon Township, Yangon	Thant Zin	Thesis, M.Med.Sc (Public Health) DSMA	2012	UPH

6	Behavioral and biological risk factors of major non-communicable diseases among employees at the Inland Water transport Enterprise, Kyautada Township, Yangon	Kyu Kyu Thinn	Thesis, M.Med.Sc (Public Health)	2012	UPH
7	Awareness and utilization of mothers on childhood immunization services in north okkalapa Township	Tint Tint Kyaw	Thesis, M.Med.Sc (Public Health)	2010	UPH

Accident

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Non-accidental injuries	Aye Min Ko	Thesis, M.Med.Sc (Medical Jurisprudence)	2014	UMM
2	Incidence and risk factors of post-traumatic stress disorder among road traffic accident survivors	Khin Thandar Aung	Thesis, M.Med.Sc (Mental Health)	2013	UMM
3	Socio-demographic characteristics of children with accidents and smoking	Zin Mar Win	Thesis, M.Med.Sc (Paediatrics)	2013	UMM
4	Pattern of fatal injuries in motorcycle accidents	Myo Ko Ko	Thesis, M.Med.Sc (Medical Jurisprudence)	2013	UMM
5	Identification of pre-existing cardiac diseases in deaths due to road traffic accident at North Okkalapa General Hospital	Tun Kyaw Oo	Thesis, M.Med.Sc	2013	UM 2

			(Medical Jurisprudence)		
6	The study of road traffic accidents in children at Yangon General Hospital	Htun Nanda	Thesis, M.Med.Sc (Orthopaedics)	2015	UM 1
7	Road traffic accident cases in North Okkalapa general hospital	Ye Lwin Maung	Thesis, Dip.H.A	2014	UPH
8	Road traffic accident cases in Emergency Reception Center 2, Yangon	Hla Hla Htay	Thesis, Dip.H.A	2014	UPH
9	The study on "Accident and Injury cases during Thingyan Festival (YGH)	May Thu Zaw	Thesis, Dip (H.A)	2013	UPH
10	An Epidemiological study on work related injuries attending emergency receiving center at Yangon General Hospital	Zaw Myo Aung	Thesis, M.Med.Sc (Public Health)	2012	UPH
11	External causes of injuries of the patients admitted to (1000) Bedded Naypyitaw General Hospital	Ei Shwe Sin Win	Thesis, M.Med.Sc (Public Health)	2012	UPH
12	Characteristics and associated factors of injured cases caused by interpersonal violence attending Hlaing Tharyar Hospital, Yangon	Aye Nyein Moe Myint	Thesis, M.Med.Sc (Public Health)	2012	UPH
13	Pattern of injuries among young people in Yangon General Hospital	Aye Mya Chan Thar	Thesis, M.Med.Sc (Public Health)	2012	UPH

14	Risk factors for severe motorcycle injuries among motorcyclists in Magway township	Lwin Lwin Aung	Thesis, M.Med.Sc (Public Health)	2011	UPH
15	Epidemiology of road traffic accidents and other injuries in selected hospitals	Thet Su Wai	Thesis, M.Med.Sc (Public Health)	2010	UPH
16	Road traffic accident cases in North Okkalapa General Hospital	Nilar Tun	Thesis, Dip (H.A)	2010	UPH
17	Fatal and Non-fatal Cases of Road Traffic Accident at No(1) Defense Service General Hospital (1000 Bedded) and Defense Service Orthopedic Hospital(500 Bedded)	Wai Phyo Maung	Thesis, M.Med.Sc (Medical Jurisprudence) DSMA	2013	DMR
18	Fatal injuries due to Auto Accident Brought to Yangon General Hospital	Min Mg Mg	Thesis, M.Med.Sc (Medical Jurisprudence) DSMA	2013	DMR
19	Fatal injuries due to Road Traffic Accident No(1) Defense Service General Hospital Yangon	Thet Zaw Tun	Thesis, M.Med.Sc (Medical Jurisprudence) DSMA	2011	DMR

Respiratory diseases

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Effectiveness of home-based pulmonary rehabilitation program in patients with chronic obstructive pulmonary disease	Aung Chan Thu	Thesis, M.Med.Sc (Medical Jurisprudenc)	2014	UMM
2	Admission blood glucose level and in-hospital events of acute exacerbation of chronic obstructive pulmonary disease	Lin Aung Thet	Thesis, M.Med.Sc (Internal Medicine)	2013	UMM
3	The effect of exercise training on pulmonary function in patients with chronic obstructive pulmonary disease	Mar Mar Lwin	Dissertation, Ph.D (Physiology)	2011	UMM
4	Ankle brachial pressure index in chronic cigarette smoker and chronic cheroot smokers	Moe Moe Oo	Thesis, M.Med.Sc (Physiology)	2011	UMM
5	Cardiovascular risk in patients with chronic obstructive pulmonary disease in Mandalay General Hospital	San Htay	Thesis, M.Med.Sc (Internal Medicine)	2009	UMM
6	A comparative study on cardiorespiratory changes in smokers and nonsmokers during induction of anesthesia and endotracheal intubation.	Nilar Shwe	Thesis, M.Med.Sc (Anaesthesiology)	2012	UM2
7	Study on lung function among the workers in No	Thandar Win	Thesis, M.Med.Sc	2010	UPH

	(3) Saw Mill, Shwepyithar Township		(Public Health)		
8	Association between six minute walks test and spirometer parameters for disease severity in patients with Chronic obstructive pulmonary disease.	Naing Shin Htet	Thesis M.Med.Sc. (Internal Medicine) DSMA	2014	DMR
9	Cardiovascular assessment in chronic obstructive pulmonary disease patients.	Myo Zin Htwe	Thesis M.Med.Sc. (Internal Medicine) DSMA	2014	DMR
10	Serum lipid profile in patients with chronic obstructive pulmonary disease	Phyo Mouk Aung	Thesis M.Med.Sc. (Internal Medicine) DSMA	2014	DMR
11	Relationship Between Corticosteroid Therapy and 10-Year Fracture Risk in Chronic Bronchial Asthma Yangon	Arkar Hein	Thesis M.Med.Sc. (Internal Medicine) DSMA	2013	DMR
12	Osteoporosis in patients with chronic obstructive pulmonary disease. Yangon; University of Medicine (2); 2013	Hnin Mya Thida	Thesis M.Med.Sc. (Internal Medicine) UM2	2013	DMR
13	Respiratory function and cognitive performance of middle age male chronic obstructive pulmonary disease patients.	Nay Yee Win	Thesis M.Med.Sc. (Internal Medicine)UM1	2013	DMR

14	A Study of Activities of Daily Living in People with Chronic Obstructive Pulmonary Disease in Military Hospitals	Myo Min Thein	Thesis M.Med.Sc. (Internal Medicine) DSMA	2013	DMR
15	Prevalence and severity of childhood asthma in school children of age 10-14 years in north Okkalapa Township	Thet Su Su Aung	Thesis M.Med.Sc. (Paediatrics) UM2	2012	DMR
16	Study on the Effect of Lower Limbs Exercises in Pulmonary Rehabilitation for Chronic Obstructive Pulmonary Disease	Kyaw Naing Oo	Thesis M.Med.Sc. (Rehabilitation) DSMA	2012	DMR
17	Knowledge and practice on asthma among parents or caregivers of children with asthma before and after health education	Yu Mon Myint	Thesis M.Med.Sc. (Paediatrics) UM1	2011	DMR
18	Factors associated with exacerbations of bronchial asthma in children attending YCH	Thuzar Myint	Thesis M.Med.Sc. (Paediatrics)UM1	2010	DMR
19	Study the Effect of upper and lower limbs Exercises in Pulmonary Rehabilitation for Chronic Obstructive Pulmonary Disease	Shein Myat Aung	Thesis M.Med.Sc. (Rehabilitation) DSMA	2010	DMR
20	A Study of activities of daily living in elderly people with exacerbation of chronic	Cho Mar	Thesis M.Med.Sc.	2008	DMR

	obstructive pulmonary disease in YGH.		(Internal Medicine) UM(1)		
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Cardiovascular disease

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Outcomes of acute stroke in patients with chronic kidney disease	Yu Maung	Thesis, M.Med.Sc (Internal Medicine)	2013	UMM
2	Essential hypertension and associated factors in early adolescents	Htar Htar Myint	Thesis, M.Med.Sc (Paediatrics)	2013	UMM
3	Chronic arsenic exposure on cardiovascular risk parameters	Soe Minn Htway	Dissertation, Ph.D (Physiology)	2012	UMM
4	Effects of chronic alcohol consumption on cardiovascular autonomic function	Kyaw Zin	Thesis, M.Med.Sc (Physiology)	2012	UMM
5	Hypertension and its associated factors among workers of No(1) Pharmaceutical factory, Yangon region	Aye Myintzu	Thesis, M.Med.Sc (Public Health)	2013	UPH
6	Prevalence, Awareness, Treatment Seeking Patterns and risk factors of Hypertension among the Middle Age people in Bago Township	Zaw Htet Kyaw	Thesis, M.Med.Sc (Public Health)	2013	UPH
7	Assessment of school physical activities and healthy eating practices in	Cho Mar Kaung Myint, Min Ko Ko, Saw saw,	Dissertation M.Med.Sc	2013	UPH

	Monastic Education Schools and Basic Education Schools of Mingalardon Township, Yangon	Cho Thet Khine, Aue Sandar Mon, Nay Soe Maung	(Public Health)		
8	Knowledge, attitude and practice on Hypertension among Hypertensive patients in selected military community, Pyin Oo Lwin	Htoo Pyie Aung	Thesis, M.Med.Sc (Health Care Management) DSMA	2012	UPH
9	Awareness and treatment seeking pattern of hypertension among school teachers in Insein Township, Yangon region	Wint Mon Khin	Thesis, M.Med.Sc (Public Health)	2012	UPH
10	Factor associating with overweight and obese middle school children in South Okkalapa Township, Yangon Region	Thet Naing Tun	Thesis, M.Med.Sc (Disease Prevention and Control)	2012	UPH
11	Knowledge, attitude and Practice on cardiovascular disease, diabetes mellitus and obesity among the workers of a selected small scale industry in South Dagon Township, Yangon	Thant Zin	Thesis, M.Med.Sc (Public Health) DSMA	2012	UPH
12	Assessment of leisure time physical activity among sedentary workers	Aye Aye Thwe	Thesis, M.Med.Sc (Public Health)	2012	UPH
13	Study on prevalence and associated risk factors of hypertension in selected military community in Yangon Command	Tay Zar Hein	Thesis, M.Med.Sc (Disease Prevention &	2011	UPH

			Control) DSMA		
14	Assessment of blood pressure body weight and height among adult population in Kyeik Ma Yaw Urban area	Win Aye Hlaing	Thesis, M.Med.Sc (Public Health)	2010	UPH
15	Risk factor and awareness regarding hypertension among hypertension patients attending hypertension clinic at No.(2) Military Hospital (500 Bedded)	Zay Yar Win	Thesis, M.Med.Sc (Public Health) DSMA	2009	UPH
16	Physical activity, diet and obesity among high school students mawlamyine	Win Thuzar Aye	Thesis, M.Med.Sc (Public Health)	2008	UPH
17	Cardiovascular assessment in chronic obstructive pulmonary disease patients.	Myo Zin Htwe	Thesis, M.Med.Sc (Internal Medicine) DSMA	2014	DMR
18	The Study of cardiovascular autonomic dysfunction in patients with alcohol dependence syndrome.	Win Min Latt	Thesis, M.Med.Sc (Internal Medicine) DSMA	2014	DMR
19	Cardiovascular risk assessment between recent-onset and established rheumatoid arthritis using framingham risk score.	Zar Chi Wai Linn	Thesis, M.Med.Sc (Internal Medicine) UM1	2013	DMR

20	Cardiovascular Risk Factors in Patients with Chronic Kidney Disease	Aung Nyan Lynn	Thesis M.Med.Sc. (Internal Medicine) DSMA	2013	DMR
21	Effect of Coffee Consumption on Cardiovascular Responses to Mental Stress	Aung Phone Zaw	Thesis, M.Med.Sc (Physiology) DSMA	2012	DMR
22	Assessment of Cardiovascular Aspect of Autonomic Functions, Blood Lead Level, Haemoglobin Level and Haematocrit in Battery Factory Workers	Aye Aung Ko	Thesis, M.Med.Sc (Physiology) DSMA	2012	DMR
23	Relation Between Insulin Resistance, Non-Alcoholic Fatty Liver Disease and Cardiovascular Risk Factors in Type 2 Diabetes Mellitus	Khin Soe Win	Thesis, M.Med.Sc (Internal Medicine) DSMA	2011	DMR
24	Insulin resistance, beta cell function and cardiovascular risk factors in Myanmar adults with varying degree of glucose tolerance.	Ko Ko	Dissertation Dr.Med.Sc (General Medicine) UM2	2011	DMR
25	Effect of salt loading on cardiovascular responses to mental and physical stress in young adults.	Po Po Win	Thesis, M.Med.Sc (Physiology) UM2	2010	DMR
26	The Effect of mental and physical stress on cardiovascular responses in	Naw Hnin Hnin Oo	Thesis, M.Med.Sc	2010	DMR

	women taking contraception.		(Physiology) UM2		
27	Age and sex dependent difference in cardiovascular autonomic functions in Myanmar subjects.	Thinn Thinn Soe	Thesis, M.Med.Sc (Physiology) UM1	2010	DMR
28	Effect of meditation on cardiovascular responses to mental stress and plasma malondialdehyde level in normal healthy medical cadets.	Aung Ye Thu	Thesis, M.Med.Sc (Physiology) UM2	2010	DMR

Diabetes

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	The clinical profile of type 2 diabetes in the elderly	Aung Khine	Thesis, M.Med.Sc (Internal Medicine)	2012	UMM
2	Anemia in diabetic and non-diabetic patients with chronic kidney disease	Aye Aye Win	Thesis, M.Med.Sc (Internal Medicine)	2012	UM1
3	Knowledge and risk taking behavior of diabetes mellitus among military personnel and their families from selected units in Mingalardon cantonment area	Wai Min	Thesis, M.Med.Sc (Public Health) DSMA	2014	UPH
4	Factors influencing chronic complications of type 2 diabetes mellitus among persons attending diabetes	Aung Htet Mon	Thesis, M.Med.Sc	2012	UPH

	clinic at No, (2) Military Hospital (500- Bedded)		(Public Health) DSMA		
5	Treatment Seeking behaviors of diabetes patients in Hmawbi Township, Yangon Region (2012)	Ei Sandar U	Thesis, M.Med.Sc (Public Health)	2012	UPH
6	Factors influencing chronic complications of type A diabetes mellitus in a selected diabetes clinic of Yangon 2009.	Chaw Nande	Thesis, M.Med.Sc (Public Health)	2012	UPH
7	Knowledge attitude and practice on diabetes mellitus among persons attending diabetes clinic at No(2) Military Hospital (500 Bedded)	Ye Thway Hlaing	Thesis, M.Med.Sc (Public Health) DSMA	2009	UPH
8	Evaluation of echocardiographic findings and risk factors for diastolic dysfunction in type 2 diabetes without cardiac symptoms.	Win Kyaw Oo	Thesis, M.Med.Sc (Internal Medicine) DSMA	2014	DMR
9	Plasma adiponectin levels and risk for coronary heart disease patients with type 2 diabetes mellitus.	Thein Myint	Dissertation Dr.Med.Sc (General Medicine) DSMA	2012	DMR
10	Acetylator status in Myanmar type 2 diabetes mellitus patients and its influence on pharmacokinetics of gliclazide.	Htet Htet	Thesis, M.Med.Sc (Pharmacology) UM(1)	2012	DMR
11	Influence of renal function on pharmacokinetics of ethambutol in Myanmar	Htet Aung	Thesis, M.Med.Sc	2012	DMR

	tuberculous patients with type 2 diabetes mellitus.		(Pharmacology) UM(1)		
12	Study of cognitive functions in patients with Type 2 diabetes mellitus	Moh Mon Myint Aung	Thesis, M.Med.Sc (Internal Medicine) UM(2)	2012	DMR
13	Urinary tract infection in women with type 2 diabetes mellitus	Nan Phyu Sin Toe Myint	Thesis, M.Med.Sc (Internal Medicine) UM(2)	2012	DMR
14	Gestational diabetes mellitus in pregnant population of North Okkalapa General Hospital.	Win Pa Pa	Thesis, M.Med.Sc (O & G) UM2	2012	DMR

Cancer

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Knowledge, attitude and practice on human papilloma virus vaccine for prevention of cervical cancer	May Myat Thu	Thesis, M.Med.Sc (O & G)	2013	UMM
2	Awareness of breast and cervical cancers among women in Mandalay cantonment area	Aung Zin	Thesis, M.Med.Sc (Public health) DSMA	2014	UPH
3	Knowledge and practice of betel quid chewing among	Ar Kar	Thesis, M.Med.Sc	2014	UPH

	urban area of Than-Daung Township Kayin State		(Public health)		
4	Knowledge and attitude towards breast cancer and breast self- examination among nursing students, University of Nursing Yangon	Sandar Aung	Thesis, M.Med.Sc (Public health)	2012	UPH
5	Economic burden of Lung cancer patients at Yangon General Hospital	Phyu Win Thant	Thesis, M.Med.Sc (Public health)	2012	UPH
6	Information related to breast cancer among women of reproductive age in Minbu	San Kyu Kyu Aye	Thesis, M.Med.Sc (Public health)	2010	UPH
7	Drug utilization pattern and efficacy of opioid and other analgesics in hospitalized cancer patients with pain.	Thandar Htar Lwin	Thesis M.Med.Sc (Pharmacology)	2015	DMR
8	Role of MRI in pretreatment assessment of operable cervical cancer.	Kyi Kyi Aye	Dissertation Dr.Med.Sc (Radiation) UM(1)	2015	DMR
9	Role of virtual bronchoscopy in lung cancer	Thandar Lwin	Dissertation Dr.Med.Sc (Radiation) UM(1)	2014	DMR
10	Clinical study of locally advanced breast cancer	Sie Thu Myint	Thesis M.Med.Sc (Surgery)	2014	DMR

			UM(1)		
11	A role of combined sentinel lymph node biopsy and Axillary sentinel lymph node sampling in Early Breast Cancer	Aung Myat Kyaw	Thesis M.Med.Sc (Surgery) DSMA	2014	DMR
12	Study of Association between self-efficacy and Depressive symptoms in family Caregivers of Lung Cancer patients attending at No.(1) DSGH(1000Bedded) and No.(2)MH(500Bedded)	Soe Thu Ya	Thesis M.Med.Sc (mental health) DSMA	2013	DMR
13	Experience of patient with cervical cancer undergoing concurrent Chemoradiotherapy: A Case Study	Myat Myat Htwe	Thesis M.N.Sc	2013	DMR
14	Anxiety Symptoms among Patients with Cervical Cancer at No.(1) DSOGCH (300 Bedded) and No.(2)MH (500 Bedded)	Aung Kyaw Moe	Thesis M.Med.Sc (mental health) DSMA	2013	DMR
15	Awareness of cervical cancer Between cervical Cancer Patient and Patient with Other Gynaecological Diseases	Myo Min Htike	Thesis M.Med.Sc (O & G) DSMA	2013	DMR
16	A Role of Axillary lymph Node Sampling in Women in Early Breast Cancer	Soe Min Aye	Thesis M.Med.Sc (Surgery) DSMA	2012	DMR
17	A role of Axillary sentinel lymph node Biopsy in Early Breast Cancer	Hein Thu Aung	Thesis M.Med.Sc (Surgery) DSMA	2012	DMR

18	Quality of Life Assessment in Lung Cancer Patients Using Myanmar Version of European Organization for Research and Treatment of Cancer Quality of Life Core Questionnaire (EORTC QLQ-C30)	Thurein Win	Thesis M.Med.Sc (Internal Medicine) DSMA	2012	DMR
19	Preservation versus sectioning of intercostobrachial nerve during axillary dissection for operable breast cancer.	Soe Myat Mon	Dissertation Dr.Med.Sc (General Surgery) UM(1)	2012	DMR
20	The Clinical Study of Recurrent Cervical Cancer Patients in Yangon General Hospital	Thet Khine San	Thesis M.Med.Sc (Medical Oncology) UM(1)	2012	DMR
21	The Effects of Oral Fluconazole on Treatment induced Mucositis in Oral Cavity Cancer Patients.	Ngu Wah Than	Thesis M.Med.Sc (Radiation Oncology) UM(1)	2012	DMR
22	A Clinical study of recurrent colorectal cancer patients in Y.	San Yee Myint	Thesis M.Med.Sc (Oncology) UM1	2011	DMR
23	A Comparative Study of Anxiety State in Cancer Patients Admitted to No. (2) MH (500-Bedded)	Aung Zin Oo	Thesis M.Med.Sc (mental health) DSMA	2011	DMR
24	The study of Blood transfusion requirement in surgery for Breast Cancer Patients	Si Thu Myat Wai	Thesis M.Med.Sc (Surgery) DSMA	2011	DMR

