

Research Article

Cost analysis in health promotion, disease prevention and controlling program in Asia: A systematic review

Arthorn Riewpaiboon^{1*},
Ragil S Dianingati^{1,2}

¹Social, Economic, and Administrative Program, Faculty of Pharmacy, Mahidol University, Bangkok, Thailand

²Department of Pharmacy, Faculty of Health, Ngudi Waluyo University, Ungaran, Indonesia

***Corresponding author:**
Arthorn Riewpaiboon
Arthorn.rie@mahidol.ac.th

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ABSTRACT

Some health problems have been a global burden, the top ranks are ischemic heart disease and cerebrovascular disease that are non-communicable diseases (NCDs). Many countries have tried to prevent from getting worse and more costly. Health promotion, disease prevention and control programs have been implemented, but the budget allocation seems to be not enough. Evidence of empirical costing studies may help on decision of more investment. PubMed were searched for published costing studies in health promotion, disease prevention and control program in Asia, without using any time limitation. Some searching terms and features in PubMed were used as search terms. Costing methods were explored and analyzed by descriptive statistics. This systematic review provided information about the situation in costing analysis studies of health promotion, disease prevention and controlling program that had been done in some countries in Asia. This study is expected to be helpful to develop costing methods or other costing analysis studies in health promotion and prevention program. It is found that the common activity is institutional routine program, and the costing method is micro-costing approach, using provider perspective. Some factors that may affect the development of costing analysis study were, for instance, the health problem of each country, the availability of financial support, and the availability of researcher or facility. Many improvement steps should be implemented to improve the quantity and the quality of costing analysis study in Asia.

1. INTRODUCTION

Nowadays, health related problems have been a global burden. A study by IHME (Institute for Health Metrics and Evaluation) in 2015 ranked the highly prevalent causes of death. The top ranks are ischemic heart disease and cerebrovascular disease that are non-communicable disease (NCD)¹. On the other hand, as a result from WHO study in 2005, only 20% chronic disease deaths occur in high income countries, while 80% occur in low and middle income countries, where most of the people in the world live in². The premature deaths caused by heart disease, stroke and diabetes in some countries showed a serious impact in their economies. Meanwhile, chronic diseases could be prevented, because the major causes are known and if we could minimize the risk factors like unhealthy diet,

physical inactivity, and tobacco use, at least 80% of all heart disease, stroke, and type 2 diabetes and also 40% of cancer would be prevented².

HIV that was ranked by IHME in 42 in 1990, became at the 10th rank with percent change 232,2%¹. It means that the burden is twice larger in 2015 than in 1990. The budget spent to prevent and control HIV also increases every year³.

Despite some facts explained above, some developed countries have been starting to focus not only in curative programs, but also in preventive programs and run economic evaluation to evaluate the cost and the effectiveness of the program. In some developing countries like Indonesia, Thailand, and other countries in South East Asia, they already have some health promotion, disease prevention and control programs, but the budget allocation is not based on evidence of empirical costing studies. To promote the effectiveness of health promotion, disease prevention and control programs, rational budget allocation is basically needed. Based on a preliminary traditional search of database only few records showed. That is why a systematic review about cost analysis in health promotion and disease prevention program is needed. This study aims to explore the situation of the studies and how a cost analysis in health promotion and disease prevention program has been conducted.

2. MATERIALS AND METHODS

2.1. Study design

This study is a systematic review following the PRISMA guidelines⁴ in PubMed databases since MeSH (Medical subject heading) feature of PubMed help to cover a broad area of health promotion and disease prevention intervention and all countries in Asia.

2.2. Searching strategy

MeSH was used to get more results, since there were many specific interventions that might not be able to cover all of them by their titles. The searching terms that had been used were “Asia”([MeSH]) AND (((“Health Care Costs”[MeSH] OR cost*[Title]) OR economic*[Title])) AND ((“Health Promotion”[MeSH]) OR (“prevention and control” [Subheading])).

2.3 Selection criteria

Inclusion criteria:

Study on cost analysis in health promotion, disease prevention and control programs as defined below that used cost analysis study method in their research.

Health promotion is defined as the process of empowering people to increase control over their health and its determinants through health literacy efforts and multi sectors action to increase healthy behaviors. This process includes activities for the community-at-large or for populations at increased risk of negative health outcomes. Health promotion usually addresses behavioral risk factors such as tobacco use, obesity, diet and physical inactivity, as well as the areas of mental health, injury prevention, drug abuse control, alcohol control, health behavior related to HIV, and sexual health⁵.

Disease prevention, as specific, population-based and individual-based interventions for primary and secondary (early detection) prevention, aims to minimize the burden of diseases and associated risk factors⁵. Disease control is defined as the reduction of disease incidence, prevalence, morbidity or mortality to a locally acceptable level as a result of deliberate efforts; continued intervention measures are required to maintain the reduction⁶.

Exclusion criteria:

Prevention or health promotion program in the economic evaluation without complete detail of costing methods, using modeling, a review, comments, workshop, or study protocol, not in English and not available in full text.

