

## **Statistical Analysis of Social Determinants of Health: An Exploratory Study for Global Comparison**

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Received Aug. 14, 2017, Revised Dec. 13, Accepted Dec. 29, 2017

### **ABSTRACT**

*The American healthcare system has become a whipping boy for many global health care professionals who contend that the United States spends more than any other similar countries on health care, yet the health outcomes measured by life expectancy and infant mortality rates of this country have been hovering at the bottom for industrialized nations (Bradley-Springer, 2012). Scholars and researchers in the health care and related fields have been arguing for many years that investment in the health care system alone cannot improve health outcomes (Butler, Bowen and Cabello, 2017).*

*In the United States, another danger is that financial pressure, the decision makers in healthcare may look for a quick and short term solution (Kim and Kwon, 2015). These scholars and practitioners have developed a different hypothesis to explain health outcomes. They argue that “health” can be explained with a composite measure of medical as well as social determinants of health. Social determinants here are defined in this study as spends not directly tied to financial investment in the medical system. The implication for policy makers is that investment in the medical area alone cannot produce intended positive health outcomes. Rather, a nation’s health policy should address investment in the combined health “basket” (medical plus social agents) to achieve health goals. This study using a few industrialized countries similar to the United States in economic characteristics and political system to investigate statistically how much “social determinants” played a role in determining a nation’s health outcomes. Economic agents are also included in the model to investigate comparative contribution to nation’s health outcomes by these two sample groups. Findings show “social determinants” play a more significant role in determining the nation’s health outcomes compared to economic agents (spending in medical care). Policy implications are addressed at the end of this paper.*

***Keywords:*** *Social Determinants of Health Theory, Life Expectancy, Infant Mortality, Stepwise Regression*

## INTRODUCTION

Health is a complex issue and measuring health outcomes require data for many areas that are not directly related to and impacted by health care. Medical intervention and drug

management are just part of health care management (Laaksonen, et. al, 2005). Many studies demonstrated that social agents in health care such as housing, drug abuses, gun violence, poverty, poor sanitations are also play significant roles in determining the nation's health (Braveman, et. al, 2011; Bradley-Springer, 2012; Gawande, 2014; Marmot and Allen, 2014). Nevertheless, many researchers especially in medical fields believe that medical intervention coupled with and assisted by unprecedented use of drugs would improve health status of a nation. Health care spending in this country is the largest portion of gross national product (WHO, 2017) and business in pharmaceutical companies is booming providing so-called miracle new drugs almost on a daily basis.

America is the giant “medicated” and over “medicalized” nation in the world (Gawande, 2014). Yet, health outcomes of this country measured by most common health indicators such as infant mortality rate and life expectancy are hovering at the bottom of industrial countries for many years. On the other hand, Park (2006) found that changes in health resources or socioeconomic variables alone may not reduce the state level infant mortality. A new paradigm is needed to explain such poor outcomes and explore a new approach to investigating causes of unexpected relationship between the amount of investment in the health care system and health outcomes.

Most studies in this field of investigation employ a single sample space (country) as a unit of analysis. Although a study with a single sample space (country) may yield statistical outputs convenient to interpret and understand, such research design produces outputs difficult if not impossible for comparative analysis between and among study countries.

The purpose of this paper is to statistically demonstrate what factor or factors determine/ influence health outcomes in

industrialized countries. A multivariate statistical model is used to demonstrate extent of relationship, if any, between economic/social variables (determinants) and health outcomes. This paper is organized as follow: a brief literature review will be presented in Section 2 which is followed by study methods along with sources of data in Section 3. Summary and conclusions will be presented in Section 4. Limitations and contributions of this study will be provided in Section 5.