25	A study of Depression and Associated Risk Factors in Cancer Patient	Htain Linn Aung	Thesis M.Med.Sc (Psychology) DSMA	2010	DMR
26	A clinical study of recurrent breast cancer patients in Yangon General Hospital.	Zun Thynn	Thesis M.Med.Sc (Medical Oncology) UM(1)	2010	DMR
27	Relation between rectal dose and acute rectal complications of cervical cancer patients undergoing radiation therapy at Radiotherapy Department, YGH.	Wah Wah Myint Zu	Thesis M.Med.Sc (Radiation Oncology) UM(1)	2010	DMR
28	Experience of family living with woman undergoing chemotherapy for breast cancer (Qualitative Research: Case Study Method).	Aye Myint Khine	Thesis M.N.Sc (Nursing)	2010	DMR

Smoking and alcohol drinking

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Utilization and perception of adult populations in Tobacco in urban area of hpa-an Township Kayin State	Ye Min Thaung	Thesis, M.Med.Sc (Public Health)	2014	UPH
2	Tobacco use among working age group in urban area of leymyethna Township Ayeyarwaddy region	Su Mon Chell	Thesis, M.Med.Sc (Public Health)	2013	UPH
3	Knowledge, attitude and practice towards smoking, alcohol drinking and	Chan Nyein Aung	Thesis, M.Med.Sc	2012	UPH

	sexual behavior among adolescent boys in University of Dental Medicine, Mandalay		(Health Care Management) DSMA		
4	Effectiveness of health education on knowledge and attitude of smoking among military personnel in Hmawbi cantonment area	Soe Htet Aung	Thesis, M.Med.Sc (Health Care Management) DSMA	2012	UPH
5	Perception and practice of smoking, alcohol drinking and betel chewing among third year male students at University of Agriculture, Yezin	Aung Si Mon Myo	Thesis, M.Med.Sc (Health Care Management) DSMA	2012	UPH
6	Assessment of health related knowledge about smoking and alcohol consumption among adolescent boy at selected private school in North Okkalapa Township, Yangon	Myo Kyi Phyu	Thesis, M.Med.Sc (Public Health)	2012	UPH
7	Knowledge, Attitude and practice on tobacco consumption among recruits in No(1) Myanmar Army Recruiting Unit in Mingalardon Township, Yangon region	Kyaw Zaw Win	Thesis, M.Med.Sc (Public Health) DSMA	2012	UPH
8	Knowledge, Attitude and practice of tobacco use among house officers in University of Medicine (2), Yangon	Thida Aung	Thesis, M.Med.Sc (Public Health)	2012	UPH
9	Factor influencing concurrent behavior of alcohol drinking and tobacco smoking among	Yi Yi Win	Thesis, M.Med.Sc	2011	UPH

	male migrant young people in selected area of Mandalay City		(Public Health)		
10	The effectiveness of smoking cessation activities through health promotion approach in Ayeyarwaddy Naval Regional Command of Myanmar Navy	Myat Khine	Thesis, M.Med.Sc (Public Health) DSMA	2010	UPH
11	Factor influencing tobacco consumption in Kayan urban area, Yangon region	Khine Zar Win	Thesis, M.Med.Sc (Public Health)	2010	UPH
12	Exposure to electronic media and attitude towards smoking, alcohol drinking and sexual behavior among adolescents in Bago	Myo Myint Aung	Thesis, M.Med.Sc (Public Health) DSMA	2010	UPH
13	Smoking among adolescent males South Okkalapa Township, Yangon	Ye Min Naing	Thesis, M.Med.Sc (Public Health) DSMA	2010	UPH
14	Knowledge and attitude on smoking among high school students in Dagonmyothit (North) Township, Yangon Division	Nyi Nyi Zaw	Thesis, M.Med.Sc (Public Health) DSMA	2009	UPH
15	A study on youth smoking and tobacco consumption in south dagon township	Kyi Win	MPA	2012	DMR

16	A Study of clinical features of alcohol induced psychosis and comparison of alcohol drinking history between patient with alcohol dependent syndrome and alcohol induced psychosis admitted at Psychiatric Ward, No (1)DSHG (1000) Bedded.	Thet Aung	Thesis, M.Med.Sc (Mental Health) DSMA	2011	DMR
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Snake bite

Sr	Title of Research	Investigator & Co-investigator	Diss Notes	Published year	Source
1	Awareness and practice on Prevention of Snake Bite Among Farmers in Taungdwingyi Township	Swan Htet Yan	Thesis, M.Med.Sc (Public Health)	2012	UPH

Annex 5: Qualitative report on perceptions of key stakeholders on the research gaps related to the burden and risk factors of Chronic Non-communicable Diseases (NCD) in Myanmar

1. Executive summary

Background

Myanmar, in its recent political, demographic and socioeconomic transition, is facing not only the burden of communicable disease but also the problem of non-communicable diseases (NCD). According to the WHO Non-communicable Disease country profile 2014, NCD accounts for 59% of total deaths of 441,000 in Myanmar.

In response to the NCD epidemic, Myanmar has developed a National Policy on NCDs including tobacco control, conducts workshop and meetings on NCDs and implements specific programmes on prevention and control of NCDs in National Health Plan (2011-2016). A draft policy and action plan for NCDs has been developed by Ministry of Health but they are not yet engaged at higher levels such as other Ministries, the Parliament and other stakeholders. An NCD Unit has recently been established in the Department of Public Health and requires the support of different sectors and organizations to implement and scale up interventions for NCD control.

Program description

Since 2015, HelpAge International (Myanmar) is implementing a project, “Strengthening public health capacity to respond to Myanmar’s disease transition” funded by the European Union. The project is being carried out in collaboration with University of Public Health, University of Medicine (2) and Thailand’s Thammasat University of Public Health. It aims to strengthen public health institutions and other health stakeholders in Myanmar to support evidence-based public health policy and improved health services for NCD control. One of the activities to achieve its aim includes a critical review of available research and identification of research gaps. Specifically, the review consists of 3 elements - a review of published literature on NCDs between 2000 and 2015, a qualitative study on identification of NCD research gaps among key stakeholders and a review of ethical committee inquiries on NCD research. This report presents the findings from the 2nd element – a qualitative study to explore the perceptions of key stakeholders on research gaps on NCD burden and risk factor.

Study objectives

The general objective of this qualitative study was to explore the perceptions of key stakeholders on research gaps on the burden and risk factors of non-communicable diseases in Myanmar. Specifically, the study aimed to describe type of researchers and institutions that perform NCD research in Myanmar and their usefulness on value of NCD research, to identify scope and areas of NCD research that had been done in Myanmar, to describe issues and barriers to conducting NCD research in Myanmar and to identify priority NCD research areas that should be conducted in the near future in Myanmar. Data collection took place from 3rd December 2015 to 3rd April 2016.

Methodology

The study was a qualitative study using an interview guide developed by a short-term research officer and reviewed by the program manager, technical advisor from HelpAge Myanmar, HelpAge International (UK) and an international independent consultant. Study respondents were purposively selected based on their experience related to NCD research and their activities related to NCD projects and research. They included key informants from Ministry of Health, Medical Universities, Department of Public Health, Agencies, Co-investigators of STEPs surveys, NGOs and foundations which focused on NCDs. Those key informants from NGOs were all ex-government officials. In total, there were 29 key informants participated in the study.

Key Findings

The majority of respondents agreed with the current list of NCDs and NCDs of public health importance. They agreed that WHO had identified 4 major NCDs such as Cardiovascular (CVD), Diabetes Mellitus, Cancer and Chronic respiratory disorders and they had common risk factors. In Myanmar, those 4 diseases are the commonest NCD nowadays and priority should be given to 4 major NCDs.

Respondents perceived that compared to communicable diseases, NCDs were paid less attention previously and hence there was less NCD research than communicable disease research undertaken to date. Yet they also recognized that there were more interest in NCDs these days when compared with the past. In general, Chronic Disease Risk Factor Surveys (STEP) was recognized as useful surveys for the health sector and for the public. Data from STEP surveys was of paramount importance and valuable for the country as it indicated areas for prioritization and resource allocation. Some agreed that most NCD research in Myanmar was based on clinical

aspects and it was sometimes of limited use for program implementation. Researchers did not share findings with programmers and it was also claimed that programmers did not use the research findings as sufficiently as possible. Respondents also thought that research done by clinicians was not being disseminated to the public health professionals and there were gaps.

The total number of NCD burden and risk factor research studies in which key informants were involved from 2011 to 2015, was 43. Yet, this number is not comprehensive since some respondents provided only a selection of their research as it was not possible to remember all the NCD research they have been involved in the past 5 years. Of these only 31 research studies were conducted on burden and risk factors of NCDs with 11 studies focused on risk factors and 20 studies focused on burden of NCDs. Studies conducted within five years consisted of national, regional and township level or small scale research. One internationally collaborative research study was carried out in 2012 within ASEAN countries i.e. Thailand, Cambodia, Laos and Malaysia participated in the study. Key informants involved the studies were principal investigators (64%), co-investigators (26%) and research assistants (10%). Organizations that executed research were National and International Universities, Government Departments, Projects and national NGOs. Funding agencies for the research were WHO, international and national universities, NGOs, World Diabetes Foundation and UNICEF.

When asked about the scope of research in more detail, respondents thought that there was less NCD burden research compared to risk factor surveys. This finding was contrary to the list of NCD research reported by respondents outlined in the previous section. They acknowledged that there had been an increasing trend of NCDs generally in Myanmar and a number of them mentioned that most NCD research was on 4 major NCDs and they were usually small scale. Among the 4 major NCDs, respondents thought that diabetes and CVDs were paid most attention and there were few research studies on the other two major NCDs i.e. cancer and COPD. A cancer registry is in the process of development for Yangon General Hospital and respondents mentioned that a registration system for cancer should be available at the lower level facility so that community level data can be obtained. Some other areas of NCD burden research that would support the program implementation included NCD mortality and morbidity studies, more in-depth qualitative studies on NCDs, disease registry system, research on economic burden and quality of life studies, operational research, health system research and a nationwide research agenda for NCDs. Among these suggestions, NCD morbidity, premature mortality from NCDs, cancer incidence and economic burden of NCDs were mentioned as priority burden research that should be conducted in the near future.

In regard to the scope of NCD risk factor research conducted in Myanmar, the majority of respondents made reference to the STEP surveys that were conducted in Myanmar in 2004 (Yangon Division), 2009 and 2014 (Nationwide). A couple of respondents were involved in STEP and they perceived that it was representative for the country while other studies were small scale. Particularly, those respondents who worked at medical universities and Public Health University revealed that students conducted risk factors studies but they were small projects. Among risk factor research, hypertension was the most common research area among major NCDs. While risk factor research on tobacco and injuries were increasing, those on snakebites were now less common than before. The least common research was conducted on food and nutrition, aspects of which were recognized as key risk factors for major NCDs. In addition, there had been no or little research on risk factors related to rare diseases. NCD risk factor research prioritized by key informants included: tobacco use in adolescents, physical inactivity in adolescents and overweight and obesity in adolescents. In addition, most respondents prioritized salt intake, raised blood pressure and diabetes as NCD behavioural and biological risk factor research.

Other priority areas of national system response included i) Marketing to children of foods and non-alcoholic beverages, ii) Essential medicines and technologies for NCD, iii) Cervical cancer screening, iv) Drug therapy and counselling to prevent heart attacks and stroke and v) Vaccination for HPV, Hepatitis B and palliative care.

Having STEPs surveys conducted at five-year intervals was perceived as the strengths of NCD research conducted in Myanmar. They were comprehensive and high quality since STEPs were conducted as per WHO guidelines. For NCD research in Myanmar, researchers from DMR were regarded as providers of good technical support. Respondents especially program managers received methodological back up from DMR.

Common weaknesses of NCD burden and risk factor research identified included being small-scale and there were limitations in the technical skills in some areas of NCD research such as developing a comprehensive research protocol and health economic studies. In addition it was perceived that research was not compiled systematically.

Issues and barriers to conducting NCD research, and areas to address to support NCD research in the country comprised of the following areas:

Issues and barriers	Urgently needed
Weak political commitment	Policy and Planning in support of NCDs
Low funding	Funding support
Limited human resources	Additional human resources
Weak collaboration and coordination	Collaboration and Coordination
Poor dissemination of research findings	Improved community awareness, Research center at Medical Universities that compile all NCD research for better dissemination and utilization
Poor Utilization	Research center at Medical Universities that compile all NCD research for better dissemination and utilization

In Myanmar, non-communicable diseases are being paid more attention than previously but there are still gaps in certain areas of NCD research. Developing a research agenda for NCD with different stakeholders from different departments within Ministry of Health as well as with different ministries is considered useful for evidence-based decision making. Strengthening collaboration and coordination between different departments would also contribute to the use of research findings in program implementation. This study identified a number of potential research areas of NCD prevention and control that would provide support to the NCD action plan and help in the development of evidence-based policy briefs.

2. Background

The total population in Myanmar is 51.4 million with 29.6% living in urban areas (Myanmar Population and Housing Census, 2014). Life expectancy at birth in 2014 was 66.8 years with 63.9% for males and 69.9% for females (Census Report Volume 2-A, Highlights of the Main Results, The 2014 Myanmar Population and Housing Census).

Myanmar, in its recent political, demographic and socioeconomic transition, is facing not only the burden of communicable disease but also the problem of non-communicable diseases. According to the WHO NCD country profile 2014, NCDs account for 59% of total deaths (totalling 441,000) in Myanmar. Among the four major NCDs, cardiovascular diseases leads with the highest death rates

of over 300, cancer ranks second with a death rates of nearly 150, Chronic respiratory diseases are third with over 100 and diabetes contributes approximately 50 per 100,000 age standardized deaths. The probability of dying between ages 30 and 70 years from the four major NCDs is 24 percent (World Health Organization – Non communicable Diseases (NCD) Country Profiles, 2014).

According to the “National Diabetes and NCD Risk Factors Survey (STEPS), 2014” which was conducted among adults aged 25-64 in 52 townships in Myanmar, the percentage of those who currently smoke was 26.1%, the overall percentage of hypertension previously diagnosed within one year was 15.7%, prevalence of overweight (BMI \geq 25 kg/m²) was 22.4% and obesity (BMI \geq 30 kg/m²) was 5.5% (Report on National Survey of Diabetes Mellitus and Risk Factors for NCD in Myanmar 2014).

A recent study on the economic burden of chronic disease identified that households with asthma reported greater out-of-pocket spending (I\$ 1.53 – I\$ 2.01) (I\$1=125.09 Myanmar Kyats; I\$=International Dollar), almost half of which was spending on medicines; greater reliance (40-49%) on borrowing and sale of assets to finance health care and lower employment rates than matched controls (Soe Htet et al, 2014).

To respond to the rapidly growing burden of NCDs, WHO endorses the Global Strategy developed in 2000 that states “WHO in close collaboration with other partners, will promote and support research in priority areas of prevention and control, including analytical, operational and behavioural research to facilitate programme implementation and evaluation.” The objective 5 and 6 of the 2013 Global Strategy Action Plan for the Prevention and Control of NCDs includes promoting research for the prevention and control of NCDs (Global Action Plan for the prevention and control of Non-communicable diseases 2013-2020, WHO, 2013).

Recognized NCDs as a major challenge for sustainable development, the Sustainable Development Goals (SDGs) includes a specific target for NCDs and several NCD-related targets which were not addressed in the Millennium Development Goals (MDGs). The 2030 Agenda for Sustainable Development included the government’s commitment to develop national responses to overall implementation of the Agenda, such as to reduce by one third premature mortality from NCDs, to improve in tobacco control; to strengthen response to the harmful use of alcohol, to support research and development of vaccines and medicines for NCDs that primarily affect developing countries, to substantially reduce deaths from hazardous chemicals, as well as air, water and soil pollution and to provide access to affordable essential medicines and vaccines for NCDs (WHO Global Coordination Mechanism on the Prevention and Control of NCDs).

For NCD prevention and control, Myanmar advocates the “population approach” rather than the “high risk” approach, which aims at reducing the risk factor levels in the population as a whole through community action, in order to achieve mass benefit across a wide range of risks and cumulative societal benefits (Health in Myanmar, 2014). In response to the NCD epidemic, Myanmar has developed a National Policy on NCDs including tobacco control, conducts workshop and meetings on NCDs and implements specific programmes on prevention and control of NCDs in National Health Plan (2011-2016).

The response of health and other sectors for NCDs control is still insufficient and slow in Myanmar. A draft policy and action plan for NCDs has been developed by Ministry of Health but has not yet engaged at higher levels such as other Ministries, the Parliament and other stakeholders. An NCD Unit has recently been established in the Department of Public Health, and the new Director for NCD Control has started to organize activities for NCD prevention and control. However, this new unit will require the support of different sectors and organizations to implement and scale up interventions for NCD control.

3. Project description

In 2015, HelpAge International (Myanmar) is implementing a project, “Strengthening public health capacity to respond to Myanmar’s disease transition” funded by the European Union. The project is being carried out in collaboration with the University of Public Health, University of Medicine (2) and Thailand’s Thammasat University of Public Health. It aims to strengthen public health institutions and other health stakeholders in Myanmar to support evidence-based public health policy and improved health services for NCD control through National NCD Network, MOHS policy consultations, increased NCD knowledge of UPH staff and having university curriculums emphasized more on NCD. Among the 6 key project results, one of them is enhanced research and evidence based policy analysis to respond to health transition in Myanmar. In order to achieve this result, a critical review of available research and identification of research gaps is needed. The overall review consists of 3 elements – a review of published literature 2000-2015 on NCDs and their risk factors; a qualitative study on the perceptions of key stakeholders engaged in NCD research in Myanmar, and additional reviews of Myanmar ethical committee inquiries and post-graduate research on NCDs in Myanmar. The current report summarizes the findings of the qualitative study.

4. Study Objectives

General objective:

The study was to explore the perceptions of key stakeholders on research gaps on the burden and risk factors of non-communicable diseases in Myanmar.

Specific Objectives:

Specific objective was to explore the perceptions of key stakeholders on the burden and risk factors on non-communicable diseases in Myanmar to

- (1) describe type of researchers and institutions that perform NCD research in Myanmar and their impressions on value and usefulness of NCD research,
- (2) identify scope and areas of NCD research that had been done in Myanmar, their strength and weaknesses and reasons of not doing certain areas of research,
- (3) describe the issues, constraints, obstacles and barriers to doing NCD research in Myanmar and
- (4) identify priority NCD research areas that will be necessary to conduct in the near future.

5. Methodology

5.1 Sample size

This was the qualitative study using key informant interview (KII) methods. Respondents were selected purposively based on their experience on NCDs and their activities related to NCDs project and research. Respondents included researchers, health project managers from departments, professors and trainers from universities and responsible persons from UN Agency, NGOs and foundations.

Respondents were selected based on the following criteria –

- Those who were experts on NCD – both clinical and non-clinical and/or
- Those who had experience of conducting NCD research and/or
- Those who were currently involving in the NCD control program as program

managers e.g., managers for Cancer, Accident, Tobacco, Cardio Vascular Diseases, Chronic Respiratory Diseases, Snakebite, Mental Health etc.)

In addition, those who were working in Occupational and Environmental health, Health Promotion program and Disease control program were also involved since they were responsible for both communicable and non-communicable diseases. In particular, a representative from an agency was also included who was responsible for NCD projects in Myanmar.

All interviewees were either current or retired government staff. The total sample size was 29 and the following table shows the total number of respondents by category.

Table 1: Total number of respondents by category and gender

Sr. No.	Organizations/Institutions/Department	M	F	Total
1	NGOs/Foundations	2	1	3
2	Ministry of Health	2	1	3
3	Medical Universities and Public Health University	3	8	11
4	Department of Public Health	5	6	11
5	Agencies	1	0	1
	Total	13	16	29

Please see **Annex 2** for the detail list of respondents with designations and affiliated institutions.

5.2 Instrument development

An interview guide was developed based on the objectives and research questions. The guide was reviewed and revised by the project manager, technical adviser, an international consultant from the Help-Age International (UK) and an international independent consultant. The final interview guide was translated into Myanmar language and pretested. A copy of the interview guide is included in **Annex 1**.

The interview guide used open-ended questions to address several key topics related NCD research such as experiences and opinions on NCD research, their scopes and quality, their usefulness in program implementation, barriers in conducting NCD research.

