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Health Research Priorities in Malaysia for the 10th Malaysia Plan (2011 – 2015)

EXECUTIVE SUMMARY

National health research priorities in Malaysia reflect the unique characteristics of the health sector. The primary goal of the health sector is to improve the health and quality of life of the people of Malaysia. This, in turn, would enhance their productivity and competitiveness, thereby contributing to the economic development.

The purpose of identifying health research priorities is to facilitate research that provides information and evidence to support the primary goal of the health sector. Such research outputs would improve the health status and the delivery of health care in Malaysia. Health research primarily aims to bring social benefit. In this respect research in the health sector differs, for example, from research and development (R & D) for industry where the primary focus is on innovative technology that has commercial value. Only some research in health technology might have a direct commercial value, but they are primarily valued for the health benefit they bring to Malaysians.

The selection of priority areas or domains for health research was guided by information/evidence requirements related to two fundamental principles. First, is the role of the health sector in achieving the national Vision 2020, and more immediately the goals of the 10th Malaysia Plan. Second is the continuing need to promote wellness and to reduce the burden of disease among Malaysians.

The Role of the Health Sector

The 10th Malaysia Plan (10MP) is the five-year road map (2011-2015) of developmental strategies for achieving the national aspirations articulated in Vision 2020. The country is attempting to achieve 'advanced nation' status by 2020. In relation to health, it is envisaged that "An advanced nation is not solely about the income level. ... Good healthcare and social support will be measurable through higher life expectancy and a superior standard of living. The benefits of these improvements will be accessible to all communities and income groups"¹ In this context, the 10MP envisages "*transforming health care to improve quality and provide universal access*"². The Country Health Plan 2011-2015³ defines four strategies for this purpose, namely

¹ National Economic Advisory Council. 2010. *New Economic Model for Malaysia*. Federal Government Administrative Centre. Putrajaya Malaysia.

² Economic Planning Unit. 2010. *Tenth Malaysia Plan 2011-2015*. Prime Minister's Department. Putrajaya. Malaysia.

- Establish a comprehensive **healthcare system** & recreational infrastructure
- Encourage health awareness & **healthy lifestyle** activities
- **Empower** the community to plan or implement individual wellness programmes (responsible for own health)
- Transform the health sector to increase the efficiency and effectiveness of the delivery system to ensure **universal access**.

The thrust of these strategies is to promote wellness rather than merely deal with illness; and to transform health care delivery to meet the needs and growing aspirations of the community and yet be affordable to individuals and society.

Priorities for Health Research

Research that addresses critical gaps in information and evidence to support these strategies will be priority research.

However, while promoting wellness, the health sector has to continue dealing with illness. In order to improve health status, the **burden of disease** among Malaysians needs to be tackled. Burden of disease refers to illness, death or disability from illness. The leading contributors to the burden of disease in Malaysia are dengue, obesity, cancer, cardiovascular disease, diabetes, chronic lung diseases, trauma due to accidents, tuberculosis and HIV/AIDS, and emerging health issues among adolescents. For most of these conditions, there is considerable knowledge on effective interventions. However, research is needed to provide evidence to fill gaps in knowledge on how best to apply such interventions in the Malaysian context. Similarly, in relation to **health technology**, there are critical gaps in knowledge. For example, there are issues related to the safety and use of traditional and complementary medicine (TCM); need for newer diagnostic tools pertinent to Malaysians for some conditions such as cancer, dengue, drug resistance, mental health; and need to adapt existing technology to the Malaysian context. Examples are coordination in the use of information technology, and adaptation of some prostheses.

The 10MP also defines strategies for **environmental protection and conservation**. Since environment hazards have serious impact on health status, this too is a priority area for health research.

In summary the, **priority research** in the health sector would address critical gaps in evidence and knowledge in:

³ Ministry of Health. 2011. *Country Health Plan 2011-2015*. Bahagian Perancang dan Pembangunan, Kementerian Kesihatan Malaysia. Putrajaya.

1. Improving the quality of, and access to **Health Care** (through improved service delivery; governance; financing; human resources for health; and health information)
2. Promoting a **Healthy Lifestyle** (focusing on knowledge and perceptions; obesity and diet; exercise; and smoking.)
3. **Empowerment** of (a) vulnerable groups such as teens, children and pregnant women; (b) the community regarding the use and misuse/overuse of health care including available health services, medication, traditional and complementary medicine; healthy lifestyle; and (c) the community to contribute towards a sustainable environment.
4. Further prevention and reduction in the **Burden of Disease** through improved detection, monitoring, management, prevention and delivery of health care for the leading contributors to the Malaysian burden of disease.
5. **Environment:** detection of environmental health hazards in Malaysia; and development of specific environmentally healthy spaces.
6. Development or adaptation of **health technology** to respond to specific Malaysian situations and conditions.

Transparency and Inclusiveness In the Selection of Research Priorities

In the past, the choice of research areas often has been guided mainly by the personal interest of researchers or of managers of research funding agencies. These interests might not be aligned to the information needs that are perceived by clinicians, health care managers and policy makers and consumers of health care. This has resulted in many research findings “ending up on the shelf” and wasteful use of research funds. In order to address this gap between research and the use of research results, the Ministry of Health (MOH) has evolved a process for selecting health research priorities. This process was used initially for the 9th Malaysia Plan (9MP) and a later chapter provides a summary of the priorities and priority research funded by the research grant to the MOH in the 9MP.

The process is transparent. Priority areas for research are identified by review of existing national and international literature to determine critical gaps in evidence or knowledge in the priority areas. The process is also inclusive. It involves a wide range of stakeholders. Although led by experts in the respective topics, the process involves mixed groups of researchers, policy makers, clinical practitioners from the public and private sectors and academia, managers at different levels of the health care system and from related sectors, and community representatives. All these stakeholders provided their knowledge, perceptions and judgments on

- The magnitude or severity of a problem in the priority area
- Its economic importance
- The expected impact of research, and
- The feasibility of research to be complete within the 10MP period

The stakeholders participated in group exercises to rank order the selected research areas, and thereby select the priorities for research.

The health research priorities that emerged from this process are summarized in the Table 1.

The research priorities identified through this process will guide the use of the Research Grant of the Ministry of Health. The rationale for identification of each priority area is elaborated in the detailed tables provided in later chapters. Potential researchers are encouraged to use the rationale to shape their research proposals. This would facilitate the subsequent application of their research results. Researchers are also encouraged to improve the focus of their research by identifying the specifics of information or evidence that is required to improve health care or behavior and empowerment of the Malaysian community.

Table Executive_ 1: Indicative areas for priority research in the health sector during the 10th Malaysia Plan (2011-2015)*

Research domain	Research areas	Indicative Priorities for research
Improving the quality of and accessibility to health care	Health service delivery	Accessibility for vulnerable or remote groups
		Efficiency and effectiveness
		Quality of care
		Role of NGOs
		Health needs assessment
	Human resources for Health	Quality of training & competency
		Specialist manpower needs & roles
		Primary care needs
		Brain drain
		Foreign contract doctors
	Health care financing	Affordability
		Costs of health care
		Cost benefit/cost- utilization of services; economic modeling
		Provider behaviour
	Governance	Service contracting
		Health regulation
		Health planning
		Organizational structure
	Health information	Health information management
Quality of information systems		
Research domain	Research areas	Indicative Priorities for research
Promoting a healthy lifestyle	Lifestyle	Exercise
		Stress management
		Health literacy
		Diet and Nutrition
		Obesity

	Adolescent health	
	Smoking	
Empowerment	Adolescents	Teenage pregnancy
	Children & young people	Children's rights
		Infant and young child feeding & oral health
	Women	Maternal Mortality & oral health
	Adults	Healthy lifestyle
		Burden of Disease
		Use and misuse of Medication
Use & misuse of health services		
Sustainable environment	Development of healthier environments	Children's health, built environment
		Indoor quality
	Health hazards arising from pollution	Industrial air emission
		Water related
		Motor vehicle
	Technology	Cost of 'green' technology in health care
	Food	Consumer food safety
		Supplements and organic foods
		Processed food
		Livestock
		Zoning regulations & violations
	Land and soil	Land use effect on health
Health impact of pollutants from soil		
Further reduce burden of illness and shift to prevention & wellness model	Diabetes	Genetic factors, behaviour, delivery and monitoring of care,
	Mental health	Prevention (epidemiology, identification of vulnerable groups for early intervention), Monitoring & evaluation of interventional strategies, Training,
Research domain	Research areas	Indicative Priorities for research
Further reduce burden of illness and shift to prevention & wellness model	Cardiovascular disease	Economic & social cost, behaviour and empowerment strategies,
		Congestive heart failure, Valvular disease and heart rhythm disease: epidemiology, diagnostic & therapeutic strategies
	Trauma and injuries	Road traffic accidents: monitoring trends, improved injury management; rehabilitation. Injuries among

		children	
	Obesity	Determinants, monitoring, economic impact, evaluation of intervention strategies	
	Metabolic syndrome	Evaluation of interventional and service delivery strategies	
	Tobacco control		
	Women's health	Cervical cancer, maternal mortality	
	Nasopharyngeal cancer	See later chapters for details	
	Oral cancer		
	Oral health		
	Adolescent and Elderly Health		
	Chronic lung disease		
	Nutrient disorders		
	And several others		
Health Technology	TCM		See later chapters for details
	Use of ICT		
	Improved information systems		
	Improved diagnostic tools		
	improved prostheses		

*The research grant of the Ministry of Health will focus on the priority areas. Other institutions that fund health research are encouraged also to focus on the priority areas.

INTRODUCTION

Setting priorities for health research is essential to maximize the impact of investments in research. Health research priority setting processes assist researchers and policymakers in effectively targeting research that has the greatest potential public health benefit.⁴ In general, the primary aim of health research is to improve the health status of the population and to improve the quality and delivery of health care that is affordable and accessible. In order for this to happen, research outputs should be relevant to the requirements of the health system and be valued by potential users who might be policy makers, health care managers, clinical practitioners or consumers who are individuals and communities. Health research might not have a direct marketable commercial value. However, it should have a high social value.

While there is international consensus on the need for priority setting, there is no consensus on the best methodology for doing it. Several different approaches have been used to set priorities. All of them have a common feature of being transparent and inclusive. Researchers as well as potential users of research outputs are involved in the process.

For more than a decade, Malaysia has recognized the need for priority setting in health research and has taken a leading role in applying various methods at a national level. The priority setting exercise for the 10th Malaysia Plan builds on the experience gained in previous years and in particular the priority-setting exercise of the 9th Malaysia Plan. The priorities provide guidance for the allocation of research grants from the funds allocated to the Ministry of Health (MOH). For a few selected priority areas, MOH with inputs from experts from other institutions also prepared Letters of Intent (LOIs) to facilitate researchers to focus on the priority topics. Table Introduction_1 gives a summary of the 9MP priorities and the alignment of LOIs and research projects that were funded. Universities and other institutions also do have research grants that support health research. However, information is not available at present on the alignment of such research to the national priorities.

Table Introduction_1: Health Research Priorities in 9MP

⁴ Roderik F Viergever et al. 2010. A checklist for health research priority setting: nine common themes of good practice. <http://www.health-policy-systems.com/content/8/1/36>

Priority areas based on the 9MP Thrust		
Reduce Burden of disease	No. of Projects	No. of LOI
Cardiovascular disease & stroke	5	1
Cancer	31	10
Infectious diseases	35	16
Road traffic accidents	1	1
Mental illnesses	4	4
Diabetes Mellitus	14	10
Respiratory illness	4	4
Enhance service delivery		
Strengthen health policy and systems	106	26
Develop medical technology	25	0
Improve Pharmaceuticals and medical devices	36	7

National Health Research Priorities For The 10th Malaysia Plan

The fundamental principles and development policies as articulated in the Government Transformation Programme (GTP)⁵, the New Economic Model⁶ and the 1Malaysia concept guided the preparation of the 10th Malaysia Plan (10MP)⁷. Those principles and policies as well as the objectives and strategies outlined in the 10MP were the foundation for selecting health research priorities. The 10MP envisages “*transforming health care to improve quality and provide universal access*”. The Country Health Plan 2011-2015⁸ defines four strategies for this purpose, namely

- Establish a comprehensive **healthcare system** & recreational infrastructure
- Encourage health awareness & **healthy lifestyle** activities
- **Empower** the community to plan or implement individual wellness programmes (responsible for own health)
- Transform the health sector to increase the efficiency and effectiveness of the delivery system to ensure **universal access**.

⁵ Jabatan Perdana Menteri. 2010. Program Transformasi Kerajaan. Pelan Hala Tuju. Percetakan Nasional Malaysia Bhd.

⁶ National Economic Advisory Council. 2010. New Economic Model for Malaysia. Part 1. Strategic Policy Directions. Percetakan Nasional Malaysia Bhd.

⁷ Economic Planning Unit. 2010. Tenth Malaysia Plan 2011-2015. Prime Minister's Department.

⁸ Ministry of Health. 2011. *Country Health Plan 2011-2015*. Bahagian Perancang dan Pembangunan, Kementerian Kesihatan Malaysia. Putrajaya.

The thrust of these strategies is to promote wellness rather than merely deal with illness; and to transform health care delivery to meet the needs and growing aspirations of the community and yet be affordable to individuals and society.

However, while promoting wellness, the health sector has to continue dealing with illness. In order to improve health status the **burden of disease** among Malaysians needs to be tackled. Burden of disease refers to illness, death or disability from illness. Identified as a priority for the 9MP, burden of disease continues as a research priority in the 10MP. Similarly, **health technology** was a priority in the 9MP and continues as a priority in the 10MP since there are critical gaps in knowledge. The 10MP also defines strategies for **environmental protection and conservation**. Since environment hazards have serious impact on health status, this too is a priority area for health research.

In summary the, **priority research** in the health sector will address critical gaps in evidence and knowledge six areas as listed below:

1. Improving the quality of, and access to the **Health Care** (service delivery; governance; financing; human resources for health; and health information)
2. Promoting a **Healthy Lifestyle** (knowledge and perceptions; obesity and diet; exercise; and smoking.)
3. **Empowerment** of (a) vulnerable groups such as teens, children and pregnant women; (b) the community regarding the use and misuse/overuse of health care including available health services, medication, traditional and complementary medicine; healthy lifestyle; and (c) the community to contribute towards a sustainable environment.
4. Further prevention and reduction in the **Burden of Disease** through improved detection, monitoring, management, prevention and delivery of health care for the leading contributors to the Malaysian burden of disease.
5. **Environment:** detection of environmental health hazards in Malaysia; and development of specific environmentally healthy spaces.
6. Development or adaptation of **health technology** to respond to specific Malaysian situations and conditions.

Each of these areas is elaborated in subsequent chapters.

CHAPTER 1: METHOD

The research priority-setting process for the 10th Malaysia Plan period (2011-2015) (10th MP) was informed by a similar effort carried out for the 9th Malaysia Plan period (2006-2010) (9th MP) and by Oxman *et. al*/ who recommended consultation with relevant stakeholders, explicit criteria, systematic and transparent processes, open to inspection and documentation for setting priorities.

Leadership for the research priority setting was provided by the Director-General of Health Malaysia. The process began with the commissioning by the Deputy Director-General of Health (Research and Technical Support) of a task force, led by the Director of the Health Systems Research Institute, one of the institutions under the umbrella of the National Institutes of Health (NIH). This task force comprised of the secretariat of the NIH, key representatives of all the institutes under the NIH and two of the main players in the first priority-setting exercise carried out in the 9th MP period. The task force planned, coordinated and implemented the priority setting process in a series of stages.

Stage 0: Pre-prioritisation Stage

This task force pre-identified domains requiring research, searched for relevant input documents as well as identified and recruited members deemed suitable to deliberate on each of the domains. The domains were based on objectives of the 10MP as well as experience from the 9MP the chairpersons for all the domains were agreed upon and notified, during which time they were provided with their terms of reference. The chairpersons were chosen amongst MOH personnel who the task force felt were experienced and able to lead the domain groups.

Stage 1: Research Areas Identification Stage

In Stage 1, participants developed a comprehensive list of all possible research areas for their respective domains. They identified the national problem each raised, the questions each was expected to answer, the scope of the research, the knowledge gaps and needs in each of the areas as well as the expected output.

On completion, the lists for each of the domains were placed on the MOH web-site with an invitation for additional inputs (Annex 1.), to be forwarded, by a stipulated deadline, by all visitors to the site. This was an attempt to incorporate wider societal values and priorities.

Simultaneously, the lists were e-mailed to heads of programmes in the Ministry, state health directors, Heads of all Technical Working Groups for 1CARE, the Health Promotion Board and

relevant clinicians (through e-mail group networks). Other recipients of the e-mails are listed in Annex 1.. To ensure that the research area lists were exhaustive, to prevent unnecessary duplication, minimise skewness of scope, foster ownership resulting in better chances for successful implementation, extra care was taken to consult multi-sectoral and multi-disciplinary individuals and agencies of differing expertise and geographical representations.

All inputs were incorporated into the final list, either as new research areas or as sub-sets of areas already available in the initial list.

Stage 2: Scoring and Ranking Stage

In Stage 2, the scoring and ranking of the research areas were carried out. The criteria used for ranking were:

- Magnitude and/or severity of the problem
- Economic importance
- Impact of the research output
- Feasibility of the research

Each of these criteria was given a score of 1 to 10 by the participants of each group. The combined or overall score was calculated. The overall score of all topics were then ranked. For each research areas, the maximum number of rank was 9. The criteria for scoring, their definitions and respective weights, as decided by the task force, are illustrated in Annex 1..

The list of research areas were distributed to all participants and the respective guides (Annex 1.) were also handed to the chairpersons, moderators and all members.

Stage 3: Ratification Stage

All the research priority lists were presented to the Director-General of Health for ratification and endorsement and subsequently the final documents were placed on the web-site of the NIH Secretariat as a guide for research to be conducted over the following five years for the 10th MP.

Annex

Annex 1.1: Format for Identification of Areas Requiring Research – obtaining feedback from a wider audience

IDENTIFICATION OF AREAS REQUIRING RESEARCH

No.	Group	A	B	C	D	E	F
		National Problems (Document referred to)	What do you need to know?	Research Scope	Gaps & Needs (Rationale)	Suggested Research Areas	Expected Output
1							
2							
3							
4							

References:

1	
2	

Guide to Completing this Format:

1. For each section, identify issues of concern that requires research/evidence to help in achieving the goals for that section, in line with the 10th Malaysia Plan/National Agenda for Malaysia
2. For each issue, complete a row
 3. For each issue, complete in the above format as in the other documents (in pdf for the 6 groups)
 4. Please make sure that **ALL** columns are completed
 5. Please insert the references you have referred to in the References table.

Thank you for your contribution.

Annex 1.2: Non-MOH Sources Consulted Regarding the List of Research Areas

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Annex 1.3: Criteria for Scoring and Ranking

HEALTH RESEARCH PRIORITY SETTING -10 (HRPS-10) CRITERIA FOR SCORING AND RANKING

Criteria	MAGNITUDE AND/OR SEVERITY OF PROBLEM	ECONOMIC IMPORTANCE	IMPACT OF THE RESEARCH OUTPUT	FEASIBILITY OF THE RESEARCH
Clarification/ Explanation	• Does the issue have a high incidence/prevalence?	• Will the problem incur a high cost to the health service? (to rectify/solve)	• Can the solution or clarification of the problem lead to development/improvement that will strengthen national health development?	• Are there sufficient research capability and capacity so that the issue can be addressed with confidence?
	• Is the problem severe (mortality, morbidity, quality of life)?	• Is there a strong probability of the research/output having a high commercial value?	• Will the research lead to the development of new scientific knowledge and/or adaptation of knowledge to various national contexts?	• Is there a strong probability that research could be conducted within the 10th MP period (2011-2015)?
	• Will the issue have a significant impact on the current and future health status?	• Will the research be able to avert/reduce a high cost to the health service?	• Are there means available to ensure that any benefit arising from the research as a particular issue can be translated into desired (health) outcomes?	
			• Will the research strengthen human resources in research and development in our country through national capacity building?	
Additional Words used for Clarification				

Annex 1.4: Guides for Chairpersons, Moderators and Participants

Guideline for Chairperson

1. Set the scene for the HRPS-10. Inform the group that:
 - This research priority setting is for the nation, not merely for MOH
 - The output expected: scores for each area, and ranked list of areas
2. Clarify the following:
 - Focus the scoring on the research area (column E)
 - Scores are relative to other research areas
 - Criteria are fixed, and need to be understood prior to scoring
3. Remind all group members to review all the research areas prior to the start. Each research area is to be scored relative to other research areas. One hour is provided for this (8.30-9.30 am, with running tea).
4. The moderator will display all the criteria, their details and the respective weights.
5. Starting with the **first** criterion, invite the group to ask questions and clarify if in doubt.
6. The moderator will display the list of research areas to the respective group members.
7. Starting from the first research area, invite the group to score based on the first criterion.
8. If different scores are proposed, invite each of the 'scorers' to give his/her rationale for the score he/she had proposed. This is for group deliberation.
9. If it is felt that the 'scorer' has misunderstood the research area, provide/ask for clarification.
10. The 'scorer' may then decide to propose a different score or agree with the score proposed by others.
11. If different scores are still being proposed, invite the group members to vote on the scores.
12. Group members may refrain from voting on any research area/criteria.
13. The score with the highest vote will be taken as the score given against the indicated criterion for that research area.
14. If a tie occurs in the highest vote, the mean of the two scores could be taken.
15. Once a score has been allocated to a research area, emphasise that that this score is relative to the other research areas.
16. For the scores of the first few research areas, anchor the group members that these scores are relative to the scores given earlier.
 - If, the same score given (e.g. a "9" for research area # 1 and a "9" for research area # 2 means both areas are considered of equal importance for this criterion.
 - Probe the group, "Are we sure"?
 - If the scores differ (compared to previously scored research areas), probe "Are we sure"?

17. The process is repeated for every research area.
18. Once all the research areas have been scored against one criterion, re-start the process with the **next** criterion.
19. Do this until all the research areas have been scored against all criteria.
20. The moderator will then show the computed total scores and the ranks for all research areas.
 - Ranking is based on the total scores.
 - The minimum score possible (“A” e.g. 40) is subtracted from the maximum score achieved (“B” e.g. 220). This is then divided by 9, as the ranks to be allocated are to be only from 1 to 9.
 - Hence, for each additional score of “(B-A)/9”, the ranks will change by 1 rank according to this additional score.
 - In the event there are no areas for a particular rank, a lower ranked area will then assume the “missing” rank. All other lower ranked areas will then move up accordingly.
21. The prioritisation process is complete.

Note: The moderator will ‘hide’ all other criteria and scores while the scoring process for one criterion is carried out.

Guideline for Moderator

1. Insert all the research areas into the excel format.
2. Display the criteria and the corresponding explanation, to the group members (sheet: Criteria).
3. If there are additional words/terms used to help clarify a particular criterion, add these word(s) into sheet “Criteria” at the relevant criterion section (in “Additional Words used for Clarification”).
4. Display the list of research areas to the respective group members (sheet: Grp_XXX).
5. Once the scoring and voting process for one research area against one criterion is complete, key in the score for each row, for that particular criterion.
6. Ensure that the correct scores are keyed in and in the correct cells.
7. When all the research areas have been scored against all criteria, the computed total scores will appear. Sort the file according to the total scores column, in descending order.
8. Rank the total scores.
 - Ranking is based on the total scores.
 - To calculate the Rank Interval, key in the maximum and minimum values into the excel file.