## **LITERATURE REVIEW**

Health care researchers and practitioners are searching for other disciplines to better understand reasons why the United States has such poor health outcomes in spite of spending almost twice as much on health care as other industrialized countries. For example, the United States spent in average \$9,024 per capita in 2015 (see Appendix Table) while other comparative countries in our sample study spent in average a little over \$5,000 per capita. In terms of percentage of health care spending to gross domestic product (GDP), the United States spent 16.6% while comparative group spent in average 11.1%. Yet, life expectancy and infant mortality rates of the United States are contrary to what researchers expected; lower life expectancy and higher mortality rates than their counterpart in the study.

The above statistics appear to imply that medical intervention alone has not improved health of the nation. Therefore, it is not surprising that health professionals have looked for other fields of discipline to better understand the relationship between health and the level of investment in health care system. Pioneer work on causes of changes in health status was undertaken by McKeown, Record and Turner's study (1975) on death records for England and Wales from the mid-19th century through the early 1960s. They

found that mortality from multiple causes had fallen significantly and steadily a decade before the availability of modern medical care modalities such as antibiotics and intensive care units. They attributed this decline in mortality rate primarily to social agents such as improved living conditions including sanitation and clean water. Another example can be found in ever widening mortality disparity between social classes in the United Kingdom in the decade following the creation of the National Health Service in 1948 (Black, et. al, 1988). Health outcomes significantly differ among different income groups in spite of universal health coverage for all.

The Canadian Lalonde Report (Lalonde, 1974) acknowledged for the first time that there were other factors external to the health care system in improving nation's health. Further, Braveman and Gottlieb (2014) reports that large disparity in health status according to social class have been documented across different European countries despite universal access to medical care implying that there are other than medical care impacting the nation's health. In a study of longitudinal data over 30 years across 34 OCED countries, Rand Europe (2016) found that higher levels of public social spending seem to have a particularly strong relationship with better health (Butler, et. al, 2016). Butler, Mathew and Cabello (2017) argue that focusing heavily on medical services is not necessarily the best way to improve health. Atta (2012), on the other hand argues that quality care with emphasis of patient satisfaction is the best way to improve care under limited resources.

Although there are many different definitions of social determinants in health (SDH), the World Health Organization has the most comprehensive definition. According to their definition, social determinants of health is defined as “the conditions in which people are born, grow, live, work and age” and “the fundamental

drivers of these conditions.” (WHO, 2008). The SDH concept differentiates health attributing to medical care from social inequity of the countries/societies. Some even argue that medical care was responsible for only 10% to 15% of preventable mortality in the U.S. (McGinnis, William-Russo and Knickman, 2002). Marmot and Allen (2014) quoted a Canadian study that shows health care accounts only 25% of health, while socio-economic accounts 50% of health. They even claim that social inequity leads to health inequity. This statement echoes a similar argument advanced by Bradley and Taylor (2011) that “to fix health, help the poor.”

Bradley-Springer (2012) showed that of the ratio of investment in social services to medical services, the United States has a far lower ratio (0.91) than the average ratio of other comparable countries (2.0) ranging from 1.2 for New Zealand to 2.6 for Poland. The U.S. seems to spend more resources on medical care than on social agents. Such an imbalance in resource allocation between medical and social services may have resulted in a lower life expectancy in this country as McGinnis and Foege (1993) concluded in their study on causes of death in the United States. They argue that half of the deaths in the United States involve behavioral causes. Other evidence of attributes to death includes income disparity, education and employment, not directly related to medical care (Braveman, et. al, 2011).

## **METHODOLOGY**

This study uses a cross sectional comparative analysis of selected variables among 10 industrialized countries whose political and economic systems are similar to those of the United States; primarily market oriented economic systems. Countries in sample include; Australia, Austria, Belgium, Canada, France,

Germany, Italy, Netherlands, Sweden, Switzerland, United Kingdom and the United States. Information on selected variables came from the United Nation, World Health Organizations and other sources that publish pertinent health related statistics on a regular basis. Selection of variables that impact nation's health is rather challenging and limited as this study seeks for a comparative study of pertinent variables that are related to health behavior between the United States and other similar countries. For example, information uniquely relevant to the United States such as income inequality by races may not be so pertinent or relevant to other countries in our sample.