2.4. Data extraction

A summary table of data was designed to extract data from each article. The first author read and extracted the data to the table. Second opinion from the second author was consulted to make census when there are controversial issues. The situation analysis has been done under two categories, institutional routine service and health campaign or program. Institutional routine service is for paper that studies health promotion, disease prevention or control program, which is conducted routinely in an institution or health care center. While health campaign or program is defined as a non-routine program in health

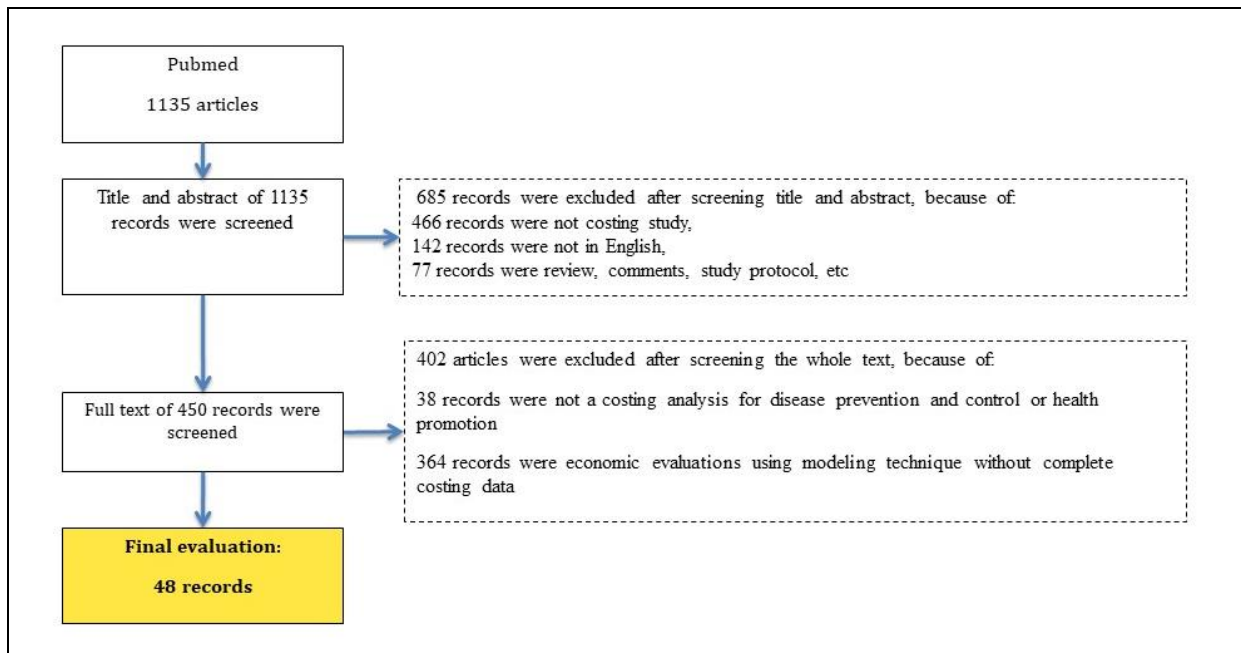


Figure 1. Article selection flowchart and results of article selection.

promotion, disease prevention or control, which held by an institution or often NGO to raise awareness and quality of life of people. Situation analysis was defined as the presentation of country, year, type of activity, type of illness and costing method. And for the costing approaches itself we defined into three categories based on followings:

- Macro costing for papers that stated top-down approach
- Micro costing for papers that stated bottom up, ingredient, or activity based costing
- Not available (NA) for papers that did not state their costing method

2.5. Analysis

Qualify articles are required to have complete presentation and descriptive statistics to summary the results of analysis (Table 1) as mentioned above. Trend and situation of the studies were analyzed and the researcher and the financial support from each paper were assessed to explore the factors that may affect costing study development in each country.

3. RESULTS

The results of the systematic search process that had been done in December 2016 could be found in Figure 1. From PubMed database we found 1135 articles, 680 records

excluded after screening title and abstract because no costing, not in English, and a review, comment, or study protocol. From 455 records that had been screened by its full text 407 articles were excluded. Forty-eight records met the selection criteria, and had been extracted and analyzed.

3.1. Situation of the study

The number of published article for costing analysis in health promotion, disease prevention and control programs was not too much in Asia. Disease prevention activity got the highest number amongst others. The fluctuation of the published articles for health promotion, disease prevention and control programs could be seen, whereas only one paper published from 1998 to 2002. And in some years the number was quite high but in 2003 there was not any paper published about costing study in Asia as shown in Table 2.