- The minimum score possible (“A” e.g. 40) is subtracted from the maximum score achieved (“B” e.g. 220). This is then divided by 9, as the ranks to be allocated are to be only from 1 to 9.

$$\begin{aligned}\text{Rank Interval} &= (\text{Maximum} - \text{minimum}) / 9 \\ &= (B-A) / 9\end{aligned}$$

- Hence, for each additional score of “(B-A)/9”, the ranks will change by 1 rank according to this Rank Interval.
- Key in the ranks for the corresponding scores in the Consensus Rank column (Column L).
- In the event there are no areas for a particular rank, a lower ranked area will then assume the “missing” rank.

9. Show the total scores and the ranks for the research areas.

Guideline for Group Members

1. Please note the following:
 - This research priority setting is for the nation, not merely for MOH
 - The output expected: scores for each area, and the ranked list of areas
2. In the group work later, you will be required to score all the research areas against the criteria provided.
3. Please read the list of research areas carefully.
4. Take note of all the criteria and the respective weights for each of them.
5. You may wish to do a preliminary scoring for all areas.
6. During the group work:
 - The Chair will explain the criteria.
 - You may add additional words/terms to help clarify the criteria.
 - Starting with the first criteria, you will be asked to score the research areas as a group
 - A group consensus will be sought for.
 - You may refrain from voting on any research area/criteria.
7. Score each research area relative to other research areas. Please note that:
 - If the same score given (e.g. a “9” for research area # 1 and a “9” for research area # 2 means both areas are considered of equal importance for this criterion.
8. Once all the research areas have been scored against one criterion, the process will restart with the **next** criterion.
9. A ranking of all the research areas will be carried out, based on the total scores.

CHAPTER 2: HEALTH SYSTEMS

Introduction

The World Health Organization (WHO) defines health systems as “*all the organisations, institutions, and resources whose primary intent is to promote, restore or maintain health.*” This definition includes the full range of players engaged in the provision and financing of health services including the public, private, voluntary and not-for-profit organisations.

Health systems have multiple goals. The World Health Report 2000 defined overall health system outcomes or goals as: improving health and health equity, in ways that are responsive, financially fair, and make the best, or most efficient, use of available resources. There are also important intermediate goals: the route from inputs to health outcomes is through achieving greater access to and coverage for effective health interventions, without compromising efforts to ensure provider quality and safety.

Guided by these documents, the national problems for priority areas were organised into five key functions of the health systems: (1) service delivery (2) governance (stewardship) (3) manpower (human resource), (4) financing and health economics, and (5) information.

Health services are the most visible part of any health system, both to users and the general public. Good health services are those which deliver effective, safe, high quality care to those that need it, when needed, and with minimal waste. Effective health service delivery depends on having key resources which include trained personnel, adequate devices, good infrastructure and information. Many questions remain about how to improve the organisation and management of health service delivery so as to achieve better outcomes.

The governance function reflects the fact that people entrust both their lives and their resources to the health system. The government has to play the role of a steward, because it makes regulations that govern the operation of health services. The MOH develop, implement and enforce health sector policies to improve the health system performance.

Human resources involve the recruitment, training, deployment, and retention of qualified personnel. WHO noted that human resources are the most important part of a functional health system and the lack of human resources in health will lead to serious implications for the health goals.

Health financing is a key determinant of health system performance in terms of equity, efficiency and quality. Health financing encompasses resource mobilisation, allocation, and distribution at all levels. Understanding health financing can help answer questions on financial protection, equity of access and efficiency of the health systems.

Health information system (HIS) in many countries suffers from poor management and insufficient resources. HIS is an essential part of health management and a vital component of the health system. The main aim of information is to inform and guide decision making. The lack of capacity in measurement and analysis of health information are well-known constraints to national policy-making and resource allocation.

Priority Areas for Health System

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Financing	Affordability	There are gaps in care for vulnerable groups and persons not able to cope with finance for catastrophic events. Current GDP spent on health care. Income per capita. Out of pocket spending by public by population groups. Size, location and coverage of health services for vulnerable group.	Accessibility & affordability of care from user perspective. Including barriers to user and focus on vulnerable groups (LSEC, children & elderly, disabled, etc) & catastrophic events (e.g. cancer)	Understanding of health care users purchasing power and improving equity of access to services for different population groups	1
		Not aware of public capacity and willingness to pay for HC services. Limited data on out-of-pocket spending by public by population groups.	Health care users willingness to pay for healthcare/pre-pay mechanism	Understanding of health care users quantum/level of willingness to pay for specific benefit packages	3
	Costing	limited costing data on delivery of health care	Cost analysis in delivering health services (ambulatory care, transportation, in-patient care, non-hospital based specialist care, etc). Focus on actual quantum for services (including direct non medical costs (patient's costs)	Cost analysis data by services to be used in health care planning, budgeting and reimbursements.	2
Health Economics	Economic evaluation	Limited information on cost-benefit/cost-utility	Economic evaluation of selected health interventions/programmes/drugs (primary, secondary, tertiary). Focus is on value for money.	Providing cost-benefit evidence for decision making	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Health Economics	Economic modeling / projections	Limited understanding of economic growth and sustainability	Project economic growth and sustainability for health sectors.	Projected growth for planning	9
		Lack of data to predicting the costs and outcomes of intervention/healthcare programme.	Health economic modeling for cost effectiveness/benefit studies	Models to assist decision maker in making decision.	5
Governance	Contracting	Current outsourced support services have not fully achieved expectations and uncertain if value for money (cost effectiveness).	Capacity of MOH to monitor and enforced contractual services with special reference to major outsourced services (drug purchase, engineering services, support services, etc)	Improved capacity of MOH to use outsourced services effectively. Better utilisation of money spent on services. Improved functioning of outsourced services.	2
	Health planning	International literatures suggest that many Ministries of Health do not fully utilise evidence for health planning.	To evaluate the degree/level of evidence utilisation by MOH in planning and decision making (e.g.. manpower, hospital beds, norms, etc). Search for available methodologies (systematic review) for evidence based health planning for 21st century (bed numbers, planning services, norms, etc).	New innovative ways of health planning for 21st century	4
		International literatures suggest that many Ministries of Health do not fully utilise evidence for health planning.	Evaluation of existing research output translated into policy. How useful has the research been, how much has been used, how much has it affected or transformed policy?	Methodologies to improve mechanisms of translation of research into policy. Strengthen partnership between managers needing evidence and researchers providing it.	6

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Governance	Health planning	International literatures suggest that many Ministries of Health do not fully utilise evidence for health planning.	Development of monitoring mechanism to monitor and capture the impact of 'Knowledge Translation' and utilization of research.	System (web-based) for project management and knowledge translation activities	8
		Public not fully involved in health care transformation process. People centered care.	Public views, acceptability development of intervention and strategies to buy in stakeholders for health care reform	Facilitate implementation of healthcare reform initiatives/policies.	4
	Health regulation	Private Healthcare Facilities and Services Act recently enforced and needs evaluation.	Impact of Private Healthcare Facilities and Services Act on delivery of services (Evaluating implementation, enforcement, private service providers perspective, benefits to consumers of health care)	Input to assist revision of Private Healthcare Facilities and Services Act. Suggestions on better implementation, enforcement of the act.	5
		Geographical mal-distribution of infrastructure and services with lack of equity.	Mechanisms to regulate service development by private and public healthcare (e.g. How to decide where to build a clinic/hospital)	Tools to improve regulate and distribute service development/ delivery by private and public healthcare. Improved equity of services.	3
Organization structure	To meet current and future challenges of transforming health care system. Strengthen MOH roles as health regulator.	Review & reorganization of MOH operating system. A critical evaluation of existing work culture, management structure, regulations, legislations, etc.	Improved functioning of organisation to meet health challenges for 21st century and offer ideas for organisational transformation	6	
Information	Data management	Require additional on-going data for health management planning. Improve reliability of existing data.	Review of data management and collection in MOH and private facilities with a view to transform data quality and data capture	Improved data capture systems that allow better and faster decision making by managers	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			mechanisms		
Information	Quality of IT	Health IT systems recently introduced widely and need evaluation.	Quality of current health IT systems. Evaluate the implementation, quality & reliability of clinical data when compared with old systems, etc.	Improved implementation and use of health IT systems.	3
Manpower	Brain drain	Migration is an international issue. Need to understand and develop strategies to retain and attract manpower.	Adapting to the challenges of migration and reverse migration of trained HC personnel	Understanding of migration trends and reasons to enable managers to plan for manpower needs	8
	Primary care needs	Meeting RM 10 targets for health promotion, prevention, and community involvement. Primary HC expected to be gatekeeper to curative care.	Identifying the optimal ratio between primary care vs. hospital manpower needs	Enable managers to project and plan for manpower needs	3
	Quality of training / competency	Rapid expansion/output of HCP graduates. Concerns about quality of training and competency.	Auditing of training and student qualification for medical graduates and other health professionals	Enhance the quality of medical graduates and health professionals entering the health service	1
	Remuneration	Limited evidence to show influence of direct payment on HCP behaviour.	Impact of payment & payment method on behaviour of healthcare provider	Facilitate implementation of healthcare reform initiatives/policies.	7
	Specialist manpower needs	Loss of generalist manpower internationally & nationally. Need to reverse trend to meet HC delivery needs.	Identifying the optimal ratio between generalist vs. sub specialist manpower needs (hospital, primary care levels)	Enable managers to project and plan for manpower needs	3
	Specialist manpower roles	International trend & mechanism for health transformation. Overcome hospital - health barrier for patient centred care.	Extension of specialists' roles to encompass prevention/primary care.	Better utilisation of trained manpower to achieve health transformation goals. Health care cost reduction by promoting prevention	8

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				strategies.	
Manpower	Specialist manpower roles	Concern over quality of care provided by foreign contract doctors	To evaluate the quality of HC provided by foreign contract doctors.	Allow managers to have a critical evaluation of benefit and weakness of this policy and strengthen initiatives.	8
Service delivery	Accessibility of care	Concern that vulnerable groups not receiving optimal care.	Accessibility of care from user perspective. Including barriers to user and focus on vulnerable groups (poor, disabled, marginalised, remote rural, urban poor etc)	Improve accessibility and equity in health care delivery	2
		Limited dental care services for adults, population with special needs (elderly, HIV patients and indigenous populations of Sabah and Sarawak) and marginalised groups.	Evaluation of dental services - focus on accessibility and utilization of services by adults and population with special needs. Look at current services, barriers, impact and manpower needs.	Improvement and expansion of dental services especially for adults and population with special needs without compromising current services for children.	8
		Need for government support for NGOs to play a more effective role in supporting health services. NGOS are untapped resource for health care/health promotion.	Role of NGOs as healthcare providers to compliment MOH services (1 care) - focus on financial sustainable support for NGO services	Improved, sustained NGO involvement in health services	4
		Existing services for remote rural population limited and challenging. Help meet NKRA targets under rural basic infrastructure development programmes.	Development of services in remote rural population and urban poor. Focus on strengthening village healthcare workers programme, MOH involvement in these underserved populations	Improve accessibility and equity in health care delivery. Achieve MDG4/5 goals.	3

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Service delivery	Efficiency & effectiveness	In line with national transformation agenda (GTP/ETP) all programmes require evaluation to assess impact and value.	Evaluate the impact of service provision and programme delivery (public and private). This is at programme level.	Strengthen and revision of existing MOH programmes.	2
		To ensure success of the national transformation agenda (GTP/ETP).	Pilot projects on health sector reform. Initiatives to test models of care that allow for seamless services that benefit all populations.	Facilitate implementation of healthcare reform initiatives/policies.	4
		Concern that initiatives to retain medical manpower have compromised quality of health care provided, including equity and access.	Impact/effect of MOH initiative to encourage retention of HCP (private wing/full paying patients/locum etc) on manpower, services, equity and accessibility	Allow managers to have a critical evaluation of benefit and weakness of this policy and strengthen initiatives	5
		In line with national transformation agenda (GTP/ETP) all programmes require evaluation to assess impact and cost benefit analysis.	Impact of health tourism on equity and accessibility on local HC. Focus on benefits/disadvantages to local HC and country. Including opportunity to enhance health tourism	Allow managers to have a critical evaluation of benefit and weakness of this policy and strengthen initiatives.	6
		To look at the extent of integration of private - public HC services. To improve communication between private - public HC services and optimally utilise services.	Public /private referral - effectiveness and efficiency of referral systems. Benefit of referral services to HC user.	Strengthen mechanisms of referral (transparency, ease). Facilitate implementation of healthcare reform initiatives/policies.	7
	Efficiency & effectiveness of HC programme &	1Malaysia clinic recently introduced and require evaluation.	Evaluation of impact of 1Malaysia clinic (concept, quality, delivery, etc). Evaluate the effect of these clinics on health care services in	Allow managers to have a critical evaluation of benefit and weakness of this policy and strengthen initiatives.	4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	services		the area and health outcomes.		
Service delivery	Efficiency & effectiveness of HC programme & services	To prepare local HCP to face impending challenges of globalization	Potential impact of external health care forces on Malaysian HC services (globalization of HC services). The role and effect non-Malaysian health care providers and services may have on local service	Allow managers to have a critical evaluation of benefit and weakness of this policy and strengthen initiatives.	9
	Health need assessment	Limited involvement and input of end users and their perspective of HC in the planning and development of the health care services in the country. Meeting RM 10 direction where designing of services must be around people.	User's perspective of health care systems (what HC users want). Focus on service delivery mechanism, unmet needs, barriers, vulnerable groups.	Improve accessibility and equity in health care delivery. Facilitate implementation of healthcare reform initiatives/policies.	5
	Quality of care	Need to harness the potential of NGOs and community groups, to participate and expand role in managing selected chronic diseases.	Assess capacity and capability of communities (NGOS, community groups) to manage selected chronic diseases (e.g.. HIV, mental illness)	Strengthen Community/NGO capacity and involvement in health services	4
		Concern about quality of care, efficiency and value for money for service provision for user.	Evaluation of quality of care at public & private; primary care & hospital. This is at provider level. Evaluate appropriateness of care, consequences, technology used, and manpower qualification preference of HC user.	Identifying gaps in care. Standardising and balance care to meet optimal norms (best evidence). Equity of care.	3
Service delivery	Quality of care	Health care users not able to discriminate from various "health" products/services and need guidance. Promote good	Role of HC providers in educating HEALTHCARE users on best care/best medicine.	Strengthen health education and anticipatory guidance.	5

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	Efficiency & effectiveness	standards for quality health care Limited knowledge on how efficient our public hospitals are in improving health care. Need to be efficient in managing resources in impending health sector reform.	To assess the performance of public sector hospitals in terms of efficient use of resources.	Hospital performance - efficiency of public sector improving health care	2

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CHAPTER 3: HEALTHY LIFESTYLE

Introduction

The lifestyle of a particular person or group of people is the living conditions, behaviour, and habits that are typical of them or are chosen by them. Behaviour refers to the way a person does things whereas habit refers to something that is often or regularly carried out by a person. Putting all these terms together in the context of a '*healthy lifestyle*', they refer to how people live or the manner in which they conduct their lives which can influence their health status and well-being. Healthy habits and behaviours that characterise the daily, normal lives of people can be imposed on persons through social norms, peer pressure, regulations or adopted by them voluntarily.

Many people in modern, sophisticated and affluent societies such as ours have developed unhealthy lifestyle practices due to several factors such as rapid development, economic progress resulting in people having more disposable income, automation, sedentary lifestyle, easy availability of fast food and unhealthy substances and also the influence of advertising and peer groups. Consequently, we are now experiencing a rising trend of unhealthy lifestyle practices among our population which increases the risk of getting diseases like cardiovascular, hypertension, diabetes and cancer which pose a real and significant threat to Malaysia.

In Malaysia, the Healthy Lifestyle Campaign has been introduced by the Ministry of Health since 1991 as a recognition of the important role that lifestyle plays in health and disease. The time has now come for us to review our progress thus far, and plan towards further improving the health status of our population and expanding the scope of disease prevention and control, while maintaining current preventive strategies such as promoting the practice of healthy lifestyles and regular screening as well as early risk factor identification and modification.

Priority Areas for Healthy Lifestyle

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Sedentary lifestyle	Understanding of the current situation and factors affecting physical inactivity	With the advent of technological advances, Malaysians lead a largely sedentary lifestyle and consequently higher rates of obesity. There is a need for in depth understanding of the current situation and factors affecting physical inactivity	1.1 Promoting physical activity through : 10, 000 steps/ per day	Input for the programme development and evaluation of active lifestyle of the population.	3
Sedentary lifestyle	Understanding of the current situation and factors affecting physical inactivity	With the advent of technological advances, Malaysians lead a largely sedentary lifestyle and consequently higher rates of obesity. There is a need for in depth understanding of the current situation and factors affecting physical inactivity	1.2.1 What Kind of messages touch people heart: Touch messages e.g.: Walking is Cheap (CNN Heroes) 1.2.2 Factors influencing physical activity level of population. - Effect of work hours on opportunity for physical activity and exercise. 1.2.3 Types of exercises and do it right for different age group. 1.2.4 Factors contributing to sustainability of continuous physical activities.	Input for the programme development and evaluation of active lifestyle of the population.	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Overweight and obesity	Psychosocial aspect of obesity	Psychosocial of obesity in Malaysia need to be assessed Public perception of health in relation to obesity influences the success of obesity prevention and management	2.1.1 Psychosocial factors and quality of life in obese 2.1.2 Perception of obesity 2.1.3 Cultural and social influences on obesity and body image	Improve programmes	2
Overweight and obesity	Dietary intake, appetite control and eating behaviour	Eating behaviour especially higher consumption prevent weight gain. Improper weight loss methods may lead to yoyo effect on body weight during night-time and dieting may affect energy intake. Psychological mechanisms influencing eating may help maintain appropriate body weight	2.2.1 Night eating behaviour and syndrome and its relationship with obesity 2.2.2 Identification of psychological mechanisms influencing eating behaviour 2.2.3 Relationship between stress and eating behaviour 2.2.4 Dieting behaviour and body weight of adolescent and young adults	Improve programmes comprehensive picture of the situation	2
Overweight and obesity	Dietary intake, appetite control and eating behaviour	Eating behaviour especially higher consumption prevents weight gain. Improper weight loss methods may lead to yoyo effect on body weight during night-time and dieting may affect energy intake. Psychological mechanisms influencing eating may help maintain appropriate body weight	2.3.1 Survey of weight loss method being practised by Malaysian population 2.3.2 Health supplement use in weight reduction	Improve programmes comprehensive picture of the situation	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Overweight and obesity	Dietary intake, appetite control and eating behaviour	Eating behaviour especially higher consumption prevents weight gain. Improper weight loss methods may lead to yoyo effect on body weight during night-time and dieting may affect energy intake. Psychological mechanisms influencing eating may help maintain appropriate body weight	2.4.1 What kind of novel intervention to change people behaviour toward controlling body weight.	Improve programmes comprehensive picture of the situation	3
Smoking among adolescent and adult	Anti-smoking campaign	prevalence among adolescent still increasing in spite of Anti-smoking campaign and enforced policies by the government e.g. tobacco products tax, loose pack, regulation and etc.	3.1.1 Evaluation the effectiveness of various anti smoking campaign - Silent messages - empower passive smoker (hand sign) - persepsi/effective or not	to improve campaign strategies	6
Smoking among adolescent and adult	Smoking behaviour	prevalence among adolescent still increasing in spite of Anti-smoking campaign and enforced policies by the government e.g. tobacco products tax, loose pack, regulation and etc.	3.2.1 Factors that influencing smoking behaviour	To improve/ develop anti-smoking programme	6
Smoking among adolescent and adult	Smoking behaviour	prevalence among adolescent still increasing in spite of Anti-smoking campaign and enforced policies by the government e.g. tobacco products tax, loose pack, regulation and etc.	3.2.1 Factors that influencing smoking behaviour	To improve/ develop anti-smoking programme	6

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Smoking among adolescent and adult	Quit smoking services	prevalence among adolescent still increasing in spite of Anti-smoking campaign and enforced policies by the government e.g. tobacco products tax, loose pack, regulation and etc.	3.3.1 Public awareness on quit smoking services	To improve the availability, accessibility and quality of quit smoking services	5
Smoking among adolescent and adult	Quit smoking services	prevalence among adolescent still increasing in spite of Anti-smoking campaign and enforced policies by the government e.g. tobacco products tax, loose pack, regulation and etc.	3.3.1 Public awareness on quit smoking services	To improve the availability, accessibility and quality of quit smoking services	5
Stressful lifestyle	Stress management skills	Stress related problems increased.	4.1.1 Population skills in managing stress.	Specific programmes for stress management	3
Stressful lifestyle	Stress management skills	Stress leads to social problem/ risk behaviour.	4.2.1 Stress related risk behaviour. E.g. Ideation of Suicide	Specific programmes for stress management	1
Health literacy	Health Literacy relating to Healthy Life Style	Tool for assessing HL not available in the Malaysian context.	5.1.1 Development of health literacy tool appropriate for Malaysian population.	standard HL measurement tool to assess general HL	1
Health literacy	Health Literacy relating to Healthy Life Style	Data on HL not available.	5.2.1 HL related to healthy life style among population. 5.2.2 HL related to healthy life style among patient.	5.2.1 Data on HL among population 5.2.2 For future programme planning	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Lack of public interest on MOH website services (Infosihat, e-learning , telehealth and MyHealth)	6.1.1 Health information delivery through various type of New Media 6.1.2 evaluation of MOH web based health information	No base line information on the web base health information seeking	6.1.1 Evaluation of MOH web based health information (Infosihat, e-learning , telehealth and MyHealth) 6.1.2 Health seeking information among internet user through MOH website.	For future programme planning	7
Improper food intake and unhealthy dietary practices across the lifespan	7.1.1 Behavioral factors influencing Improper food intake and unhealthy dietary practices 7.1.2 Effective method in promoting food intake and dietary practices	The baseline data important for needs assessment and decision making process (policies and programmes)	7.1.1 Evaluation of risk behavior and socio economic factors on food consumption 7.1.2 Determination of factors affecting the risk behavior on dietary pattern and physical activity 7.1.3 Determination of effective method in promoting dietary practices by age groups 7.1.4 Carbonated drinks intake among children and adolescents 7.1.5 Meal pattern and food intake among urban community	7.1.1 Needed for an effective programme planning especially for non-communicable diseases control and prevention. 7.1.2 Ensuring proper planning, implementing, coordinating, monitoring and evaluation of the programmes and projects	1
Improper food intake and unhealthy dietary practices across the lifespan	Behaviour modification in management and maintenance of normal body weight	No data base. The baseline data important for needs assessment and decision making process (policies and programmes).	7.2.1 Behaviour modification on the management and maintenance of normal body weight 7.2.2 Barriers in the management and		4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			maintenance of normal body weight		
NUTRITION (Diet related non-communicable diseases)	Evaluation of the intervention programmes in different settings (community, institution, workplace & school)	8.1.1 Ineffectiveness of current intervention programmes in reducing prevalence of NCD 8.1.2 Poor understanding on the roles of psychosocial factors, perception, optimistic bias, motivators and barriers for behavioural change 8.1.3 Inadequate published data on the effectiveness of nutrition promotion	8.1.1 Role of mass media and inter-personnel communication in delivering and influencing dietary and lifestyle behaviour in the general population and specific target groups such as children, adolescents and elderly 8.1.2 Identification, implementation and evaluation of psychosocial factors including theories in reducing prevalence of diet-related NCD	to improve current nutrition promotion programme in relation to NCD	1
Professional Well-being in relation to Occupational Health Related Problems in Public Dental Facilities ¹⁸	To assess the prevalence and risks in relation to occupational health aspects.	Few studies on Occupational Safety and Health (OSH) among dental personnel in developing countries.	Epidemiological and KAP studies Evaluation of Healthy Lifestyle Campaign in schools: PROSTAR & Doktor Muda programmes - tengok negara yang rendah % merokok kenapa terutama di kalangan remaja? Sexual practices among the adolescents	Baseline data for surveillance of occupational health and recommendations for healthy and safe working environment	3

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CHAPTER 4: EMPOWERMENT

Introduction

The term empowerment covers a vast landscape of meanings, interpretations, definitions and disciplines ranging from psychology and philosophy to the highly commercialised self-help industry and motivational sciences (from Wikipedia, the free encyclopedia).