5.3 Data collection and management

Seven interviewers from the University of Public Health, University of Medicine II and the Help-Age International (Myanmar) health project conducted the data collection. Interviewers were provided with an overview of the study and trained on collecting informed consent, qualitative interview techniques and administration of interview guides.

After interviewer training, interviewers carried out key informant interviews using the interview guide. First, interviewers made appointments with key informants for their availability for

interviews. On the agreed date and time, they conducted interviews after obtaining informed consent. Data collection was from 3rd December 2015 to 3rd April 2016. Interviews were conducted with one interviewer together with one note-taker (who was also trained as interviewer) so that the interviewer could fully focus on the interview and there were few chances of missing interview topics. All data collectors had experience of conducting qualitative research. They all are from medical field and had knowledge on NCD. The average interviewing time was 45 minutes, with minimum 25 minutes and maximum 90 minutes.

5.4 Data entry and data analysis

Interviews were conducted in Myanmar by all 7 interviewers. Detailed steps of data analysis were as follows.

- 1) Five people transcribed the audio-recorded files by verbatim for each interview.
- 2) The lead researcher then read the transcripts multiple times and manually coded thematically for broad themes for both burden and risk factor NCD research such as scope, strength and weakness, researchers' skills, areas of research suggested, data needed for program implementations, barriers for conducting NCD research, priority research topics and sources needed for NCD research.
- 3) Codes were then further analysed and arranged into a smaller set of themes which captured the main topics emerging from the data.
- 4) The same individual who transcribed the audio files then translated coded quotations to English.
- 5) Lead researcher checked the translated quotations for correct translations and when necessary, edited or revised in order to keep the same meaning as Myanmar transcripts.
- 6) Then they were entered into Atlas Ti software and coded again using predefined acronyms. Codes with respective quotations and respondents' IDs were then exported to Microsoft word documents.
- 7) Under each code, detail analyses were done based on the frequency of themes emerging consistently across all respondents and particular themes which were specific to particular respondents.

Under each topic, themes that came up frequently were presented first and less frequent themes were described subsequently.

6. Ethical Considerations

The research protocol was submitted to the Ethical Review Committee of University of Public Health, Myanmar and was granted approval on 10th December 2015. The research was being conducted with the ethical guidelines listed by the Ethical Review Board such as - clearly informed about the nature and purpose of the study, obtained the informed consent, protected anonymity and confidentiality, minimized psychological discomfort of respondents and granted the right to refuse to participate or withdraw from study.

7. Findings

Perceptions of key stakeholders on NCD research are presented as follows. The first 3 sections described key stakeholders' opinion on the list of NCDs, on the value of NCD research, and key persons and organizations that involved in NCD research. The following 2 sections present the scope of NCD burden research, and burden research and data needed for program implementation. Subsequent 2 sections describe the NCD risk factor research such as scope of risk factor research, and risk factor research and data needed for program implementation. The last 5 sections focus on

NCD research in general such as skills of researchers, strengths and weakness of NCD research, issues and barriers of conducting NCD research, NCD research prioritized by key informants and issues in the accomplishment of NCD research in Myanmar.

7.1 Opinion on the major NCDs and NCDs of public health importance

Respondents were shown the current lists of NCDs as follows. The lists were prioritized in National Health Plan (2011-2016) with the aim to prevent, control and reduce disease, disability and premature deaths from chronic non-communicable diseases and conditions. Respondents were asked their opinion on the lists whether they agreed or wanted to add or remove certain diseases/conditions.

No.	Four major non-communicable diseases
1	Cardiovascular disease
2	Diabetes Mellitus
3	Cancer
4	Chronic respiratory disorders

No.1 to 4 in the above table were listed as the Chronic non-communicable diseases/conditions with shared modifiable risk factors – tobacco use, unhealthy diet, physical inactivity, harmful use of alcohol in the “Myanmar response to NCD Burden” in “Health in Myanmar 2014”.

No.	Non-communicable diseases of public health importance for Myanmar
1	Accidents and injuries
2	Disabling conditions (Blindness, Deafness, Community based rehabilitation)
3	Mental Health
4	Substance abuse
5	Snake bite
	Other chronic conditions and diseases
6	Renal
7	Endocrine
8	Neurological
9	Haematological
10	Gastroenterological
11	Hepatic
12	Musculoskeletal

13	Skin
14	Genetic disorders
15	Oral diseases
16	Others (Specify)-----

In the above table, No. 1 to No. 5 was listed as non-communicable diseases/conditions of public health importance in the “Myanmar response to NCD Burden” in “Health in Myanmar 2014”. No.6 to No.16 are other chronic conditions and diseases that contribute significantly to the NCD burden in the Region mentioned in the WHO’s “Action plan for the prevention and control of non-communicable diseases in South-East Asia, 2013-2020”.

The majority of respondents agreed with the current lists of NCDs of major and of public health importance. They agreed that WHO had identified 4 major NCDs such as Cardiovascular (CVD), Diabetes Mellitus, Cancer and Chronic respiratory disorders and they had common risk factors. In Myanmar, those 4 diseases are commonest NCD nowadays and priority should be given to 4 major NCDs.

“This is WHO list of NCD and I do not want to add more.” University respondent

“We cannot add more. When we think of priority for Myanmar, there is only 4 major and there could not be five. Those four have common or shared risk factors and disease burden.” MOHS respondent

“We have known that there are four major NCDs. Others listed here are included in other NCDs. Why they are called major NCDs because they caused high morbidity and mortality and also high disease burden. That’s why I agree these four diseases are major.” University respondent

“Major NCDs and public health importance list is defined by MOHS so I have no reason to disagree.” NGOs/Foundations respondent

Few respondents argued that IHD and hypertension should be listed as separate major NCDs and not including in CVDs (Cardiovascular diseases) in general. According to WHO, cerebrovascular disease (stroke) was included in CVDs² but hypertension was listed as one of the causes of strokes when it combined with other risk factors such as tobacco use, unhealthy diet, obesity, diabetes, etc.

“I agree with the table for the list of major NCDs but I want to separate hypertension and stroke.” Department of Public Health respondent

“Diabetes is common in Myanmar. Although it can’t cause sudden death, most patients died with IHD and stroke with the underlying cause of diabetes. We should think as diabetes and hypertension with combining stroke as majority.” University respondent

² <http://www.who.int/mediacentre/factsheets/fs317/en/>

Some of the respondents pointed out the increasing trend of accidents and injuries in Myanmar and they thought that they should be also prioritized among NCDs of public health importance. Within the WHO South East Asian Region, Myanmar was now ranked 2nd for deaths from road traffic accidents after Thailand, increasing from a previous ranking of 6th out of 11 countries. Since WHO's last report in 2013, the number of deaths related to road crashes has increased, and in 2016 total number was very high at 20.3 per 100,000 people³.

"I would like to add accidents and injury in addition to 4 major NCDs. It is becoming quite common these days in Myanmar, almost similar to those of Diabetes and Hypertension."
Department of Public Health respondent

"I want to prioritize CVD, COPD, Diabetes and Cancer as the main NCDs Diseases. Also Mental health and Accident and Injury want to add in this list because of less research on these diseases." MOHS respondent

"Accidents and injuries are also important. The most common cause of death in adolescent is the accidents and injuries." Department of Public Health Respondent

Mental health including substance abuse was also becoming important and several respondents wanted to see it included in the major NCD list.

"I would like to suggest that we should classify the list base on the disease burden. Why does mental health not included in the major NCD list?" Department of Public Health respondent

"I agree with this list. What I want to add and prioritize is mental health as it is hidden. For community intervention, we would do what we can at the community level and we would refer to hospital for cases that community could not handle." University respondent

"In my opinion, mental health becomes another important NCD other than four major NCDs nowadays." University respondent

Other diseases that were recommended to include in the priority list were obesity, ageing, renal diseases and snake bite. It seemed that the priority disease mentioned by respondents varied by experiences and perceptions of individual respondent. While a couple of respondents wanted ageing to be given priority, few respondents thought that obesity was getting popular these days and needed attention.

"I agree with the table. As for me, these 4 are major NCDs. I do not want to add in NCD list but nowadays, aging has become important for public health and if we are getting old, many diseases are occurred so I want to put ageing in others." NGOs/Foundations respondent

"It is better to add Obesity under NCD list. Now Hypertension, Diabetes and cancer are

³ http://www.searo.who.int/myanmar/areas/roadsafety_datacollection/en/

included under NCD list. So I think adding obesity is better.” Department of Public Health respondent

“For the public health importance, obesity and overweight are underlying cause as well as disease. So it would be better if they are included in the list.” Department of Public Health

7.2 Value of NCD research

When respondents were asked about the value of NCD research, some respondents revealed that NCD research were useful. Yet they perceived that there was only few NCD research conducted in Myanmar. Compared to communicable diseases, NCDs were paid less attention before and hence NCD researches were fewer than communicable disease research.

“The research that is being carried out is useful, yet there should be more. Now there is only few researches and not enough research done.” MOHS respondent

“Up till now NCD research are fewer than other research. We should conduct more research to have effective data for project implementations.” NGOs/Foundations respondent

“NCD burden is increasing eventually in Myanmar. However, researches are done mostly on communicable diseases and less on NCD. I think it will be important for our work if NCD researches like these will be conducted.” University respondent

Almost all respondents mentioned that NCD burden researches are supportive to the project implementation. They valued burden research saying that research identified the magnitude of the diseases and the gaps in implementations. For example, mental health research identified the gaps between patients with mental health and those who received treatment. Nonetheless, most respondents provided the responses in general and did not specify how NCD burden researches were helpful for program implementation.

“I think this NCD table is useful for NCD control program in Myanmar. We have done some research on under-nutrition/over-nutrition, anthropometric measurement and Biochemical studies. The results are very much important for NCD control program.” Department of Public Health respondent

“Previous NCD research project are helpful in implementing NCD control project. Project managers conducted research to be useful e.g., diabetes and CVD. While conducting research, interventions were also included, like providing treatment for adults and communities.” Department of Public Health respondent

“From burden research on mental health, we can calculate mental health gap. It means the percentage of patients receiving mental health care and thus how to bridge these gaps.” Agency respondent

“If you ask whether NCD researches are helpful for NCD control program, its implementation and funding, I would say ‘yes’. 1. We know the magnitude of disease. 2. We know what the needs are and what supports we could provide.” University respondent

“Burden data are very important for strategic information and project planning as well.” Department Public Health respondent

“We always change action from research findings and researches are helpful for planning and implementing, e.g., in prevalence survey, the occurrence of disease can be known. From risk factor survey, we know which risk factors are more common and which information is needed for diseases prevention.” University respondent

Some respondents regarded that research were important for receiving funding to implement the NCD projects. One respondent had provided example of receiving grants from using data of previous research.

“Yes, research are important to the funding for project implementation.” MOHS respondent

“Earlier, as our country was isolated, few grants were received. However, most of the time when we look for research grants, we used available research data for submission of grants and I think they have been helpful.” University respondent

“I think surveys are supportive to funding request and NCD control program and implementations. Only when we know what the problems (diseases) are and the root cause of the problems, we could continue working on them.” Department of Public Health respondent

Policy makers were becoming more aware of NCDs and had witnessed the increasing trend of NCD from STEP surveys. Two respondents even highlighted that because of NCD surveys in the country, there had been the development of NCD unit which would mainly handle NCD projects in Myanmar.

“NCD burden and risk factor surveys have an influence on the program, project implementations and funding support. Because of those researches, NCD unit was set up which specifically worked on NCD. Budget is also given for NCD and I think these all are because of surveys.” University respondent

“The benefit of awareness rising is that NCD unit is established in MOHS. Base on the research, though the Health systems of Myanmar may not change, we get the advantages indirectly.” University respondent

Some respondents revealed that NCD morbidity data were useful for treatment services in adjusting for medicines and equipment based on this information. In addition, when NCD research data were highlighted at the medical universities, students became aware and more interested in NCD, and thereby they were more likely to participate in NCD prevention, control and treatment programs.

“NCD researches are important for our department. We use the medicines when the diseases occurred and disease prevalence rate is high. In the meantime, supporting medicines is the important role in the control program. When the prevalence is not decreased while controlling, we can check and test the quality of drugs.” Dept Public Health respondent

“Research is useful for my current job. I am now taking roles in treatment services and I can know about the disease morbidity based on the research data. So we can adjust the treatment services based on the disease morbidity and we can supply the required medicine and equipment. Besides, I can highlight the important of NCD when I am teaching to the undergraduate and postgraduate students. In a meanwhile, students will motivate and actively participate in NCD prevention, control and treatment program.” University respondent

“For my university and for my current work, research is valuable. We get updated information and can share updated knowledge to students. The other thing is we came to know potential area of research which are needed to be conducted. And then if we know prevention methods (from research), we can implement better prevention program.” University respondent

In general, Chronic Disease Risk Factor Surveys (STEP) were recognized as useful surveys for the health sector and for the public. They could provide trends of NCD at 5 year intervals and could help identify which behavioural risk factors were increasing and which factors were on a downward trend. Some mentioned that data from STEP surveys was of paramount importance and valuable for the country as it indicated areas for prioritization and resource allocation.

“The STEP surveys are useful for the project implementation. From this survey, we can show the 5th year trend. Researches are so useful because they give the evidence-based result for the starting point of the program. Research is the life of the project program. For risk factor survey, the risk factors are related to each other. As the risk factor for NCD is so important for the nation, we should choose the priority risk factors so that we can make resource allocation. The more varieties of research we do, the better for the priority setting.” MOHS respondent

“STEP is the worldwide recommended survey as well as international survey. So, it is very useful for Myanmar. Nutrition is also linked with NCD and therefore STEP survey is very helpful for my current position, department and as well as for Myanmar people.” Department of Public Health Respondent

“STEP surveys provided baseline data. WHO regional countries are doing survey every 5 year and therefore we know which risk factors are becoming more or few. If they increased, we could plan for actions and it (STEP) is useful.” Agency respondent

“As for NCD research, STEP survey is widely done. It was conducted again in 2014. It is no doubt that this STEP survey is very important for NCD project because this is the only baseline NCD data which represent the whole country and there is no another baseline survey for Myanmar recently.” University respondent

“STEP survey, which is under surveillance, is very useful for the NCD control program. It can

provide data for 7 global targets of NCD among 9 except global target (1) - mortality and global target (9) – affordability.” Department of Public Health respondent

Nevertheless, a couple of respondents were not aware of STEP surveys and did not provide opinion on the usefulness. This finding was in line with the weakness in dissemination of results mentioned by the majority of respondents.

“I don’t know what research they do for NCD and I usually don’t go and listen their research talk. They also do not share with us.” Department of Public Health respondent

Some agreed that most NCD research in Myanmar was based on clinical aspects and it was sometimes of limited use for program implementation. One respondent pointed out that research conducted at community level, would be more useful for program implementation. Specifically, those who had worked in the Department of Medical Research (DMR) mentioned that most research from DMR was at a molecular level and academically oriented and there was a need to make it more directly applicable at the community level.

“I would want more applied research rather than academic. They should be more useful directly to the community and should be given priority to the community and directly applicable.” MOHS respondent

“These researches are not mainly done by DMR and especially on clinical and molecular aspect, treatment aspect, less on program aspect and so they are not very much useful at program level. So we should emphasize on research support for program wise e.g., Operational research, epidemiological research, Health system research. Even though DMR conducted Public health research, but they do not focus on NCS in terms of PH.” Agency respondent

“Most research are being done as per interest of donors. There are only few research done for programs need. Nowadays, research related to some projects e.g., snake bit research are not done much, but the prevalence of snakebite is getting high.” Department of Public Health respondent

Some respondents emphasized that research in Myanmar including NCD research were being done on a small scale and not representative at national level, and therefore was less useful.

“Research done by DMR is not actually included in the list of NCD program and I hardly seen NCD research at National level and not even at regional and township level as well. National level research is mostly done by program side. DMR is good at molecular level and academic aspects and not much supported for program aspect.” Agency respondent

“NCD is the one of the major health problems for Myanmar. So, NCD research is helpful for the NCD control program but in recent situation, it is difficult to tell about the prevalence rate of each specific NCD. So if we do the country representative survey for NCD, we will know the exact data of NCD prevalence rate.” University respondent

A couple of respondents highlighted that limited usage of research findings by program managers. They revealed that there was weak collaboration between researchers and program managers. Sometimes, researchers did not share findings with programmers and it was also claimed that programmers did not use the research findings properly. Respondents also thought that research done by clinicians was not being disseminated to the public health professionals and there were gaps. In addition, research was not compiled systematically.

“The research is not useful and not practical due to its weakness in every part of them. This happened because of not understanding, not accepting, not implementing research results and findings from the implementers, stakeholders.” Department of Public Health

“Only research is not enough to support the control program. We should let the program managers know the findings of the research so that they can use the information in the control program. There is useless if we don’t use the research findings properly. Research is useful only when they are being conducted in collaboration with researcher and program managers or when researchers could provide information to program managers.” University respondent

“I think we are weak in utilization of research findings.” University respondent

“Among NCD research conducted in Myanmar, some are very useful but some are not. The reason is that there are two kind of research: public health research and clinical research. Although clinical research disseminated the data but they did not reach to the public health site. In the same condition, public health data are not also disseminated to the clinical site. There is no link between them and there is a gap. Besides there is no data compiled when implementing projects and it is difficult to implement the project.” University Respondent

7.3 NCD burden and risk factor research conducted by key informants within last five years

The study explored the research that had been conducted by key informants in the past five years. A number of respondents had not been involved in any NCD research in the past 5 years. However other respondents provided details of the NCD research they had been involved in such as the name and scope of the research, executing agencies and funding agencies. In some cases this was only a selection of their research as it was not possible to remember all the NCD research they have been involved in the past 5 years.

The following table summarizes the area and number of NCD research involved in the past 5 years reported by study respondents.

Table 2: NCD burden and risk factor research conducted by key informants within last five years

Sr. No.	Area of research	No: of studies	Percentage of total research	Scale of Research	Executing agency	Funding agency
I. Burden						
1	STEP survey	1	2.3	National	Diabetes Project	WHO/ WDF
2	Poisoning and intoxication (Lead, Arsenic, Pesticide, fluorosis, Mercury, Air pollution)	6	14	National/ Regional	Occupational and environmental health Project, DOH	WHO/ UNICEF/ Government
3	Accidents and injury (RTA, Workplace)	5	12	Regional	DMR/ DPH/ Injury project	WHO
4	CVD epidemiology	1	2.3	Regional	CVD Project	WHO
5	Catastrophic health expenditure and 12 month mortality of cancer patients	1	2.3	International comparative research	International universities study group	International universities study group
6	Hepatitis B, C prevalence	2	4.5	National	DMR, Liver Foundation, DPH	Clinton Health Access Initiative
7	NCD epidemiology	1	2.3	National	UM II	WHO/ WDF
8	Cause of death	1	2.3	Township level	DHP	WHO
9	Cancer	2	4.5	Yangon General Hospital	Dept. of Oncology/ Dept. of Radiology	Not available
	Total	20	46.5			

II. Risk Factor						
1	Tobacco use	7	16.3	National/ Regional/ Township	UPH/ Uni. of Dental Medicine	WHO/ UPH
2	STEP Survey	1	2.3	National	Diabetes Project	WHO/ WDF
3	Betel chewing	1	2.3	Township	Uni. of Dental Medicine	DMR
4	NCD risk factors	2	4.6	Regional	UM I	UM I
	Total	11	25.5			
III. Other						
1	Other studies apart from burden and risk factor	12	28			
	Total	12	28			
	Grand Total	43	100			

The total number of NCD research studies conducted by key informants in Myanmar from 2011 to 2015 is 43. Of these only 31 research studies were conducted on burden and risk factors of NCDs. Eleven studies focused on risk factors and twenty studies focused on burden. Other studies conducted on different aspects of NCD which were not related to burden and risk factor. Studies of NCD burden mainly consisted of poisoning and intoxication, injuries, hepatitis B, C and cancers. STEP survey was key NCD burden research which was conducted at the national level and reveals prevalence of diabetes, hypertension and cardiovascular disease risk. There was only one study which measured the economic burden experienced by cancer patients. A total of 11 studies including STEP survey concentrated on risk factors of NCD. Main risk factors measured by the studies were behavioural risk factors mainly tobacco use, betel chewing and overall risk factors of NCD. Again STEP survey was the only research that estimated both behavioural risk factors such as tobacco, alcohol, fruit and vegetable consumptions and physical inactivity, and biological risk factors such as raised blood pressure, raised blood glucose, overweight and obesity and raised total cholesterol. In terms of category and area, NCD burden research outnumbered the risk factor research and other studies such as disease screening, rehabilitation of disease, treatment seeking behaviour were also fairly common.