For the situation analysis, as explained in the method, it was divided into two kinds of activity, institutional routine service and health campaign or community program as symbolized as 2A (routine) and 2B (campaign/community program) in Table 2. Thirty nine papers were indicated as institutional routine service, while nine papers were campaign or community program. The routine program study is mainly from India, Thailand, China, and some from other countries as we could see in Figure 2 and Table 1. But for the

Table 1. Summary of costing methods and cost items that used in the reviewed papers

Category	Subcategory		Routine program		Campaign program	
			Number	Percentage	Number	Percentage
Introduction cost		Not included	32	82%	6	67%
		Included	7	18%	3	33%
		Total	39	100%	9	100%
	If include, number of year	5 years	4	10%	1	11%
		8 years	0	0%	1	11%
		Not available	3	8%	1	11%
		Total	7	18%	3	33%
	If Include, discounted rate used	0%	1	3%	0	0%
		3%	4	10%	0	0%
		5%	0	0%	1	11%
		10%	1	3%	0	0%
		Not available	1	3%	2	22%
		Total	7	18%	3	33%
Cost component	Provider direct cost	Capital, Labor, Material	28	72%	4	44%
		Capital, Material	4	10%	2	22%
		Capital, Labor	1	3%	2	22%
		Material, Labor	6	15%	0	0%
		Material	0	0%	1	11%
		Total	39	100%	9	100%
	Indirect cost	Not available	38	97%	9	100%
		Included as project management administration	1	3%	0	0%
		Total	39	100%	9	100%
Participant cost		Not included	33	85%	8	89%
		Included	6	15%	1	11%
		Total	39	100%	9	100%
	if include, direct cost component	Not included	2	5%	0	0%
		Medication fee	3	8%	0	0%
		Travel cost	0	0%	1	11%
		Meal	0	0%	0	0%
		Accommodation	0	0%	0	0%
		Medication fee, travel, meal	1	3%	0	0%
		Total	6	15%	1	11%
if include, indirect cost component	Productivity loss	6	15%	1	11%	

campaign program, the number of studies from each country was distributed normally.

As shown in Table 1, the type of illness in the studies was divided the articles based on the 3 program targets, illness, risk factors, and others. The illness targeted program was defined into non-communicable disease and communicable or infectious disease. Only four papers talked about non-communicable disease like congestive heart failure, ischemic stroke, iodine deficiency, diabetes mellitus, and hypertension. Most of the articles concerned

about communicable disease especially HIV, while the rest concerned about eliminating the risk factors and visual disorder preliminary study.

The perspective commonly used in the reviewed papers was provider perspective for both routine and campaign program, whilst some papers did not clearly state their perspective (Figure 3). Other perspectives are from payer perspective, societal perspective, provider and societal perspective, and combination of provider, patient and societal perspectives found in 1 paper in the routine program.

Table 2. Data extraction table for reviewed papers

No	Year	Country	Perspective	Type of Cost	Type of activity	Costing method	Type of analysis	Author reference
1	1998	China	provider	1B	2B	3A	4A	(8)
2	1999	Thailand	provider	1A	2A	3D	4D	(9)
3	2000	Thailand	NA	1A	2B	3D	4C	(10)
4	2001	Thailand	provider	1A	2A	3D	4A	(11)
5	2002	China	payer	1C	2A	3D	4B	(12)
6	2004	India	provider	1C	2A	3D	4A	(13)
7	2004	Pakistan	provider	1D	2A	3D	4A	(14)
8	2005	India	provider	1F	2A	3B	4A	(15)
9	2005	India	provider	1F	2A	3D	4A	(16)
10	2005	India	provider	1C	2A	3B	4A	(17)
11	2005	Indonesia	provider	1D	2B	3B	4A	(18)
12	2006	India	provider, patient, and societal	1E	2A	3B	4B	(19)
13	2007	Cambodia	provider and societal	1C	2A	3D	4C	(20)
14	2007	India	NA	1B	2A	3D	4A	(21)
15	2007	India	provider	1C	2A	3D	4C	(22)
16	2007	Vietnam	NA	1A	2B	3D	4C	(23)
17	2008	India	provider	1G	2A	3D	4A	(24)
18	2008	India	societal	1G	2A	3D	4D	(25)
19	2008	India	provider	1F	2A	3D	4C	(26)
20	2008	India	provider	1C	2A	3D	4C	(27)
21	2008	Taiwan	provider	1G	2B	3B	4B	(28)
22	2009	Cambodia	payer	1F	2A	3B	4A	(29)
23	2009	India	provider	1C	2A	3A	4A	(30)
24	2009	India	provider	1G	2A	3D	4C	(31)
25	2009	Thailand	provider	1G	2B	3D	4A	(32)
26	2010	Cambodia	payer	1A	2A	3D	4C	(33)
27	2010	India	provider	1F	2A	3B	4C	(34)
28	2011	China	societal	1G	2A	3B	4A	(35)
29	2011	India	NA	1F	2A	3D	4D	(36)
30	2011	Vietnam	provider	1G	2A	3B	4C	(37)
31	2012	Bangladesh, India, and Nepal	NA	1G	2B	3B	4C	(38)
32	2012	Bhutan	provider and societal	1G	2A	3C	4C	(39)
33	2012	Thailand	societal	1G	2A	3C	4A	(40)
34	2012	Vietnam	payer	1G	2A	3D	4A	(41)
35	2013	China	societal	1G	2A	3B	4A	(42)
36	2013	China	provider	1G	2A	3D	4A	(43)
37	2013	Korea	payer	1A	2A	3D	4A	(44)
38	2013	Vietnam	societal	1A	2A	3D	4A	(45)
39	2014	India	provider	1D	2A	3B	4B	(46)
40	2014	India	provider	1G	2A	3D	4A	(47)
41	2014	India	provider	1G	2A	3B	4D	(48)
42	2014	India	provider	1C	2A	3A	4C	(49)
43	2015	Bangladesh	societal	1C	2B	3B	4C	(50)
44	2015	India	provider	1G	2B	3D	4C	(51)
45	2015	Malaysia	payer	1G	2A	3B	4C	(52)
46	2015	Malaysia	provider	1A	2A	3B	4B	(53)
47	2015	Thailand	provider	1C	2A	3B	4C	(54)
48	2016	India	provider	1G	2A	3A	4A	(55)