Empowerment for health is a process in health promotion through which people gain greater control over decisions and actions affecting their health and lead a socially and economically productive life. (WHO, 1998)

The committee which consists of policy makers, physicians, allied health workers and researchers (refer list of contributor) had identified the national problems for health research priority setting for 10-MP under 'empowerment'. These are issues related to teenage pregnancy, lack of policy for paediatric palliative care, unvoiced needs of children, maternal mortality, infant and young child feeding and health system in relation to empowerment, healthy lifestyle, burden of disease covering communicable and non-communicable diseases, knowledge of drugs and utilisation of traditional & complementary medicine, empowerment for better oral health, misuse or overuse of healthcare system and sustainable environment.

Priority Areas for Empowerment

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Burden of Disease , Non-Communicable Diseases	To identify factors / barriers influencing the health seeking behaviour	High prevalence of NCDs	To identify and establish training programmes targeting health care provider and patients to overcome identified factors or barriers	Empowerment of both the healthcare providers(HCP) and patients/community	4
	To empower people to practice healthy living i) Physical activity II) coping with stress III)Refrain from smoking and substance abuse To evaluate life style practice	Malaysian Adult Nutrition Survey 2003 noted findings of sedentary lifestyles, inactivity and inadequate exercise among Malaysian adults. 85.7% of Malaysian adult reported to be inactive physically during leisure time There is a need to empower the people to achieve and maintain a healthy body weight 11.2% of the adult population (18 years old and above) in Malaysia have some form of psychiatric morbidity The recent data showed 21.5% of Malaysian is smokers. Initiation age had reduced from 19.9 years (NHMS II, 1996)to 18.6 years (NHMS III, 2006) therefore we have to empower the youth not to smoke.	To identify the barriers in practicing healthy living a)exercise b)physically active To identify the effective strategies in empowering the community to practice healthy living a)exercise b)physically active c)smoking & substance abuse d)coping with stress To evaluate the existing healthy lifestyle campaign Strategies to integrate physical activities into daily life (workplace, home, anywhere)	Supportive environment	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		Only 35.8% were knowledgeable of Sexually Transmitted Infection symptoms			
Burden of Disease , Non-Communicable Diseases	To assess the individual / community readiness to change	High prevalence of NCDs	to assess the individual / community readiness to change		9
	To assess the effectiveness of the current interventions/programmes	Younger age of onset	To assess the effectiveness of the current interventions/programmes		8
			Intervention studies- to study the utilisation of existing health facilities		9
	Community trial of the suggested new approach	higher rates of complications & late presentation of patients with complications of NCDs	To develop new approaches in management of NCDs to reduce the rate of complications and late presentation		2
Burden of Disease- Communicable Disease	To identify factors / barriers influencing the health seeking behaviour	Rising prevalence	To identify factors / barriers influencing the health seeking behaviour		5
Burden of Disease- Communicable	To evaluate life style practice	Younger age of onset	To evaluate life style practices among the population (at risk)		7

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Disease	To assess the individual / community readiness to change	Rising trend among females	to assess the individual / community's readiness to change		9
	To assess the effectiveness of the current interventions/programmes	New emerging diseases	To assess the effectiveness of the current interventions/programmes		8
	Community trial of the suggested new approach		To develop new approaches in management of CDs to reduce the rate of complications and late presentation		3
Entire cardiovascular disease spectrum, specifically on patients with this condition	Health promotion issues Behavioural research, and how direct patient empowerment will impact CV health outcomes	As CV disease impacts many young patients, and predominant family breadwinners, empowerment of patients to participate in the management of CV disease becomes more significant.	Subclinical disease phase Acute disease phase Chronic disease phase Heart failure disease phase	Empowerment of patients to management their CV disease could improve their quality of lives and/or clinical outcomes	2
Empowerment for better oral health in children and women	To determine parental perceptions towards child's oral health. To identify predictors for dental caries in		Parental perceptions towards different aspects of their child's oral health To determine parental perceptions towards child's oral health. KAP studies To identify predictors for dental caries in children.		4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	children.				
Empowerment for better oral health in children and women	To investigate the association between PLBW and Periodontal disease.	Need for improved uptake of oral healthcare services during pregnancy Important to empower parents as they are primary care givers. Reduce oral disease burden in children	To investigate the association between PLBW and Periodontal disease. Intervention studies	Recommendations to augment existing policies for empowering ante-natal mothers, parents and care-givers towards better oral health.	6
Oral cancer (under burden of disease)	Awareness of Mouth self-examination among Empowering individual to perform mouth self-examination	The 6th most common cancer in the world 80% of the Oral Cancer Detected at late stage. reduce Quality of life of oral cancer patient	Evaluation of the effectiveness for Mouth self-examination among Malaysian population Awareness of oral cancer among high risk group	To increase the number of early detection of oral cancer lesion	5
Healthy Lifestyle	To empower people to practice healthy eating	Prevalence of obesity and NCDs is on the rise –1996: Obesity 4.4%, DM 8.3%, HPT 29.9%. 2006: Obesity 14%, DM 14.9%, HPT 32.2% There is an urgent need to empower the community	Health literacy among the community on healthy eating To identify the barriers in practicing healthy eating To identify the effective strategies in empowering the community to practice healthy eating To identify the supporting environment to promote healthy eating a) knowledge, understanding and able to interpret the Malaysian Dietary Guideline and Food Pyramid	Individual and community will practice active lifestyle in their daily life New understanding of media channels in delivering y the health messages	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			b) understanding the nutrition labeling		
Evaluation of effectiveness of physical activity / diet in school for obesity control among school children			Evaluation of effectiveness of physical activity / diet in school for obesity control among school children		6
Infant and young child feeding		<p>Infant & Young Child Feeding (IYCF) practices play an important role in achieving Millennium Development Goals (MDG): Goal 1, 4 & 5. Current data (NHMS III) shows that only 41.5% of young children between aged 6 to 10 months received timely complementary feeding which is relative low compared to global data 56%</p>	<p>To assess the level of knowledge and skills on appropriate complementary feeding (the importance, timely introduction, frequency, serving size, preparation method, etc.) To identify barriers in empowering mothers/careers in giving appropriate complementary feeding</p>	<p>Increase knowledge & practices on appropriate complementary feeding for the young child Barriers in giving appropriate complementary feeding for the young child identified</p>	1
	To empower mothers to practice exclusive breastfeeding	<p>IYCF practices are influencing the nutritional status of the population. Improper IYCF gives an impact on the development of chronic diseases during childhood. Current data (NHMS III) shows that exclusive breastfeeding at 6 months was only 14.5% (2006) which is relative low compared to global data 35% (2009).</p>	<p>To assess the level of knowledge and skills on breastfeeding (importance, position, length, milk storage, etc.)</p>	<p>Increase knowledge on breastfeeding (importance, position, length, milk storage, etc.) Barriers in practicing exclusive breastfeeding were identified and overcome with effective strategies to promote exclusive breastfeeding</p>	8

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				practices	
Infant and young child feeding			<p>To identify barriers in practicing exclusive breastfeeding</p> <p>To identify effective channels of communication to empower mothers to exclusively breastfeed until 6 months</p> <p>To identify a supporting environment to promote breastfeeding</p> <p>Intervention studies- To study the utilisation of breastfeeding facilities</p>		5
Health system	Knowledge, attitude and practices (KAP) of empowerment	<p>World Health Survey – 25.4% reported autonomy to be extremely important to the community</p> <p>Patient’s unvoiced needs - 1 in 5 patient have problems in addressing their health needs during consultation (ref 3)</p>	<p>-Barriers in exercising self empowerment among patients/community /minority group</p> <p>-Effective strategies to promote empowerment in relation to health seeking behaviour</p> <p>-Possible mechanisms to promote empowerment among healthcare providers, patients/communities</p> <p>-To address perspective on being empowered among healthcare provider / patients / communities / youth</p> <p>-Accessibility to information of health issues</p>	<p>approach / strategies to increase health literacy through empowerment</p> <p>IMPACT: increase the individuals ability to make decisions, informed choices for their own health / dependent (children)</p>	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Health System: Maternal mortality	<p>-To identify health seeking behaviour among women of different socioeconomic background that contribute to maternal mortality</p> <p>-To develop effective programmes to improve the maternal mortality rate among special groups</p>	<p>-Higher maternal mortality rates in certain area/ socioeconomic groups</p> <p>-The rate among migrants is increasing the overall Malaysian MMR.</p> <p>-Thus we are unable to achieve MDG5 target. MMR for Sabah state in 2009: (refers to MMR minus fortuitous deaths; over 100,000 livebirths)</p> <p>Overall: 71.6 Malaysian: 29.7 Non-Msian: 180.5</p>	<p>-Exploring the implications of empowerment among mothers (family)towards maternal and child health service utilization</p> <p>-Studies should lead to identification of health seeking behaviours among groups with high risk of maternal mortality and how they differ from the general population studies should lead to identification of effective programmes with suggestions on appropriate methods of implementation and impact assessment.</p> <p>Assessment of existing health empowerment programme (e.g. effectiveness, cost evaluation, feasibility)</p> <p>Sustainability of the health empowerment programme</p> <p>Involvement of the community in empowerment programmes</p> <p>Explore the community's understanding or appreciation of the meaning of empowerment</p> <p>To prevent misconceptions on empowerment among community members, patients and health care providers</p> <p>Measurement of community</p>	<p>-Reduce maternal mortality</p> <p>-Improving maternal health</p> <p>-Better understanding on health seeking behaviour among women related to pregnancy issues</p> <p>-Empowerment programmes to improve the MMR</p> <p>Influences of organisations on community empowerment (e.g.: participation, leadership, problem assessment, organizational structure, resources mobilization, links to others, asking why, programme management, the role of the outside agents.</p> <p>IMPACT: reduce maternal deaths</p>	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			<p>health related empowerment with focus on organisational issue Factors influence community empowerment in relation to health promotion and prevention. Registry for empowerment programmes</p>		
<p>Health system : Gender and health</p>	<p>To determine Health seeking behaviours that are influenced by gender</p>	<p>There is a lack of programmes on enhancing empowerment 35% of Danish cancer pts use the internet to find information on diagnosis and different treatments</p>	<p>To study the relationship between powerlessness and susceptibility to ill-health among specific group. - Empowerment approaches/programme Identify barriers that prevent particular groups (women/children) from seeking health care Identify facilitating factors that encourage particular groups (women/children) to seek health care for herself / children Ensuring greater access to basic healthcare service</p>	<p>Understanding health seeking behaviour and barriers Impact: patients/women can take control over their illnesses/treatment</p>	<p>9</p>
<p>Unvoiced needs of children Rights and needs of special groups</p>	<p>Unvoiced needs of children</p>		<p>How to educate children to be able to voice their need (the rights of children) How to educate this group that are unable to voice their own needs</p>		<p>1</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Lack of a policy for Paediatric Palliative Care as opposed to the Adult Medicine	To gain feedback from children and parents as to the unmet needs as well as gain perspective from healthcare professionals and workers	Without a needs assessment, it is difficult to come up with a policy that meets the needs of children with life limiting illnesses in this country	<ul style="list-style-type: none"> - To empower children with life limiting illness in the community as well as in hospitals to voice their frequently unmet needs as paediatric palliative care will be a relatively new area. - a needs assessment for the healthcare workers 	A clear understanding of the needs of the clients i.e., the children and their caregivers, as well as the needs of the healthcare workers will help the managers delineate a relevant policy and framework for paediatric palliative care for the nation.	1
Teenage Pregnancy (unwanted pregnancy, unwed pregnancy and underage)	<ul style="list-style-type: none"> -To determine the factors contributing to teenage pregnancy -To assess the level of awareness and knowledge on the implication of teenage pregnancy. -To determine reasons why they get involved -To determine the methods to empower teenagers in prevention of 	<ul style="list-style-type: none"> -Number of pregnancies among teenagers is increasing. -It is often associated with social issues, cultural and religious, complications to the child. -Baby dumping rates -Number of teenage pregnancies 	<ul style="list-style-type: none"> -Assessment of the underlying issues and significance of these factors -Assessment of awareness among adolescents of various socioeconomic backgrounds on the implications related to teenage pregnancy -To determine effective methods to encourage behavioral change among adolescents. 	<ul style="list-style-type: none"> -Factors identified -Level of awareness identified -Effective methods to empower adolescents to avoid unwanted teenage pregnancies 	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	pregnancy.				
Misuse/Overuse of Health Care System	To identify the patient-load contributed by minor ailments that could be self-medicated. To identify current patient knowledge on appropriate medication of certain minor ailments. To identify factors influencing overuse of healthcare facilities		Studies should lead to identification of main reasons for primary care visits and proportion of visits for minor ailments. Studies should lead to identification of level of patient knowledge in treatment of minor ailments. Studies should lead to identification of factors influencing overuse of facilities for treatment that could be influenced by 'free' insurance coverage and doctor hopping		5
Sustainable environment		WHO, 2002 •24% of total diseases are due to environmental factors and causes 23% of the mortalities 85 diseases out of 102 diseases are due to interaction with poor environmental factors In developing country : 60%-80% of morbidity & 1/3 of mortality are due to environmental factors Malaysia: -MOH hospitals generated :	To study the financial implications & economic benefits of a sustainable environment Future planning and development policy direction The relationship between human behaviour and environment A comparative study with other regional and international Bench marking on standard	Awareness among the Malaysian population Economic benefits in terms of sustainability of raw resources Alternatives to plastic material	5

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		3500 tons of clinical waste in 1998 (mean generation rate of 0.51kg /occupied bed/day (Clinical Waste Management in Msia: a case study at Teluk Intan District Hospital) -Generation of waste (tones per capita for some Asia countries	utilization of recycled products		
Medication use	Empowering the public on medication use		Prevalence of medication abuse among the Malaysian population –therapeutic, cosmetic, & aesthetic.		4
	Empowering public on the effect of advertisement on traditional medication used Awareness of the side effects of alternative medicine products		KAP on traditional & complementary medicine 3.Impact of advertisements on medicine use patterns		6
Knowledge on drugs	Empowering individual in knowing the drug/ medication, their correct usage and their side effects	Small percentage of population knows their drugs (ref: National Survey on Utilisation of Medicines by Consumers, 2008)	Evaluation on current strategies in empowering patients in medication use (counseling, MTAC, Know your medicine programme) Knowledge about drugs, their correct usage and side effects of drugs	Increase knowledge about drugs and awareness on the side effects	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Utilization of TCM (in government Hosp - with TCM)			To study the utilization of traditional medicines and integrated medicine in Malaysia		9

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CHAPTER 5: SUSTAINABLE ENVIRONMENT / GO GREEN

Introduction

This is a research scope that had only been introduced in this 10th Malaysia Plan period. It arose out of the concern for the environment that we live in and how it increasingly impinges on health and healthcare. These concerns revolve around increased pollution, global warming, respect for the planet, increased lung ailments due to impurities in the air, diseased game and poultry, and the list goes on.

While we realise that the impact of the environment may not be immediate, research conducted within this scope may contribute towards alleviating future health issues such as cancer and respiratory and mental problems. In turn, the potential burden on healthcare and healthcare costs may be reduced, if not avoided.

In other countries, such as Canada, United Kingdom and Sweden environmental issues had already been on the fore-front of research for quite some time. Malaysia's move to follow suit is certainly heartening and expected of a country fast moving towards achieving its goal of becoming a developed nation by 2020.

Priority Areas for Sustainable / Go Green

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>Water-related diseases/ disorders such as heavy metal poisoning, other chemical toxicity, cancer</p>	<p>Is the water supplied by water authorities safe for use?</p>	<p>Although water is tested at source and at certain distribution sections, the safety at point of use is not known.</p> <p>There was variation in water quality, and barium levels were found to be exceedingly high, more than 10 times the guideline value in Kuala Lumpur (Ong, Ibrahim & Sen Gupta. 2007).</p> <p>In addition, insufficient / ineffective water treatment may pose hazards (Siti Farizwana et. al., 2010).</p> <p>Environmental pollution with metal poisoning is an acknowledged problem in developed countries, with urban areas becoming the “hot spots” of metal pollution (Nriagu, 1988).</p> <p>In addition, the at-risk population for poisoning is not known and needs to be determined. Are women in the reproductive age at risk? Congenital abnormalities an issue? Is aging accelerated? Silent insidious chronic low dose exposures lead to undetected risk of diseases with long lead-time</p>	<p>Investigating tap water and other water sources used by households in terms of quality, presence of heavy metals and other chemicals, at household level, work place and surroundings (at point of use).</p> <p>Studies on population to identify knowledge, attitude and practice, for input towards behavioral change. Is exposure long term or short term?</p> <p>Do consumers comply with recommended safe practices? What are the reasons? What unsafe behaviour is being practiced?</p> <p>To answer the question of what are the recommended practices to guide policy makers.</p> <p>To what extent are the adverse effects of exposure in</p>	<p>Comprehensive data on water quality and safety – in terms of physical, chemical and biological parameters.</p> <p>Knowledge on extent of problem for remedial action.</p> <p>Understanding consumer awareness and practices to help in strategising public education programmes, other interventions to inculcate safe use.</p>	<p>1</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>e.g. cancer, accelerated ageing.</p> <p>We need to explore the extent of (undocumented) adverse effect on the growing child e.g. compromising learning potential. Similarly so for the undocumented adverse effect on pregnancy and the fetus e.g. habitual abortion, prematurity, congenital anomalies.</p> <p>Endocrine disrupting compounds (EDCs) in raw and drinking water. (Andrea, 2003) is an emerging interest among environmental health researchers. EDCs cannot be treated at water treatment plants. EDCs include pesticides, organotins (stabilizers in plastics), dioxin, bisphenol A, alkylphenols (all environmental contaminants), synthetic oestrogens (clinical waste). No local study available contributing to huge gap in knowledge. EDCs have been linked to reduced fertility and increased incidences of obesity, diabetes, endometriosis, intersex phenotype and behaviour and some cancers.</p> <p>To what extent are the population exposed to cancer-related compounds in water, cancer-causing agents</p>	<p>our community? Who are the subpopulations at risk?</p>		

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>resulting from water containers, heavy metal poisoning, water borne diseases?</p>			
<p>Water-related diseases/ disorders such as infertility, cancer</p>	<p>Is the practice of drinking bottled water harmful to health?</p> <p>Does the use and reuse of plastic bottles for water storage for consumption safe?</p> <p>What are the unsafe practices in the use of plastic ware now being observed?</p>	<p>There are many types of bottled water in the market, and it is increasingly being used for drinking.</p> <p>Is this practice safe?</p> <p>In addition, plastic bottles are increasingly being used for storing water for consumption. These bottles, additionally, are being exposed to heat and other stressful environment. Do these practices make the population at risk of certain disorders?</p> <p>Link between health status and consumption of bottled water/use of plastic bottles (by level of safety and quality) is unclear.</p>	<p>Investigating quality of bottled water. Is it safe to be consumed?</p> <p>Research into the use of plastic ware for drinking water and food/beverages, and the use/reuse and handling of such plastic containers.</p> <p>Studies on population to identify knowledge, attitude and practice, for input towards behavioral change. Is exposure long term or short term?</p> <p>To answer the question of what are the recommended practices to guide policy makers:</p> <ul style="list-style-type: none"> • dangerous practices that should be curtailed; • Safety of materials used as water containers, and its handling (single use/ recyclables, exposure to heat, reuse of bottles etc.) 	<p>Comprehensive data on water quality and safety – in terms of physical, chemical and biological parameters.</p> <p>Knowledge on extent of problem for remedial action.</p> <p>Understanding consumer awareness and practices to help in strategizing public education programmes, other interventions to inculcate safe use.</p>	<p>2</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			<p>To study the link between health status and use of bottled water and plastic ware, and exposure to possible contaminants (physical, chemical, biological and other parameters).</p> <p>To what extent are the adverse effects of such exposure in our community? Who are the subpopulations at risk?</p>		
<p>Water-related diseases/ disorders such as heavy metal poisoning, cancer</p>	<p>Does the practice of filtering water make it safe, or it is more dangerous?</p>	<p>There are numerous filters and equipment for filtering in the market; implied is that the use of these filters is widespread. To what degree are these safe is unknown.</p> <p>Drinking water quality and safety of tap water filters. Link between health status and use of filtered water (by level of safety and quality) unknown.</p>	<p>Investigating quality of filtered water, at household level, work place and surroundings (at point of use).</p> <p>Are filters safe to be used? Does the practice of using water filters reduce the safety of water for consumption?</p> <p>Studies on population to identify knowledge, attitude and practice, for input towards behavioral change. Is exposure long term or short term?</p> <p>To answer the question of what are the recommended</p>	<p>Comprehensive data on water quality and safety – in terms of physical, chemical and biological parameters.</p> <p>Knowledge on extent of problem for remedial action.</p> <p>Understanding consumer awareness and practices to help in strategizing public education programmes, other</p>	<p>5</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			<p>practices to guide policy makers:</p> <ul style="list-style-type: none"> • dangerous practices that should be curtailed; • safety of materials used as water containers, and its handling (single use/ recyclables, exposure to heat, reuse of bottles etc.) <p>To study the link between health status and use of filtered water and/or water contaminants (physical, chemical, biological and other parameters).</p>	<p>interventions to inculcate safe use.</p>	
<p>Water-related diseases/ disorders such as heavy metal poisoning, cancer</p>	<p>Is ground water (from tube wells/wells etc) safe for drinking?</p>	<p>Presumed by community as safe and good for health. Inadequate objective information on safety of ground water for consumption, and its effects on health.</p> <p>Has this water been tested at source? Is it safe for consumption?</p> <p>Quality of underground water (Talalaj 2007) Undocumented safety and quality of tube well water for BAKAS program. Need to do: a) Prospective repeated water sample testing from tube wells to detect</p>	<p>Assessing quality and safety ground water/ tube well –e.g.: testing for heavy metals, leachates needed.</p> <p>Is exposure long term or short term? What unsafe behaviours are being practiced?</p>	<p>Link between health status and use of ground (well) water.</p> <p>Knowledge on extent of problem for remedial action.</p> <p>Understanding exposure risk, adequacy of procedures adhered to in the placement, location and testing of</p>	<p>4</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>intermittent heavy metal, POPs, pesticide and radioactive leachates into underground water.</p> <p>b) novel method to develop environmental health soil risk mapping using integrated geological databases from Minerals and Geoscience Dept Malaysia for safe tube well siting.</p>		<p>ground water prior to its use can assist in improving practices at community and programme levels.</p>	
<p>Water-related diseases/ disorders linked to recreational water use, such as acute gastroenteritis (AGE), leptospirosis, Hanta virus pulmonary disease, dermatological disorders, injuries.</p>	<p>Is the water in recreational areas safe for play?</p> <p>Is safety requirements available/enforced, such as lifeguards, flotation devices etc?</p> <p>Are signage and other injury prevention devices in place to reduce/prevent injuries?</p> <p>Are there</p>	<p>Recreational areas with water bodies need to be safe for the community. Gazetting it as a recreational area, enforcing the required safety measures and periodic monitoring and maintenance is crucial for safety of the users.</p> <p>The outbreaks of AGE, leptospirosis, Hepatitis A (Venugopalan, 2004) and other infections at recreational water areas signal a need for assessments of the safety of recreational water bodies in the country.</p> <p>Additional physical corrosive and teratogenic /carcinogenic effect of chlorine in over-chlorinated pools and its effects in Malaysia are not well known.</p> <p>Diseases related to recreational waters and rodent & wild life ecology, e.g. leptospirosis.</p>	<p>Investigating recreational water quality for contaminants and biological agents is needed to help prevent recreational-related illnesses which can sometimes prove fatal.</p> <p>Are swimming pools safe for use?</p> <p>Are recreational areas with water bodies conforming to the minimal safety requirements?</p> <p>Are the safety parameters monitored for preventive measures?</p> <p>Do users of recreational water areas comply with the recommended safe practices? What unsafe behaviour is being practiced? What are the reasons for risky behaviour?</p>	<p>Information on safety of recreational water bodies is required to inform policy makers to ensure safer recreation areas for the community.</p> <p>Knowledge on extent of problem for remedial action.</p> <p>Understanding consumer awareness and practices to help in strategizing public education programmes, other interventions to inculcate safe use.</p>	<p>6</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	measures to monitor the safety of the water from biological and other contaminants ?	Recreational water quality standards and indicators [Interim National Water Quality Standards Malaysia (INWQS)]	<p>To answer the question of what are the recommended practices to guide policy makers:</p> <ul style="list-style-type: none"> • dangerous practices that should be curtailed; • safety of the environment that necessitates periodic monitoring for effective public health 		
Land use and adverse effects on health of population.	Effects of land use on health of community.	<p>Inadequate information on the link between land use and effects on health.</p> <p>Additionally, migration of wild animals may disturb wild life ecology. This may pose a risk of ticks and mites borne diseases such as rickettsial diseases like scrub typhus.</p> <p>E.g. #1. Inadequate documentation on positive correlation between the built environment and vector proliferation causing dengue transmission</p> <p>E.g. #2. Inadequate documentation on new economic/deforestation and recreational activities causing human encroachment on jungles infested with vectors of simian malaria</p>	<p>To identify pattern and extent of land use in terms infra-structure development, forest reserves, parks, ecological sites, "green lung" , etc. and the possible link to diseases.</p> <p>Deforestation leading to climate change, increased risk of zoonosis. To what extent do we suffer from this?</p>	Identification of patterns of land use and effects on health – may change ways in which land is used.	3