Studies conducted within five years consisted of national, regional and township level or small-scale research. One internationally collaborative research study was carried out in 2012 within ASEAN countries i.e. Thailand, Cambodia, Laos and Malaysia participated in the study. Key informants involved the studies were principal investigators (64%), co-investigators (26%) and research assistants (10%). Organizations that executed research were National and International Universities, Government Departments, Projects and national NGOs. Funding agencies for conducting research were WHO, international and national universities, NGOs, World Diabetes Foundation and UNICEF.

NCD burden research

7.4 Scope of NCD burden research conducted in Myanmar

When respondents were asked about the scope of research in more detail, respondents thought that there was less NCD burden research compared to risk factor surveys. This finding was contrary to the list of NCD research reported by respondents outlined in the previous section.

“Generally, morbidity and mortality of communicable diseases such as TB, malaria are more than NCD surveys in Myanmar although morbidity and mortality due to NCD is more than 50% and it is currently in increasing trend both locally and globally.” Agency respondent

“There is no burden research widely done in the past five years although we had STEP survey done for 3 times. We should call STEP as the research which showed magnitude of burden of NCD.” University respondent

“NCD burden survey was rarely done and most of the NCD burden surveys are in township level, e.g., cancer incidence survey was done in Yangon General Hospital, not the nationwide.” University respondent

Although respondents acknowledged that there had been an increasing trend of NCDs generally in Myanmar, a number of them mentioned that the majority of NCD research was on 4 major NCDs and they were usually small scale. Among 4 major NCDs, respondents thought that diabetes and CVD were paid more attention and there were few research on other two major NCDs such as cancer and COPD.

“Scope of burden research is only for 4 major NCDs, and DM and CVD are the strongest. There are only few researches on COPD and CA.” MOHS respondent

“Most of research focused on diabetes and cardiac.” Department of Public Health respondent

“Mainly DM and CVD have common risk factors and could reflect by one intervention. CRD research is less commonly done in DMR.” Agency respondent

“I would suggest conducting cohort study. Only Dr... can conduct cohort study on his diabetic patients who come to his clinic. For routine, we can rely only on hospital data. If we could conduct research like cohort study, we could study risk factor and reduce the burden.” Department of Public Health respondent

“Most of the NCD research are prevalence studies and small scale but useful.” University respondent

Among other NCDs, respondents perceived that research were conducted more on accidents and injuries, snakebites, deafness and blindness.

“Snakebite research are excellent, on the other hand, mental health research are not much, and they are more or less done by program side. There are quite a lot for blindness and deafness and some are community surveys.” Agency respondent

“There are research on other NCDs like deafness, blindness, and snakebite. Regarding national level or state and district level, I was not aware of it.” University respondent

“Lately, research on accidents and injuries are much done.” University respondent

To keep track of the burden of NCDs and to provide a basis for programmes to reduce the burden of NCDs, the country was in the process of developing surveillances such as cancer registry and injury surveillance, mentioned by few respondents. They thought that a cancer registry would be quite useful once it was set up, giving an example that the registry would help identify which cancer were prevalent and could prevent it with delivering IEC materials to the community. As for injury surveillance, it was set up only at 5 major cities in Myanmar where injury morbidity and mortality were recorded systematically.

“We need to know about risk factor rather than burden. Yet, burden is also important and now we are planning to set up cancer registry.” Department of Public Health respondent

“Working together with WHO, PACT programme, IACR (International Association of Cancer Registries, (that is a programme like research), we can be able to calculate the burdens from cancer surveillance. We aim to set up “Population Based Cancer Registry”. If this registry is well-developed, we would have opportunity to do research.” Department of Public health respondent

“Injury surveillance of Myanmar is set up at 5 sentinel places such as YGH (Yangon General Hospital), North Okkalapa Hospital (in Yangon), Naypyitaw 1000 bedded Hospital, MGH (Mandalay General Hospital), Magway Hospital. Morbidity and mortality survey can be conducted only in those 5 sentinels.” Department of Public Health respondent

Nonetheless, surveillance studies were still very limited in Myanmar, as perceived by some of the respondents. One respondent provided the reason that surveillance took time and was difficult to conduct unlike cross sectional studies and case-control studies.

“In Myanmar, there were very few surveillance type surveys; actually there was nothing as such I would say.” Department of Public Health respondent

“Risk factor surveys are more common than surveillance like unhealthy behavioural surveillance.” University respondent

“There are very few surveillance type of study since it takes time. It needs continuous observation and it is becoming like cohort. It is quite difficult to conduct cohort studies although we could conduct cross sectional and case control studies.”

Few respondents mentioned that they did not know much about NCD burden research and did not express much about their opinions on NCD burden research while they know about risk factor research. It could be assumed that they were not aware of NCD burden research conducted in the country. This could be due to poor research dissemination or busy schedules of clinical staff or both.

“I have done some NCD research, but I don’t know how many NCD burden research are being done in which field and I do not know their extent too.” University respondent

“I have no experience with NCD burden research so I cannot give any comment about it.” Department of Public Health respondent

“I don’t know exactly about current situation of the burden research but one thing that I notice is NCD projects are increased than before.” University respondent

7.5 Burden research and burden data needed for program implementation

The study identified some areas of NCD burden research that would support the program implementation such as NCD mortality and morbidity studies, more in-depth qualitative studies on NCDs, disease registry system, cancer registry, research on economic burden and quality of life studies, operational research, health system research and research on specific NCDs. A couple of respondents perceived that there should be nationwide research agenda for NCDs.

Mortality and morbidity surveys

Most respondents perceived that there were only few burden research in the country when compared to risk factors surveys. This was contrary to previous section where more burden research were reported than risk factor research when we explored the type of NCD research participated by study respondents. Among burden surveys, they mentioned that mortality and morbidity surveys needed to be prioritized. Since the country did not have proper record of deaths at rural areas and there were missing information on the mortality from village level. In addition, hospital statistics were not strengthened and weak in recording and reporting.

“The least common researches are qualitative studies, then, mortality and morbidity studies. We do not know how many are dying in the villages. We need those. Only then, we would know the impact. There is no research that shows economic impact and that show social. Those should be done more.” University respondent

“There were not much NCD mortality and morbidity research. DMR (Department of Medical Research) conducts basic research, laboratory and hospital based research. There are mortality and morbidity figures but I don’t know where these figures were coming from.” NGOs/Foundations respondent

“We should give mortality and morbidity as first priority. When doing these researches, risk factor can be known. If possible, these all should be done in parallel.” Department of Public Health respondent

“More mortality data are needed to strengthen hospital statistics. There is weak reporting in hospital statistics. Moreover, verbal autopsy and sentinel survey should be done from time to time in Yangon and Mandalay let’s say 3yearly or 5 yearly e.g., Dr... had done such surveys at Pyinmanar region.” NGOs/Foundations respondent

“For me, I would like to conduct research on diseases that we had not yet known much, e.g., how much the burden existed in community - morbidity, mortality as well as socio economic burden.” University respondent

There were public hospital data but systematic recording was set up only at tertiary hospitals and State and Regional hospitals and therefore they did not represent for the whole country. Even in urban areas, there were private hospitals and military hospitals but data from those facilities were not available for compilation as well as for analysis. In addition, data did not cover the morbidity and mortality in rural areas where the majority of people sought care through traditional medicine and were not been registered at health facilities.

“We still need some data on burden e.g., diabetes and hypertension prevalence at community level. But we do now know the prevalence of IHD and stroke because we have data only from YGH (Yangon General Hospital) which is not representative for the country. In Yangon, there are other private hospitals and defence hospitals and they do not have such figures. We do not have stroke prevalence data or AMI prevalence data for Yangon Region.” Department of Public Health respondent

“In my field (COPD and asthma), there is only hospital data. Actually represented research of the whole country for chronic respiratory disease like incidence and prevalence should be done. But now, existing data is hospital-wise and only in tertiary hospital, state and regional hospitals. So we can’t get township hospital data that are not reported to regional.” Department of Public Health respondent

“For the NCD burden research, we need to focus on cancer because among the people who suffered cancer, some did not take treatment as they already knew about the consequences. Therefore, I would like the public knows what disease could be cured easily if known earlier. There are also some who knew that their diseases could be curable but they did not want to try because they did not want to lose their income and possession (by spending on treatment). They tried to take plant extract only. Only when they became worse, they got admitted to hospital. So, for getting accurate data, we should get data from not only from government hospital but also from the community who are taking traditional medicines.” Department of Public Health respondent

*“Private hospital data are needed as they are missing. Only if we could get data from all such sources, mortality data could be reasonably correct.” NGOs/
Foundations respondent*

More In-depth studies

When the type of data needed was explored, some respondents thought that previous research did not explore the issues qualitatively, and that there was limited qualitative research such as research based on in-depth interviews and focus group discussions. They perceived that in-depth qualitative studies could provide insights into the reasons behind risk factors such as obesity, and could provide information to help in the planning of control programs.

“There is limited research on “in depth” and there is no in-depth qualitatively. There is overweight but there is no reason for the cause of overweight. There is no detail root of analysis. We do not know what to do first for implementation.” University respondent

*“It is important to know the human behaviours. I do not know to what extent the researchers conducted research for NCD in the past. From my point of view, we should do firstly the focus group discussion with the heads of the village for hypertension. We should not do the research superficially. It is preferable to do the community based research, which is representative for the real situation because almost 70% of the people in Myanmar live in the rural area.”
Department of Public Health respondent*

“I think most burden researches are done for disease morbidity e.g., they measure how many people have a disease. Yet, it is difficult to have burden research such as morbidity and mortality from hospital statistics. It would be easier to conduct such research superficially but in-depth researches are rare.” University respondent

One respondent highlighted that some information were not covered in STEP survey e.g., salt consumption which was a major risk factor in the country for NCDs. The study did not collect data on the amount of salt consumption to compare with future studies. The respondent claimed that there should have a separate survey other than STEP to explore more in-depth.

“There are some data that STEP survey could not catch up, for example salt intake. We need to know how much salt consumption is to compare how much reduction in its prevalence in 2025. For those kinds of data, we should have big community survey. Only STEP survey is not sufficient to provide such data and we need a separate survey.” Department of Public Health respondent

Registry system

An important area of burden research strongly highlighted by some respondents was the “Registry system”. There was no system as such in the past and respondents realized that the country should have better recording and reporting system. It was perceived that Myanmar data from WHO were

based on small scale studies which were not representative for the whole country except STEP survey. There was no mechanism to collate and compile information at one place and no coding system was set up. Therefore, it was not possible to identify the magnitude of the problems such as cancer, AMI and stroke, examples provided by some respondents.

“Data reporting system should be established for all the data with accessible by everybody. Then, they can be prioritized when more people aware of them.” NGOs/Foundations respondent

“What is the source of the WHO data? I think most of the data from WHO are from estimation. By using small studies, data were estimated and they are not like STEP survey which can represent the whole country and measure the magnitude of problem. Only then we know if our country had this much of prevalence. Moreover, we should set up the Registry system for each disease in order to assess the magnitude of problem. But in Myanmar, we cannot set up the registry system especially for cancer.” University respondent

“For AMI cases, we have kept admission data at Yangon General Hospital like how many AMI and stroke cases are admitted and how many of them died. Data are only for YGH and not for the whole country. Only when the Ministry keeps the country-wise data and assigns who collect data. Then we would need to have coding system that could be used by all hospitals including private sector. We cannot rely only on Yangon General Hospital alone. Even now, server at YGH was broken.” Department of Public Health respondent

Even though NCD data were collected in HMIS, not all NCDs were recorded and there was still a need to differentiate data for different type of NCDs. In addition, NCD data from rural areas were not accessible.

“Research is one of the surveillance systems that collate the information and it is needed to compile daily information. There is NCD data collection in ICD 10 column 19 of HMIS but it is not included all NCDs and it still needs to differentiate data for different type of NCDs. We need to do those. Another thing is we need to get NCD data from both public and private sector data for NCD and also NCD patients data from out of reach areas and hard to reach areas. We also need to do surveys and we need triangulation in data collections.” MHOS respondent

Cancer registry

Some respondents mentioned cancer registry as an important area to set up and it also needed to be nationwide. Moreover, registration system for cancer should be available at the lower level facility so that community level data can be obtained. Currently, data from rural area were not recorded at any place since rural people usually relied on traditional medicines for cancer and did not come to the health facilities or hospitals.

“We still need to have cancer registry in terms of data need because strategic information is very important. We could use it for planning and for public awareness.” Department of Public Health respondent

“Working together with WHO, PACT programme, IACR (International Cancer Registry, (that is a programme like research), we can be able to calculate the burdens from cancer surveillance. We aim to set up “Population Based Cancer Registry”. If this registry is well-developed, we would have opportunity to do research.” Department of Public Health respondent

“If we would conduct more NCD burden research, there are still a lot to do. However, among them, we still need to have nationwide STEP survey for CVD and also for cancer and cancer registry. Similarly, we could not do surveys for COPD. We cannot say about their magnitude of problem now.” University respondent

“For the NCD burden research, we need to focus on cancer because among the people who suffered cancer, some did not take treatment as they already knew about the consequences. They tried to take plant extract only. Only when they became worse, they got admitted to hospital. So, for getting accurate data, we should get data from not only from government hospital but also from the community who are taking traditional medicines.” Department of Public Health respondent

Research on economic burden

Estimates of the economic burden can be used as a basis for resource allocations. Previously there were only a few economic burden surveys compared to risk factor research and other burden research and some respondents revealed that those areas needed to be explored. According to respondents, previous NCD research measured the prevalence of NCDs but did not assess their economic burden. Possible reasons given were limited technical expertise and grants.

“NCD research on socioeconomic aspect is less commonly seen since it needs more technical expertise like health economists.” University respondent

“The least common is the social and economic burden because of technical limitations; I mean there are no sufficient health economic specialists.” University respondent

“For burden survey, effective economic burden should be prioritized because there are not many researches on this topic. I think there is not much support for such kind of research.” University respondent

“Social burden should be explored more than prevalence, incidence, and risk factors. Either from social burden or economic burden surveys, if we know the extent of the burden, we could work accordingly.” University respondent

“NCD burden- finally I want to prioritize the CVD, mental and RTA. Also we should conduct research on economic burden and diseases burden to some extent. We should find out the reasons. We should also do need based assessment, meta-analysis especially for trauma and NCDs.” MOHS respondent

“We have research mainly on risk factors. We have not done socio economic loss study and public health surveys.” Department of Public Health respondent

“Research on socio-economic burden of NCDs is few because there was few grants I think. We knew prevalent of the disease in the community and we ended up at that stage.” University respondent

Studies on quality of life with regard to NCD such as DALY and QALY were rare with regard to NCD burden research. According to WHO, DALY⁴ is used to quantify the burden of disease from mortality and morbidity and QALY measures equivalent healthy years lived. A couple of respondents perceived that such kind of studies needed special technical skills.

“If we say burden, many things may be possible; social burden, economic burden. In disease burden, morbidity and mortality are included and we also measure disease burden with quality of life such as DALY, QALY. But I have rarely seen such kind of study, either for major NCDs or all other NCDs.” University respondent

“The main thing is we need to conduct research on quality of life from burden of NCD especially on ways to reduce the burden. We need skilful persons to conduct such kind of research since it is quite difficult to measure quality of life. NCD is a lifelong disease and patients would not die immediately and we should conduct research on quality of life.” University respondent

Some respondents enthusiastically stated that there should be surveillance system at national level. They thought that surveillance system would monitor the prevalence of the diseases and their risk factors essential for effective planning and program implementation. One respondent provided an example that there should be a surveillance system for measurement of change in salt consumption, a major risk factor for NCDs in Myanmar.

“For the national level, there must have surveillance system to know the disease prevalence so that we can plan for the treatment service based on this data. We must support research activities to be able to conduct continuously.” Dept Public Health respondent

“We need to do surveillance because we need to understand the disease burden and to monitor RF, magnitude of risk factor.” MOHS respondent

“I would like to do the burden of mental health and substance abuse. I would also like to do mortality surveillance system for the whole country so that we would get best data for the country.” University respondent

“We should know disease prevalence through surveys, but also we should do surveillance for measurement of change in risk factors e.g., increase or decrease in salt consumption.” University respondent

Operational research

Some respondents stated operational research was needed for program implementation. They thought that with the information from operational research, program managers and policy makers

⁴ Definition of DALY : One DALY can be thought of as one lost year of “healthy” life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.

could plan and implement better NCD prevention and treatment services such as CA cervix vaccinations, diabetes treatment.

“It is more important to introduce effective intervention to reduce NCD incidence. There is no need to wait for the results of upcoming research, but to start the intervention straight away. It has been long time since the country had stopped conducting intervention research. Even now it’s quite late to start. Those intervention researches should be conducted in parallel with risk factor and burden research.” MOHS respondent

“To lessen cancer burden, I have intended to ask for cervirax vaccination to School Health Program. If this process is successful in collaboration with School Health, we are able to give cervirax vaccine injection to young girls like grade 9 or grade 10. I think that it will make a reduction in cervical cancer risk in next 5 years. It would be impossible to give vaccination at the ward level.” Department of Public Health respondent

“If we think about prevention of NCDs, that means mechanism of prevention and there are ways and methods for prevention, e.g., for cancer prevention. For example; Ca Cervix can be immunized and can give vaccination. We should conduct research on which vaccination program is the most effective. If we can choose the most cost effective intervention, it would be more suitable for our country as LMIC (Low and Middle Income Country). We can choose intervention by conducting cost effectiveness studies, cost benefit analysis and economic burden analysis. By doing so, we can give input for program implementation.” University respondent

One respondent addressed the issue of research on clinical interventions for NCDs. He argued that there was no research that tested the potential of a non-physician-centered care model where shortage of physicians and nurses are pervasive in the country.

“Actually, there is less qualitative research and implementation research. E.g. Can non-physicians do the treatment of DM? Non-physicians means e.g., midwives? Can they provide DM treatment? There is no research on that. Such kind of implementation research is weak.” University respondent

Another respondent emphasized the need to conduct research on program sustainability. There should be studies that identify factors that could contribute to sustainability of programs when the funds were reduced or stopped by funding agencies.

“Normally community based programs cannot keep sustainability when the funds are tailed off by UN or other donors. Various factors such as TMO’s interest on public health program at Township Health department, community mobilization and advocacy. These factors should be determined in research and we would know what factors contributes the sustainability of program, what the impediments and constraints are. It would be very useful if they can be explored.” Agency respondent

Health system research

Some respondents suggested of doing health system research in order to help with program implementation. NCD control needed interventions at different levels of the health system and there were no such studies as yet. The research needed to identify the gaps in health system and thereby improve the health system response.

“There should be research on health system. When there is widespread of NCDs, we should

conduct policy analysis for NCD to determine how much care is to be provided at which level. To provide comprehensive health care at different levels, we need to provide standard guidelines for NCDs.” MOHS respondent

“You should have done quantitative research, e.g., on infrastructure such as how many PHC (Primary Health Care) Unit in Myanmar with how many BHS (Basic Health Staff), what is their training capacity. At each Unit, what is the availability of essential drugs and what is their capacity on treatment. We also need to know which level provides them supervision and the extent of the training received by the supervisors. Now you do qualitative study and the results could be nonsense.” NGOs/ Foundations respondent

“Research mainly done by DMR are especially on clinical and molecular aspect, treatment aspect but less on program aspect and so they are not very much useful at program level. So we should emphasize on research support for program wise e.g., Operational research, epidemiological research, Health system research. Even though DMR conducted Public health research, but they do not focus on NCDs in terms of PH.” Agency respondent

“There is less research on health system too. Only if we know what is weak in the health system, we can do health system strengthening.” University respondent

One key informant pointed out that there should be a catalogue for NCD research that had been conducted in the country. Currently, different departments such as clinical, public health and DMR were conducting NCD research individually and any one department or place did not compile them.

“For NCD surveys, we need somebody who could collect data on research related to NCDs that are done by public health, research department and Clinical (departments). Some OGs conducted research on CA cervix. I think if we could collect all research papers, there would be complete NCD pictures.” MOHS respondent

Research agenda

Two respondents suggested having a strong research agenda at national level upon which evidenced based planning and decision-making could be done. Research is one component of National NCD plan, but more encouragement and support for research activities is needed from the government..

“There is a need for a research agenda. There should be a strong agenda so that research could be done which reflect the real situations.” MOHS respondent

“But one thing is there is no strong policy for research because they cannot support sufficient facilities to do survey. Research is included as one of the topics in National NCD plan. So we can assume that the policy encourages for NCD research but do not help us to conduct the survey.” University respondent

Disease areas

In addition to general suggestions of respondents on research and data needs of NCD burden, some respondents perceived that studies should be done on specific disease areas such as early detection of cancer, magnitude of CVD and COPD and magnitude of mental health problems from alcohol and the causes and incidence of RTAs.