Footnotes: 1A: Financial total; 1B: Financial incremental; 1C: Economic total; 1D: Economic incremental; 1E: Economic total and incremental; 1F: Financial total and economic total; 1G: Not available; 2A: Routine program; 2B: Campaign/community program; 3A: Macro-costing; 3B: Micro-costing; 3C: Macro and micro-costing; 3D: Not available; 4A: Total program cost; 4B: Total program cost and cost per activity; 4C: Total program cost and cost of output of the program; 4D: Total program cost, cost per activity, and cost of output of the program

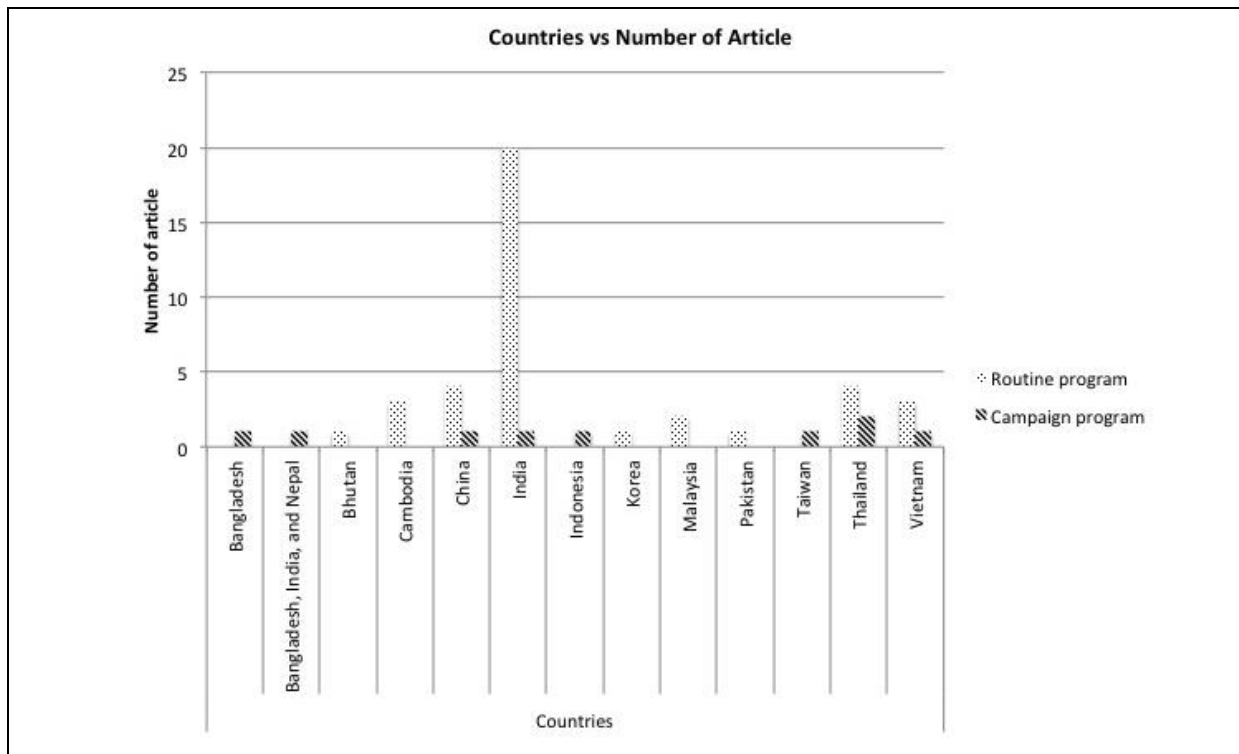


Figure 2. Number of articles by countries

Type of cost could not be found in half of the reviewed papers, while the rest used various type of cost. The type of cost was divided into three approaches, financial, economic, and combination of financial and economic approach. For the routine program, the commonly used is

economic total cost, while in campaign program is financial total cost (Figure 4). Micro-costing method was mostly used both for routine or institutional program, on other hand number of articles that not stated their costing method clearly were high (Figure 5).