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		E.g. #3. Undocumented soil radiation from previous mining sites developed for housing and public amenities (Malaysia, 2009)			
Obesity, sedentary lifestyle and inactivity and the built environment.	<p>Assessment of the built environment for a healthier living.</p> <p>Identification of existing green infrastructures as a model for learning.</p>	Barriers and facilitators of practicing green living. Database of existing environmentally friendly infrastructures.	<p>To assess the built environment in terms of infrastructure that facilitates or hinders green living (cycling, walking, energy consumption/increased physical activity).</p> <p>Research on existing infrastructure and its compliance with green technology (e.g. availability of sustainable environmental friendly design, pedestrian walkway, pedestrian mall, bicycle lanes, etc)</p> <p>To review current evidence and movement for a greener living using enablers designed into the built environment, to provide a guide to policy makers and community on measures for improvement.</p>	<p>Addressing barriers identified and promoting facilitators to encourage green living more extensively.</p> <p>Create awareness and promote the design of healthier built environments in Malaysia.</p> <p>A comprehensive database to be referred to (improve implementation and enforcement of standard recommendations).</p>	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>Obesity, sedentary lifestyle and inactivity and the built environment.</p>	<p>Assessment of the knowledge, attitude and practices of communities on the built environment for a healthier living.</p>	<p>In 1996, 21% of Malaysians were overweight, and 6% obese (Ismail <i>et. al.</i> 2002). A rising trend has been observed, and in 2006, overweight was 29% and 14% (Khambalia & Seen, 2010).</p> <p>However data is still lacking for populations at risk (Tee, 2002), though the escalation of disease from urban to rural settings has already occurred (Ismail <i>et. al.</i>, 2002).</p> <p>In 2011, The Health Minister announced that Malaysia had an estimated 60% of overweight population and is ranked 6th in the list of Asian countries with the highest percentage of obese adults (The Star, 2011).</p> <p>Inadequate knowledge on community's knowledge, attitude and practices (KAP). This includes knowledge on professional agencies (engineers, town planners, medical personnel etc.) and the general community.</p>	<p>Research into community behaviour in terms of existing practices (using lifts vs stairs, walking vs driving to nearby destinations, etc).</p> <p>Studies on populations, such as professionals (engineers, town planners, medical personnel etc.) and lay communities, to identify knowledge, attitude and practice, for input towards behavioral change.</p>	<p>Understanding KAP level; planning public education programmes.</p> <p>Understanding level of awareness and preparedness of professionals who should lead the change in the built environment towards a healthier lifestyle.</p>	<p>3</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Obesity, sedentary lifestyle and inactivity and the built environment.	Innovative strategies to promote an active lifestyle	<p>Strategies to promote an active lifestyle co-exist with mechanisms to conserve a person's energy consumption, e.g. stairs, escalators and lifts present at one place. However, through observation, consumers tend to choose the more convenient method instead of the healthier option.</p> <p>There is a need to identify strategies to promote an active lifestyle.</p>	<p>Identifying innovative ways to promote an active lifestyle in the Malaysian community (i.e.: the use of lift vs. stairs vs. escalator).</p> <p>What behaviour is being practiced? What are the reasons for their choices?</p> <p>What is the current evidence on strategies used elsewhere to promote an active lifestyle in a built environment?</p>	<p>Improve current strategies to encourage better choice and practice of healthier options.</p> <p>Provide evidence and strategies that worked for policymakers and the community, towards improving awareness and possible adoption of strategies for the future.</p>	2
Obesity, sedentary lifestyle and inactivity and the built environment.	Identifying determinants of health, and population density.	Inadequate data linking population density, built environment and determinants of health indices.	Assessing association between population density and determinants of health indices (life expectancy, BMI, mental health problems, CVS problems, asthma, cancers, etc) - cycling route in km/1000 people, number of parks or outdoor recreational areas/1000 people, leisure time of individuals, number of hours travelling on the road per individual (stress due to traffic congestion, exposure to pollutants, ergonomics, etc), presence of disability and	Use findings to educate public and prioritise on developing amenities/ infrastructure that improves health indices.	5

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			age-friendly amenities, healthy city / healthy settings, covered walkways connecting between places or buildings as a means to encourage walking etc.		
Children’s health and the built environment	Design of the built environment to improve children’s health.	With high/rising trends in obesity, diabetes, asthma and illnesses such as attention deficit disorders, environmental designs can help combat them (CDC, undated).	<p>What are the strategies to be employed in environmental design to help reduce these illnesses/improve children’s health?</p> <p>What is currently practiced now? Are town planners /architects/engineers etc. aware of the possible strategies for this?</p>	<p>Use findings to educate public and prioritise on environmental design and/or modification for improvement.</p> <p>To be able to promote/modify/design the built environment in the country to foster better health for children.</p>	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Floods, the built environment, illnesses and injuries.	Availability of infrastructure and its design to minimise flooding.	<p>The design of the built environment impacts on the environment in many ways, one of which is the increase the risk of flooding with more built up land surfaces.</p> <p>There is a need to minimise risk of flooding from such environmental design issues, as this could be avoided, and the flooding and its risk of diseases and injuries preventable.</p> <p>The natural reservoir of cholera in Malaysia is undocumented. It is important to identify this to control and ultimately eliminate cholera outbreak in Malaysia. It has been reported that the natural reservoir of cholera is in the aquatic environmental. Halpen M et al., Natural reservoir of cholera non 01 and non 0139 Microb Ecol 2004 May;47(4):341-9. Epub 2003 Dec 23.; filamentous green algae, copepods, crustaceans associated with V. cholera, Sedas et al., J Infect Dev Ctries 2007 Dec 1;1(3):224-41. It is known that climate change cause sea level rise, acidification of seawater</p>	<p>To assess extent of available infrastructure to avoid flooding (porous pavements in parking lots or other open areas).</p> <p>Assess the awareness and knowledge, attitude, practices of professionals involved in the built design.</p> <p>To identify the natural reservoir for cholera in Malaysia so as to control and ultimately eliminate cholera outbreak in Malaysia.</p>	<p>Use findings to educate public and prioritise on developing amenities/ infrastructure that prevents / reduces risk of floods.</p> <p>To be able to effectively control cholera in the country</p>	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>and extreme weather causing increase precipitation and flooding which are factors facilitating the proliferation of pathogenic vibrio cholera. Several studies have demonstrated that environmental non-O1 and non-O139 V. cholerae strains and V. cholerae O1 El Tor and O139 are able to form a three-dimensional biofilm on surfaces which provides a microenvironment, facilitating environmental persistence within natural aquatic habitats during interepidemic periods.</p>			
<p>Built environment, legislation and risk of disorders/ diseases</p>	<p>Do people live dangerously near harmful places, especially on land meant to act as buffer zones?</p> <p>Is the policy of buffer zones for land use</p>	<p>One may see that land areas meant for buffer zones, such as that under high voltage cables, are used sometimes for agriculture or residential.</p> <p>Is this harmful to the people in close proximity there? Are the food crops grown in these buffer zones safe for consumption?</p>	<p>To identify compliance to zoning policies and buffer zones (e.g.: residential areas away from farm land, industries that produces harmful waste, high tension voltage, etc.).</p> <p>To identify current evidence on the risks and possible outcomes of exposure in such buffer zone areas; for creating awareness and improving knowledge and practice among the policy makers in</p>	<p>Use findings to educate public and prioritise on developing amenities/ infrastructure that prevents harmful effects</p>	<p>4</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	enforced/ practiced?		Malaysia.		
Built environment, indoor air quality and health-related quality of life	Association between health-related quality of life, illnesses and the built environment	<p>Is the built environment a “healthy” building? Do people get sicker in certain buildings than others?</p> <p>A properly designed building would incorporate features that promote health, rather than increase likelihood of illness.</p>	<p>Assessing quality of life at home and at workplace.</p> <p>Are buildings designed to make people healthy, or sicker? Are materials used to build the built environment safe for the inhabitants?</p> <p>Are the relevant professionals aware of, and do they possess the skill and relevant knowledge to ensure buildings provide a healthy environment for its inhabitants.</p> <p>To identify current evidence on the risks and possible outcomes of exposure in such buffer zone areas; for creating awareness and improving knowledge and practice among the policy makers in Malaysia.</p>	Use the information to improve design of buildings to promote building of healthier built environments and to improve interior of buildings for the inhabitants.	3

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Environmental Design, crime and injuries	<p>Extent of problem in Malaysia.</p> <p>Extent of practice of principles of environmental design in Malaysia for crime prevention.</p> <p>Evidence of proven methods/ approaches for crime prevention and personal safety in the environment.</p>	<p>There has been an international move since the 1970s towards designing environmental strategies to prevent crime, termed Crime Prevention Through environmental Design (CPTED) (Ray, 1971). To what degree do the built environment in Malaysia utilise such strategies?</p>	<p>To assess availability and effectiveness of crime prevention facilities and amenities in the Malaysian environmental design.</p> <p>To study the application of CPTED in the Malaysian context, in terms of awareness and practice of engineers, town planners, architects etc and the community.</p> <p>To identify and review effective methods/ strategies for crime prevention to create awareness and inform policy makers.</p>	<p>To improve personal safety and reduce injuries through the use of CPTED principles in Malaysia.</p>	<p>15</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Built environment and asbestosis and cancer	Asbestos (in certain buildings such as older buildings) and awareness of asbestos in construction workers	<p>Asbestos ceilings and materials can still be found in some buildings in Malaysia, though by law it is no longer allowed. There is a need to identify the extent of this problem in Malaysia.</p> <p>Additionally, to what degree do workers adhere to safe handling practices when handling asbestos?</p>	<p>To identify areas in the built environment that still uses asbestos materials, and buildings with asbestos ceilings etc, that poses a risk to its inhabitants.</p> <p>To determine the awareness, attitudes and practices of workers exposed to absestis, such as construction workers, factories/plants that handle asbestos etc.</p>	<p>Identification of buildings: asbestos free and non asbestos free.</p> <p>Identification of population at risk and compliance to safe handling practice</p>	7
Climate change and illnesses	Diseases/ illnesses patterns in Malaysia	<p>Airborne fine particulate matter (PM2.5) such as ozone have adverse respiratory and cardiovascular effects, causing lung damage, cardiac dysrhythmias and imcreasing morbidity and hospital admission (Roth, 2010).</p> <p>No local study on heat wave and global warming as enhance factor for known subpopulation with cardiovascular and stroke risk factor (Draft Malaysia NC2 Report 2010). Research needed to determine attributable risk quantification to plan for risk reduction and adaptation strategy.</p>	<p>Identify trends/changes in prevalence/rates of illnesses such as asthma, COPD, respiratory allergies, airway diseases, cardiovascular diseases and its association with environmental factors such as climate change, air quality etc.</p> <p>Trend analysis of related diseases internationally and in Malaysia.</p> <p>Evidence of strategies and approaches towards reducing</p>	Trends of illnesses, populations at risk and strategies for improvement for Malaysian context.	4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>Green house gases emission and increase PM10 suspension is associated with respiratory diseases however global warming is a slow process and prevention is dependent on effective use of PPE which need to be researched.</p> <p>Additionally, other diseases implicated include Kidney stones, malaria, Lyme disease, depression (Efstathiou, 2009). It is reported that 42% of malarial cases is attributed to by poor land use/water resource and habitat management (MOH, 2009).</p> <p>The change in ambient temperature has an association with infections, though the actual mechanism remains unclear (Science Daily, 2010).</p>	<p>respiratory illnesses resulting from environmental changes.</p>		

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Climate change and illnesses	Zoonotic, vector- air-, water- and food-borne diseases/ illnesses patterns in Malaysia	<p>Climate change has been found to have a significant impact on zoonotic, vector- air-, water- and food-borne diseases.</p> <p>Climate change causes increase precipitation and global warming which facilitate vector proliferation and increase egg production causing increase vector density and risk of dengue, chikungunya and malaria (Ebi KL 2006) with few local documentations on this. Another problem is the resurgence of malaria.</p> <p>Typhoid, cholera, hepatitis A, giardiasis, cryptosporidiosis</p> <p>The change in ambient temperature has an association with infections, though the actual mechanism remains unclear (Science Daily, 2010).</p> <p>Quality and safety of recreational waters</p> <p>Health risk studies lacking on diseases related to recreational waters and rodent & wild life ecology, e.g leptospirosis.</p>	Trends in zoonotic, vector- air-, water- and food-borne diseases in Malaysia, and its association with climatic change needs to be explored.	Trend analysis of related disease	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>Although recreational water standards has been established, environmental microbiological indicators are lacking (I., Khan 2007) Recreational water quality standards and indicators [Interim National Water Quality Standards Malaysia (INWQS)]</p> <p>Heat stroke rare in Malaysia, risk group elderlies and lower socioeconomic group.</p> <p>Leptospirosis, typhoid, cholera, dengue following or during floods.</p> <p>e.g 1. Inadequate documentation on positive correlation between the built environment and vector proliferation causing dengue transmission</p> <p>e.g 2. Inadequate documentation on new economic/deforestation and recreational activities causing human encroachment on jungles infested with vectors of simian malaria</p>			

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
The cost of green technology with regards to health and health care	Cost implications of implementing green technology and its health savings.	<p>Using green technology may sometimes incur additional cost that to continue the status quo, or so people lament. To what extent is this true?</p> <p>How can going green save cost in the long run?</p> <p>How can going green reduce health care and health costs, for the individual and for the nation?</p>	<p>To review evidence on the cost of going green and the strategies that could be employed to reduce such costs.</p> <p>To explore the costs saved by going green with the costs of health care averted.</p> <p>Assessing daily practices of the population in certain housing areas/subpopulations or the homeless that may be harmful to the environment (including in orang asli settlements).</p>	The information obtained could be used to create awareness on the need to go green, especially in terms of health and health care.	2
Soil-related diseases/ disorders caused by heavy metals	<p>How much is this caused by leachates from industrial wastes/ landfills?</p> <p>Are there regulations to halt/ monitor the</p>	Heavy metals leaching from solid waste facilities pose concerns. Heavy metals such as iron, manganese, copper, arsenic, cadmium, mercury, chromium, thallium, lead, etc have been recognised to have harmful effects to the ecosystem. Human health can also be affected by these as some are carcinogenic, and some affect the food chain to lead to toxicity [1].	<p>Investigating soil quality at crop and agricultural land areas.</p> <p>Investigating soil quality at recreational areas (playgrounds, parks, etc).</p> <p>Assessing types of leachates and level of contamination at industrial areas.</p>	<p>Comprehensive data on soil quality and safety – in terms of physical, chemical and biological parameters.</p> <p>Knowledge on extent of the problem for remedial action.</p>	3

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>degree/ extent of leaching from industries?</p> <p>What other types of industry contribute to this problem?</p> <p>How much information is made freely available to the public to increase awareness? Is the public well-informed on this? What are the measures taken to effectively disseminate</p>	<p>In addition, the at-risk population for poisoning is not known and needs to be determined.</p> <p>To what extent is the population exposed to cancer-related heavy metal based compounds in soil?</p> <p>Inadequate local studies to describe type of soil leachates and its effect on health and the environment.</p> <p>Unsure how soil contaminated with heavy metals affect the evolution of disease vectors.</p>	<p>Assessing types of leachates and level of contamination at landfills.</p> <p>Investigating the extent to which human health is harmed because of soil contaminated with heavy metals.</p> <p>What is the level of exposure in our communities now? Is exposure long- term or short-term?</p> <p>Studies on population to identify knowledge, attitude and practice, for input towards behavioral change.</p> <p>Do industries comply to recommended safe practices? What are the reasons for not complying? What unsafe behaviour is being practiced?</p> <p>To identify recommended safe practices to reduce/control the level of heavy metals in soil.</p>	<p>Understanding consumer awareness and practices to help in strategizing public education programmes, other interventions to inculcate safe use.</p> <p>To answer the question of what are the recommended practices to guide policy makers.</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	information on this?				
Soil-related diseases/ disorders caused by pesticides/ insecticides.	<p>What kind of pesticides/ insecticides are currently being endorsed for use and how far is this regulation complied to.</p> <p>Are there regulations to halt/ monitor the degree/ extent of soil contamination (which could lead to groundwater contamination) caused by use of these chemicals?</p>	<p>In tropical countries such as Malaysia, crops such as rice and vegetables are particularly susceptible to the negative impacts of pesticide use [2].</p> <p>In addition, the at-risk population for poisoning is not known and needs to be determined. Are women in the reproductive age at risk? Congenital abnormalities an issue? Is aging accelerated? How far are we exposed to carcinogenic pesticides?</p> <p>Unsure how soil contaminated with pesticides/ insecticides affect the evolution of disease vectors negatively.</p>	<p>Investigating soil quality for pesticide level at crop and agricultural land areas.</p> <p>Investigating soil quality for pesticide level at recreational areas (playgrounds, parks, etc).</p> <p>Assessing types of leachates and caused by use of pesticides/ insecticides.</p> <p>Investigating the extent to which human health is harmed because of soil contaminated with insecticide/ pesticides.</p> <p>What is the level of exposure in our communities now?</p> <p>Studies on population to identify knowledge, attitude and practice, for input towards behavioral change.</p>	<p>Comprehensive data on soil quality and safety – in terms of physical, chemical and biological parameters.</p> <p>Knowledge on extent of the problem for remedial action.</p> <p>Understanding consumer awareness and practices to help in strategizing public education programmes, other interventions to inculcate safe use.</p> <p>To answer the question of what are the</p>	5