Cancer/diabetes/Hypertension

“In my opinion, burden surveys on cancer, diabetes and hypertension should be conducted because people are not interested without showing the burden. We knew that there are more occurrences of diseases and burden surveys are ought to be conducted; yet no burden research is being conducted.” Department of Public Health respondent

“If we would conduct more NCD burden research, there are still a lot. However, among them, we could do research on diabetes, hypertension, obesity and measuring of weight, and we still need to have nationwide STEP survey for CVD and also for cancer and cancer registry as well. Similarly, we could not do for COPD. We cannot say about their magnitude of problem now.” University respondent

Cancer

“In Myanmar, among different types of CAs, most common CA are cervical, lung and liver CA. Research should be done on their preventive aspect such as early detection, treatment and especially palliative care for various type of CA.” Agency respondent

“Most research is only risk factor survey rather than burden, such as STEP survey. I would want to conduct studies which are not yet conducted. I would want to conduct studies cancer incidence and stroke. There is no nationwide cancer (study).” MOHS respondent

Deafness

“Deafness data is not up to date. Proper research on Injury is not collected. But the injury data from other ministry and some doctors presented in the RTA conference was great. We should do data collection on RTA.” MOHS respondent

Cardio Vascular Diseases and Road Traffic Accidents

“NCD burden- finally I want to prioritize the CVD, mental and RTA. Also we should conduct research on economic burden and diseases burden to some extent. We should find out the reasons. We should also do need based assessment, meta-analysis especially for trauma and NCDs.” MOHS respondent

Mental health

“We have very few burden researches. I would like to do research on mental health. I would like to know the magnitude of mental health problem from alcohol, but I think alcohol could be related to substance abuse and mental health. I have heard that there are studies on methadone with regard to substance abuse done by NAP. As there is no research on mental health, I would like to do research on it.” University respondent

“I think we have very limited mental health research at the country level. Similarly, there is a project for substance abuse and nowadays amphetamine use and alcohol consumption rate is getting higher. As a consequence, there are problems that we could not control. Therefore, we need to conduct more research on those areas as well.” Dept Public Health respondent

Road Traffic Accidents

“We want to compile RTA data from all States and Regions, e.g. How many accidents in which township, what type of person usually causes accidents, what type of vehicle.” Department of Public Health respondent

“A planning department at MOHS is no more working, now, but under other department and working. My project can’t implement at country level. Free of RTA should be done as they are happening a lot in Myanmar. Lack of data, under reporting such as hiding the actual case by taking compensations for car accidents and reported as falling down from the building). There is a major need to have (data) coverage for country level. I want RTA to be prioritized.” Department of Public Health respondent

NCD Risk factor research

7.6 Scope of NCD risk factor research conducted in Myanmar

Respondents thought that there were more NCD risk factor research in the country when compared to NCD burden research. When asked about the scope of NCD risk factor research conducted in Myanmar, respondents’ first response was the nationwide risk factor surveys called STEP. A couple of respondents were involved in STEP and they perceived that it was representative for the country while other studies were small scale. Among risk factor research, hypertension was the most common research area among major NCDs. While risk factor research on tobacco and injuries were increasing, those on snakebites were now less common than before. The least common research were done on food which was one of the risk factors for major NCDs. In addition, there had been no or few research on risk factors of rare diseases, according to a couple of respondents.

The majority of respondents made reference to the STEP surveys that were conducted in Myanmar in 2004 (Yangon Division), 2009 and 2014 (Nationwide). STEP surveys collected information on Diabetes and risk factors for NCDs such as socio demographic and behavior characteristics, physical measurements such as height, weight and blood pressure and biochemical measurements (blood glucose, total cholesterol, triglycerides, HDL and LDL).

“Regarding risk factor, WHO STEP Survey is done every 5 years since 2003. In 2003, it is done in over 5000 populations.” University respondent

“I have participated in the research in STEP 2004, 2009 and 2014 which all are included for the risk factors of Non-communicable diseases and prevalence of diabetes mellitus. These studies are mainly on diabetes and cardiovascular diseases.” MOHS respondent

“We have research mainly on risk factors. We have not done socio economic loss study and other public health surveys. Now, there are implementations of a lot of risk factor survey in Myanmar, of which STEP survey is the representative for the country.” Dept Public Health respondent

“NCD risk factors survey is STEP survey. It is a nationwide survey.” University respondent

Although STEP surveys were regarded as nationwide, other risk factor surveys were counted as small scale and narrow scope. Those who worked at medical universities and public health universities revealed that students conducted risk factors studies but they were small projects.

“Many risk factor researches are done. Even though they are not at national level, they are done individually and master students done in various areas such as tobacco, harmful use of alcohol and major NCDs risk factors are done.” University respondent

“Student level surveys are small scale because they have no support for grant and they do the survey with their own pocket money. So most of the survey can represent only small population such as 200 to 300 and maximum was 400. These can only be useful for awareness raising but not for advocacy purposes.” University respondent

“There are small-scale research done by master students and they included all principles other than 4 major NCDs. As far as I know there are some NGOs emphasizing on mental health but I do not know if they are nationwide or not.” University respondent

According to some respondents, risk factors of hypertension were paid more attention than other major NCD risk factors such as diabetes mellitus, cancer and COPD.”

“Risk factor research that we conducted focuses mainly on hypertension.” Department of Public Health respondent

“Most risk factor research is mainly on behaviour risk factor and there are research on life style linked to IHD and hypertension.” Department of Public Health respondent

Some respondents identified that tobacco had been given priority recently among research on risk factors of NCDs and a number of respondents noticed that research on smoking as well as smokeless tobacco was an increasing trend. Universities emphasized this area and applied for funding from the WHO.

“Tobacco was mostly done with regard to NCD risk factor studies with WHO support. Universities also seek funds for themselves for tobacco research and some received grants from WHO. For tobacco research, both smoking and smokeless tobacco were done profoundly.” University respondent

“Tobacco risk factor researches are moderately conducted but others are less.” NGOs/Foundations respondent

“For respiratory diseases, there are research done on smoking as risk factors but there are few research on other confounding factors.” Department of Public Health respondent

“For smoking, we have the smokeless tobacco study at the University (of Public Health). We have four KAP studies on smoking.” University respondent

“Risk factor research is mainly done on smoking. There are events on tobacco day too.” Department of Public Health respondent

Respondents suggested that risk factors for major NCDs were paid more attention when compared to other NCDs. However, some respondents highlighted the existence of research on snake bites among non-major NCDs. Snakebite research had been quite popular at DMR in the past and there had been quite a number of snake bite surveys conducted by DMR. However more recently there has been only a limited number of research studies on snakebite.

“I would say NCD risk factor research mostly focus on 4 major NCDs. But others like injuries, snakebites were being done depending on grants.” University respondent

“Snakebite research from DMR is excellent.” Agency respondent

“Snakebite researches were conducted in DMR in the past, but these days I don’t see much.” NGOs/Foundations respondent

“Other than four major NCDs, I have heard a study on mental health which was done in a refugee camp by an NGO. There is also snake bite research. But I think they all are only small scale.” University respondent

“Risk factor research was done not only on 4 major NCDs. I was involved in a study on child snakebite conducted in December 2014, e.g., what kind of snakes, at what time children got snakebite – those type of risk factors. There is also another study about anti snake venom on whether it reduced mortality and how much mortality rate could be reduced if anti snake venom is injected in which time period of snakebite.” University respondent

Nevertheless, a couple of respondents mentioned that they had not heard of research conducted on snakebites, probably because they were not familiar with DMR in the past and had been working on other disease areas not related to NCDs.

I have not heard of any research on minor NCD researches like snakebites and blindness. There are some groups that are working on it here and there but I do not know. They did not come and tell us.” University respondent

“I think that there is no survey for snake bite and minor NCD.” Department of Public Health respondent

Apart from snakebite studies, research on injuries was mentioned by few respondents. They thought that injuries were becoming widespread and there were some research on injuries.

“Risk factor surveys are more common than surveillance like unhealthy behavioural surveillance. According to area, major NCDs researches are conducted more than other NCDs. Among other NCDs, researches relating injury are more common.” University respondent

“We are also doing some research on injury prevention because the whole country is now having troubles with injuries.” Department of Public Health respondent

“Previously studies focused on major NCDs but now injury is included.” MOHS respondent

Few respondents perceived that there were only few researches on deafness, blindness and mental health when compared to other NCDs such as tobacco, snake bites and injuries.

“For risk factor surveys, surveys for injury are done but deafness and blindness are less. In my point of view, there are few research papers from Eye and ENT with regard to risk factors.” University respondent

“There are hardly no research conducted for other NCDs such as locomotor, mental health and neurological diseases.” MOHS respondent

Respondents thought that the least common risk factor research was food related risk factors. Nowadays modifications of food become popular and there was an increased risk of cancers from unhealthy food and diet. Yet, research on food related risk factors were quite rare in the country.

“Least research is done on food, diet, dye that can cause cancers e.g., there is no research for chili sauce. There are very few research related to food.” Department of Public Health respondent

“There are very few research done on risk factor of cancer. I think we could not even conduct research whether high consumptions of street food could lead to cancer.” Department of Public Health respondent

There were also a couple of respondents who thought that risk factors of rare diseases were not explored in previous NCD risk factor research, which rather monitored known risk factors.

“Scope for risk factor studies is not too big. Mostly, it is monitored on evidence of established risk factors. Usually research on new risk factors is the least and only known risk factors are being prioritized.” MOHS respondent

“The weak point is that we cannot do rare risk factors survey.” University respondent

7.7 Risk factor research and risk factor data needed for program implementation

When explored what type of risk factor research and what type of information were needed for NCD program implementation, majority of key informants considered that the country needed nationally representative data. Yet, they did not specify the disease areas except for one respondent who requested national data on chronic respiratory diseases. Respondents perceived that more data were needed on established or major modifiable behavioural risk factors such as food or diet, alcohol and smoking, and others such as air pollution, Road Traffic Accidents (RTA) and deafness.

Nationally representative data

Most respondents eagerly stated that risk factor research was needed at national level to implement prevention and early detection and control programs. Currently limited risk factor research was conducted at small scale and could not identify the incidence and prevalence of risk factors at national level.

“If we can conduct incidence research at national level, which we should be doing, we can find related risk factors and implement prevention and early detection of risk factors. Since we do not have sufficient treatment facilities like developed countries, we should implement prevention as the first priority.” NGOs/Foundations respondent

“There is still limited risk factor research for NCD. I want to conduct research that could provide representative data.” University respondent

“All risk factors can be adjusted based on the research data. So, we should do a lot of research which are reliable and representative for the whole country.” University respondent

“I was thinking whether even sample size in STEP survey should be increased in order to be more representative? For PEN project, there is a plan to increase to 300 townships.” Department of Public Health respondent

“When we go to international meeting and conferences, we have nothing to tell. National data does not exist for CRD (Chronic Respiratory Disorders) too. So we want data that can be representative for the nation.” Department of Public Health respondent

One respondent highlighted that specific risk factors should be identified for own country since there could be new risk factors specific to Myanmar and the survey should be conducted at country level.

“Usually, the scope for risk factor is not too big. Mostly, risk factor surveys monitored the evidence of established risk factor and we do not usually look for new risk factors. We should do research on risk factors which are specific to our own country. We should do nationwide study for that” MOHS respondent

Food/Diet

Some respondents perceived the behavioural risk factor research on “Food or dietary pattern” as an area of research that was limited to date. They thought that dietary habit varied by family income and by ethnic group. Salt consumption was also highlighted as an important area to explore through research.

One respondent explained that the ability of a family to choose or not to choose certain potential areas of risk behaviour depended on the family income and there should be studies on dietary patterns to support behaviour change.

“For risk factor, STEP survey is the most prominent survey in our country. But we should study the dietary pattern in real situation. We should study on food diversity for which we choose with our income, for example, how much a family can choose for taking or not taking dried fish. We know what kind of diseases could be occurred from food through biological research. But for behaviour change data, MOHS should provide enabling environment to conduct such kind of research.” MOHS respondent

Food related risk factors in Myanmar may be different from those of other countries. This was mentioned by a couple of respondents. They also emphasized the level of food diversity among different ethnic groups because Myanmar has a number of ethnic groups and their dietary patterns vary extensively depending on the geographical locations.

“Although there are international references for research, here we have our own Myanmar way. In Myanmar, unlike international, we have multiple factors. In foreign countries, hypertension could be due to just stress but in Myanmar, it could be due to traditional medicines and other causes. Therefore, we have to think about other factors in Myanmar. e.g., for risk factors of diabetes, it is better to get etiological, epidemiological data of different geographical areas of Myanmar. We need to know what factors influenced on what kind of race and ethnicity.” Department of Public Health respondent

“Tobacco is the most common well-known risk factor and there are many studies. Other research should be done on dietary pattern and food safety as they have common risk factors and public interest is now rising. In addition, dietary pattern of Myanmar would be different from international data.” University respondent

Few respondents also stressed on salt consumption, one of the major risk factors of NCD in Myanmar, as an important area for risk factor studies.

“Regarding NCD risk factor, STEP survey is sufficient. Yet, two more points are needed. No.1, There are no data concerning household population and data related to salt consumption. I want to conduct such kind of risk factor research, by name, “ salt reduction risk factor research No. 2 is Orientation of NCD by basic health staff.” University respondent

“We should know disease prevalence through surveys. In addition, we should do surveillance for measurement of change in risk factors e.g., increase or decrease in salt consumption.” University respondent

One respondent in particular repeatedly emphasized the environmental risk factor such as accessibility to cigarettes and alcohol in the surroundings. She perceived that programmers needed to understand what risk factors promoted risk behaviour within the family and in the surroundings, instead of exploring the amount of consumption by individuals.

“Regarding the risk factor, we have to think about the personal risk factor and environmental risk factor. For example, even if you have to prohibit smoking and if a person also does not want to smoke personally, but there are many cigarette selling shop in front of you. Do we recognize this kind of environment risk factor? Or we only accept like the personal risk factor. Next example, the father is a drinker so it will promote the children to be drinkers. We should

emphasize this kind of risk factor in the family unit. Rather than the question such as : do you drink, how many do you drink in one day, how many do you usually eat salty food, we need to look for the risk factors that make them the enabling environment. This is what we need now.”
Department of Public Health respondent

Alcohol

A couple of respondents thought that alcohol consumption was high nowadays but there had been no quality control for consumers or tax reinforcement for sellers. One respondent argued that the country needed policy research on taxation of alcohol and cigarettes such as what the current taxes was, how the taxes were being levied, and how they were being used.

“We need to conduct research on taxation. It is important that we need to assess how the taxation is performed. It was quite tiresome from seeing sales girls selling cigarettes and alcohol. We should know how the quality of alcohol and cigarettes are being tested, why people drink, how to tax on alcohol selling and how to use the taxes.” MOHS respondent

“Nowadays amphetamine use rate and alcohol consumption rate are getting higher. Since we could not control them (to use), the problems related to them to are increasing. Therefore, I think we need to conduct more research on those areas which are related to mental health. I want to draw the alcohol policy based on the alcohol research data.” Department of Public Health respondent

Smoking

Another important area of research highlighted by one respondent was on smoking. He thought that in-depth understanding was needed on the increasing trend for smoking despite the tobacco law being promulgated 9 years ago.

“From the STEP surveys data, the smoking status of the community is dangerously higher. It has been 9 years since the tobacco law was established. I would like to know the reasons.”
MOHS respondent

Air Pollution

Several respondents stressed that air pollution was increasing these days and emphasized this as a risk factor for COPD and cancers. They also thought that passive or secondary smoking and indoor air pollution were important risk factors for COPD but that there were few or no studies on this.

I would like to study on pollution since there are a lot of pollutions nowadays. People do not know the consequences of pollution e.g. from copper mining. There are a lot of risk factors from pollution as well. Passive smoking is through pollution and indoor air pollution would end with cancer.” Department of Public Health respondent

“For the cause of COPD, air pollutions are quite prevalent here nowadays and there should be studies on that. There are also secondary smoking and indoor air pollutions. I saw studies on

tobacco and smokeless tobacco but I have not seen studies on indoor air pollutions.”
University respondent

RTA

Another specific health area for risk factor research was road traffic accidents mentioned by a respondent. He perceived that risk factors could influence the behaviour of drivers which could in turn lead to road traffic accidents.

“We need a lot of information and we need to discuss with psychiatrists. We need to know which factors influenced behaviour. For some people, their mind is always changing and we need to define behaviour and road traffic injury precisely.” Department of Public Health respondent

“The research should be done for human factor such as behaviour, e.g., Drivers became arrogant, impatient, no sympathy which were led to car accidents. We need to do studies on these.” Department of Public Health respondent

Deafness

One respondent thought that the overuse of mobile phones could be one of the risk factors for deafness and she would like to study the association between phone usage and deafness.

“We should do the survey about usage of phone for Deafness studies. In Myanmar, using of the electronic things are not systemically and being overused.” Department of Public Health respondent

7.8 Researcher skills in NCD research

The interviews explored the current skills of researchers to conduct research on both NCD burden research and NCD risk factors. Most respondents did not distinguish between the skills of researchers to conduct burden research and risk factor research.

The majority of the respondents thought that the skills of the researchers who conducted NCD research were competent and they had sufficient knowledge and experience of NCD.

“Concerning skilfulness of researchers, researchers are doing their parts skilfully. I consider they are competent. Let's say, some people hired experts but those consultant will not know situations on our ground. I would say people in Myanmar are not incompetent. They cannot use their full capacities because conditions are not granted. It's my view.” University respondent

“I think researchers have sufficient skill and knowledge.” University respondent

“Researchers who conducted NCD research are very expert. Because of them, there was the development of NCD unit. They were competent in their subjects and they knew burden and risk factors of NCD deeply.” Department of Public Health respondent

Some respondents perceived that research supported by the Department of Medical Research (DMR) was of a high quality because of its technical expertise in research. Some of them also thought that WHO and other international agencies provided technical support to NCD research and they were of high standard.

“Researchers are experts at their respective areas. Dr.Ko Ko is the one who did STEPs survey as well as the prevalence survey. He is the NCD focal person of Myanmar to international. In STEP survey, WHO supported technically and Dr.Ko Ko Zaw from DMR, who is the expert, supported statistical analysis. So, we don’t need to have doubts about the quality of STEP survey.” University respondent

“I had no problem in my own research because we cooperated with DMR and it provided training to my people.” Department of Public Health respondent

“Burden study is funded by WHO and also got technical support. We had a consultant from Australia and we developed questionnaire together. We had received training on data collection and later we continued the study ourselves.” University respondent

“It is a bit early to comment on the capacity of researchers and we need to wait and see but they have done their best whatever research they have conducted based on the funding support and technical support. I really appreciate the investigators of STEP surveys such as Dr... from DMR and Dr....” Department of Public Health respondent

“Regarding capacity, researchers implemented STEP survey in 2014 were academics. Leader is a professor from the academic institution.. WHO gave technical support. Experts from Geneva also came. Over 50 investigators (doctors) were trained on interview methods. On-job trainings were also given. That is why I think it is comprehensive. Also for sampling, I think it was really global standard because it used random sampling.” University respondent

However, some respondents disclosed that the skills of the researcher were still limited. One respondent thought that NCD was distinct from other health areas and researchers in Myanmar needed better skills for NCD research. Specifically, there were weaknesses in analytical and data interpretation skills.

“General capacity of researcher is not bad since we all (including UPH) could conduct research by ourselves. I think researchers are good in general but their capacity on NCD specific research is still limited. (Area of) NCD is quite significant.” MOHS respondent

“Currently these research are being conducted by senior Professors and they are smart. But there is weakness in data analysis and interpretation. It would be better if there were epidemiologists who are skilful in data analysis and data interpretations.” Department of Public Health respondent

“I think more trainings are needed for researchers in terms of technical competency.” University respondent

“When compare to burden research, risk factor surveys need more academic capacity and such kind of persons are rare. They need to be competent in statistic skills and epidemiologically strong.” MOHS respondent

Few respondents particularly project managers admitted that they had limited skills in research methodology and analysis. They thought themselves that they were weak in research methodology including study design and analysis. One respondent revealed that he conducted research based on the research skills that he had received from his master’s program.