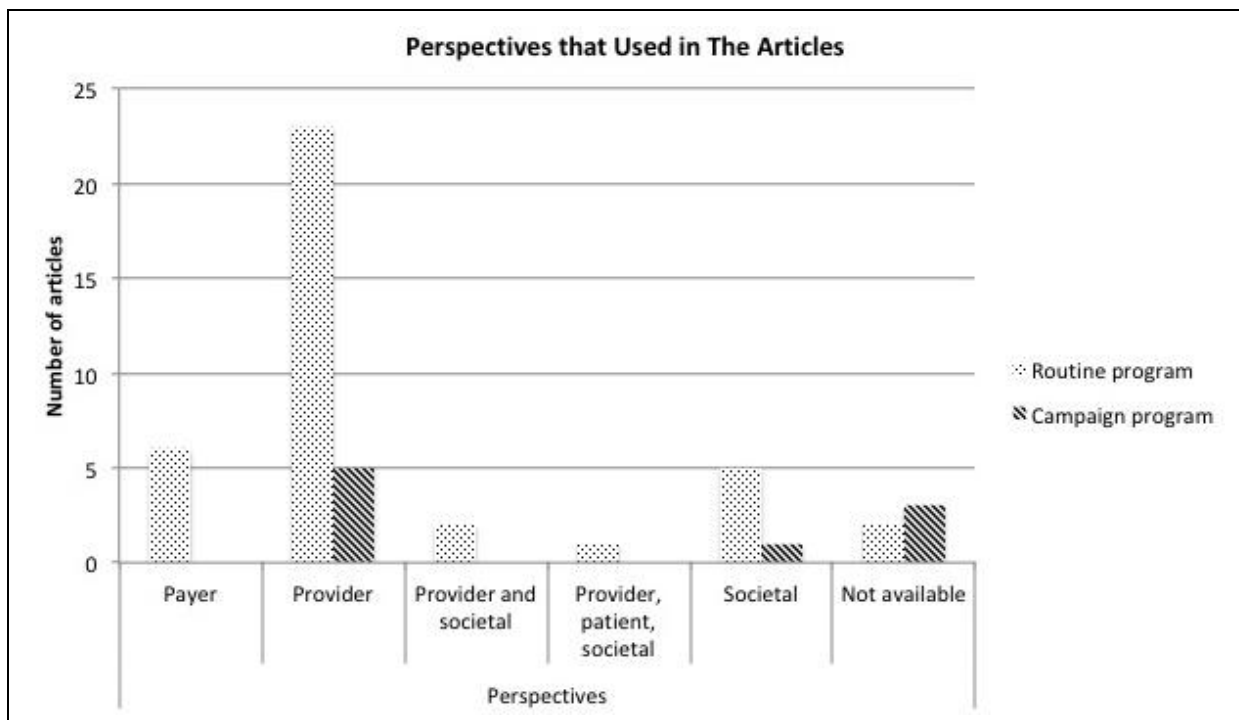


Figure 3. Perspectives that used by the articles in previous studies

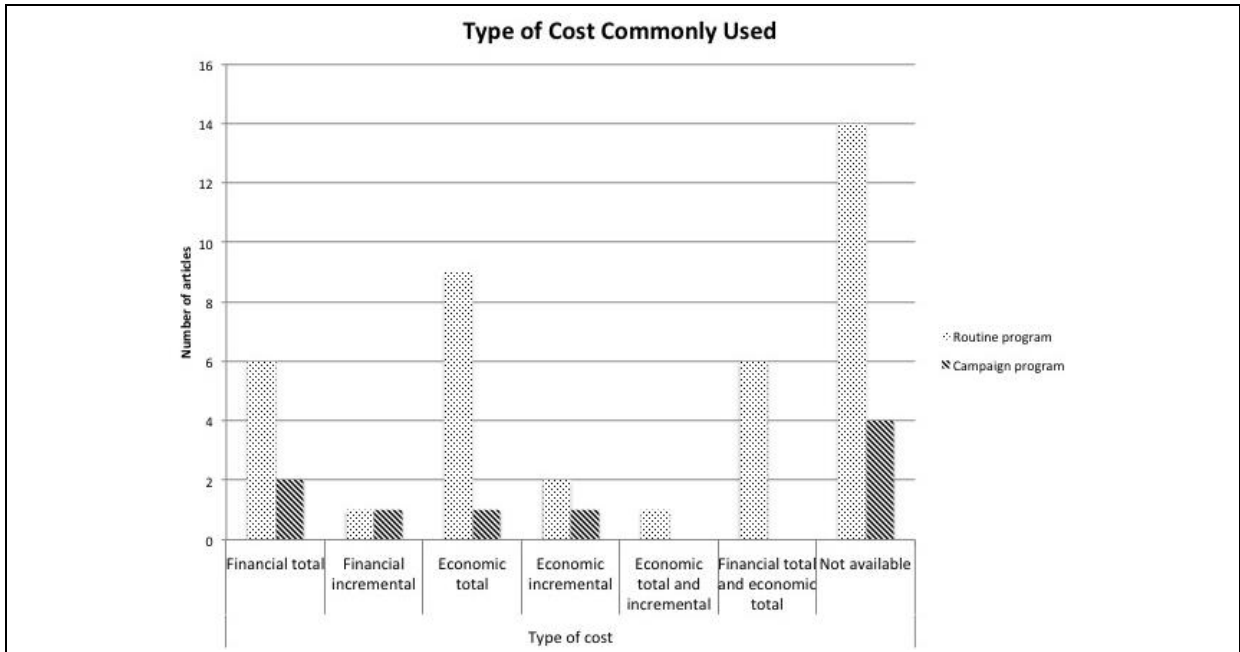


Figure 4. Type of cost that used by the articles in previous studies

3.2. Trend of the costing studies in Asia

The trend of costing analysis studies in health promotion, disease prevention and control program is not high. The implementer, researcher and the financial support of the program are some factors that predicted to affect. Most of the researches were implemented by the Ministry of Health or by the government of each country. But, in India 9 papers were implemented by the non-government organization, and the program

was concerned about HIV. And for the financial support, most of them got the financial support not from the domestic support but from other organization or NGO as happened in India, but in Thailand all the papers were supported by the domestic support (could be government, Ministry of Health or local university). Most of the papers had been done not only by local researcher, but also the researcher from other countries. Sometimes it was collaboration with WHO members that responsible for that area.

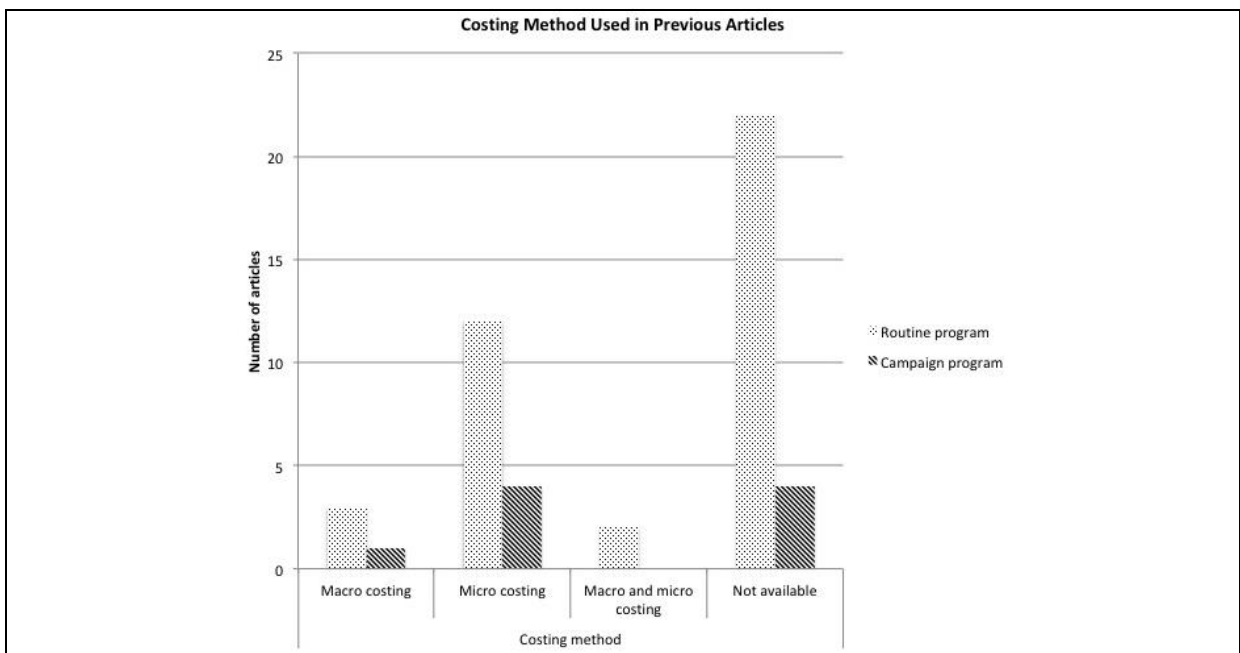


Figure 5. Costing method that used by the articles

4. DISCUSSION

From the results of this systematic review research, some articles that had been conducted to do costing analysis in health promotion, disease prevention, and controlling program in Asia were found and explored the situation and the quality of those researches.

4.1. Limitations of the review

This systematic review only provided brief information about the cost analysis study situation and quality in Asia and did not 100% reflect the real picture, because some papers might be missing, since this systematic review only reviewed the international published paper in PubMed database. We only used PubMed database since it was not a specific theme of health promotion, disease prevention and controlling program, and we wanted to cover all the topics that used cost analysis method. PubMed has some features that allow us to do a research in a broad theme, while the other database does not. We did not include the national published journal, or the journal that not published in English, grey papers or journal that published in other databases such as Scopus. And the searching technique in this systematic review might not be appropriate because the usage of broad terms and MeSH and number of articles was quite high since there were lot of articles that used keywords cost or health care cost, but after the author read the abstract, there was not any part that related to cost analysis. This could be the mistake from the officer who put the keywords into the PubMed database. And there were some articles that were irrelevant with health promotion, disease prevention, and controlling program, such as cost of treatment, and also just review or comments.