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>How much information is made freely available to the public to increase awareness? Is the public well-informed on this? What are the measures taken to effectively disseminate information on this?</p>		<p>Do industries/ individuals in a community that uses insecticides/ pesticides comply to recommended safe practices? What are the reasons for not complying? What unsafe behaviour is being practiced?</p> <p>To identify recommended safe practices to reduce/control the level of pesticides/ insecticides in soil to a safe level for humans without compromising its pesticidal- or insecticidal effects.</p> <p>To what extent are the population exposed to cancer-related pesticide-based compounds in soil?</p>	<p>recommended practices to guide policy makers.</p>	
<p>Soil-related diseases/ disorders caused by other chemicals</p>	<p>How much is this caused by leachates from industrial wastes/ landfills?</p>	<p>Leaching of chemical compounds from solid waste facilities pose concerns. It disrupts the entire ecosystem and has harmful effects on health. Some of these chemicals are carcinogenic, and some affect the food chain to lead to toxicity [1].</p>	<p>Investigating soil quality at crop and agricultural land areas.</p> <p>Investigating soil quality at recreational areas (playgrounds, parks, etc).</p>	<p>Comprehensive data on soil quality and safety – in terms of physical, chemical and biological parameters.</p>	<p>4</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>Are there regulations to halt/ monitor the degree/ extent of leaching from industries/ landfills?</p> <p>What other types of industry contribute to this problem?</p> <p>What other types of industry contribute to this problem?</p> <p>How much information is</p>	<p>In addition, the special at-risk population for poisoning is not known and needs to be determined.</p> <p>To what extent is the population exposed to carcinogenic compounds in soil?</p> <p>Inadequate local studies to describe type of soil leachates and its effect on health and the environment.</p> <p>Unsure how soil contaminated with chemical compounds affect the evolution of disease vectors</p>	<p>Assessing types of leachates and level of contamination at industrial areas.</p> <p>Assessing types of leachates and level of contamination at landfills.</p> <p>Investigating the extent to which human health is harmed because of soil contaminated with chemical compounds.</p> <p>What is the level of exposure in our communities now? Is exposure long- term or short-term? Studies on population to identify knowledge, attitude and practice, for input towards behavioral change.</p> <p>Do industries comply to recommended safe practices? What are the reasons for not complying? What unsafe behaviour is being practiced?</p>	<p>Knowledge on extent of the problem for remedial action.</p> <p>Understanding consumer awareness and practices to help in strategizing public education programmes, other interventions to inculcate safe use.</p> <p>To answer the question of what are the recommended practices to guide policy makers.</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>made freely available to the public to increase awareness? Is the public well-informed on this? What are the measures taken to effectively disseminate information on this?</p>		<p>To identify recommended safe practices to reduce/control the level of heavy metals in soil.</p>		
<p>Diseases/ disorders caused by radiation from soil</p>	<p>Where do they come from? Are there regulations to halt/ monitor the degree/ extent of radiation exposure?</p>	<p>Inadequate local studies to describe type of radiation from soil and its effects on health and the environment. Unsure how radiation from soil affect the evolution of disease vectors In addition, the at-risk population for poisoning is not known and needs to be determined.</p>	<p>Investigating soil quality at crop and agricultural land areas. Investigating soil quality at recreational areas (playgrounds, parks, etc). Assessing types of radiation and the level of contamination at industrial areas and landfills. Investigating the extent to</p>	<p>Comprehensive data on soil quality and safety – in terms of physical, chemical and biological parameters. Knowledge on extent of the problem for remedial action.</p>	<p>3</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>How much information is made freely available to the public to increase awareness? Is the public well-informed on this? What are the measures taken to effectively disseminate information on this?</p>		<p>which human health is harmed because of radiation from soil.</p> <p>What is the level of exposure in our communities now? Is exposure long- term or short-term? Studies on population to identify knowledge, attitude and practice, for input towards behavioral change.</p> <p>Do industries emitting these substances comply to recommended safe practices? What are the reasons for not complying? What unsafe behaviour is being practiced?</p> <p>To identify recommended safe practices to reduce/control the level of radiation in the soil.</p>	<p>Understanding consumer awareness and practices to help in strategizing public education programmes, other interventions to inculcate safe use.</p> <p>To answer the question of what are the recommended practices to guide policy makers.</p>	
<p>Diseases/ disorders caused by soil contaminated with genetically modified microorganism</p>	<p>How much is this caused inappropriate use of pesticides/ insecticides?</p>	<p>Inadequate local studies to describe type of GMOs in soil and its effect on health and the environment.</p> <p>Unsure how soil contaminated with these GMOs affect the evolution of disease vectors</p>	<p>Investigating soil quality at crop and agricultural land areas.</p> <p>Investigating soil quality at recreational areas (playgrounds, parks, etc).</p>	<p>Comprehensive data on soil quality and safety – in terms of physical, chemical and biological parameters.</p>	<p>8</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>Are there regulations to halt/ monitor the degree/ extent of use of substances that promote the development of GMOs?</p> <p>What other types of industry contribute to this problem?</p> <p>How much information is made freely available to the public to increase awareness? Is the public</p>	<p>To what extent is the population exposed to the effects these GMOs have made to our food?</p>	<p>Assessing types of GMOs and level of contamination at various areas.</p> <p>Investigating the extent to which human health is harmed because of soil contaminated with GMOs.</p> <p>Do industries comply to recommended safe practices which would prevent the development of GMOs? What are the reasons for not complying? What unsafe behaviour is being practiced?</p> <p>To identify recommended safe practices to reduce/control the level of GMOs in soil.</p>	<p>Knowledge on extent of the problem for remedial action.</p> <p>Understanding consumer awareness and practices to help in strategizing public education programmes, other interventions to inculcate safe use.</p> <p>To answer the question of what are the recommended practices to guide policy makers.</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>well-informed on this? What are the measures taken to effectively disseminate information on this?</p>				
<p>Health impacts from waste disposal management</p>	<p>How does waste management affect soil, water, air quality?</p> <p>What type of and how much leachates form from industrial wastes/ landfills?</p> <p>Are there regulations to halt/</p>	<p>Inadequate local studies to describe the level of microbial emissions, leaching from composting sites/ recycling areas and landfills.</p>	<p>To study the association between types of waste management strategies and its effects on health.</p> <p>KAP assessment of waste management in the community.</p> <p>Waste management programme evaluation (for radioactive waste, clinical waste, disposal of batteries, biohazard waste, emissions from burning, recycling, incinerator, etc.)</p> <p>Investigating soil , water and air quality at areas nearby</p>	<p>Comprehensive data waste management techniques and its effects on the environment, expressed in physical, chemical and biological parameters, including disease prevalence levels.</p> <p>Knowledge on extent of the problem for remedial action.</p> <p>Understanding</p>	<p>3</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>monitor waste management / disposal?</p> <p>What are health impacts from waste incineration?</p> <p>How much information is made freely available to the public to increase awareness? Is the public well-informed on this? What are the measures taken to effectively disseminate information on this?</p>		<p>waste disposal sites.</p> <p>Investigating the extent to which human health is harmed because of the effects of current waste disposal/ management practices.</p> <p>Studies on population to identify knowledge, attitude and practice, for input towards behavioral change.</p> <p>Do industries comply to recommended safe practices? What are the reasons for not complying? What unsafe behaviour is being practiced?</p> <p>To identify recommended safe practices to incorporate them into current policies and practices.</p>	<p>consumer awareness and practices to help in strategizing public education programmes, or other interventions to inculcate safe practices.</p> <p>To answer the question of what are the recommended practices to guide policy makers.</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Food Borne Diseases		With global warming , environmental change , influx of foreign workers as food handlers, increase in changes in food consumption habits emerging foodborne diseases need to be closely watched for (Tauxe, 1997), while the known food borne diseases need to be monitored.	Identify potential loci of emerging food borne diseases. Epidemiology of known food borne diseases.	Epidemiological data on food borne diseases	5
Dietary practices		As Malaysians become more affluent and with globalisation, calorie intake protein and fat intake per capita was on an increasing trend (Tee, 1999; Mohd Ismail, 2002) with implication in environmental sustainability and health. With rising obesity and chronic diseases, food is one of the major determinants to be examined carefully.	Consumption and cultural practices of food; -types, portion, -wastage - beliefs, value systems. Development of culture specific interventions for behavioural change. Identification of food items which increases/decreases risk of - diabetes - cardiovascular disease - hypertension	Data on dietary practice by demographic Data on food related beliefs and value system in the Malaysian society. Methods and framework to affect behavioural change Food related risk factors for diabetes and cardiovascular disease	5

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Food safety		Food and food premises monitoring was well structured and regular; however we need to continuously look for more advance, effective and efficient methods (Market analysis of biosensors for food safety, 2003.)	Analysis and research of new food safety measurements, management and policies.	Updates on food safety measurement and management.	6
Consumer Food Safety		<p>Household food safety practice: Food preparation in the common household in Malaysia is unstudied (Schutz2, 1999), these practices may not be adequately clean or utilize the nutrient content of the food in the most optimal way.</p> <p>Safety of Food Utensils and containers: New cooking utensils with safety profile not established yet.</p> <p>Usage of food containers, which were inappropriate to the purpose and might be unsafe</p>	<p>Food preparation practice: Cleaning Cooking Storage</p> <p>Identification of cooking utensils with unsafe features Identifcation of inappropriate use of cooking utensils and container which render it unsafe</p> <ul style="list-style-type: none"> - plastic bags - silicone cookware - paper bags which were used to substitute for plastic bags 	<p>Knowledge on food practice</p> <p>Practice and utilization of cooking utensils and containers.</p>	2
Livestock		Poultry and meat are increasingly farmed in a high-density manner; antibiotics, hormones (Langea et. al., 2002; Ying et. al., 2002) and standard animal feed are often used in the production; the health effects of these	<p>Safety and long-term effects of antibiotics and hormone usage in livestock on human beings.</p> <p>Comparison of nutrient content of livestock of different farming</p>	Biological effects of antibiotics/ hormones in animal produce in human	4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		need to be examined.	methods		
Genetically Modified Food		<p>Regulations and implementation of labelling of Genetically modified food required detection method of GMO in raw materials and food products (Abdullah et. al. ,2006.)</p> <p>Genetically modified food is new and long term health effects are unknown.</p>	<p>New method to detect genetically modified food</p> <p>Public perception and labeling of Genetically modified food.</p> <p>Health effects of GM food.</p>	<p>Better detection methods for genetically modified food.</p> <p>Knowledge on public perception and acceptance of GM food.</p> <p>Absence/Presence of adverse effects of GM food.</p>	6
Health Supplements		<p>Society become more health conscious and affluent, and health supplements is a market on its own. Utilization of health supplements, unlike prescription drugs, are rarely studied; understanding utilization and its determinants of use help us to examine the underlying health beliefs and highlight areas of concern if safety is an issue.</p>	<p>Utilization of health supplements:</p> <ul style="list-style-type: none"> -types of supplements -demographic of use -beliefs and value -expenditure -prevalence of unregulated health supplements on the market and its safety issue 	<p>Utilization data of health supplements</p> <p>Social determinants of health supplement usage</p>	3

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Processed Food		As the standard of living rise in Malaysia, we increasingly use processed food (10); the health effects of these need to be examined.	<p>Nutrient content of processed food</p> <p>Consumption pattern of processed food in different populations.</p> <p>Additives in processed food and its health effects: long term and short terms; eg. Preservatives Colouring MSG</p>	Information of nutrient, consumption and health effects of processed food.	3
Organic Food		Organic food in Malaysia is certified and inspected by Department of Agriculture with a set standard (11) ; and are perceived to be healthier (12) However literature on the nutritional content of organic food is scarce (13-14); as organic produce tend to be more expensive than non-organic, research on this would be valuable as intensively farmed produce has its role in providing food source for a planet with expanding population.	<p>Nutrient content of organic food compared to non-organic food.</p> <p>Pesticide, pests and carcinogenic substances on organic produce and non-organic produce</p>	Comparisons of nutrients and harmful substances on organic and non-organic produce.	4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Communication of scientific evidence for Go Green & Sustainability		<p>There is plenty of research evidence available; however to fully utilize it, it needs to be available, easily understood and applicable to the right settings. Proper utilization of research findings reduces R&D cost and speed up Innovation and improvement.</p> <p>Collaboration and communication across research disciplines provide holistic and multi- faceted approach to an issue and foster creative solutions.</p> <p>Right communication tools enable the public to understand the evidence (15).</p>	<p>Effective communication method to target groups: -Researcher from different discipline - policy makers - public Advocacy and effective health promotion and awareness programmes</p>	<p>Methodology of communication to target groups.</p> <p>Methodology of advocacy.</p> <p>Methodology of effective awareness programmes</p> <p>Methodology of effective health promotion programmes</p>	1
Air borne allergens		<p>Allergy and its allergen are poorly studied; and identification of these could improve clinical practice by increase awareness in healthcare practitioners and susceptible persons.</p> <p>Air pollution controlled in Malaysia through enforcement of Environmental Quality Act and Regulation 1974.</p> <p>The government established Malaysian</p>	<p>Prevalence of allergies, susceptible populations and source of the allergens.</p>	<p>Baseline knowledge of allergens in its susceptible population</p>	6

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>Air Quality Guidelines, the Air Pollution Index, and the Haze Action Plan to improve air quality. Monitoring in several large cities in Malaysia, which cover air pollutants such as Carbon monoxide (CO), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Ozone (O₃), and Suspended Particulate Matter (SPM). The air pollution comes mainly from land transportation, industrial emissions, and open burning sources. Among them, land transportation contributes the most to air pollution</p> <p>Forty-three of 68 (63%) patients with nasal polyposis versus 6 of 35 (17%) controls were positive on SPT with airborne allergens (P < .001). A clinically slight respiratory allergy, particularly to perennial airborne allergens, might play a relevant role in the pathogenesis of nasal polyposis, probably through the induction of a long-lasting inflammation of the nasal mucosa.</p> <p>Study by Goh et al suggested that</p>			

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>individual susceptibility of exposed subjects might be influenced by several factors associated with mould exposure; for example, inhaled mycotoxins or volatile organic compounds, which may, in some complex way, affect the immune response</p> <p>One example of air pollutant contributed by stationary sources at Malaysia is due to the petrochemical industry</p> <p>Study by Sam et al in 200 asthmatics from the University Hospital in KL, found 164 (82%) patients with skin prick test (SPT) reactivity to one or more of a panel of 14 allergens, which included indoor and outdoor animal and plant aeroallergens.</p>			
Health effects from seasonal events like haze		<p>Events which cause air pollution and are occurring on an increasingly regular basis requires proper examination of health and economic impacts to enable efficient resource planning and projection. For example: peat fires on Indonesia.</p>	<p>Haze and attributed health services utilization, economics and loss of manpower Long term effect of exposure to particles like carbon in haze; intra-uterine effect of exposure.</p>	<p>Resource consumption and expenditure from haze. Knowledge and practices of</p>	6

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>The haze episodes in Southeast Asia in 1983, 1984, 1991, 1994, and 1997, 2005 when the Air Pollution Index reached levels higher than 300 in some areas. Effect to human by air pollution may categorize into three impacts which are; chronic, acute and carcinogen</p> <p>The public needs to be aware of health hazards and implement appropriate protective measures.</p> <p>Study by Teoh and Tan indicated that there was a general increase in emotional problems such as feeling depressed, lacking in energy, not feeling like doing anything, feeling anxious and afraid, difficulty sleeping, feeling agitated and irritable, and having no appetite. There was also an increase in physical symptoms such as itchy or red eyes, itchy or running nose, dry throat/cough, headaches, nausea, and fever.</p>	<p>Personal Protection Equipment like mask; effectiveness and appropriateness of use</p>	<p>personal protection equipment during haze.</p> <p>Absence/Presence of long term health effects?</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Zoning regulations and violation		<p>There are rules and regulations on zoning however violation is often seen and its extent and health effects are unknown.</p> <p>Just jumpa The 1981 Fisheries Licensing Policy in Malaysia, which prohibits trawling within the five-mile limit and allocates fishing grounds by zones and types of gear.</p> <p>Foo and Razwan highlighted that since the introduction of Environment Quality Act in 1974, some 23 related regulations have been gazetted (including the Environmental Quality (Prescribed Premises) (Environmental Impact Assessment) Order 1987) which have provided a profound regulatory framework in the shaping of the environmental protection and conservation landscape of Malaysia</p>	Types of zone violations, reasons of zone violations, population at risk from zone violation and the resulting health effects.	Knowledge and reasons of zone violation for intervention measures.	4
Indoor improvement of air quality		<p>Devices were used to improve air quality indoors however without regulation , we do not know if these devices were effective or actually harmful.</p> <p>Nazaroff et all mentioned that certain</p>	Types and chemical content of air fresheners, utilization and health effects. Air ioniser and its effects.	Safety profile and utilization of air fresheners and related items.	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>chemicals from air fresheners and cleaning agent are listed by the state of California as toxic air contaminants (TACs) and a subset of these are regulated by the US federal government as hazardous air pollutants (HAPs). They also contain chemicals that can react with other air contaminants to yield potentially harmful secondary products. Exposure to primary and secondary pollutants depends on the complex interplay of many sets of factors and processes, including cleaning product composition, usage, building occupancy, emission dynamics, transport and mixing, building ventilation, sorptive interactions with building surfaces, and reactive chemistry.</p> <p>Study headed by Lee in 7 Asian country on exposure to secondhand smoke (SHS) revealed that Asian countries having the highest smoking prevalence are seriously affected by SHS. The average indoor (particulate matter of <2.5 μm) PM2.5 level was</p>			

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>137 µg/m³, Bar/club had the highest PM_{2.5} level of 191 µg/m³ and restaurants had the lowest PM_{2.5} level of 92 µg/m³. The average indoor PM_{2.5} level in smoking venues was 156 µg/m³, which was 3.6 times higher than non-smoking venues (43 µg/m³). The current levels are comparable to the levels in Western countries before the adoption of smoke-free policy. Since Asian country has high prevalence of SHS in public places, there is an urgent need for comprehensive smoke-free regulation in Asian countries.</p> <p>Bruce et al indicate that exposure to indoor air pollution may be responsible for nearly 2 million excess deaths in developing countries and for some 4% of the global burden of disease. Indoor air pollution increases the risk of chronic obstructive pulmonary disease and of acute respiratory infections in childhood, the most important cause of death among children under 5 years of age in developing countries. Evidence also exists of associations with low birth weight, increased infant and</p>			

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		perinatal mortality, pulmonary tuberculosis, nasopharyngeal and laryngeal cancer, cataract, and, specifically in respect of the use of coal, with lung cancer			
Industry air emission and its health effects		<p>With increasing industrialisation and expansion of residential areas closer to industrial zones; morbidity from air pollution with industrial sources need to be examined if there are emerging trends of respiratory and neurological diseases; or if there is a need for new regulatory measures</p> <p>In Rozana thesis indicates that residential-industrial community in the city of Pasir Gudang Johor, facing indoor environmental problems</p>	<p>Mapping of geographical distribution of air pollutants and industries ; attributed health diseases from inhalation, acid rain or exacerbations of pre-existing conditions like bronchial asthma and COPD</p> <p>literature review of newly identified carcinogens and identification of potential sources in our industry</p>		1
Motor vehicle usage, its emission and health effects		<p>With increase in motor vehicles on the road, air pollutants from vehicular emission increases and increases frequencies and severity of respiratory and neurological diseases. Exposure to carcinogens like benzene from petrol also increases.</p> <p>Study by Yousef indicated that total</p>	<p>Assessment of life expectancies and morbidity of vulnerable populations</p> <ul style="list-style-type: none"> -residents of high traffic/ high pollutant areas -motorcyclist and bicyclist -workers in petrol stations, logistic industries 		2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>polycyclic aromatic hydrocarbons (PAH) concentrations in the atmospheric particles and roadside soil particles were found to be $6.28 \pm 4.35 \text{ ng m}^{-3}$ and $0.22 \pm 0.11 \text{ } \mu\text{g g}^{-1}$, respectively. Benzo[g,h,i]perylene and coronene were found to be the most abundant PAHs in airborne particles at all locations. The most abundant PAHs in the roadside soil particles were fluoranthene, pyrene and phenanthrene.</p>			

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CHAPTER 6: BURDEN OF DISEASE

Introduction for Burden of Disease

According to WHO, Disease Burden is the impact of a health problem in an area measured by financial cost, mortality, morbidity, or other indicators. It is often quantified in terms of quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs), which combine the burden due to both death and morbidity into one index. This allows for the comparison of the disease burden due to various risk factors or diseases. It also makes it possible to predict the possible impact of health interventions.

This burden of disease including variety of diseases, for example diabetes, dengue, non-communicable diseases such as cardiovascular disease and congestive heart failure, obesity, oral disease, injuries, chronic pain and burn. This all diseases expected to increase in number as increase in population.

Dengue is a public health priority for the Ministry of Health of Malaysia (MOH). According to statistic from January to June 2011, dengue has dropped 57% with 11,270 cases compared to same period of last year January to June 2010 with 26,270 cases nationwide. While the death caused by dengue nationwide dropped by 77% (84 cases to 19 cases in 2010 and 2011 respectively). According to MOH, there are 103 dengue spot nationwide with 5 top hot spot. Currently there is no specific treatment or a vaccine available for dengue fever and vector control remains the bedrock for controlling this disease. All available preventive and control measures will be utilized to the optimum. From a clinical perspective, MOH has worked with both the public and private hospitals in the country to report on dengue cases with the aim of monitoring the spread of the disease. MOH has also worked tirelessly with various authorities from both the public and private sectors in ensuring that nationwide fogging is done in areas reported to have high aedes breeding activity.

According to WHO statistic in 2008, out of 57 million global deaths in 2008, 36 million, or 63%, were due to non-communicable diseases. The four main NCDs are cardiovascular diseases, cancers, diabetes and chronic lung diseases. The burden of these diseases is rising disproportionately among lower income countries and populations. In 2008, nearly 80% of non-communicable disease deaths -- 29 million -- occurred in low- and middle-income countries with about 29% of deaths occurring before the age of 60 in these countries. The leading causes of NCD deaths in 2008 were cardiovascular diseases (17 million deaths, or 48% of all NCD deaths), cancers (7.6 million, or 21% of all NCD deaths), and respiratory diseases, including asthma and chronic obstructive pulmonary disease (4.2 million). Diabetes caused another 1.3 million deaths.

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems. Body mass index (BMI), a measurement which compares weight and height, defines people as overweight (pre-obese) if their BMI is between 25 and 30 kg/m², and obese when it is greater than 30 kg/m². According the Global Health Observatory (GHO) by WHO in

2008, at least 2.8 million people worldwide die each year as a result of being overweight or obese, and an estimated 35.8 million (2.3%) of global DALYs are caused by overweight or obesity. Obesity in Malaysia for 2011 is expected almost 30% or 8.1 million people obese, compare to 14% obese according to National Health and Morbidity Survey 2006.

The World Health Organization defines mental health as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community". It was previously stated that there was no one "official" definition of mental health. Cultural differences, subjective assessments, and competing professional theories all affect how "mental health" is defined. There are different types of mental health problems, some of which are common, such as depression and anxiety disorders, and some not so common, such as schizophrenia and Bipolar disorder. According to National health and Morbidity Survey 2006, there are 11% or 2.6 million people has mental problem in Malaysia, and this figure are rising over the time.

Cardiovascular diseases, diabetes and their related complications pose a real and significant threat to Malaysia. The prevalence of non-communicable diseases (NCD) and NCD risk factors in Malaysia are increasing at an alarming rate, according to Ministry of Health Malaysia. As a concerted effort to manage this disease at the primary health care level, The National Diabetes Prevention and Control Programme were strengthened in the year 2000. Since then, we have made significant progress in the provision of care to the patients, with the establishment of dedicated diabetes service, dedicated diabetes teams and the diabetes resource centres.

Since the beginning of the epidemic, more than 60 million people have been infected with the HIV virus and nearly 30 million people have died of AIDS. In 2009, there were an estimated 33.3 million people living with HIV, 2.6 million new infections, and 1.8 million AIDS-related deaths. The WHO African Region is the most affected, where 1.8 million people acquired the virus in 2009. The estimated 1.3 million Africans who died of HIV-related illnesses in 2009 comprised 72% of the global total of 1.8 million deaths attributable to the epidemic. According to HIV and AIDS Data Hub for Asia Pacific, the first reported HIV case in Malaysia was in 1986. By the end of 2009, an estimated 100,000 adults and children (up from 67,000 in 2001) were living with HIV, of which 11,000 were women 15 years and older. The estimated adult prevalence was 0.5% in 2009, up from 0.4% in 2001. According to the 2010 UNAIDS Report on the Global AIDS Epidemic, there were an estimated 10,000 people newly infected with HIV and 5,800 deaths due to AIDS in 2009 (up from 3,900 in 2001).

Tuberculosis (TB) is a potentially fatal contagious disease that can affect almost any part of the body but is mainly an infection of the lungs. It is caused by a bacterial microorganism, the tubercle bacillus or *Mycobacterium tuberculosis*. In 2010, WHO has reported almost 8.8 million people worldwide are the new TB cases, while 1.4 million people are deaths from TB including 0.35 million people with HIV. According to the World Health Organisation, there are approximately 20 million active cases in the world today, and they infect 50-100 million people largely children annually. The mortality due to disease is approximately 3 million annually and at least 80 per cent of them are in the developing countries. Tuberculosis accounts for 26 per cent of all avoidable deaths in Third World countries. These statistics are surely alarming as tuberculosis is a curable disease if properly managed. With regards to Malaysia, the number of cases detected per year has not declined substantially either. Since 1989, we detected on the average 11,500 to 12,000 cases per year. In 1995, we detected 11,778 cases of which 6,500 cases are sputum positive and therefore are infectious.