“I don’t know about the capacity of researcher who conducted NCD research since I have never studied about them. As for our mental health unit, we can say that our research capacity is not competent because it is not our specialization. We conducted research based on our own interests and we are weak in research methodology and statistics. I know as much as I learnt from my master course.” Department of Public Health respondent

“All three risk factor research are implemented at the national level. In the first year, we chose Yangon Region for care seeking behaviour project. Whenever we conduct research, we started at Yangon Region and assessed whether it was okay or not. Then we came to know from Dr. Ko Ko Zaw (from DMR) that surveys should not be conducted in that way and later we had developed questionnaires. We had limitations in sampling and survey designs. Therefore we got used to consult with U Ko Ko Zaw from DMR. DMR helped us with protocols and provided trainings. From their advice, we needed to change sampling method in second survey and we avoided possible biases.” Department of Public Health respondent

One respondent from public health specialization also perceived that clinicians, in general, were less experienced in research methodology although they were competent in clinical treatment. He also explained that clinicians usually consulted with his department and they coordinated on research projects.

“Researchers are more skilful regarding tobacco but weak in other areas. As for physicians, although they are skilful clinically, they are weak in research methodology. When they come and consult with us, we work together mostly.” University respondent

7.9 Strengths and weakness NCD research

Strengths

Among most respondents, the STEP surveys were well known and perceived as the most comprehensive research in Myanmar. STEP surveys focused on obtaining core data on the established risk factors that determined the disease burden for diabetes and other non-communicable diseases in Myanmar. Amongst 3 STEP surveys conducted in 2003, 2009 and 2014, STEP 1 of the survey in 2003 was conducted in Yangon Region only and the 2014 one was the most comprehensive, providing an analysis of all States and Regions within Myanmar through questionnaires and physical measurements – STEPs 1 and 2 of the survey – as well as data obtained through biochemical measurements (STEP 3).

Respondents considered STEPs as nationwide survey and very informative especially with respect to the magnitude of the problems for the country.

“Among the risk factor surveys, STEP survey is very informative and completed with various risk factors data. So, we can regard it as measurement of essential package.” Department of Public Health respondent

“STEP surveys mainly provide magnitude of risk factor. It is WHO’s STEP survey and not much is needed to say in terms of it weakness. STEP survey is nationwide, sampling frame is appropriate and it was done according to the WHO guideline.” Agency respondent

Some respondents talked about the strengths of NCD research in general. They revealed that NCD research could identify risk factors specific to Myanmar e.g., betel chewing. One respondent recognized that risk factor data such as tobacco data could be used for application of funding.

“When we conduct risk factor research in Myanmar, we came to know that which risk factors are common for the country. For example, betel chewing might not be risk factor for western country but in Myanmar, it is the risk factor.” University respondent

“Strength is that when we apply for grants, we can use risk factors data such as risk of tobacco and tobacco control data.” University respondent

One respondent thought that research was needed to submit to ethical review committee (from DMR) and therefore all research protocols were examined thoroughly. She, therefore, perceived that those research approved by ethical boards were useful.

“All research are quite systematic because all research have protocol and submitted to ethical committee. If needed, committee criticized and made them revised for better protocol, and that’s why results of studies that pass ethical committees are useful.” NGOs/Foundations respondent

Weakness

For both NCD burden and risk factor research, being small-scaled and limited technical expertise were common weaknesses, mentioned by some respondents. Discontinuation of Health Information System (HIS) and unavailability of private sector data were other weaknesses of NCD

burden research. With regard to NCD risk factor research, some indicators were needed to include in STEP surveys. In addition, more in-depth understanding about the risk factors in the country was not thoroughly explored.

Small-scale

Respondent revealed that risk factor research, except STEPs surveys, were small scaled. One of the main reasons mentioned by respondents was limited funding and human resources to conduct nationwide surveys.

“NCD has burden. Yet it is difficult to tell for the whole population in general.

Most of the burden research focused on public health importance and they are more emphasized on the regional level, institutional level and project area.” Department of Public Health respondent

“We could focus only at lower level, e.g., one township in Cause of Death study. I would like to do this kind of surveillance of mortality in all States and Regions. Only then we could get data for the country. But we could do only pilot study and could not conduct nationwide study. This study is very expensive and we had burden on human resource and time too.” University respondent

“When we go to international meetings and conferences, we have nothing to tell. National data does not exist, also for CRD (Chronic Respiratory Diseases). So we want data that can be representative for nation. Now researches are done in some places that are preferable by researchers.” Department of Public Health respondent

“The weak point of risk factor survey is most of them are small scale survey, and could not go beyond pilot study level and just hospital base data. Case selection can be biased because only those patients who were extreme go to hospitals. So, the result cannot represent the whole country like STEP survey which is a population based study and nationwide.” University respondent

“Weakness is that research is not representative since they are done on small scale.” University respondent

“Risk factor survey is easy to do. The weakness is that we need the representative study. We have a lot of studies on risk factor which are just small scale. I have not heard that there is representative study especially for alcohol and diet.” University respondent

Limited Technical expertise

Several respondents mentioned limited technical expertise as a weakness of NCD research. Some types of research needed special technical skills e.g., health economics. One respondent thought

that because of the limited number of health economists in the country, there was limited burden research, while another perceived that risk factor surveys needed certain academic skills and persons with such skills were rare in the country.

“We have very limited specialists for health economic field in our country. During MPH, we had learned health economic as one portion but we cannot specialize it. I think there are some INGOs that implement health economic studies but they cannot widely implement like government organization. I think INGOs are working for areas that are interesting and donor driven.” University respondent

“People from the medical (clinical) field are not familiar with health economics and therefore there are only few NCD burden research. We do risk factors research because we are good at it.” University respondent

“When compare to burden research, risk factor surveys need more academic capacity and such kind of persons are rare. They need to be competent in statistic skills and epidemiologically strong.” MOHS respondent

No more Health Information System (HIS)

Another weakness was that the country had stopped having Health Information System (HIS) and there was lack of NCD data. Until 2011, the Ministry of Health Resource Centre used to compile data from different level of government health facilities from primary health care level to hospital level. Data on individual clients, information on curative services, information on preventive services, resource management e.g. inventories (staff list, health facility, and equipment), logistics and commodities, finance / user fees and Village Health Teams (Integrated Community Case Management) were collected in HMIS for performance and trend analysis. Nevertheless, HMIS did not include data from private sectors even when Ministry of Health Resource Centre had collected it at central level.

“HMIS had two data entry: Hospital based and Community based. Previously HMIS section was a separate department under Ministry of Health and they could make regular compilation of data from both hospitals and communities, but now I do not know.” MOHS respondent

“I have not much experience about burden research but one thing that I know is there is no data on burden except HMIS. But it had some limitations because it could not include data from private sectors and some communities. So some data were under reporting.” Department of Public Health respondent

“There was a department under Ministry of Health which collected and compiled data and information. There is no more such unit now.” Department of Public Health respondent

“Cancer register is available only in hospitals, yet data are not that accurate. Those are necessary. Population also needs to know it. They have to be shown how much cancer incidence has been there.” University respondent

A few respondents also talked about weakness in data validity. They perceived that in some surveys, data collection was not systematic and in some, data validity was weak. One respondent who had extensive experience on NCD research thought that in general, findings on NCD research were not reliable due to resource constraints.

“We need supervision. In some part of (data processing), data are not strong and we needed to make them up. Data validity is weak.” Department of Public Health respondent

“Even though it was clearly mentioned sampling procedure in proposal, data enumerator should strictly follow these procedures in data collection stage. In my own opinion, data enumerators usually not follow these procedures mentioned in protocol.” University respondent

“Any project except DM is not reliable, as they are do in generally, due to time constraint, lack of funding, no integrated approach.” NGOs/Foundations respondent

“Conducting research with wrong method is wasting money and therefore there should be sound knowledge for research methodology. Yet, there are weaknesses in statistics and research methodology except DMR in the country.” Department of Public Health respondent

Availability of hospital data only

Burden studies such as morbidity, mortality and cause of death studies were conducted based on hospital data and they did not usually include data from community. Even for hospital data, they were available only for government hospitals while health care in the private sector is gradually increasing.. When combined hospital data for whole country, there could be overlapping of cases because patients sought care at different hospitals and they were recorded in registers of different hospitals.

“For burden data, we need to think whether we want hospital data or the community data. I think for now we can only access the hospital data which is the iceberg.” Department of Public Health respondent

“Another weakness for burden studies is we don’t have the data system for the disease and registration system of the patients. For example, when patients go to YGH, they registered at YGH and next time if they go NOGH hospital, they do another register. Finally it becomes the amplification of data and we cannot get the correct data when we collect data form the registers.” University respondent

“Survey gap is at morbidity and mortality data, e.g. AMI (Acute Myocardial infract). We do not know the exact numbers of people died of AMI. To have mortality data, we can gather data from hospitals but we are lack of data from private sectors like private hospitals and military hospitals. When there was the Department of Registration run by Daw Thet Thet Mu at YGH, there could be data from YGH. I do not know if this department is still present or not.” Department of Public Health respondent

Causes of death in the community were not usually recorded accurately and could not provide correct data for cause of deaths in the whole population, e.g., cause of death of elderly was usually regarded as “old age disease”. There was no proper recording system or death registry in rural areas and therefore mortality data from NCDs might be missed out.

“I am not sure that 2012 WHO data is based on what kind of data but one thing I know is that cause of death for NCD was calculated based on death registry. Actually cause of death for NCD is not sufficient based on hospital data alone; deaths in the ward could also be due to NCD. But when asked for cause of deaths for elderly, people usually answered “old age”. But no one knows that “old age disease” is CVD or stroke, etc.” Department of Public Health respondent

Missing indicators in STEPs surveys

Although most respondents were satisfied with STEP surveys, some respondents said that STEP surveys did not include some indicators such as household population data, salt intake and some physical inactivity indicators. In addition, STEP Surveys did not include other health areas such as cancer, mental health, injury and COPD.

“There are some data that STEP survey could not catch up, for example salt intake. We need to know how much salt consumption is to compare how much reduction in its prevalence in 2025. For those kinds of data, we should have big community survey. Only STEP survey is not sufficient to provide such data and we would need a separate survey.” Department of Public Health respondent

“Regarding NCD risk factor, STEP survey is sufficient. Two more points are needed though. There are no data concerning household population and data related to salt consumption. I want to conduct such kind of risk factor research.” University respondent

“Among risk factor surveys, STEP survey is very informative and completed with various risk factors data. So, we can regard it as measurement of essential package. But, I'd like to point out one thing about physical inactivity. STEP includes how many hours work out in a week. But did this survey also include how many hours of watching TV a day and eating while watching TV, playing games, and eating fast food etc.? If these factors have not yet included in this survey, we should include those factors so that those results would be visible for community.” Department of Public Health respondent

“I have participated in the research in STEP 2004, 2009 and 2014 which all are included for the risk factors of Non-communicable diseases and prevalence of diabetes mellitus. These studies are mainly on diabetes and cardiovascular diseases. But there is no data on cancer, mental health, Injury and COPD. If they can't be combined in STEP survey, we should do separate surveys.” MOHS respondent

Did not include in-depth component

Risk factor studies should be done more in-depth and should explore why certain behaviours are persistent in order to promote or reduce such behaviour e.g., why not quitting betel chewing, why there is drinking and binge drinking. Currently most studies focused on known risk factors and were mostly quantitative surveys asking knowledge and attitudinal questions.

“Weakness is that qualitative cannot be done. We know only about not eating of vegetables, but not the reasons not eating. In-depth interviews are not yet done (to explore more). Only if we get in-depth interviews, we know what to do next, what to prioritize.” University respondent

“I think risk factor research is redundant, I mean there are many knowledge and attitude studies. There is no in depth study on a particular risk factor especially there are very few qualitative research on behaviour risk factor. For example, people knew that it is not good to chewing betel quid but they could not quit it. So we need to find out how we could remove risk factor for betel chewing.” University respondent

“There are risk factor surveys on NCDs but one thing is we need to do more of these surveys to be in-depth and more detail. We already knew about common risk factor such as alcohol. We knew what diseases could be happened from drinking. But I have not seen any research that studied the reasons for drinking and binge drinking. Therefore, we should conduct the kind of studies that go in-depth.” Dept Public Health respondent

“Risk factor survey should include questions on why and how. From that, I would also like to know what would be the planning for NCD control.” MOHS respondent

7.10 Issues and Barriers of conducting NCD research in Myanmar

Respondents revealed some issues of conducting NCD research in the country. From their experience, budget allocation and funding support was still quite low for NCDs. As one of its consequences, the scope of NCD research was narrow with only a few nationwide surveys. Project managers in particular lacked the human resource needed to conduct NCD research. Respondents also elaborated on the weak collaboration between different departments of MOHS. Other barriers mentioned by respondents included weak political commitment, limited technical skill, poor dissemination and limited utilization of findings.

Less funding

Majority of respondents openly stated that although NCDs were receiving more attention than before, funding support was still quite limited for NCD research when compared to communicable diseases. Several respondents stated that even though funding from government or other agencies was received, the amounts were small.

Internal funding is still very low even it is requested. It is now better than before but not that much. MOHS respondent

At the moment, there is less funds concerning NCD research. If they (funds) come to a country, they were given to where the country's prioritization is. One thing is Malaria can be cured within 7 days. Polio and leprosy clearance can be shown but not NCD, which will never get cured. As it is long-term and giving long-term funding is difficult. Also it is also difficult for doing behaviour change, and as it is not included in country's prioritization and thus there is no interest and less funding.” University respondent

WHO provided technical and financial support for snakebites, diabetes, CVS, respiratory and RTA project, but funding support is quite limit compared with communicable diseases. Besides, other INGO also interested in communicable diseases.” Department of Public Health respondent

In general, UN, WHO and other NGOs are interested in NCDs but their interest and financial support are prioritized on infectious diseases when compared to NCDs.” Department of Public Health respondent

Funding support from WHO depended on their own set budget for certain project. We could get only that amount. According to the available budget, we draw the work plan.” Department of Public Health respondent

A couple of respondents expressed their opinions on budget process of funding agency, the WHO. In addition to restrictive funding, financial process of the agency was lengthy and did not receive funding in time and could not start the project as planned.

“We cooperate with WHO. But, the first constraint is resource. There is not enough in human resource and material resource and also delay in budgeting. So there was a problem in budgeting and therefore there is often a time lag in implementation (e.g.; we cannot start in time). Therefore there are some issues in planning and implementation. There is no sufficient resource and weakness in supplies and equipment. Financial process is also restrictive.” Department of Public Health respondent

“Then the burden for us was the financial rules of donors. We claimed many vouchers with their formats and we needed to provide signatures for each form.” Department of Public Health respondent

Limited research scope

As a consequence of limited funding, the scope of the research became a limitation for conducting research, revealed by a couple of respondents. They also associated limited funding with geographical constraints. In order to conduct nationwide surveys, it was necessary to spend a considerable amount of money for transportations to get to hard to reach areas in the country.

“Funding is paramount important. We could not conduct big surveys at National level if we could not get enough grants. Since two-thirds of the country could not be accessible easily, we need certain amount of money for transportation and facility cost.” University respondent

“As there is fund limitation, there were times that we could not expand as much as we wanted. The other thing is geographical constraint. Because transportation is difficult, some places are left out although they should be included.” University respondent

“According to our country’s geography, conducting research like finding incidence is difficult. Survey is easy to conduct but survey for national level is quite difficult to conduct.” NGOs/Foundations respondent

Inadequate human resource

Some respondents sadly disclosed that they had to conduct research with inadequate human resources and one of the reasons was poor funding support, either limited funding or the financial process of donor agencies. They usually needed to seek help from their own clinical staff from hospitals and from the Department of Medical Research (DMR).

“We could not conduct research on CRD because I do not have resource especially human resource. I alone cannot run the research project. Even for previous research, data collection was done by DMR mostly. Currently I do not have anyone helping me for data collection and there is no budget for supporting staff for research. I do not have my first assistant being appointed. If I were to conduct research, there would be missing out in my routine work management (clinical responsibilities).” Department of Public Health respondent

“We could only focus in one township in COD (cause of death) study. I would like to do this kind of surveillance of mortality in all States and Regions. Only then we could good data for the country. But we could do only pilot study and could not conduct nationwide study. This study is very expensive and we had burden on human resource and time too.” University respondent

“We do not have enough human resource to conduct socio-economic loss surveys. For CVD (Cardio vascular disease) project, we have one project manager and one MO (Medical Officer), but no other staff. For socio economic loss surveys, we need human resources for data collection. We also need funding and training. Luckily, we had got Technical support from Dr Ko Ko Zaw and he took the position of the head of the project although he did not have responsibilities. He was just helping us.” Department of Public Health respondent

“We need more manpower, money, materials and training courses for research. As for human resource, we have cancer centers in Mandalay, Taunggyi, Naypyitaw and Yangon so the total is four with 20 postgraduate students. Each center has only 5 or 6 doctors and the numbers of doctors are less than 20 in all these four centers. Department of Public Health respondent

Weak collaboration and coordination

Some stated about lack of collaboration as a barrier to NCD research and its implementation. Usually, there were no collaboration and coordination between different departments within the Health Ministry. The clinical side and public side did not cooperate and they were in the habit of conducting research individually and not sharing the results.

“For epidemiology survey, there is no cooperation between departments. Each department conduct researches and keep data separately and there is no sharing between each other. In my opinion, MOHS should take the leading role at central level and combine all data. The main reason is weakness in collaboration and cooperation. For epidemiology level, national cooperation is needed. If not, we can’t get relevant data.” NGOs/Foundations respondent

“Work place and NCD have connections, e.g., sedentary workers have quite a lot of risk for NCDs. Yet, my department (Occupational and Environment Health) and those NCD groups have no linkage. There was no NCD related survey at work place. So, my department conducted surveys on diseases due to occupation and environment. We cannot conduct project wise. We do not have donors and we focus only on work places that measure air pollution, water pollution and accidents. There are still weaknesses in discussions between my department and NCD unit in prevention of NCDs of work place.” Department of Public Health respondent

“Researchers are disjointed and they did not integrate and were working on small scale instead of building up on previous studies.” NGOs/Foundations respondent

“In our settings, we usually face difficulties in program operation. Cooperation and collaboration are difficult to follow although it is easy to say.” University respondent

Weak political commitment

Weak political commitment was revealed by some respondents as one of the barrier to conducting NCD research since government did not provide enough support when compared to other health areas. Policy makers sometime did not accept the NCD research findings and NCDs were not given priority.

“WHO is supporting for financial and technical so it is favourable. Weakness is that we do not get enough support from national level, and cannot help us in practical. Government provides only manpower and venues as per needed, but does not provide any financial and technical support.” Department of Public Health respondent

“NCD surveys are certainly needed for the country. We did not get sufficient support from policy level. Government sometimes accepted data of previous research but sometimes did not. There had been limitation of voice for NCDs and therefore they were not prioritized.” University respondent

“Why research on NCD are not widely done is that there is no political commitment. Government itself is prioritizing MCH (Maternal and Child Health) and CD (Communicable disease). International NGOs are prioritizing them too. Although NCD occurrence rates are high in Myanmar, they are not included in priority level.” University respondent

Limited technical skills

Technical skills were limited in some research areas such as developing comprehensive protocols, using proper methodology and conducting health economics studies.

“I think most research are being done as per handiness (let-tann), with weakness in methodology and no time-fix.” Department of Public Health respondent

“For a researcher, methodology is important. Conducting research with wrong method is wasting money and therefore there should be sound knowledge for research methodology. Yet, there is weakness in statistics, research methodology except DMR (Department of Medical Research) in the country.” NGOs/Foundations respondent

“No proper research based on comprehensive protocol, no enough literature from the beginning. Data from projects except DM (Diabetes Mellitus) are reliable. There is no integration. NGOs/Foundation respondent

Poor dissemination of findings

Research data dissemination was mentioned as a weakness of NCD research by majority of respondents. They revealed that NCD research findings were not usually disseminated through conferences or any other means. One respondent compared NCD with reproductive health, which was receiving more attention from the MOHS and donor agencies, and there were frequent dissemination of reproductive health research. The context of comparison can be illustrated in the quotes below.

“NCD research is not widely disseminated, unlike RH on which DRM is very strong. I have experienced of attending dissemination of RH research which are done in collaboration among donor agencies, other UN agencies and MOHS. But there is not much dissemination on NCD research.” Agency respondent

Some respondents thought that NCD research findings were being disseminated at research conferences organized by Department of Medical Research (DMR) and Myanmar Medical Association (MMA), but there were few international publications. In addition, respondent stated that research findings were not distributed to the public although there were different communication channels available nowadays.