4.2. Trend of the studies

The number of the costing study in Asia in this systematic review fluctuated every year since 1998-2016. Many papers were conducted in low and middle-income countries because they might have good relationship with the international organization or they faced some diseases that became the burden of that country. According to the type of the program, institution routine program has more various countries than the campaign program, since the number of articles also differs.

Preventive program is the common studies found among the reviewed papers in this systematic review, especially for the communicable diseases such as HIV and malaria, and also the chronic disease like diabetes and hypertension. This result showed that many countries in Asia seemed to realize that those illnesses became burden for them and preventive program is needed in order to prevent high number of the patients. Institutional routine service program dominated the result. It showed that many countries start to assess their routine program to know whether it was effective and/or efficient or not.

Some countries had a few number, it might be because they did not have any financial support or grant to do the costing analysis from their own government, NGO, or other organization. Some papers in this systematic review had not been done by their own government but by other organization, especially NGO. Other reasons are maybe because there was no university that had a teaching health economics program, they lack of researcher in costing analysis, and there is no collaboration with WHO or other organization to run a cost analysis study. Or they did not publish it in the journal indexed by PubMed, it could be in Scopus or other database, a national journal or in their own language that met the exclusion criteria since many papers were excluded because they did not use primary costing, they use some assumptions to estimate the cost and do the economic evaluation based on the modeled cost.

From the fact above, some factors that might affect number of costing analysis study in some countries in Asia could be assessed in this systematic review. They were the health problem itself that happened in each country, the grant or the support to do costing analysis, and the availability of researcher or facility (like an institution or collaboration with WHO) to do costing analysis.

For an example, number of articles that had been published in India was the highest amongst others. It is because India had a project called Avahan, a model of HIV prevention system funded by Bill and Melinda Gates Foundation during 2003-2008. They run many analyses for this project especially in costing analysis in purpose to adapt and adopt the model. And Avahan had a beneficial effect in reducing HIV prevalence at the population level over 5 years of program implementation in some of the states⁷.

It was important to state the method clearly so it could be beneficial to other researcher who might conduct the similar research. But some situation analysis criteria could not be found at the reviewed papers or some could be found but not in correct terms as in Figure 6, that make it hard to understand the method. Perhaps, it was because of the availability of data source or lack of knowledge of the human resources in costing analysis, or it was because of the quality of the researcher, they had not enough knowledge to do costing analysis or they might have enough knowledge to do costing analysis but they might not think that it was important to present such as year of cost value or the perspective in the published paper.

On the other hand, bad presentation did not mean the research was not good enough, maybe they did not know how to make a good presentation or the limitation of the journal itself, since some papers were published not in journal that specialized in the Pharmacoeconomics study.

4.3. Costing methods employment

Perspective is a pivotal part of costing study as a guide on cost component and methods.

In this systematic review, perspective that is commonly used is provider perspective, both for routine and campaign program. Few papers used provider, patient and societal perspective, which mean they covered all the costing components in their calculation.

For the costing method, both in institution routine or campaign program, despite of the fact that some papers did not mentioned clearly about it, many papers used micro-costing method to calculate the cost of each activity of a program. The micro-costing method is more accurate than the macro-costing method, since it can provide the cost of each activity in detail, which is more useful to know. It links to the perspective that they use, since the commonly used is provider perspective, so in the future the provider might select to do some activities that more valuable and cost-effective to promote, prevent or control the disease.

Economic total cost is commonly used for the routine program, while the financial total cost for the campaign program. It seems that many studies in routine program want to assess the program cost in economic approach since they want to run economic evaluation studies. In campaign program, the length of the program is usually not more than 1 year.