For adolescent health, MOH has prioritised certain areas such as Knowledge on sexual reproductive health, Adolescent communication about sex, Teenage pregnancy and abortion. Sexual transmitted diseases and Human Immunodeficiency virus infection which became major social problems in Malaysia nowadays.

Same goes to other diseases which are includes in burden of diseases, we need to expand and enhance the promotive aspect of healthy lifestyle, educate our people and community and finally this strategies will promoting healthy lifestyle in order to prevent the disease among our community.

Priority Areas for Burden of Disease

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>Infectious Disease/ Communicable Disease/ Transmissible NTD</p> <p>1.1 Dengue (MOH annual report) and (<i>Pelan Strategik Kawalan dan Pencegahan Denggi, 2009 – 2013</i>)</p>	<p>1. Outbreaks recurrence. 2. Why certain localities? 3. Why patients die? 4. Why certain patients turn severe? 5. Are the accurate and reliable early diagnostic tools? 6. Effectiveness of vector control programme?</p>	<p>I. Community studies on hotspots /localities. II. As above III. Clinical study on dengue death profiling IV. Clinical study on severe dengue profiling V. To develop / evaluate diagnostic tools</p>	<p>Dengue: prevalence and mortality data There is urgent need to develop more effective and affordable (include costing component) risk factors (preventive) diagnostic and management profiles. 1. Incidence rate: 136.89 2. Mortality rate: 0.02 *Health Facts 2009, per 100,000 populations.</p>	<p>1. To identify risks factors for recurrence outbreaks 2. To identify predictors of mortality 3. To identify early predictors of severity (DHF and DSS) 4. To search and validate early diagnostic tools (including biomarkers studies</p>	1
<p>1.2 HIV AIDS</p> <p>HIV AIDS (Malaysia - National Strategy on HIV and AIDS, 2011 – 2015)</p>	<p>1.2 HIV AIDS</p> <p>HIV AIDS (Malaysia - National Strategy on HIV and AIDS, 2011 – 2015)</p>	<p>I. The need for effective treatment to reduce cost of treatment and improve quality of life. II. To reduce morbidity and mortality due to HIV AIDS. III. To improve effectiveness HIV AIDS control programme.</p>	<p>1. The trend of HIV AIDS epidemic – increasing / plateau / decreasing and magnitude – in general population and HRGs? Mortality rate: 0.65 *Health Facts 2009, per 100,000 populations. 2. Effectiveness of drug modality. 3. Effectiveness of public health interventional control programme.</p>	<p>1. Drug clinical trial. 2. Bio behavioural studies in population and high risk population. 3. Cost-effectiveness/ benefits studies. 4. Drug clinical intervention study on maternal- child HIV transmission. 5. Prospective studies on needle</p>	3

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			<p>4. Rate of HIV transmission among antenatal mothers (0.02%-0.04%, 1998-2006)</p> <p>5. Outcome of post needle prick injury intervention.</p> <p>6. Need to achieve Malaysian NSP 2011 – 2015.</p> <p>7. Incidence rate: 10.88</p>	prick injuries.	
<p>1.3 Tuberculosis (National Strategic Plan for Tuberculosis Control, 2011 – 2015, MOH) WHO TB Research Movement.</p>	<p>1. Trend of pathogenicity and susceptibility of mycobacterium tuberculosis.</p> <p>2. Effectiveness of vaccination for TB.</p> <p>3. Risk factors for TB among healthcare workers.</p> <p>4. Prevalence of TB among migrants (Legal/Illegal)</p>	<p>1. Microbial and drug sensitivity studies of M. tuberculosis.</p> <p>2. Effectiveness of vaccination in prevention of pulmonary and extra pulmonary of TB.</p> <p>3. Surveillance of TB among migrants.</p>	<p>1. Pattern of virulence of M. tuberculosis.</p> <p>2. Populations at risk to TB.</p> <p>3. Effectiveness of TB Control programme.</p> <p>4. Need to achieve MDG 6c: Stop TB partnership –WHO.</p> <p>5. Incidence rate TB: 63.95</p> <p>6. Mortality rate: 5.59</p> <p>7. *Health Facts 2009, per 100,000 populations.</p>	<p>1. Viability and susceptibility study of mycobacterium tuberculosis.</p> <p>2. Prospective study of TB vaccines.</p> <p>3. Case control study of TB among healthcare workers.</p> <p>4. Surveillance of TB among migrants</p>	3
<p>1.4 Emerging and reemerging diseases Emerging infectious diseases of public health importance. MOH Strategic Plan (2006-2010)</p> <p>Health Research Priorities 9th Malaysia Plan 2006</p>	<p>1. Effective anti-viral for emerging viral/ zoonotic infections.</p> <p>2. Effective containment of epidemic due to emerging infections.</p> <p>3. Disease related to global climate change/ disaster?</p>	<p>I. Emerging viral agents</p> <p>II. Action research in Public Health Crisis</p> <p>III. Effect of Global climate change of Emerging and reemerging diseases.</p>	<p>1. Epidemic due to emerging infections caused serious socio economic implications.</p> <p>2. Public anxiety and concern of epidemics.</p> <p>Infectious diseases related to global climate change, e.g: Flood, Haze, and Heat.</p>	<p>1. Clinical trial of antiviral for emerging viral infections.</p> <p>2. Action research in public health crises.</p> <p>3. Global climate change threat to the pathogenicity of infectious diseases</p> <p>4. Microbiological study of emerging</p>	7

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
– 2010.				viral agents. 5. Action research in Public Health Crisis Management.	
1.5 Emerging and reemerging diseases at points of entry (Tick borne Diseases)	Effective containment of epidemic due to emerging infection	Rapid identification of vectors and normal hosts for arthropod-borne zoonotic infections	During outbreaks of arthropod-borne zoonotic infections, rapid detection of potential vectors and their normal hosts, that may be reservoirs of the infectious agent, is essential for effective control and management of the outbreak. Currently available information is inadequate and techniques are slow and labour intensive.	Detection of zoonotic pathogenic agents in arthropods and animal hosts Rapid arthropod vector blood meal identification for identifying potential natural animal hosts of zoonotic infections	7
Introduction of disease bearing arthropods into the country through the importation of exotic animals and pets from disease endemic countries	Collection and identification of arthropods found on exotic animals and pets quarantined at Points of Entry (Airport, Seaport, Ground Crossings) into Malaysia. Examination of the arthropods for infectious agents.	Currently the surveillance conducted at points of entry does not cover all potential arthropod vectors. There is a possibility for tick vectors to be imported into the country via exotic pets (Mariana et al., 2011)	Collection and identification of ticks and mites found on exotic animals and pets quarantined at Points of Entry (Airport, Seaport, Ground Crossings) into Malaysia. Examination of the arthropods for infectious agents.	Information on imported arthropods and their infectious pathogens will lead to improved preparedness of control and managing outbreaks of imported arthropod borne infections.	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
The potential public health risk of rodents and their ectoparasites (besides fleas) present at Points of Entry (PoE) into Malaysia under International Health Regulations (IHR 2007)	Detection of pathogens in the rodents and Identification of ectoparasites of public health importance found on those rodents	Inadequate information. Mites of public health importance have been found on rodents caught in KLIA since 2010.	Detection of pathogens and Identification of ectoparasites of public health importance found on rodents caught for vector surveillance at all PoE into Malaysia.	Information on pathogens and ectoparasites of rodents at all PoE into Malaysia will lead to improved prevention of importation of zoonotic infections into the country.	
The tick and mite-borne infections present in Malaysia	Identification of pathogens of potential public health importance in ticks and mites	Tick-borne and mite-borne diseases have been overlooked or misdiagnosed. These infections are second to mosquito-borne infections worldwide and are becoming increasingly important globally. Little is known about the prevalence and epidemiology of such infections in Malaysia.	Collection of ticks and mites from various natural hosts and ecologies. Examination of those ticks and mites for presence of pathogens of potential health importance.	Information of tick and mite-borne pathogens of public health importance that will lead to improved preparedness for the management of such infections.	
1.6 Leprosy	Undiagnosed leprosy among foreign workers due to insufficient pre-employment screening Prevalence of undiagnosed leprosy during pre-employment medical check up	To identify geographic location of foreign workers with leprosy	The incidence of leprosy among Malaysians versus foreign workers for the year 2008 was 123 to 95 patients (Internal survey in public hospitals, not published yet)	1. Pre-employment medical check-up to include screening for leprosy. 2. To identify the geographical location (in the country of origin) of foreign workers with leprosy	4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>2.3 Metabolic Syndrome (MetS) Metabolic syndrome—a new world-wide definition. A Consensus Statement from the International Diabetes Federation K. G. M. M. Alberti, P. Zimmet, J. Shaw Article first published online: 20 APR 2006. DOI: 10.1111/j.1464-5491.2006.01858</p>	<p>Measurement of magnitude Application of solutions and evaluation of impact To address the role of gene-environmental interaction</p>	<p>I. Identification of effective intervention strategies II. To identify areas for improvement of patient care III. the aetiology of the MetS IV. Determining interventions which can prevent progression to CVD and Type 2 diabetes</p>	<p>There is an urgent need to address the high prevalence of metabolic syndrome in Malaysia. (ref DIAB 497, WHO definition; prevalence 32.1%) -Xavier Formigura et al. Best practice and research clinical gastroenterology - Metabolic syndrome, diabetes and atherosclerosis: Influence of gene-environment interaction, Maria Grazia Andreassi</p>	<p>1. To obtain data on burden of disease 2. To obtain evidence to support policy development 3. To monitor the effectiveness of current interventions 4.To identify the susceptibility factors for metabolic syndrome 5.To evaluate the effective intervention 6.To improve patient care 7.Identification of genetics polymorphisms in patients with MetS 8.the relationship between different constellations of factors and CVD outcomes 9.better identification</p>	<p style="text-align: center;">2</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				<p>of high-risk patients with MetS in different populations</p> <p>10. defining the components of the MetS by measuring more precisely a wide range of variables and in particular establishing the most predictive markers and cut-points for central obesity in different ethnic groups</p> <p>11. Determining interventions which can prevent progression to CVD and Type 2 diabetes</p>	
<p>Non-Communicable Disease 2.1 Cardiovascular disease</p>	<p>Measurement of magnitude Application of solutions and evaluation of impact</p> <p>To address the role of gene-environmental interaction</p>	<p>epidemiology of NCD eg I. Smoking II. Economic impacts. Eg: a) Generate country specific information on risk factors, the disease burden, economic and social costs, b) Analysis of gender issues in the prevention and control of NCD</p>	<p>Lack of data on economic and social costs on NCD and NCD risk factors in Malaysia. Currently lack of data on gender specific issues, in line with government needs for gender issues to be highlighted CVD as manifest as</p>	<p>Basic Research, Epidemiological, Intervention Studies, Surveillance</p> <p>1) To identify the genetics factors in CVD 2) To obtain data on NCD disease burden, economic and social impact, together with</p>	<p>1</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>Impact of cardiovascular (ACS) risk factors on ACS presentation and outcomes in Malaysia</p> <p>Study of existing and novel strategies to diagnose and treat patients with ACS</p>	<p>c) Develop observational cohorts to study social, cultural, economic determinants of behavioral and other cardiovascular risk factors</p> <p>d) Risk factors of ACS – new and old.</p> <p>Cardiovascular epidemiology and outcomes</p> <p>Health technology-type assessments and evaluation of existing diagnostic and therapeutic strategies for ACS</p> <p>2) intervention Studies screening, clinical intervention, prevention, CM, ACS remain the most COMMON cause of mortality in Malaysia.</p> <p>Malaysian patients with ACS are younger and have proportionately more risk factors than populations from other developed nations The cost of diagnosing and treatment of ACS are climbing: not only from the increasing numbers of patients with CV</p>		<p>gender specific issues</p> <p>3)To obtain evidence of effectiveness of cardiovascular programmes</p> <p>4)To develop risk calculator for Malaysia</p> <p>5)To obtain evidence to support development of policies</p> <p>6)To develop the best model for CVD screening in the primary healthcare clinics</p> <p>To develop and implement effective behavioural, modification strategies, Improvements in patient care</p> <p>Intervention Studies Screening ,clinical intervention,prevention,TCM,Behavioral, community ,Healthy Lifestyle,</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>risk factors, but the complexity of these new strategies. Behavioral, community, Healthy Lifestyle, Empowerment, Self care</p> <p>3)QOL studies 1. psychological studies on NCD</p> <p>4) Determinant of NCD- Eg Biological Markers</p> <p>5)CVD Risk Calculator Development of stratification of cardiovascular risk factors for Malaysian by the separate ethnic groups</p>		<p>Empowerment, Self care</p> <p>Determine the effectiveness of community education campaigns, community participation and multi-sectoral action for CVD prevention in different cultural and economic setting II. To assess the potential contribution of traditional and complementary medicine to prevention and control of NCDs III. Validate cost effective screening approaches, risk prediction methodologies and clinical algorithms IV. Develop means of training, and improving performance of the health workforce to deliver good quality</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				<p>NCD care</p> <p>V. Patient empowerment – To design and validate models for enabling NCD patients to become self reliant in monitoring and managing their conditions using innovative methods e.g. mobile phones to address issues related to health literacy, self care and adherence to long-term therapy</p> <p>VI. To design and validate simple and reliable audit systems to monitor the impact and quality of NCD programmes in primary care</p> <p>3)QOL studies E.g.: psychological studies on NCD</p> <p>4) Determinant of NCD- Eg Biological Markers</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				5)CVD Risk Calculator Development of stratification of cardiovascular risk factors for Malaysian by the separate ethnic groups	
2.2 Non communicable disease – Psoriasis	d. The association between psoriasis and other non communicable diseases (metabolic syndrome, CVD etc)	1. Lack of data on risk factors, economic and social cost of psoriasis (Ref No. 1 & 2)	1. To determine the risk factors and co-morbidities of psoriasis 2. Intervention study 3. Quality of life 4. Cost effectiveness study	1. Strong evidence base data on burden of disease, including economic and social cost for better patient care and resource allocation	5
2.3 Metabolic Syndrome (MetS) Metabolic syndrome—a new world-wide definition. A Consensus Statement from the International Diabetes Federation K. G. M. M. Alberti, P. Zimmet, J. Shaw Article first published online: 20 APR 2006. DOI:	Measurement of magnitude Application of solutions and evaluation of impact To address the role of gene-environmental interaction	I. Identification of effective intervention strategies II. To identify areas for improvement of patient care III. the aetiology of the MetS IV. Determining interventions which can prevent progression to CVD and Type 2 diabetes	There is an urgent need to address the high prevalence of metabolic syndrome in Malaysia. (ref DIAB 497, WHO definition; prevalence 32.1%) -Xavier Formigura et al. Best practice and research clinical gastroenterology - Metabolic syndrome, diabetes and atherosclerosis: Influence of gene-environment interaction, Maria Grazia Andreassi	1. To obtain data on burden of disease 2. To obtain evidence to support policy development 3. To monitor the effectiveness of current interventions 4.To identify the susceptibility factors for metabolic syndrome	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
10.1111/j.1464-5491.2006.01858				5.To evaluate the effective intervention 6.To improve patient care 7.Identification of genetics polymorphisms in patients with MetS 8.the relationship between different constellations of factors and CVD outcomes 9.better identification of high-risk patients with MetS in different populations 10.defining the components of the MetS by measuring more precisely a wide range of variables and in particular establishing the most predictive markers and cut-points for central obesity in different ethnic groups	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				11. Determining interventions which can prevent progression to CVD and Type 2 diabetes	
2.4 Chronic respiratory diseases			There is a need to develop a comprehensive plan of action for the prevention and control of chronic respiratory diseases	I. Estimate impact of interventions to reduce morbidity and mortality due to severe/uncontrolled asthma in children II. Study the feasibility and effectiveness of prevention and management of chronic respiratory diseases through a primary health care approach III. early detection of occupational chronic respiratory disease and interventions to prevent progression of disability IV. Estimate the impact of interventions for reducing the risks	4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				<p>related to tobacco smoke, solid fuel combustion, outdoor air pollution and allergen V. Estimate the impact of early detection of occupational chronic respiratory disease and interventions to prevent disability VI. Estimate attributable fraction of risk of chronic respiratory disease related to tobacco smoke, solid fuel combustion, outdoor air pollution, allergens and other environmental factors</p>	
2.5 Tobacco Control NSP-NCD document				<p>Evaluate the economic impact of tobacco control - includes impact on jobs, effects of SFA policies on hospitality sector, reduced health care costs, benefits from increased</p>	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				productivity, etc Estimate the impact of tax increases - on tobacco use (consumption, prevalence, cessation, initiation, and differences for priority populations), on revenues, and on issues around illicit trade (extent of, determinants of, effects of tax increases on)	
2.6 Oral Cancer Research		To undertake multi-centre, hospital and community-based case-control, epidemiological and molecular studies on oral cancer patients on: 1. Mouth cancer awareness 2. Nutritional intake 3. Diagnostic tools for early detection 4. Molecular biomarkers 5. Anti-cancer drug	1. Oral cancer in Stages III & IV: 58.7% 2. High prevalence among Indians: 3rd and 7th most common cancer 3. Young people without habit having oral cancer: 8.3% 4. Lack of data on effect of disease/treatment on nutritional status	To assess level of awareness on characteristics and risk factors of oral cancer among the public; to determine nutritional intake and well-being of oral cancer patients; to evaluate the diagnostic value of detection tools for early detection; to identify biomarkers significant in oral cancers; to develop new anti-cancer drug	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
				against oral cancer	
2.7 Nasopharyngeal Cancer Research	<p>To study the molecular pathogenesis of NPC for the development of new approaches to prevent, diagnose, treat and prognosticate the disease. To development/ evaluate biomarkers for screening, diagnosis and prognosis of NPC.</p> <p>To study the cellular basis of drug resistance/ radio-resistance, recurrence and cancer progression and the role of cancer stem cells/tumor initiating cells.</p> <p>To develop therapies against NPC and its cancer</p>			<p>1. Identification of molecular targets, the development of thrapeutics to treat cancer using these genes and our understanding of how they drive cancer</p> <p>I. Clinical outcomes of Nasophryngeal cancer patients II. Molecular and cellular biology of NPC</p> <p>III. Development of novel markers for screening, diagnosis and prognosis of NPC</p> <p>IV. Development of novel therapies for treatment of NPC.</p> <p>V. Evaluation of EBV DNA and other markers as well as</p>	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>stem cells.</p> <p>To study the molecular risk factors and its association with environmental factors.</p>			<p>other approaches for screening in high risk groups for the purpose of down staging of disease</p> <p>VI. Clinical trials of treatment of NPC.</p> <p>VII. Molecular epidemiology of NPC for identification of risk factors among high risk groups of NPC</p> <p>VIII. Molecular biology of environmental carcinogenesis and epigenetic mechanisms</p> <p>IX. Development of cell lines, xenografts and other models to study NPC</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
2.8 Diabetes	<p>a. To identify the genetics factors in diabetes</p> <p>k. b. To develop and implement effective behavioural modification strategies for diabetics</p> <p>l.</p> <p>m. c. Improvements in diabetic patient care including monitoring of complications, improvement of patient compliance to therapy. To improve the delivery of care at the primary care level</p>	<p>The prevalence of diabetes in Malaysia is increasing at an alarming rate (ref NHMS II, NHMS III)</p> <p>Acute Coronary Syndrome Registry 2007. Two thirds of patients admitted with ACS had abnormal glucose tolerance</p> <p>Use of insulin usage has gone up from 10 to 15% over the last few years. Study on DIAB Care there is a deterioration of control (only 15% have good control A1c below 6.5%) Based on the MSSM 2008 study, up to 20% of the study population have pre-diabetes (Impaired fasting glucose and impaired glucose tolerance)</p> <p>There is a need for cohort data on the risk of development of diabetes-related complications. QA diabetes data (2009) in primary care: only 11.4% of type 2 diabetes patients achieve glycaemic control HbA1c <6.5% Over 70% of diagnosed</p>	<p>1)Epidemiology studies: 1. Metabolic syndrome 2. GDM 3. Prediabetics 2)Preclinical Studies I. Genetics studies II. Animal Studies III. Molecular biology a. Basic experiment: Identification of genetic markers for diabetes for earlyintervention Genetic markers for diabetic complications. b. pre-clinical phase: Experiments carried out in animal models 3)Clinical Studies I. Identification of better treatment modalities for diabetes II. Diabetes cure research III. Education and Behavioral Modifications targeting children IV. Studies on incidence and mechanism of pre-diabetes as well as the contribution of pre-diabetes to CVD V. Validation of risk prediction algorithms for Malaysia VI. Develop models for optimal</p>	<p>a. Reduction in the rates of diabetes b. Development of effective behavioural modification strategies c. Improvement in survival rates for diabetes outcomes and quality of life d. Quantify how much pre-diabetes contributes to CVD burden</p>	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		diabetes patients receive treatment in MOH health clinic	delivery of diabetes education and clinical management – in particular testing and comparing different models and assessing cost-effectiveness Develop a programme for prevention and management of gestational diabetes with lifestyle intervention during pregnancy and after delivery		
2.9 Mental Health	<p>To quantify the actual burden of selected mental diseases</p> <p>b. To identify the genetic factors associated with psychotic disorders</p> <p>c. To identify the vulnerable groups for early intervention</p> <p>d.To develop training modules for education providers</p> <p>e. To ensure continuous</p>	<p>a. Focus on suicide and parasuicide</p> <p>b. improving early outreach programmes for the vulnerable and high risk groups</p> <p>c. improving patient care</p> <p>Suicide rate in Malaysia is 10 to 13/100,000 pop (Maniam et al). Average of 2 persons/day</p> <p>There is a need for a comprehensive monitoring and evaluation mechanism</p>	<p>1) Determinants of mental health biological and psychosocial</p> <p>a. To identify psychological parameters in potential individuals</p> <p>b. Genetic studies to identify susceptible individuals</p> <p>2) Epid studies of mental illness, self harm behavior.</p> <p>a. Determine the level of Mental health literacy among Malaysian population</p> <p>b. Psychosocial aspects of chronic mental illness Depression among women (including single mothers etc.)</p> <p>3) Intervention studies- Screening, Early detection,</p>	<p>1.Reduced morbidity and mortality from mental diseases – e.g suicide rate</p> <p>2. Improved patient care</p> <p>3. Development of training modules for providers</p> <p>4. Early identification of high risk populations and early intervention</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>monitoring of identified individual</p> <p>f. Psychological and social intervention</p> <p>g. Service evaluation</p> <p>h. Impact of other diseases on mental health</p> <p>Evaluation and/or develop mental health rehabilitation services</p>		<p>Rehabilitation</p> <p>a. To identify and develop effective training modules for providers in various settings e.g, schools, primary care center's</p> <p>c. .dentify strategies for improving service and patient care</p> <p>d. Develop and evaluate innovative strategies for family and community involvement and interventions to hasten recovery, minimize disabilities and reduce relapses for mental illness</p> <p>4)Community and family interventions eg, mental health literacy, empowerment, self care</p> <p>Develop and evaluate innovative strategies for family and community involvement and interventions to hasten recovery, minimise disabilities and reduce relapses for mental illness</p> <p>5)Surveillance on mental illness eg: Suicide, schizophrenia, Depression.</p>		