“Some research findings are being disseminated but some are not. There have been dissemination of research at DMR research conference and MMA research conference. As far as I know, only one NCD research had got international publication.” University respondent

“Nowadays, there are more funding and more dissemination (of research findings), but I am not sure to what extent. What we need is to disseminate information to the community. After NCD research is being done, e.g., after STEP survey, we need to disseminate information on the prevalence of diabetes and injury at the community level instead of at the technical field level.” University respondent

“People do not pay attention (for further steps) after research are being conducted.. Nowadays, we need to have good dissemination and to make good use of media. We need to think about communication channels, e.g., through talk, through newspapers. Who would read newspapers? Do we communicate through journals?” MOHS respondent

Theses conducted at masters’ courses were compiled at the Universities and their findings were not disseminated especially to wider audiences. One revealed that students did not know each other’s topics. Yet, one respondent from a medical university thought that theses of master students were shared within the universities.

“There is less data dissemination. It is good if research can be disseminated. Academic research seem to be mixed with thesis and thesis ended at the University. Their recommendations are not actually effective.” University respondent

“There are small-scale research done by master students and they included all principles other than 4 major NCDs. One thing for sure is that information from those research are not compiled in one place. Master theses are not published and they do not know each other’s research and no information sharing. Also, I do not think their research are reliable.” University respondent

“Students at University do dissemination (of research findings) among themselves (within the University). University respondent

Another key issue mentioned by a respondent included the issue of not being able to publish the findings if the study had not been through the ethical review process.

“The results are not disseminated because the study protocol was not sent to ethical board and we do not dare to disseminate the findings.” Department of Public Health respondent

Limited utilization of findings

In addition to weak dissemination, limited utilization of research findings was a key aspect of barriers in application of research for NCD program implementation. Research findings were not being used as advocacy tools and policy makers did not make decisions based on research, revealed by respondents.

“Utilization and dissemination based on research data are very weak, no data publication, utilization and dissemination. Therefore no advocacy and no policy formation by using these figures. Practically, these should be in high speed. NGOs/Foundations respondent

“I think we are weak in utilization of research findings.” University respondent

“Policy makers do not pay attention to research findings. They do not take action based on what we present. They think highly of themselves.” Department of Public Health respondent

7.11 NCD research prioritized by key informants and reasons of prioritization

Following questions on the scope of NCD research and the use of research in program implementation, key informants were asked their opinion of priority research areas for NCDs by using tables which listed NCD research and indicators adapted from the global monitoring framework indicators for Mortality and morbidity, Risk factors and National System Response.

Although there were 29 key informants in total, not all of them provided their opinions on priority research areas of NCD. Among who responded, majority of them thought that all research listed under each table were important and should be prioritized.

However, when they were asked to choose which aspects of burden research of NCD should be prioritized, majority of them answered economic burden, NCD morbidity, premature mortality from NCDs and cancer incidence. These findings tally with the scope and research gaps mentioned by respondents in earlier section.

Table 3: NCD Burden research prioritized by key informants and reasons for prioritization

No.	Research areas	Number of key informants giving priority (Total response = 26)
1.	Economic burden of NCDs	15
2.	NCD morbidity	13
3.	Cancer incidence	12
4.	Premature mortality from NCDs	10
5.	Cause of death studies	8
6.	Alcohol related morbidity and mortality	5
7.	COPD	1
8.	CVD	1
9.	Mental health	1
10.	RTA	1
11.	Diabetes and Cancer Registry	1
12.	Aging	1
13.	Intervention research	1

Reasons for prioritizing certain aspects of burden research included –

1. NCDs are common in the whole country.
2. NCD morbidity data can support the continued planning for NCD control programs.
3. NCD morbidity is easier to study and there could be a survey similar to STEP for 4 major NCDs which are considered best buys in terms of NCD support.
4. Premature mortality from NCDs should be prioritized because life expectancy of Myanmar is low.
5. To plan treatment and control measures of NCD
6. To calculate premature mortality, mortality from NCD to get full information
7. Half of hospital admission cases are due to snake bite and cause of death is due to snake bite. Cost of hospital admission is getting higher as well. Therefore, there is a need for policy and funding support to support this area.

With regard to behaviour risk factor research, a number of key informants prioritized tobacco use in adolescents, physical inactivity in adolescents and salt intake. In earlier section of the interview, some respondents mentioned research on “salt intake” should be done when interviewers explored the research and data needs on risk factor studies in Myanmar.

Table 4: NCD Behavioural risk factors research prioritized by key informants and reasons for prioritization

No.	Research areas	Number of key informants giving priority (Total response = 25)
1.	Tobacco use in adolescents	16
2.	Salt intake	14
3.	Physical inactivity in adolescents	13
4.	Tobacco use in adults	9
5.	Harmful use of alcohol: alcohol related morbidity and mortality	8
6.	Harmful use of alcohol: Adult per capita consumption	7
7.	Harmful use of alcohol: heavy episodic drinking	5
8.	Mental Health Study: Dementia, Stress & Depression	4
9.	Diet, Vegetable & oil consumption	2

Reasons provide by respondents included:

1. Behavioural risk factors are very common among adolescents, students and general population
2. To provide awareness among adolescents and general population
3. To do advocacy and to formulate measures to bring down behavioural risk factors

Among those who provided answers to the list of NCD biological risk factor research, more than half gave priority to overweight and obesity in adolescents. Some of them emphasized the need to conduct studies on raised blood pressure and raised blood glucose.

Table 5: NCD Biological risk factors research prioritized by key informants and reasons for prioritization

No.	Research areas	Number of key informants giving priority (Total response = 22)
1.	Overweight and obesity in adolescents	14
2.	Blood pressure: raised blood pressure	11
3.	Raised blood glucose/ diabetes	9
4.	Low fruit and vegetable consumption	6
5.	Overweight and obesity in adults	5
6.	Blood pressure: mean blood pressure	4
7.	Saturated fat	3
8.	Total cholesterol: raised	3
9.	Total cholesterol: mean	2

Reasons for priority included:

1. Biological risk factors become more prevalent in general public
2. To identify bottle necks to introduce measures to bring down these risk factors

Respondents thought that national system should give priority to respond to marketing to children of foods and non-alcoholic beverages, essential medicines and technologies for NCD and cervical cancer screening.

Table 6: National systems response to NCD prioritized by key informants and reasons for prioritization

No.	Research areas	Number of key informants giving priority (Total response = 23)
1.	Marketing to children of foods and non-alcoholic beverages	11
2.	Essential medicines and technologies for NCD	10
3.	Cervical cancer screening	9
4.	Drug therapy and counselling to prevent heart attacks and stroke	6
5.	Vaccination for HPV, Hepatitis B and palliative care	5

Reasons for priority included:

1. Marketing to children of foods and non-alcoholic beverages becomes a problem
2. High prevalence of hepatitis B, C and cervical cancer

7.12 Issues for the accomplishment of NCD research in Myanmar

This study also explored what key informants thought was absolutely and urgently needed to accomplish NCD research in Myanmar. Key issues highlighted by several respondents included policy and planning, funding, technical support, human resources, collaboration and coordination. There was also a need to increase community awareness on NCDs and to set up a research center to accomplish NCD research.

Many respondents perceived that policy, funding and human resource were equally important to conduct NCD research in Myanmar.

*“Financial, manpower, resources as well as cooperation and collaboration are needed and also demographical, geographical information and good transportation are needed. E.g. ; if we go to Chin State, we will need all information about it. I think central level needs to manage.”
Department of Public Health respondent*

“Policy support, technical support and funding support... all are important in parallel for the research activities.” University respondent

Policy and planning

Policy and planning were given as the first priority among respondents and majority of them strongly stated that without political commitments, nothing could be achieved. They perceived that

once there was commitment at national policy level, it would not be difficult to get funding. One respondent suggested that the Ministry of Health (MOHS) should take a leadership role on the prevention and control of NCDs, as it had done in the past with Maternal and child health, reproductive health and nutrition.

“Policy and planning are most important. If they are committed, funding can be applied. We can get technical support from international organization. If policy is not committed, we can do nothing.” NGOs/Foundations respondent

“I think Policy and Strategy are the most important. Without policy commitment, we could do nothing. Only when there is policy, funding will follow automatically.” Department of Public Health respondent

“For successful and sustainable development on NCDs, all factors (technical, policy, HR and funding) are important. But I want to prioritize political engagement.” MOHS respondent

“All are important, but policy planning is most important. It will be easy to collect data from whole country when we get the permission. Through policy planning we could coordinate with both local and international NGOs and we would have better coverage in implementations.” Department of Public Health respondent

“Proper action plan should be set up for 2016-2020. Otherwise we cannot reach these global targets in 2020 with current speed as usual. Government should strengthen its leadership role and MOHS should strengthen its advocacy to policy makers and Parliaments to achieve political commitment. MOHS should clearly direct stewardship instead of just focusing on Maternal and child health, reproductive health, nutrition, which had done in the past. A lot of people died from NCD due to negligence. NGOs/Foundation respondent

One respondent provided an example of tax policy on tobacco, alcohol and other non-alcoholic beverages.

“Government budget should be clearly allocated for NCD as separate individualized budget. Moreover, there should be dedicated funding or alternative funding. In other countries, there is ear marking of a tax or dedicated tax for unhealthy diet such as tobacco, alcohol, beer and soft drinks. Surcharge should be added on tax to make more revenue and that would make less usage of such products (by public). It does not work when they are put into the regular revenue. The surcharge of 1 or 2% should be transferred entirely to MOHS or NGO who is currently working on this area eg. People Health Foundation. Myanmar should learn the nature of other countries to provide revenue to MOHS.” NGOs/Foundations respondent

NCD policy

Few of the respondents were aware of NCD policy development. One respondent stated that it was still in the draft and not yet endorsed, but had been having multi sectoral meetings for 4-5 times in the drafting processing.

“Research formulates the NCD policy which is currently in draft and has not yet endorsed. There were multi sectoral meetings for 4-5 times for NCD policy in 2012. Multi sectoral means working with other ministries related to NCD and there were 4-5 ministries related to health. They all have to participate to finalize draft policy by coordination with parliament through National Health Committee, We need to work to get to certain level i.e., the level that could issue the policy officially.” Agency respondent

“Policy is important. NCD control program is life course approach that starts from prenatal. All of the population must be accessible for prevention and control program. There is already a policy statement that burden of NCD is reduced through life course approach and that statement will be included in the policy that is going to be approved.” Department of Public Health respondent

There were also a couple of respondents who stated that there was an NCD policy.

“There was already a commitment with regard to policy. I think we needed not only funds, but also human resources. Departments should be cooperated, too. Cooperation is required.” University respondent

“NCD policy is already developed and endorsed by National Health Committee.” NGOs/Foundations respondent

A couple of them added that a strategic action plan should be developed and the government needed to work accordingly.

“To make decisions, policy makers need to know how to plan for (prevention of) NCD (to go in-depth or details) after getting data from NCD STEP surveys.” MOHS respondent

“NCD policy is already developed and endorsed by National Health Committee. But it is weak in implementation. Nobody is interested including DGs from MOHS and permanent secretary and as a result there is no action. We already had strategic plan but we need to draw action plan which should be allied with global action plan.” NGOs/Foundations respondent

Funding

Some respondents stated that funding support was as important as policy. Currently there was a limited budget for NCDs which impacted on the NCD research that could be conducted. They argued that technical support could be received from international organizations but without sufficient financial support, neither research projects nor program implementation was feasible.

“If we get the human resource, we would still need technical training, research methodology and technical support. But I think we can request those support to international organizations such as WHO as it has experience of providing such support. Yet, they could not provide funding. That’s why if we could get funding for project wise and human resource, we could conduct many more NCD research. All in all, funding is the most important. If we get funding, we could do a lot.” University respondent

“Political commitment and funding is needed. Funding means budget. Why? Whole system can be moving only if the force of political commitment, policies, laws are leading. NCD programs are least funded ones so it cannot be implemented as much as we could. NCD could do a lot with much funding.” MOHS respondent

“The most important thing is financial support. Without financial support, we cannot proceed. Policy is important too.” University respondent

“The main thing is funding. If we have no budget, we can do nothing. Government gives grant to DMR, but budget is not enough so we need to compete for the projects at DMR to get funding from the WHO.” NGOs/Foundations respondent

Technical support

In parallel with policy and funding, technical support was also regarded as important to accomplish NCD research. Some of them firmly said that they would need technical support especially to set up a registry system or to do biomedical research on NCD

“I think it is the technical support is most important to do a survey properly. When we doing research, technical are also needed. When doing Biochemical research, equipment and reagent are needed. I think we may need the advance and updated technical support.” Department of Public Health respondent

“To set up the registry system, we first need the technical support and training from professional. I understood that we needed to set up a system including the computer networking system to implement the data registry system. Paper reporting cannot work out and data transfer from one place to another is more convenient with computerized system. The whole system should be adopted from foreign technical support and this is not the time to invent by its own. There are many organizations like WHO which is willing to support for technical assistant.” University respondent

“We need technical support e.g., for cancer registry. Although we have quite a lot of supporting agencies, we would still need technical support for higher-level measurements.” Department of Public Health respondent

Human resources

Few of them mentioned that additional human resources were urgently needed for NCD research. Respondents, particularly some research managers have specific management duties as clinicians as well as project managers. For them, without enough staff or without someone dedicated for their research project, they could not conduct research. Yet, if there were money and material support, manpower support could follow, revealed by respondents.

“We (project managers) have technical expertise but we do not have other staff to help us. We could provide advice and guidelines for intervention packages, but we could not get to the community level. For me, as I am very enthusiastic about research, I used my AS (Assistant Surgeons) for fieldwork and I also had to take support from other pharmaceutical companies. We want NCD Unit to lead NCD projects and to list all risk factors. We also want the unit to provide human resources to get to the field level. We preferred that we provide technical support in project implementation such as drawing guidelines for treatment and providing contents for pamphlets for the community. We could not reach to community level and NCD unit should have people who go to the community level. There is HE gap in the community. There is no awareness of risk factors.” Dept Public Health respondent

“We could not conduct research on CRD (Chronic Respiratory Diseases) because I do not have resource especially human resource. I alone cannot run the research project. Even for previous research, data collection was done by DMR mostly. Currently I do not have anyone helping me for data collection and there is no budget for supporting staff for research. I do not have my first assistant being appointed. If I were to conduct research, there would be missing out in my routine work management (clinical responsibilities).” Department of Public Health respondent

Collaboration and coordination

For some respondents, collaboration and coordination was also regarded as one of the factors for promoting NCD research. Currently, the clinical side and public health side conducted research by its own and sometimes their research findings were not shared each other. Even among NCD program managers who were clinicians, they do not collaborate or share the research findings. As a result, there were overlapping of research and research gap. A couple of respondents stated that higher-level authority should take the leading role for corporation and collaboration.

“The problem here is that we are working by silo approach. Instead of horizontal approach, we are using vertical approach, e.g., aging is working separately, DM is working separately and CA is working separately. We must go with horizontal and integrated approach.” NGOs/Foundations respondent

“There was already a commitment with regard to policy. I think we needed not only funds, but also human resources. Departments should be cooperated, too. Cooperation is required.” University respondent

“Only research is not enough to support the control program. We should let the program managers know the findings of the research so that they can use the information in the control program. There is useless if we don’t use the research findings properly. Research is useful only when they are being conducted in collaboration with researcher and program managers or when researchers could provide information to program managers.” University respondent

“For epidemiology survey, there is no cooperation between departments. Each department conduct researches and keep data separately and there is no sharing between each other. In my opinion, MOHS should take leading role in central level and combine all data. The main reason is weakness in collaboration and cooperation. For epidemiology level, national cooperation is needed. If not, we can’t get relevant data.” NGOs/Foundations respondent

“It can be achieved only the upper level of authorized person should consider/ cooperate with lower level technical persons. Nowadays, there is no collaboration that results in vain.” Department of Public Health respondent

Community awareness

One respondent claimed that community awareness on NCDs was also important in proceeding NCD research, its implication and project implementations. The community should understand about NCDs and they should be involved.

“Community needs to be aware of the importance of NCD and their risk and burden because incidence rate of NCD is getting high worldwide. Only when they recognize it, they would actively participate in either NCD research or NCD control program, Therefore, we need to increase health education to them and all sectors should be involved in providing health education to the public.” University respondent

Research center

One respondent highlighted that there should be a research center in the universities and that they should compile all NCD research. He also stated that Member of parliaments (MPs) were needed to lobby to conduct research for policy making.

“We should have the research center in the medical universities. We should keep/compile all the research that are being conducted on NCD rather than conducting new Nationwide study. We should also promote the grant application for NCDs from the university. In addition, we need to do lobby MPs to conduct research (for policy making).” MOHS respondent

8. Limitations

In reviewing the findings, a number of limitations of study need to be taken into consideration. In the first instance, the study included 29 key informants, however, it would have been potentially beneficial if it included additional respondents from the agencies (non-government). Secondly, few key informants were unable to share sufficient time to complete to full interview in-depth as

anticipated. Thirdly, only respondents from government (current and retired) were included although some of the respondents subsequently worked outside government.

The study took longer than expected because of the difficulties of finding time for all key informants.

9. Discussion

From this study, we identified the gaps in scope of NCD research and the issues encountered in conducting NCD research.

Findings show that respondents agreed with the current categories of chronic non-communicable diseases/conditions with shared modifiable risk factors and non-communicable disease/conditions of public health importance, according to priorities actions developed in National health Plan (2011-2016).

Respondents thought there was more NCD risk factor research than burden research in the country but when they reported the list of NCD research that they involved, we found more NCD burden research than risk factor research. This contradiction was probably due to some respondents not being able to provide the names of NCD research that they participated in and this study could not list the names of all NCD research involved by key informants.

STEPs surveys were regarded as comprehensive and they were highlighted as the only nationwide surveys. STEP surveys mainly measured magnitude of risk factors for NCD. Its sampling frame was appropriate since it was conducted according to the WHO guideline. Yet few respondents pointed out that STEPs surveys should also measure some key indicators on other NCDs such as cancers, COPD, mental health, injuries, and one of the major risk factors of hypertension in Myanmar, salt consumption. A recent study on prevalence of hypertension using 2009 STEPs results also highlighted that information about salt intake and analyses of lipid profiles should be included in further studies on NCD risk factors in Myanmar. For example, Ngapi, which is made by fermenting fish or shrimp and added salt, is a main ingredient in the majority of Burmese cooking. (Bjertness, Marius B. et al, 2016)

Except STEPs, other NCD surveys were perceived as small scale. Most of the NCD studies conducted by Department of Medical Research (DMR) were regarded as more academic orientated and molecular level rather than public health program perspectives. Those conducted at medical universities were also small scale as a part of master's course and sometimes they were not being shared with wider audiences. This information was found in agreement with another key finding of the study - weak dissemination of research findings, revealed by respondents while explored the issues of conducting NCD research in Myanmar.

Among major NCDs, respondents argued that diabetes and cardiovascular disease were paid more attention than cancer and chronic respiratory disorders.

With regard to burden research, respondents reported that they were aware of NCD research conducted on road traffic accidents, snakebites, deafness and blindness although there had been more limited research on snakebites in recent years compared to the past.

To increase understanding and to track trends of certain diseases, health registries were considered imperative. A couple of key informants said that they had recently started developing a cancer registry for Yangon General Hospital with the help from International Association of Cancer Registries and injury surveillance in 5 sentinel cities. These critical surveillance systems had started filling the research gaps that had not been existed in Myanmar. Figures in 2014 WHO cancer country profiles for Myanmar were estimated based on national incidence estimates and modelled survival and estimates from neighbouring countries since no mortality data and incidence data were available.

Findings show that morbidity and mortality surveys, economic burden studies, cancer registry and health registry were less common. For economic burden studies in particular, it was perceived that special technical skills were required and professionals from such area were limited in the country. According to the WHO's guide to identifying the economic consequences of disease and injury, economic impact studies in health can usefully contribute to health policy dialogue if undertaken in a defined manner with reference to a coherent set of conceptual foundations. It mentioned that too often in the past, however, studies have not been founded within a clear, logical framework, meaning that they produce results that can be misleading or spurious. Much greater attention is therefore called for when considering or planning an analysis of the economic impact of disease or injury. (WHO, 2009)

Respondents expressed their strong opinion on operational research related to NCD burden research. There was a need to develop and implement intervention programs and operational research can be used to assess whether a strategy is effective in addressing prevention and treatment of NCDs. This finding pointed out that there should be development of intervention package using results of previous studies and successful population interventions for NCDs. For example, a recent proposal of Myanmar Diabetes Care Model (MMDCM) for accessible and efficient provision of coordinated diabetes prevention and management services for both rural and urban areas throughout the country, which is based not only on the country specific situation especially health system, diabetes, NCDs epidemiology, and the need of the country but also on the literature review in particular on the best practices in the diabetes care and experience with PEN implementation in primary care in pilot townships. (Tint Swe et al, 2016)

Among NCD risk factor research, STEPs surveys were seen as representative for the whole country. Respondents thought it was high quality and measure the risk factors of major behavioural risk factors (tobacco use, harmful use of alcohol, insufficient physical activity and low consumption of fruit and vegetable) and 4 major biological risk factors (obesity, hypertension, raised blood glucose and abnormal lipid levels). It should be conducted 5 yearly to monitor the trends.