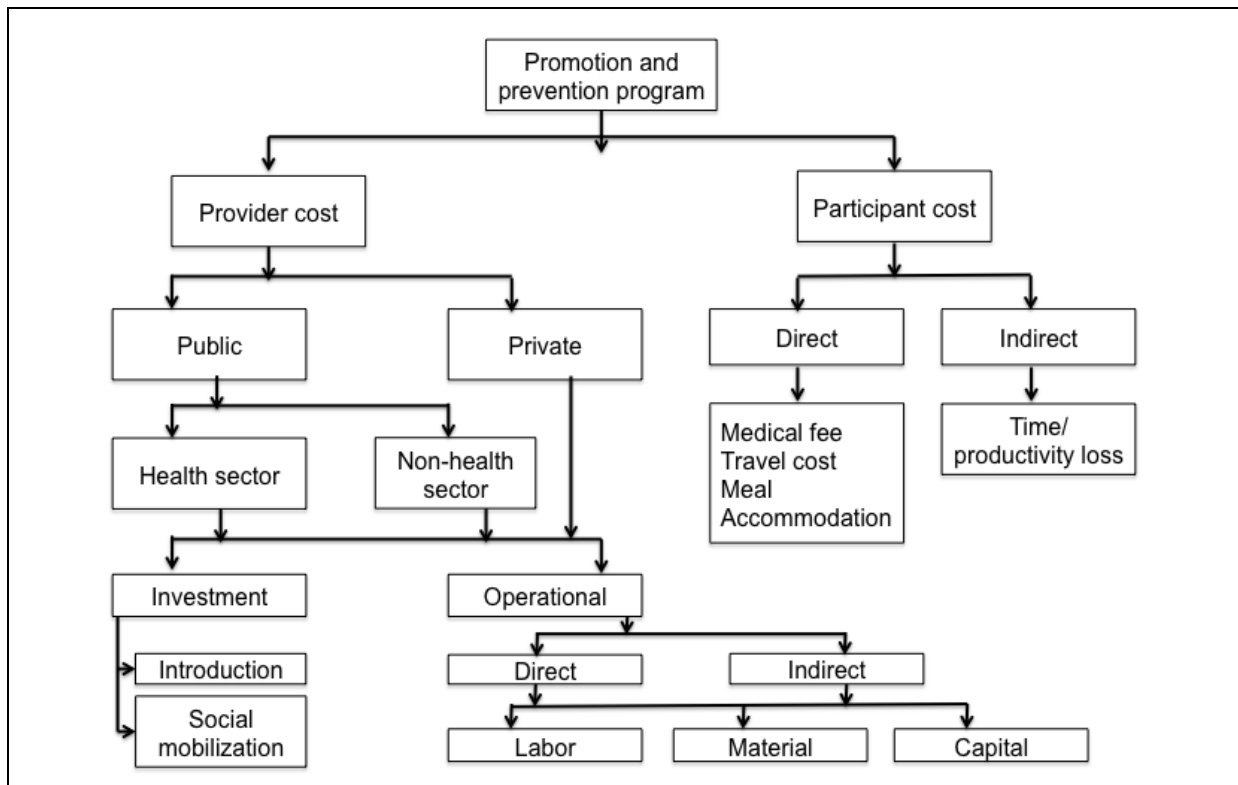


Figure 6. Cost components of health promotion and prevention program

Health program usually needs introduction or investment cost before the program starts. But most of the reviewed papers, either routine or campaign program, most of the papers did not state it. It may be because of the difficulty to gain the data or measure the resources. Few papers mentioned various numbers of years and discount rates but the most common is they used 5 years and 3% discount rate, while some papers just mentioned that they included introduction cost but did not mention the time horizon and the discount rate.

Capital, material and labor are used to be included in the calculation of direct cost for both routine and campaign program, because the calculation is commonly based on provider's view. For indirect cost, only 2 articles mentioned that Chandrasekar *et al.*, (2010) used project management administration and overhead cost at the NGO level as the indirect cost, and Meeyai *et al.*, (2015) used the knowledge management, evaluation, capacity building activities and communication as the indirect cost component. Articles that used societal perspective included the participant/customer cost, for the direct cost mostly medication fee is included, and for the indirect cost productivity loss is included.

Type of analysis commonly used is total program cost for both routine and campaign program. While for the papers that belongs to economic evaluation they used the total program cost and cost per output. Total program cost and cost per activity were commonly used for the papers that used the activity based costing and provided the detailed cost per activity in a program.

Based on the papers reviewed, we have designed a scope of costs of PP. It is composed of provider and participant cost. Provider cost is cost that is consumed by the provider (can be hospital, department of health, NGO, that owned by public or private sector) to perform a health promotion or prevention program, while participant cost means the cost that had been paid by the participant of the program. The cost components under the provider cost are defined as investment and operational cost. Investment cost is all the cost that is used before starting the program, such as introduction cost and social mobilization. Introduction cost can be initial program cost like meeting, training, and preparation cost. Operational cost is composed of direct and indirect cost, which is usually defined as capital, labor and material cost. Participant cost is composed of direct and indirect cost also,

but in this matter, the direct cost is cost is that directly paid by the participant to get the intervention, such as service fee, travel, meal and accommodation cost, while the indirect cost is defined as cost that is used because the participants get the intervention, such as time or productivity loss (Figure 6).

5. CONCLUSIONS

This systematic review provided brief information about the situation in costing analysis studies of health promotion, disease prevention and controlling program that had been done in some countries in Asia. The number of published articles in international journal is not high as expected. Some factors that may affect the development of costing analysis study could be found, such as the health problem of each country, the availability of financial support, and the availability of researcher or facility. The common activity is institutional routine program, and the costing method is micro-costing approach, using the provider perspective. Many improvement steps should be implemented to improve the number and the quality of costing analysis study in Asia.

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Conflict of interest

There is not any conflict of interest on this study.

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Ethical approval

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