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
			6)Adolescent mental health		
3.1 Intentional self-harm		<p>Justifications: There is 3756 cases in 2007(PDRM) Most case is not followed up after the initial visit to doctors. Needs: need to establish and support data systems for on-going monitoring and evaluation There were about 3000 cases admitted each year from 2006 to 2007 with males predominant whereby the higher number of cases noted among children aged less than 5 years</p> <p>Justifications: • In Malaysia annual suicide rate 10 per 1000,000 • No data on self inflicted injuries among adolescent</p>	<p>)Biological risk factors? -genetics vulnerability -deficient neurotransmitters' 2)Environmental -support/income gp -identification of high risk gp? 3)Emergency Care management. -Surgical management /effectiveness of drugs at Emergency Dept. -Cost and economic evaluation</p> <p>types of intervention/support</p> <p>Discharge: Rehabilitation Back to work</p> <p>Repeat attempt Survivor follow up Types of intervention/counseling provided in various</p>	3.1 Intentional self-harm	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>school children</p> <ul style="list-style-type: none"> • Insufficient awareness of magnitude of problem. • need to establish and support data systems for on-going monitoring and evaluation <p>1)inadequate primary intervention 2) Inadequate awareness/info on burden/support /ED management.</p> <ul style="list-style-type: none"> • needs • collaborative research • enhancement of Suicide registry • better data mining from these registry 	<p>organization cost and effectiveness of strategies/programmes/treatment</p>		
3.2 Occupational Injuries		<p>Occupational Injuries No of industrial accident in 65 per 10,000 workers in 2005(sosco) Permanent and temporary disability and work absenteeism in the productive age group. Preventable by public education and enforced training of workers. increasing</p>	<p>I. To determine the burden and high risk group II. To determine the Prevention strategies multiple strategies to various settings, including engineering controls, protective equipment and technologies, Management commitment to and investment in safety, regulatory controls, an</p>	3.2 Occupational Injuries	5

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		number of immigrants employed illegally and/or without regular working visas .	education and training.		
3.3 Injuries in children	1) domestic violence 2) Rape 3) incest	<p>Needs: need to establish and support data systems for on-going monitoring and evaluation</p> <p>Justifications: Injury and violence is a major killer of children throughout the world, responsible for about 950 000 deaths in children and young people under the age of 18 years each year (WHO Global Burden of Disease: 2004 update).</p> <p>Unintentional injuries account for almost 90% of these cases. They are the leading cause of death for children aged 10–19 years.</p> <p>There are about 196 cases of child abuse was reported in PDRM for the year 2007. Need to establish and support data systems for on-going monitoring and evaluation</p>	1)Epidemiological studies of family violence on women, children and others I. to assess the prevalence of STD and pregnancy among this victims. 2) To study the higher risk group and factors involved among the groups. 3)Shaken baby syndrome prevention	<p>To determine epidemiology of SBS, intervention effectiveness</p> <p>Local risk factors in child abuse and neglect – so as to provide data to obtain effective intervention measures</p>	4

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
3.4 Burns			Use of skin grafts Artificial skin graft		9
<p>4.1 High prevalence of oral disease and late detection of oral cancer i.e at Stage 3 and 4.</p> <p>4.1.1. Dental Services Division, Ministry of Health Malaysia. The National Oral Health</p> <p>4.1.2 Survey of Preschool Children 2005 (NOHPS). MOH/GIG/1.2007(RR), 2007</p> <p>4.1.3. Oral Health Division, Ministry of Health Malaysia. Annual Report 2009. MOH/K/GIG/40.2010</p>	To undertake national time-series community-based epidemiological surveys of identified target behavior of groups i.e preschool children in 2015, special needs children and indigenous groups in Sabah and Sarawak.	<p>1. Caries prevalence 5-year olds: 76.2 % (2005), 87.1% (1995)</p> <p>2. Oral cancer: 67 % detected in stage 3 & 4 for period 2003-2009.</p> <p>3. Indigenous groups: Mucosal lesion 17% (Sabah and Sarawak) compared with 0.04% from Malaysia (1993-1994).</p> <p>4. Special needs children: Caries prevalence 78.2 % (2008)</p>	Epidemiological studies for dental caries, periodontal disease and oral cancer among identified target groups.	<p>1. Burden of oral diseases and treatment needs</p> <p>2. Risk factors to oral diseases</p> <p>3. Identification of barriers to care</p> <p>4. Data for oral healthcare financing</p>	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>4.2 Evaluation of effectiveness of community oral health interventions against environmental issues</p> <p>1. Oral Health Division, Ministry of Health. Fluoride enamel opacities in 16-year-old children, June 2001</p> <p>2. Mah LKH. A study of the fluoride level of bottled mineral water in Sabah.</p> <p>3. Oral Health Division, Ministry of Health Malaysia. Plan of Action 2011</p>	<p>To address concerns that challenges the effectiveness of community oral health interventions.</p>	<p>1. Continuing monitoring of prevalence of enamel opacities (last done in 2001)¹ among 16-year old school children</p> <p>2. Data on fluoride content of alternative sources of drinking water is needed for informed choices of drinking water. (A study in Sabah has shown variation in fluoride levels of bottled mineral water²).</p> <p>3. Need for evaluation of</p>	<p>Evaluate effectiveness of community oral health intervention measures against environmental issues in research areas as follows:</p> <p>1. Enamel Opacity Survey among 16-year old school children</p> <p>2. Fluoride content of alternative drinking water sources</p> <p>3. Effectiveness</p>	<p>1. Monitoring data on enamel opacities on target groups.</p> <p>2. Fluoride content in bottled drinking /mineral water/reverse osmosis drinking water.</p> <p>3. Identification of risk factors to oral disease among identified communities.</p>	<p>3</p>
<p>4.2 Evaluation of effectiveness of community oral health interventions against environmental issues</p> <p>1. Oral Health Division, Ministry of</p>	<p>To address concerns that challenges the effectiveness of community oral health interventions.</p>	<p>1. Continuing monitoring of prevalence of enamel opacities (last done in 2001)¹ among 16-year old school children</p> <p>2. Data on fluoride content of alternative sources of drinking water is needed for informed choices of drinking water. (A study in Sabah has shown</p>	<p>Evaluate effectiveness of community oral health intervention measures against environmental issues in research areas as follows:</p> <p>1. Enamel Opacity Survey among 16-year old school children</p>	<p>1. Monitoring data on enamel opacities on target groups.</p> <p>2. Fluoride content in bottled drinking /mineral water/reverse osmosis drinking water.</p>	<p>3</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>Health. Fluoride enamel opacities in 16-year-old children, June 2001</p> <p>2. Mah LKH. A study of the fluoride level of bottled mineral water in Sabah.</p> <p>3. Oral Health Division, Ministry of Health Malaysia. Plan of Action 2011</p>		<p>variation in fluoride levels of bottled mineral water²).</p> <p>3. Need for evaluation of mouth self-examination programme (introduced in 2007)³ for early detection of pre-cancer and oral cancer.</p>	<p>2.Fluoride content of alternative drinking water sources</p> <p>3. Effectiveness of mouth self-examination</p>	<p>3. Identification of risk factors to oral disease among identified communities.</p>	
<p>5.1 Family Health</p> <p>Child health (Draft Report of meeting on national Research Priority Setting in FH for RM10 plan)</p>		<ul style="list-style-type: none"> • Under 5 MR/1,000 LB=8.1 (2008), 7.9(2007), 12 (2004) • Cause of mortality (2006): <ul style="list-style-type: none"> - Congenital malformations, deformations and chromosomal abnormalities (25.1%) - Certain infectious and parasitic diseases (18.8%), - diseases of the respiratory system (13.0%) - diseases of the nervous system (8.2%) and - injuries, poisoning and external causes (7.5%). • Need to achieve MDG 4 (reducing by 2/3 the mortality rate of children under 5 yrs by 2015 ie 5.6/1,000 LB) <p>Under 5 Mortality study</p>	<p>I. Epid studies of Infant/child and MMR</p> <p>II. Differentials between states, ethnic, income and minority groups</p> <p>III. types and severity of disability</p> <p>IV. gender distribution</p> <p>V. age at diagnosis</p> <p>VI. early intervention strategies eg: causes of Cong. malformations, deformations and chromosomal abnormalities</p> <p>causes of certain conditions originating in perinatal period</p>	<ul style="list-style-type: none"> • To develop national strategies in reduction of child mortality • To achieve MDG 4 targets • To develop national strategies in reduction of child mortality • To achieve MDG 4 targets • To prioritise services and resources in the management of children with special needs • To support MOE NKRA (indicator numeracy 	<p>3</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>conducted by CRC (2006) has identified disparities among ethnic groups and regions, and groups of malnourish children who died from diarrhea and pneumonia, which were preventable and treatable at low cost.</p> <ul style="list-style-type: none"> • No current Malaysian data for children. WHO estimated figure: 10 % (2006) • NHMS3:6.3/1000 physical disability and 50% need assistance from care giver. Screening and detection among preschool children showed a prevalence of 10-16% (ref); 10-30 /1,000 have intellectual disability, 20-50/1000 ADHD, 6.9/1000 developmental disorder, 50-100/1000 learning disability (ref). 		<p>and literacy)</p> <ul style="list-style-type: none"> • To priorities services and resources in the management of children with special needs • To priorities services and resources in the management of children with special needs 	
<p>5.2 Adolescent health (Draft Report of meeting on national Research Priority Setting in FH for RM10 Plan)</p>	<ul style="list-style-type: none"> • Knowledge on sexual reproductive health • Cognitive factors e.g adolescent communication about sex • Teenage pregnancy/abortion 		<p>Sexual and reproductive health, teenage pregnancy, Std and HIV, Adolescent sexual health, abortion, contraception and preconception care Reasons for low uptake of pap smear screening</p>	<p>Understanding how youth make decision to engage in early sexual activities is critical for intervention efforts to decrease negative outcomes of youth sexual behaviour as</p>	<p>3</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	STD/HIV			well as the determinants	
5.3 Women's health (National cancer registry 2003-2005; National Cancer Blueprint 2007; NHMS3 2006)		<ul style="list-style-type: none"> • Lack of data on adolescent sexual reproductive health in Malaysia • Lack of sexual and reproductive health information and skills in negotiating sexual relationship and inaccessibility of youth friendly sexual and reproductive health services • Prevalence of premarital sexual activity and low contraceptive usage results in high rates of adolescent deliveries and even abandoning of newborns • Ever have Pap Smear among women 40% (FHD) • Since 2000, MMR has stagnated at 28.3/100,000 LB • Need to address this issue as it affect the productivity of the country • The 2000 Census showed that 6.2 per cent, 1.452 million people, were aged 60 or over, by the year 2020, 9.5 per cent 	<ul style="list-style-type: none"> • Evaluation of existing cervical cancer screening programme (pap smear) • To assess unmet needs for spacing and timing among high risk women • To reduce preventable causes of MMR <p>To strengthen preconception care risk women</p> <ul style="list-style-type: none"> • To reduce preventable causes of MMR <p>To strengthen preconception care</p>	<p>to reduce the problem</p> <ul style="list-style-type: none"> • Development of intervention to reduce STD/HIV transmission • Increase in contraceptive prevalence rate contributing to reduction in MMR • Promote implementation of evidence based, cost effective reproductive health intervention with the focus on maternal health • Promote implementation of evidence based, cost effective reproductive health intervention with the focus on maternal health 	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		<p>of the country's population will be aged 60 years and over.</p> <ul style="list-style-type: none"> • Older persons made an average of 6 visits per year (Chia 1996). • No comprehensive data on elderly population in Malaysia • Available data captured only those who utilised the services 			
5.4 Adult Health Elderly	<ul style="list-style-type: none"> • prevalence and type of functional disability • Chronic diseases: prevention and control • Mobility states: expansion morbidity vs compression morbidity <p>To have validated local data for cognitive test such as the FAB, AMT etc for further research</p> <p>We only have validated MMSE and GDS currently</p> <p>To know the burden of cognitive decline and not just dementia in</p>	<p>Aging population is inevitable: but the local dependency rate of the elderly is unknown</p> <p>Aging population is inevitable: but the local cognitive impairment rate of the elderly is unknown</p> <p>As Malaysia draws closer to be an ageing population nation, CDD will also be on the rise.</p> <p>-Preparing the healthcare workers and providers in the manifestation of diseases and teaching patients how to cope with their disability will provide quality of life for the elderly</p> <p>We already have the MRI</p>	<ol style="list-style-type: none"> 1. Studies on disability 2. Epid studies, Intervention studies and Management and rehabilitation 3. QoI Studies on Caregiver, cancer survivor, Disable and mental health and etc 4. Healthy Ageing determinant and intervention 5. Epidemiology studies: <ol style="list-style-type: none"> 1. to have local validity on TUG, Grip strength and short form frailty index developed by Dr Sharul (UMMC) 6. The prevalence of elderly living with disability and dependency in 	<p>states: expansion morbidity vs compression morbidity</p> <p>to have research tool than can be applied locally.</p> <p>to estimate the burden of cognitive impairment in our local setting to help plan for future socio economic planning</p> <ol style="list-style-type: none"> 1. Patient and healthcare workers ability to cope with the disability 2. Promote quality of life for the elderly 3. Formation of an effective support group in the community 	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>Malaysia To assist the elderly in coping with the disability and pain and to promote their quality of life</p> <ol style="list-style-type: none"> 1. Preventive measures of the diseases 2. Pain management 3. Coping and rehabilitation <p>To have the validated volumetric study for brain degeneration in Malaysia</p>	<p>machine. We just need to have a special programme and minimally trained radiologist to be the first country in the region to have validated volumetric studies for dementia and cog impairment.</p>	<p>Malaysia</p> <ol style="list-style-type: none"> 7. the health expectancy in the country and sub analysis on individual states: expansion morbidity vs compression morbidity <p>Epidemiology studies:</p> <ol style="list-style-type: none"> 1. to have local validity on FAB, AMT, CDR and ZBS 2. to determine the amount of burden of cognitive impairment and to project it into the future <p>Extent and impact of the diseases on elderly patients</p> <p>Knowledge of healthcare workers on the diseases What is the most effective rehabilitative programme for the elderly? to have a normative study on the hippocampal, entorhinal, cortical vol for the normal and different type of cognitive level (less than 100 patients)</p>	<p>To be the first in the region to have volumetric studies for patient with neurodegenerative disease (help to prognosticate the who will progress to dementia and who will not) This will help the country to be one of the key centre for research in cognition without much cost needed for further research (with commitment, this research can be finish in less than 1 year)</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Obesity	<p>a. Factors contributing to obesity</p> <p>b. Food consumption patterns among obese</p> <p>c. Malaysian physical activity level</p> <p>d. Malaysian eating habits</p> <p>e. Relationship between obesity and 24 hours restaurant services</p> <p>Eating behavior</p> <p>Definition of overweight and obesity</p> <p>Psychosocial and psychological may influence in maintaining appropriate body weight and prevent weight gain</p>	<p>The prevalence of obesity increasing rapidly within these 10 years. Data NHMS II (1996) reported 4.4% of Malaysian are obese while NHMS III (2006) showed that, the prevalence is increasing 3 times, whereas 14.0% of Malaysian are obese. The prevalence of obesity also can be seen growing among children at school ages. UKM studies among primary school children also showed that the prevalence of overweight and obesity is increasing from 20.7% in 2002 to 26.5% in 2008. Current BMI definition by WHO is controversial for Asian/ Malaysian. For the same BMI, it has been suggested that Asians have higher body fat composition and thus predispose them to comorbidities. Waist circumference is an important indicator of central obesity. Cut-offs for waist circumference of adults are known, but not for children and adolescents. Obesity has a significant</p>	<p>i. Determination of factors influence obesity (cultural, social and eating behaviors)</p> <p>ii. Food Consumption among the obese population</p> <p>iii. Meal Pattern among the obese population</p> <p>iv. Habitual Food Intake among the obese population</p> <p>v. Physical Activity Assessment among the obese population</p> <p>vi. Relationship between obesity and 24 hours restaurant services</p> <p>vii. Dieting behavior and body weight</p> <p>viii. Cohort study to identify appropriate BMI cut-offs for Malaysian based on comorbidities</p> <p>ix. Development of waist circumference centile charts for children and adolescents.</p>	Prevalence of obesity can be controlled and suitable approach to prevent obesity will be identified.	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>Health economics impact of the country on obesity problem</p> <p>Evaluation of prevention & intervention activities on obesity</p>	<p>impact on health-related quality of life and functional capacity of individuals in the society. Economic cost of obesity in Malaysia needs to be assessed as increased cost obesity-related healthcare that Malaysia can ill-afford</p> <p>It is necessary to consider the specific issues which make particular groups more vulnerable to weight gain. There is lack of available model for the prevention and intervention of obesity.</p>	<p>x. The impact of the Malaysian social, political and environment on obesity.</p> <p>xi. The economic burden of obesity and obesity related conditions in Malaysia.</p> <p>xii. Cost effectiveness of individual obesity treatment compared to preventive intervention.</p> <p>xiii. Development and evaluation of school-based intervention programmes for the prevention and control of obesity in children.</p> <p>xiv. Development of media campaign to prevent obesity and evaluate its effect</p>		
<p>Macro and micronutrient excesses and deficiency</p>	<p>Determination of dietary intake status and the balance with physical activity level</p> <p>Evaluation of current and future intervention strategies</p> <p>Expand the</p>	<p>Last National Nutrition Survey was conducted in 2003 and the recent data of nutritional status is needed.</p> <p>National Nutrition Survey among adolescents is also needed as a baseline data for the programmes and activities planning and development.</p>	<p>Determination of dietary intake (macro and micronutrient) status such as fat, dietary fiber, iron, iodine, folic acid, zinc, calcium, vitamin A and D of the population sub-groups. Physical activity assessment of the population sub-groups. Cost effectiveness of prevention programmes such</p>	<p>The prevalence of micronutrient deficiency can be prevent and controlled.</p> <p>The problem of excesses of macronutrient can be monitored and early prevention of obesity</p>	<p>6</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>varieties available for each food item Improve in promotion and advising on healthy eating.</p> <p>To have normative data on laboratory investigation linked to frailty: ie CRP and vitamin D</p> <p>To look into the effect of vitamin D longitudinally in terms of its effect onto the bone(fracture prevention), frailty and other comorbidities</p>	<p>Need data on cost effectiveness off prevention programmes Need updated database of nutrient content of Malaysian foods including processed foods Data by Chan SP (UMMC) have shown that 50% of post menopausal ladies have vit D insufficiency: there is still paucity on longitudinal study on correction of vit D; effect on the bone as well as delaying frailty itself There is lacking of simple questionnaire to establish oral and sun light exposure that will facilitate many studies in the area of bone health and frailty itself</p>	<p>as prophylactic supplementation and food fortification. Nutrient content of foods available in Malaysia including processed foods. To validate questionnaire that can establish the local diet vitamin D, sun light exposure and supplements for further future study 2. to study the prevalence of vitamin D insufficiency (male and female) in Malaysia and the association with co morbidity and disability Longitudinal study: Vitamin D intervention to delay the onset of frailty (sarcopenia) and reduction in physical disability and the effect on the telomere</p>	<p>can be taken.</p> <p>To have simpler research tools for researching into the field of vitamin D</p> <p>To have an insight on the simple vitamin D correction for long term effect</p>	
<p>Chronic pain 1. to have an insight on the simple vitamin D correction for long term effect</p>	<p>To identify the different ways of expressing pain</p> <p>- To look at differences in the impact of pain in different sociocultural groups</p>	<p>Existing data from Malaysia shows that there are significant differences in prevalence as well as impact of chronic pain between different ethnic and socio-economic groups. We need to study the reasons for this and to use the information possibly to devise self-</p>	<p>1. Epidemiological 2. Qualitative studies on expression and meaning of pain</p>	<p>1. Better understanding of the ways of expressing pain</p> <p>2. Better understanding of impact of pain in different socio-</p>	<p>7</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		management strategies for Malaysian/Asian populations.		cultural groups. 3. Use the socio-cultural and beliefs information to devise self-management strategies for Malaysian / Asian populations which are relevant and meaningful to our population.	
<p>1. NHMS 2. Chronic pain and reduced work effectiveness. 3. Economic cost of diabetes</p>	<p>economic cost of chronic pain in terms of reduced work effectiveness, time off from work, utilization of healthcare services and burden on care-givers.</p>	<p>There is currently no data on the economic impact of chronic pain; this has been shown in other countries to place a huge burden not only on the health services, but also in terms of work days lost (MC) and reduced work effectiveness,</p>	<p>Prevalence-based approach, combining the demographics of the population with chronic pain prevalence rates and other epidemiological data, health care costs, and economic data.</p>	<p>Comprehensive data on economic burden of chronic pain, which is largely unrecognized. We can then lobby for appropriate allocation of resources for services for patients with chronic pain, which address return to work issues and other economic issues. for patients with chronic pain, which address return to work issues and other economic issues.</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Rheumatoid arthritis	1. To identify risk factors 2. To identify predictors of mortality 3. To identify early predictors of severity 4. To validate diagnostic tools & health-related outcomes questionnaires(including biomarker)	1.Prevalence and mortality data There is urgent need to develop more effective and affordable (include costing component) risk factors (preventive) diagnostic and management profiles. Estimated prevalence rate 1% (studies)	Example: I. Community studies on prevalence & incidence II. Studies on CV risks II. Clinical study on RA death profiling V.Immunological study on RA profiling V. To develop / evaluate diagnostic tools	Reduce morbidity and mortality due to RA. 2. Contribute to national socio and economic plan. 3. reduce risk factors such as smoking which has been found to increase the risk of developing RA 3. Increase the image of MOH in line with new emerging medical advances. 4. To develop more disable-friendly environment	5
Non-specific urethritis: Chlamydia trachomatis infection	1) To determine the prevalence, risk factors and complications in Malaysia. 2) To improve the delivery of care at the primary care level.	Lack of data on prevalence and risk factors and complications.	1) To determine the prevalence and risk factors, prevalence of complications such as infertility, pelvic inflammatory disease and ectopic pregnancy. 2) Intervention study. 3) Diagnostic tool.	1) Strong evidence base data on burden of disease. 2) Better patient care at primary care level.	6