Similar to burden research, risk factor research on diabetes and hypertension were perceived as commonest among major NCDs. Yet, respondents still gave priorities for those two major NCDs when the interviewers later explored priority research areas to be conducted in the near future.

Tobacco research were viewed as stronger among risk factors of NCDs. Universities emphasized tobacco related research including smokeless tobacco and international agencies provided funding support.

Limited food related risk factor research e.g., dyes used in food and quality of street food, has been conducted in the country although there is an increasing trend in the consumption of unhealthy diets as a result of the country's transition and changing lifestyle practices. In addition, the National Food Law is weakly enforced. Respondents thought the risk factor studies should be conducted for different ethnic groups because their food habits varied widely across geographical regions. As mentioned earlier, studies on salt intake should be done which is the major risk factor of hypertension.

One respondent stressed that risk factor studies on taxation of alcohol and in-depth studies on the

reasons of increasing trend of smoking (in spite of the tobacco law) were needed. Enacted in 2006, the control of smoking and consumption of tobacco law included all forms of tobacco use – cigar and tobacco product. It is the primary law regulating smoke free places; tobacco advertising; promotion and sponsorship; and packaging and labelling and selling of tobacco products. Despite the law, smokeless tobacco use in Myanmar is the highest among ASEAN countries, according to the ASEAN Tobacco Control Atlas (Southeast Asia Tobacco Control Alliance, 2013). A review on published reports and documents, research findings and personal communication conducted in 2014 found that a variety of smokeless tobacco products used together with betel chewing posed a challenge and betel quid chewing usually starts at younger ages. Sale, marketing, and advertising of smokeless tobacco were not under control and thus, road-side kiosks selling betel quid with smokeless tobacco were mushrooming. There was a lack of research on smokeless tobacco products in Myanmar (T Sein et al., 2014)

With regard to the strengths of NCD research conducted in Myanmar, STEP surveys were conducted as per WHO guidelines and respondents perceived them as comprehensive, nationally representative and of high quality. Respondents also recognized the value of STEPs surveys and anticipated that they would conduct it periodically. In addition, Department of Medical Research (DMR) played a major role in conducting NCD research. Key respondents especially program managers received technical support from DMR and researchers were regarded as skilful. Although there are 3 DMR centers in Myanmar such as DMR (Lower Myanmar), DMR (Upper Myanmar), and DMR (Central Myanmar), respondents in this study referred only to DMR (Lower Myanmar) which is the oldest one and located in Yangon.

Weaknesses of NCD burden research highlighted by respondents included not having a separate Health Management Information System (HMIS) Unit under the Ministry of Health as before. The Health Management Information System (HMIS) facilitates data collection during health service delivery which is critical for tracking performance and trend analysis. The HMIS has the following categories of information: data on individual clients, information on curative services, information on preventive services, resource management e.g. inventories (staff list, health facility, equipment), logistics and commodities, finance / user fees and Village Health Teams (Integrated Community Case Management). The Ministry of Health Resource Centre is responsible for the collection, processing, analysis, and dissemination of national health data collected through the Health Management Information System (HMIS). The publication of the resource center's online quarterly report for July to September 2011 compiled as of 29th November 2011, which was probably the last publication available to the general public.

Another weakness of NCD burden research was limited technical skills and it was mentioned again as one of the issues and barriers to conducting NCD research in the country. Yet there were some respondents who were quite satisfied with the skill of researchers who conducted NCD research in Myanmar with limited resources.

One of the limitations of NCD risk factor research conducted in Myanmar was that there were some missing indicators in STEPs surveys. In addition, there were only limited NCD research using a qualitative methodology such as in-depth interviews and focus group discussions which could provide insight into the nature of the problems and give some ideas and recommendations for solutions.

The following table summarizes the issues and barriers to conducting NCD research in Myanmar and the action that key informants thought were absolutely and urgently needed to accomplish NCD research in Myanmar.

Issues and barriers	Urgently needed
Weak political commitment	Policy and Planning in support of NCDs
Low funding	Funding support
No HR	HR
Limited technical skill	Technical skills in some areas
Small scale	More representative samples
Weak collaboration	Collaboration and Coordination
Poor dissemination	Community Awareness, Research center at Medical Universities that compile all NCD research for better dissemination and utilization
Poor Utilization	Research center at Medical Universities that compile all NCD research for better dissemination and utilization

10. Conclusions

In Myanmar, non-communicable diseases are now being paid more interest than before but there remain gaps in certain areas of NCD research. Developing a research agenda for NCDs with different stakeholders from different departments within the Ministry of Health as well as with different ministries would certainly be useful for evidence-based decision making. Strengthening collaboration and coordination between different departments would also contribute to the use of research findings in program implementation. Findings from the STEPs surveys should be used for effective planning and program implementation and they should be conducted 5 yearly to observe trends. High salt intake is prevalent in the country and research should be conducted on salt consumption. There should also be operational research that helps planning for effective implementation of prevention programs as well as treatment programs. Key stakeholders strongly recommended studies on adolescents in regard to tobacco use, physical inactivity, overweight and obesity as well as on the marketing of foods and non-alcoholic beverages to children.

These findings point to a number of potential research areas of NCD prevention and control to support the NCD action plan and to develop evidence based policy briefs.

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12. Annex

Annex 1: Interview guide

Interview guide for

A study on perceptions of key respondents on the research gaps for NCD control in Myanmar

* Notes to the interviewer

- Introduce yourself on who you are, where you come from, your designation
 - Explain purpose of interview as “At present NCDs are quite common in Myanmar and cause a big social and economic burden to the people of Myanmar. As NCD problem is growing, an NCD unit has been established in the DPH, MOHS recently and many projects to control NCDs are being introduced by MOHS with the collaboration of various organizations such as Government Departments, UN Agencies and NGOs. As a support for effective implementation of these projects, we are conducting a research project that focuses on the identification of research gaps for NCD control in Myanmar. If you can spare a few minutes, we like to ask a few questions and discuss about NCD research.”
 - In this study, we like to know about the research conducted on NCD burden such as NCD morbidity, mortality, disability and economic loss and NCD risk factors such as tobacco use, physical inactivity, harmful use of alcohol, raised blood pressure, raised blood glucose, overweight and low fruit and vegetable consumption.
 - Request the respondent to read the informed consent and if he/she agrees, request for sign. Then start the NCD interview by asking the following questions
- (1) What do you think about the current list of NCDs in Myanmar (4 major NCDs and other NCDs of public health importance)? Interviewer to show the list of major and minor NCD and ask whether the respondent agree or not? (Interviewer also ask whether the respondent want to add more or subtract to/from the list.)

Tables on list of NCDs

	Four major non-communicable diseases	Y/N
1	Cardiovascular disease	
2	Diabetes Mellitus	
3	Cancer	
4	Chronic respiratory disorders	

	Non-communicable diseases of public health importance for Myanmar	Y/N
1	Accidents and injuries	
2	Disabling conditions (Blindness, Deafness, Community based rehabilitation)	
3	Mental Health	
4	Substance abuse	
5	Snake bite	
	Other chronic conditions and diseases	Y/N
6	Renal	
7	Endocrine	
8	Neurological	
9	Haematological	
10	Gastroenterological	
11	Hepatic	
12	Musculoskeletal	
13	Skin	
14	Genetic disorders	
15	Oral diseases	
16	Others (Specify)-----	

Is the list useful for introducing control programs of NCDs in Myanmar? Why and why not?

(2) What is your view on conducting NCD research in Myanmar?

Probe -

- a. Do you think NCD research is helpful or not helpful in implementation of NCD control projects?
- b. If you think it helps, how and which type of NCD research helps?
- c. If you do not think it helps, why?
- d. For your current position or organization, what is the value of NCD research? Is it of high or low value and why?
For the country, what is the value of NCD research? Is it of high or low value and why?

(3) Have you ever conducted or involved any research on NCD within last five years from now? If you conducted or involved, please describe **number and list of NCD research** you have done.

(Probe – Interviewer must probe NCD research conducted by respondent as much as possible and construct a list of NCD research done by title and year using table format)

- Is these research that you have done still useful for Myanmar at this time? Why?

Table 1. List of research conducted or participated in the past five years

Sr. No. (1)	Title of the research (2)	Year (3)	Burden/Risk factor (4)	Key NCD research or not (Yes or No) (5)	Scale of the research (national/regional/small scale) (6)	Role (PI/Co-investigator or other research scientist) (7)	Department or agency that principally executed the research (8)	Department or agency that funds the research (9)	Published or disseminated or both (10)	Way of dissemination (11)	Who attended the dissemination? (from different dept. INGO etc.) (12)

- (4) Please use the list of NCD research in the Table (1) to ask the following questions on each NCD research conducted or participated:
- i. Among the studies you have involved, which studies are key for burden and risk factors of NCDs?
 - ii. What is the scale of these researches? Is it national or regional or small scale (e.g., only one or two townships)?
 - iii. Were you a research scientist or other professional when you participated in these key researches? If you participated what is your role (Principal investigator or Co-investigator or other) in the research?
 - iv. Which department or agency principally executed these researches? Which department or agency collaborated?
 - v. Which organization supported funding for the research?
 - vi. Had research been published or not? If research had not been published, why?
 - vii. Have you done dissemination of research findings? How?
If disseminated through workshop or seminar, who attended the workshop or seminar?

* Firstly, I would like to ask you some questions on NCD burden studies.

- (5) In your opinion, what is the **scope of research that had been conducted for the burden of NCD** in Myanmar? From last five years till now, is there any research conducted on burden of NCDs such as premature mortality from NCD, NCD morbidity, cancer incidence and cause of death studies and economic burden of NCDs.
- a. Do NCD burden studies focus only on four major NCDs i.e. CVDs, Diabetes, Cancer and COPD only or other NCDs such as injuries, deafness, blindness, snakebite etc.? If this type of study is conducted, is it national or regional or small scale?
 - b. Does these NCD burden research have any influence on the program or project implementation or funding support? If yes, why and how? If no, why and how? NCD burden
 - c. What are the strengths and weaknesses of the NCD burden research undertaken in Myanmar at the current time?
 - d. What do you think of capacity of researchers conducting these types of studies? Are their capacities adequate or not? Why?
 - e. What do you think the situation and interest of funding by agencies with regard to NCD burden studies? Why?
 - f. Among the research done for burden of NCDs in Myanmar (i.e. surveys (NCD morbidity and mortality, cancer incidences, cause of death studies, economic burden assessments) which research is most common and why? Which research is least common and why?
 - g. What are your conclusions or remarks in relation to research on burden of NCDs? Is there any gap in burden of NCD research? If there is research gap, what are they? Why?
- In your opinion, what type of information do you need in order to make decisions on your program?

* Now, I would like to ask you about the NCD risk factors studies in Myanmar.

- (6) In your opinion, what is the **scope of research that had been conducted for the risk factors of NCD** in Myanmar? From last five years to now, is there any research conducted on risk factors of NCDs such as 1) behavioural risk factors- tobacco use, harmful use of alcohol, physical inactivity, high salt intake, etc.; and 2) biological risk factors- raised blood pressure, raised blood glucose/diabetes, overweight and obesity, saturated fat intake, low fruit and vegetable consumption and raised total cholesterol?

- a. Do NCD risk factor studies focus for four major NCDs i.e. CVDs, Diabetes, Cancer and COPD only or other NCDs such as injuries, deafness, blindness, snakebite etc.? If this type of study is conducted, is it national or regional or small scale?
- b. Does the risk factor research have any influence on the program or project implementation or funding support? If yes, why and how? If no, why and how?
- c. What are the strengths and weaknesses of the risk factor research undertaken in Myanmar at present?
- d. What do you think of capacity of researchers conducting these types of studies? Are their capacities adequate or not? Why?
- e. What do you think the situation and interest of funding by agencies with regards to NCD risk factor studies? Why?
- f. Among the research done for risk factors of NCDs in Myanmar (i.e. NCD risk factor surveys, surveillances) which research is most common and why? Which research is least common and why?
- g. What are your conclusions or remarks in relation to NCDs risk factor research? Is there any gap in NCD risk factor research? If there is research gap, what are they? Why?
- In your opinion, what type of information do you need in order to make decisions for your program?

(7) Could you describe your experiences of participation in NCD research? Please mention good experiences as well as bad experience.

- a. Based on your experiences can you explain in detail on the **strength that favour NCD research** such as good support from policy level, high capacity of researchers, sufficient funding, good dissemination mechanisms etc.?
- b. Based on your experiences can you explain in detail on the **issues and constraints that hamper NCD research** such as low political support, inadequate expertise, insufficient funding, poor dissemination mechanisms etc.? How can we overcome these issues and constraints?

(8) What will be the **key research priorities of NCD** that could/should be carried out in Myanmar in the near future? Please describe types of studies as well as areas of studies?

- a. What will be the **key research priorities of NCD burden research** that could/should be carried out in Myanmar in the near future? (Record the respondent's answer first.)

Then ask the respondents to identify key research priorities from the lists below.

	Burden (Mortality and Morbidity)	Identify
1	Premature mortality from NCDs	
2	NCD morbidity	
3	Cancer incidence	
4	Cause of death studies	
5	Economic burden of NCDs	
6	Alcohol related morbidity and mortality	
7	Others (Specify)-----	

Why do you think those NCD burden research should be given priority?

b. What will be the **key research priorities of NCD behavior risk factor research** that could/should be carried out in Myanmar in the near future? (Record the respondent's answer first.)

Then ask the respondents to identify key research priorities from the lists below.

	Behaviour risk factors	Identify
1	Harmful use of alcohol: Adult Per Capita consumption	
2	Harmful use of alcohol: heavy episodic drinking	
3	Harmful use of alcohol: alcohol-related morbidity and mortality	
4	Physical inactivity in adolescents	
5	Physical inactivity in adults	
6	Salt intake	
7	Tobacco use in adolescents	
8	Tobacco use in adults	
9	Others (Specify)-----	

Why do you think those NCD behavior risk factor research should be given priority?

c. What will be the **key research priorities of NCD biological risk factor research** that could/should be carried out in Myanmar in the near future? (Record the respondent's answer first.)

Then ask the respondents to identify key research priorities from the lists below.

	Biological risk factors	Identify
1a	Blood pressure: raised blood pressure	
1b	Blood pressure: mean blood pressure	
2	Raised blood glucose/diabetes	
3	Overweight and obesity in adolescents	
4	Overweight and obesity in adults	
5	Saturated fat	
6	Low fruit and vegetable consumption	
7a	Total cholesterol: raised	
7b	Total Cholesterol: mean	
8	Others (Specify)-----	

Why do you think those NCD biological risk factor research should be given priority?

d. What will be the **key research priorities of national system response research** that could/should be carried out in Myanmar in the near future? (Record the respondent’s answer first.)

Then ask the respondents to identify key research priorities from the lists below.

	National Systems Response	Identify
1	Drug therapy and counselling to prevent heart attacks and stroke	
2	Essential medicines and technologies for NCD	
3	Palliative care	
4	Elimination of trans-fats	
5	Vaccination for HPV	
6	Marketing to children of foods and non-alcoholic beverages	
7	Vaccination for Hepatitis B	
8	Cervical cancer screening	
9	Others (Specify)-----	

Why do you think those research on “National System Response” should be given priority?

(9) What is absolutely and urgently needed to accomplish NCD research that you see is much needed? Why?

Annex 2: List of designations of respondents with affiliated institutions

	Designation	Name of the institution/Department/Organization
	NGOs/Foundations	
1	President	Myanmar Oncology Society (MMA)
2	President	Myanmar Diabetic Society
3	President	Liver Foundation
Ministry of Health and Sports		
4	Director (Research)	Department of Food and Drug Administration
5	Director (Epidemiology Division)	Department of Medical Research
6	Deputy Director, NCD Unit	MOHS
Medical Universities and Public Health University		
7	Rector	University of Public Health
8	Director (Admin)	University of Public Health
9	Lecturer, Department of Medical Education and Information Communication Technology	University of Public Health
10	Lecturer, Department of Medical Education and Information Communication Technology	University of Public Health
11	Lecturer, Department of Occupational and Environmental Health	University of Public Health
12	Professor (Preventive and social medicine)	University of Medicine I
13	Professor (Medicine)	University of Medicine I
14	Professor (Medicine)	University of Medicine II
15	Professor (Preventive and social medicine)	University of Medicine II
16	Consultant Physician	GI, University of Medicine II
17	Professor and Head of Medicine (Retired)	University of Medicine II
Department of Public Health		
18	DyDG	Disease control Division
19	Director	Nutrition Division
20	Director	NCD Division
21	Project Manager (Accident)	NCD Division
22	Project Manager (Cardio Vascular Diseases)	NCD Division

23	Project Manager (Chronic Respiratory Diseases)	NCD Division
24	Project Manager (Snake Bite)	NCD Division
25	Project Manager (Cancer)	NCD Division
26	Project Manager (Mental Health)	NCD Division
27	Project Manager (Occupational and Environmental Health Division)	NCD Division
28	Project Manager (Health Promotion)	NCD Division
Agencies		
29	National Professional Officer	WHO

Annex 6: Key NCD policies and strategies underpinning evidence needs

Policy/strategy document	Summary of key priorities identified
<p>Myanmar NCD policy – strategic action areas</p> <p>(Ministry of Health in draft)</p>	<p>The Myanmar NCD policy (currently in draft) outlines a number of strategic action areas. Key areas identified in the policy include: advocacy to ensure prioritisation of NCDs in national health and development agenda; health promotion and risk reduction in key behaviours associated with the major NCDs including reductions in tobacco use, harmful levels of alcohol drinking and positive impact on diet, physical activity and other healthy behaviours. The need to reduce air pollution is also recognised though only household level is identified [check this]. To complement these behavioural practices, strengthening the health system for prompt detection and management of NCDs and associated risk factors is also recognised as key. Finally strengthening monitoring, evaluation and surveillance are also highlighted.</p>
<p>National interventions based on global “best buy” interventions</p> <p>(GMF, 2011)</p>	<p>The 2011 First Ministerial conference on healthy lifestyles and NCDs identified a number of “best buys” for tackling NCDs. The interventions identified are considered “to offer significant public health impact and be suitable for scale up in resource poor environments”. The best buys concentrate on known behavioural risk factors including tobacco use and harmful use of alcohol, unhealthy diets and inactivity, and specific interventions for cardiovascular disease, diabetes and cancer.</p>
<p>National targets based on NCD global monitoring framework</p> <p>(WHO, 2013b)</p>	<p>The NCD Global monitoring framework contains a range of indicators (with definitions) which countries can use to set national targets to suit their context and particular challenges in addressing the NCD burden.</p> <p>These indicators are grouped into a number of areas:</p> <ul style="list-style-type: none"> • Outcomes: • Behavioural risk factors • Biological risk factors • National health system response

<p>WHO's priority areas for NCD research at the national level (WHO, 2011)</p>	<p>The Key WHO priority areas for NCD research is a detailed document providing a comprehensive review of priority research for each of the major NCDS – CVD, cancer, diabetes and chronic respiratory diseases. Priority research identified in these areas includes country specific information on risk factors and disease burden and well as research on economic and social costs. In addition research on different single and combination interventions to address diseases including the cost-effectiveness of different interventions is identified. Priority areas include research on key risk factors related to several conditions including tobacco control, nutrition, physical activity and obesity. Research on the inter-relationships between these risk factors and poverty and environment is also highlighted as well as cross-cutting domains such as a primary health care approach to prevention and control of NCDs and the social determinants of NCDs. The need to monitor the role of genetics is also given mention. Finally the need to research how evidence is used in decision-making to promote policies and programmes for the prevention and control of NCDs is highlighted in the priority list.</p>
<p>New SDG3 targets at the national level (WHO, 2016)</p>	<p>The SDGs have expanded the range of priority issues that countries are focusing on post-MDGs. The new targets have important implications for the prevention and control of NCDs. Four targets have been articulated under SDG3 which focus on reducing mortality from NCDs and promoting mental health; strengthening the prevention and treatment of substance abuse, halving global deaths from Road Traffic Accidents (RTAs) and reducing deaths from hazardous chemicals, air pollution and soil contamination.</p>
<p>PEN interventions (WHO, 2010)</p>	<p>The WHO package of essential (PEN) interventions to address non-communicable diseases is a package of prioritised interventions to address the main NCDS which are cost-effective and affordable in all contexts, including those with limited resources. Myanmar has piloted a package of essential interventions in 2012-2013 providing a useful basis on which to develop a programme across all 330 townships.</p>

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