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Macro and micronutrient excesses and deficiency.	<p>Determination of dietary intake status and the balance with physical activity level.</p> <p>Evaluation of current and future intervention strategies.</p> <p>Expand the varieties available for each food item.</p> <p>Improve in promotion and advising on healthy eating.</p>	<p>Last National Nutrition Survey was conducted in 2003 and the recent data of nutritional status is needed.</p> <p>National Nutrition Survey among adolescents is also needed as a baseline data for the programmes and activities planning and development.</p> <p>Need data on cost effectiveness off prevention programmes.</p> <p>Need updated database of nutrient content of Malaysian foods including processed foods.</p>	<p>Determination of dietary intake (macro and micronutrient) status such as fat, dietary fiber, iron, iodine, folic acid, zinc, calcium, vitamin A and D of the population sub-groups.</p> <p>Physical activity assessment of the population sub-groups.</p> <p>Cost effectiveness of prevention programmes such as prophylactic supplementation and food fortification.</p> <p>Nutrient content of foods available in Malaysia including processed foods.</p>	<p>The prevalence of micronutrient deficiency can be prevent and controlled.</p> <p>The problem of excesses of macronutrient can be monitored and early prevention of obesity can be taken.</p>	6
	<p>To have normative data on laboratory investigation linked to frailty: i.e. CRP and vitamin D</p>	<p>Data by Chan SP (UMMC) have shown that 50% of post menopausal ladies have vitamin D insufficiency: there is still paucity on longitudinal study on correction of vitamin D; effect on the bone as well as delaying frailty itself. There is lacking of simple questionnaire to establish oral and sun light exposure that will facilitate many studies in the area of bone health and frailty itself.</p>	<p>1) To validate questionnaire that can establish the local diet vitamin D, sun light exposure and supplements for further future study.</p> <p>2) To study the prevalence of vitamin D insufficiency (male and female) in Malaysia and the association with co morbidity and disability.</p>	<p>To have simpler research tools for researching into the field of vitamin D.</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	To look into the effect of vitamin D longitudinally in terms of its effect onto the bone (fracture prevention), frailty and other comorbidities.		Longitudinal study: Vitamin D intervention to delay the onset of frailty (sarcopenia) and reduction in physical disability and the effect on the telomere.	To have an insight on the simple vitamin D correction for long term effect.	
Chronic pain - To have an insight on the simple vitamin D correction for long term effect.	1) To identify the different ways of expressing pain. 2) To look at differences in the impact of pain in different socio-cultural groups.	Existing data from Malaysia shows that there are significant differences in prevalence as well as impact of chronic pain between different ethnic and socio-economic groups. We need to study the reasons for this and to use the information possibly to devise self-management strategies for Malaysian/Asian populations.	1) Epidemiological. 2) Qualitative studies on expression and meaning of pain.	1) Better understanding of the ways of expressing pain. 2) Better understanding of impact of pain in different socio-cultural groups. 3) Use the socio-cultural and beliefs information to devise self-management strategies for Malaysian / Asian populations which are relevant and meaningful to our population.	7
1) NHMS. 2) Chronic pain and reduced work	Economic cost of chronic pain in terms of reduced work effectiveness,	There is currently no data on the economic impact of chronic pain; this has been shown in other countries to place a huge	Prevalence-based approach, combining the demographics of the population with chronic pain prevalence rates and	Comprehensive data on economic burden of chronic pain, which is largely	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
effectiveness. 3) Economic cost of diabetes.	time off from work, utilization of healthcare services and burden on caregivers.	burden not only on the health services, but also in terms of work days lost (MC) and reduced work effectiveness.	other epidemiological data, health care costs, and economic data.	unrecognized. We can then lobby for appropriate allocation of resources for services for patients with chronic pain, which address return to work and other economic issues.	
Emerging and reemerging diseases Emerging infectious diseases of public health importance. MOH Strategic Plan (2006-2010) Health Research Priorities 9th Malaysia Plan 2006 – 2010.	1) Emerging viral agents. 2) Action research in Public Health Crisis. 3) Effect of Global climate change of Emerging and reemerging diseases.	1) Epidemic due to emerging infections caused serious socio economic implications. 2) Public anxiety and concern of epidemics. 3) Infectious diseases related to global climate change, e.g.: Flood, Haze, and Heat.	1) Clinical trial of antiviral for emerging viral infections. 2) Action research in public health crises. 3) Global climate change threat to the pathogenicity of infectious diseases 4) Microbiological study of emerging viral agents. 5) Action research in Public Health Crisis Management.	1) Prevention of global epidemics. 2) Effective public health crises management.	7
Emerging and reemerging diseases at points of entry (Tick borne Diseases)	Rapid identification of vectors and normal hosts for arthropod-borne zoonotic infections.	During outbreaks of arthropod-borne zoonotic infections, rapid detection of potential vectors and their normal hosts, that may be reservoirs of the infectious agent, is essential for effective control and management of the outbreak. Currently available information is inadequate and techniques are slow and labour intensive.	Detection of zoonotic pathogenic agents in arthropods and animal hosts. Rapid arthropod vector blood meal identification for identifying potential natural animal hosts of zoonotic infections.	Information on emerging pathogenic agents of arthropod borne zoonotic infections. Establishment of techniques for rapid identification of natural hosts of emerging arthropod borne zoonotic infections.	7

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	Collection and identification of arthropods found on exotic animals and pets quarantined at Points of Entry (Airport, Seaport, Ground Crossings) into Malaysia. Examination of the arthropods for infectious agents.	Currently the surveillance conducted at points of entry does not cover all potential arthropod vectors. There is a possibility for tick vectors to be imported into the country via exotic pets (Mariana et al., 2011).	Collection and identification of ticks and mites found on exotic animals and pets quarantined at Points of Entry (Airport, Seaport, Ground Crossings) into Malaysia. Examination of the arthropods for infectious agents.	Information on imported arthropods and their infectious pathogens will lead to improved preparedness of control and managing outbreaks of imported arthropod borne infections.	
	Detection of pathogens in the rodents and Identification of ectoparasites of public health importance found on those rodents.	Inadequate information. Mites of public health importance have been found on rodents caught in KLIA since 2010.	Detection of pathogens and Identification of ectoparasites of public health importance found on rodents caught for vector surveillance at all PoE into Malaysia.	Information on pathogens and ectoparasites of rodents at all PoE into Malaysia will lead to improved prevention of importation of zoonotic infections into the country.	
	Identification of pathogens of potential public health importance in ticks and mites.	Tick-borne and mite-borne diseases have been overlooked or misdiagnosed. These infections are second to mosquito-borne infections worldwide and are becoming increasingly important globally. Little is known about the prevalence and epidemiology of such infections in Malaysia.	Collection of ticks and mites from various natural hosts and ecologies. Examination of those ticks and mites for presence of pathogens of potential health importance.	Information of tick and mite-borne pathogens of public health importance that will lead to improved preparedness for the management of such infections.	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Burns			Use of skin grafts. Artificial skin grafts.		9
Intentional self-harm		<p>Justifications: There is 3756 cases in 2007(PDRM) Most case is not followed up after the initial visit to doctors.</p> <p>Needs: need to establish and support data systems for on-going monitoring and evaluation. There were about 3000 cases admitted each year from 2006 to 2007 with males predominant whereby the higher number of cases noted among children aged less than 5 years.</p> <p>Justifications: <ul style="list-style-type: none"> • In Malaysia annual suicide rate 10 per 1000,000. • No data on self inflicted injuries among adolescent school children. • Insufficient awareness of magnitude of problem. • Need to establish and support data systems for on-going monitoring and evaluation. </p> <p>1) Inadequate primary intervention.</p>	<p>1) Biological risk factors? a) Genetics vulnerability. b) Deficient neurotransmitters’.</p> <p>2) Environmental a) Support/income gp b) Identification of high risk gp?</p> <p>3) Emergency Care management. a) Surgical management /effectiveness of drugs at Emergency Dept. b) Cost and economic evaluation.</p> <p>Types of intervention/support. Discharge: Rehabilitation. Back to work. Repeat attempt. Survivor follows up.</p> <p>Types of intervention/counseling provided in various organization cost and effectiveness of strategies/ programmes/ treatment.</p>		

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		2) Inadequate awareness/info on burden/support /ED management. <ul style="list-style-type: none"> • Needs. • Collaborative research. • Enhancement of Suicide registry. • Better data mining from these registries. 			

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CHAPTER 7: HEALTH TECHNOLOGY

Introduction

Development of health technologies should aim at solving a health problem and improving the health status and quality of life of patients and the Malaysian population at large. As in many other countries, Malaysia faces a large imbalance between demand for healthcare and availability of resources to provide it. Despite substantial increases in research funding over the last 10 years, research output in this country often, could not provide specific answers for many common but important health questions posed by our healthcare decision-makers. In this health research priority setting exercise, the identified research gaps under health technologies were reconciliation between the needs of the Ministry of Health Malaysia and the different agendas of various other Ministries. It is hoped that with this approach, there will be a significant cultural shift among the researchers – to be more proactive and collaborative, and be doing more contractual type of research that is targeted and outcomes-based.

Priority Areas for Health Technology

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Lifestyle diseases – there is increase prevalence of obesity, diabetes, hypertension and cardiovascular diseases (CVD) in this country	<p>to identify, develop and validate biomarkers/ diagnostic tools for diabetes, obesity</p> <ul style="list-style-type: none"> - to develop and validate animal models for assessment of diagnostics/ therapeutics - to Conduct Lead optimization of specific compounds (including from natural compounds) - to develop new therapeutics for above diseases (including from natural products) 	<p>Diabetes: it is estimated that 15-22% of the Malaysian population are diabetic.</p> <p>Obesity-related diseases: it is estimated that 33.6% and 19.5% of Malaysians are overweight and obese.</p>	<p>a) Discovery of biomarkers leading to development of diagnostic or therapeutic tools</p> <p>b) Pre-clinical validation and utilisation of above diagnostic tools in laboratory, clinical settings that could lead to commercialisation of the product</p> <p>c) Therapeutic used of natural products: Target driven evaluation of bioactive extracts or compounds from natural products for therapeutic use in the above diseases. This should include safety and efficacy evaluation leading to clinical trials.</p> <p>d) Development of new drug delivery systems for pharmaceutical and therapeutic use.</p>	<p>a) Understanding of pathogenesis of obesity, diabetes, hypertension and CVD and its complications at molecular level.</p> <p>b) Understanding of the gene-gene, gene-environmental and gene-nutraceutical interactions that increase/decrease risk to above disease in respond to treatment</p> <p>c) Diagnostic and prognostic tools for early detection of the above disease or its complications</p> <p>d) A nutraceutical or pharmaceutical product from natural products for therapeutice use.</p>	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>Infectious diseases [Dengue, TB, diarrhoeal diseases, haemorrhagic diseases, malaria, emerging & re-emerging diseases (influenza, ebola)]. Increase in prevalence; presence of drug resistance strains; changes in human demographics; new approach in therapeutics and vaccines</p>	<p>to identify, develop and validate biomarkers/ diagnostic tools for dengue, TB, diarrhoeal diseases, haemorrhagic diseases, malaria, emerging & re-emerging diseases (influenza, ebola) - to develop and validate animal models for assessment of diagnostics/ therapeutics - to conduct Lead optimization of specific compounds (including from natural products) - to develop new therapeutics for above diseases (including from natural products) - to develop new</p>	<p>Dengue: prevalence (1.8/1000) and mortality data (4.5%). There is an urgent need to develop more effective and affordable early diagnostic tools</p> <p>TB: appearance of strains which are resistant to current therapies and increasing prevalence with incidence rate of 63.95 per 100,000 pop (2009).</p> <p>Diarrhoea: increasing prevalence with incidence rate of 38.9 per 100,000 pop (2009).</p> <p>Hemorrhagic diseases, Incidence rate of 9.84 per 100,000 pop (2009)</p> <p>Malaria: Incidence rate of 24.76 per 100,000 pop (2009) Emerging & re-emerging diseases:</p>	<p>a) Understanding the pathogenesis of emerging and re-emerging diseases; resistance strain of the infectious agents and other infectious agents, with the potential for development into new diagnostic/ therapeutic tools</p> <p>b) Diagnostic tools for early detection of infectious agents</p> <p>c) A nutraceutical or pharmaceutical product from natural products against infectious agents and for drug-resistant strains</p> <p>d) Vaccines for dengue, TB and malaria</p> <p>e) Drug delivery system</p>	<p>Infectious diseases [Dengue, TB, diarrhoeal diseases, haemorrhagic diseases, malaria, emerging & re-emerging diseases (influenza, ebola)]. Increase in prevalence; presence of drug resistance strains; changes in human demographics; new approach in therapeutics and vaccines</p>	<p>2</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	vaccines for dengue, TB and malarial (including from natural products) - Pharmaceutical development (drug delivery modalities etc.)				
Tick-borne and mite-borne diseases		<p>Tick-borne and mite-borne diseases have been overlooked or misdiagnosed. These infections are second to mosquito-borne infections worldwide and are becoming increasingly important globally. Little is known about the prevalence and epidemiology of such infections in Malaysia.</p> <p>Various commercial kits for the detection of known tick and mite borne infections are available but these are costly. There is a need to evaluate such kits and as well as develop local more cost-effective kit</p>	<p>a) To evaluate the cost-effectiveness of commercial kits for rapid detection of tick and mite-borne diseases. b) To develop local cost-effective kits for rapid detection of tick and mite-borne infections.</p>	Cost-effective kits for the rapid detection of tick and mite-borne infections	9
Cancer – increasing incidence in Malaysia, 3rd cause of cause of admission in MOH	a) Identification of molecular targets, and markers for prognosis and	Many cancers are still not well treated in advances stages. Newer technologies have identified targets for	a) To Identify candidate genes for new diagnostic/prognostic kits		1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
hospitals. Need for new diagnostic, prognostic tools	therapy, b) Development of new anti-cancer therapeutics from Malaysian natural products to treat cancers	treatment as well as identify those suitable for certain therapies (customized medicine). Some molecular markers can also be used to differentiate good and bad prognostic groups eg by gene/protein microarray	<p>b) To identify genes which may be suitable for gene / targeted therapy</p> <p>c) To study gene-gene, gene-environmental interactions that cause increased risk to the development of cancer of interest.</p> <p>d) Discovery and development of new anti-cancer drugs from compounds isolated from natural products found in Malaysian herbs, microorganisms and other natural products to treat breast, cervix, colon, NPC and oral cancers.</p> <p>e) Imaging modalities: Development of new emerging strategies for early detection and monitoring of the disease.</p>		
High prevalence of degenerative disease (IHD, stroke, osteoarthritis, dementia). There is a need to look for new	Stem Cell Biology: - Research into genetics and proteomics of stem cells. - Mechanism for	a) models have been developed using tissue cultures and animal model. further development for use in human will be required to confirm efficacy of this	a) Identification and analysis gene expression pattern, proteins in the stem cells as they differentiate, growth of stem cells on matrices of different shapes and co-	a) Basic molecular mechanism of stem cell differentiation would enable the rational in planning of stem cell therapy and tissue	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
<p>alternative therapeutic approach - regenerative medicine (stem cell technology, bioengineered tissues)</p>	<p>cellular differentiation of stem cells. -To identify the optimal cell sources for cell and tissue therapy -the cells can be autologous and allogeneic stem cells or progenitor cells. This can also include methods for the directed proliferation and differentiation of cells. - To develop biomaterials/ scaffolds -natural or synthetic biomaterials that can direct the growth, differentiation, and organization of cells in the process of forming functional tissue. - To identify biomolecules that</p>	<p>potential new therapy. We also lack b) knowledge on the Basic physiology of stem cells. c) Requirements for stem cell based products to show safety, efficacy and quality according to current good manufacturing practice. d) Shortage of donated tissue and organs eg: cornea, heart, lung, kidney, bone, skin etc e)Increasing incidence of degenerative diseases eg: IHD, stroke, osteoarthritis, dementia f) Increasing incidence of trauma, to address Non-healing fracture</p>	<p>culturing of various cells with stem cells. b) To develop available stem cell technology: - Higher animal studies - Production of stem cells from GMP lab - Conduct clinical trials c) Regenerative Medicine: - Cell and tissue therapy. - Biomaterials. - Biomolecules to improve cell and tissue therapies performance (included in the final product) -Bioreactors. -Safety and efficacy studies of prototype products</p>	<p>replacement. b) Preclinical data of stem cell products including safety and efficacy studies. c) Clinical trials of stem cell products as replacement therapy for chronic degenerative diseases (patentable). d) New products - cells, tissues and organs for transplantation (regenerative medicine). e) Development of cells, tissues and organ models as new alternative approaches to replace/reduce use of animals for testing (patentable) f) Development of cells, tissues and organ models for use to study mechanism of diseases</p>	

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>can increase the efficacy of the cell-based therapy</p> <ul style="list-style-type: none"> - To design cell culture approaches - 2-D cell expansion/scale-up, 3-D tissue growth and bioreactor technology. - To conduct preclinical assessment including safety and efficacy studies for cell and tissue-based therapies. 				
<p>Oral Tissue Engineering (OTE)</p>	<p>a) To investigate the role of mesenchymal cell in construction of oral mucosa equivalents (OME).</p> <p>b) Evaluation of quality of life of OME</p>	<p>There is still a need for improvement in tissue grafting technology to provide a better quality of life to patients who have had defects resulting from surgery.</p>	<p>Preclinical data and clinical trials</p>	<p>Improved technology for oral tissue re-engineering</p> <p>Development of an in-vitro 3D model for various in vitro tests such as biocompatibility test, drug transportation or disease process.</p>	<p>2</p>

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Regenerative Dentistry	a) Isolation, expansion and characterization of dental and bone marrow stem cells. B) animal model for mandible bone defect	Repair and regeneration is a major issue in oral maxillofacial surgery.	Preclinical data and clinical trials	New method for treating mandible bone defects.	2
Neurological diseases - Alzheimer's, - Parkinson, Epilepsy, Immunoneurology Encephalitis			Genetic studies	Discovery of new genes with the potential for development into new diagnostic/ therapeutic tools	3
Neuromuscular disorders -Duchenne Muscular Dystrophy -Spinal Muscular Atrophy -Inherited Peripheral Neuropathy -Congenital Myopathies -Connective Tissue Disorders	Genetic research		Genetic studies	Discovery of new genes, biomarkers leading to development of diagnostic or therapeutic tools or prognostic tool	3

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
Provision of evidence-based of Traditional and Complementary Medicine (T&CM) practices and products. Lack of evidence in T&CM practices	Evaluation of extracts and active ingredients from local plants and herbs for the control of arthropod vectors and pests.	Many of the available pesticides have their origins in naturally occurring plants and herbs. There is a huge diversity of flora in Malaysia that may have tremendous potential as natural source of pesticides and repellants.	Isolation, characterization of active ingredients from plants and herbs that have demonstrated potential pesticide and repellent properties. Efficacy studies of above extracts against arthropod vectors and pests.	:Pesticides and repellants from naturally occurring plants and herbs	1
Provision of evidence-based of Traditional and Complementary Medicine (T&CM) practices and products. Lack of evidence in T&CM practices	<p>1. Research into identification of bioactive fractions/molecules in herbs of importance in Malaysia.</p> <p>2. Conduct pre-clinical studies of bioactive fractions/molecules in herbs of importance in Malaysia.</p> <p>3. Conduct clinical trials on various T&CM practices.</p> <p>4. Development of medical diagnostic tool to identify bio-</p>	<p>No diagnostic tool available to verify therapeutic claims by practitioners of T&CM.</p> <p>- Even though the potential bioactive fractions/molecules were identified but the discovery has not been put through pre-clinical phase.</p> <p>- Various T&CM practice has not been taken to pre-clinical study / clinical trial for safety and efficacy.</p> <p>- Shortage of mechanism to detect animal components in herbal preparations which is required in promotion of health tourism through Halal products.</p> <p>- Increasing of counterfeit products in market</p> <p>- Increasing incidence of</p>	<p>a). Discovery phase: in-vitro testings of natural products, with potential for development into a diagnostic/ therapeutic tool - screening of molecules in getting compound that has bioactivity to demonstrate mechanism of active with safety profile and efficacy.</p> <p>b). Pre-clinical phase: animal testing that should lead to data which can be used for nutraceutical or pharmaceutical development.</p> <p>c). Nutraceutical/ pharmaceutical phase: Development of nutraceutical/ pharmaceutical prototype of the drug delivery system.</p>	Provision of evidence-based of Traditional and Complementary Medicine (T&CM) practices and products. Lack of evidence in T&CM practices	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
	<p>active herbal component.</p> <p>5. Development of medical diagnostic tool to identify non-herbal component in the herbal preparation.</p> <p>6. Development of medical diagnostic tool to identify adulteration in herbal preparation</p> <p>7. Evidence-based practice research on T&CM practices.</p> <p>8. Safety and effectiveness of T&CM devices</p>	<p>herbal preparations being adulterated with heavy metals (lead), steroids, sildenafil and sibutramine.</p> <p>- There is need to speed-up detection of counterfeit/adulterated products by Enforcement Officers during premise inspection/raid. - Overclaim of T&CM practices or techniques can heal the diseases without scientific evidence.</p> <p>- Overclaim of effectiveness of T&CM devide can heal the diseases without scientific evidence.</p>	<p>d). Health technology assessment on safety and effectiveness of T&CM practices.</p> <p>e). Quality of life on patients using T&CM practices.</p>		
Photodynamic Therapy Research	Conduct evidence-based clinical studies to determine effectiveness			New, alternative treatment modalities for Malaysian patients	2

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
T&CM in oral healthcare	Investigate therapeutic potential of local herbs and their mechanisms in treatment of oral disease/conditions	Need to explore new therapeutic interventions for the management of oral disease/conditions	Preclinical data and clinical trials	Useful alternative therapeutic regimes for the management of oral conditions	2
Interoperability between ICT applications and between various ICT applications and medical devices	Conduct of study that qualify and quantify the status of interoperability between ICT applications, and between various ICT apps and medical devices in healthcare (MOH, non- MOH, Private) - To develop a research methodology tool to evaluate interoperability as such and to further refine each of the beachmarking criteria in evaluating Hospital Information Systems	Since HIS first implemented in 1999, we have now 12 HIS hospitals, 3 HIS hospitals under development, and - SPP Hospital. Since then some system has proven to be integrated, but not interoperable. Integrated system means, system can be exchanges, but would require further manipulation before it can be used. Whilst interoperability refers to data can be exchanged between 2 various applications and to be used immediately without further manipulation. There are no finalized benchmarking criteria from MOH to guide on implementation and evaluation of HIS product and for each criteria, a proper tools to evaluate them. All HIS Hospital are not	Software development	a) Status of interoperability between ICT applications of various categories in healthcare facilities. b) A valid tool to evaluate interoperability between the various health information systems. c) A refined tool for each of the benchmark criteria that has been developed. d) A timely data used from all resources for 1Care healthcare financing.	1

National Problem	Research Scope	Gaps & Needs (Rationale)	Suggested Research Area	Expected Output	Relative rank
		connected and interoperable to the existing back end system such as Registeries, QAP/NIA/KPI Indicators, Daily Census, SMRP, Teleconsultation. All system within and between MoH, non-MoH, and private healthcare facilities not interoperable.			
No local HIS application	Software development	All HIS hospital are running on non local product except for in-house product called SPP (Sistem Pengurusan Pesakit) which is in Hosp. Tuanku Jaafar and Hosp. Port Dickson, which is still an incomplete package		Health Information system (HIS) application developed and maintained locally, and for commercialisation	1
Lack of locally produced prosthesis	Develop and validate prosthesis	Dependent imported prosthesis; Costly method of validation for locally produced prosthesis; Lack of local expertise in production and validation	Research that lead to locally produced cost effective prosthesis that meet international standard .	Development and production of prosthesis that meet international standard for local consumption and for export.	1

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