Variable selection, therefore, follows the existing literature on health outcomes and associated variables. The following variables were collected and used in this study.

A. Resources for Health Care

1. Spending in health care per capita (\$); indication of investment in health care system (Source: OECD Health Statistic, 2016)
2. Percent (%) of spending on health care to gross domestic product; normalized indicator of investment in health care system (Source: OECD Health Statistic, 2016)

B. Health Outcomes

1. Infant mortality rate per 1000 live births (Source: UN Population Division 2017)
2. Life expectancy (years) (Source: UN Population Division (2017)

C. Associate variables impacting health outcomes

1. Income inequality (Gini index). It is a measurement of the income disparity of a country's residents. This variable ranges between 0 and 1(or 0 to 100%) with 0 representing perfect income equality and 1 representing perfect income inequality. (Source: World Fact Book 2015)

2. Insurance coverage (%), percent of people in a country covered by some types of health insurance (Source: OECD Health Statistics, 2016).
3. Drug overdose deaths per 100,000, indicator of personal health behavior (Pollack, et. al, 2005) (Source: [www.worldlifeexpectancy.com/cause-of-death/drug-use/by-country](http://www.worldlifeexpectancy.com/cause-of-death/drug-use/by-country), 2015)
4. Gun ownership per 100 residents, another indicator of personal health behavior (Source: Karp, 2007)
5. Gun homicide per 100,000, social behavior (Bingenheimer, Brennan and Earls, 2005) (Source: Preidt, 2016)

### **Statistical Analysis**

A simple descriptive statistical analysis was attempted initially to present a snap shot of each variable between two groups (United States vs. others in the sample). A one-sample mean test should reveal the extent of differences in pertinent variables between the United States and the rest of the countries in the sample. A correlation matrix is created to assess the relationship between variables on health outcomes (infant mortality and life expectancy) and associated variables stated above. Finally, a stepwise regression model is created to assess the behavior of each associate variable with health outcomes (infant mortality rate and life expectancy).  $P < 0.01$  and  $0.05$  were used to make any statistical inferences.

## **RESULTS**

### **Descriptive statistics**

As shown in Table 1, the average spending on health care by the sample countries excluding the United States is \$4,736.55 while the United States spent \$9,024, almost twice as much as other

countries. For the proportion of spending on health care to national domestic products, the United States spent 16.66% whereas other sample countries spent 10.66% on health care, almost 40% less than the United States. Table 1 shows relevant information for this research effort. It indicates descriptive statistics and other relevant results.

Table 1: Descriptive Statistics with t-values

Item	SP\$	SP%	IMR	LEP	GIX	CI%	DOD	GOP	GHP
<b>1-A: Statistics for sample countries</b>									
MVS	4,736.55	10.66	3.97	81.33	31.13	99.83	2.09	21.82	0.25
SD	912	0.92	0.58	0.74	3.05	0.35	0.99	10.44	0.20
<b>1 – B: Statistics for U.S.</b>									
UMV	9,024.00	16.6	6.5	79.1	40.5	89.6	6.99	112.6	3.61
<b>1-C: t-values between sample countries and U.S.</b>									
t-stat	-16.58*	-21.99*	-14.50*	9.97*	31.12*	97.04*	-16.26*	-28.73*	-56.99*

SP\$: Spending(\$), SP%: Spending (%), IMR: Infant mortality rate per 1000 live birth  
 LEP: Life expectancy, GIX: Gini Index, CI%: Covered Insured (%), DOD: Drug overdose death per 100,000, GOP: Gun Ownership per 100 residents, GHP: Gun related homicide per 100,000, MVS: Mean value of samples, SD: Standard Deviation, UMV: U.S. mean value, T-stat: T-statistics

In spite of such large spending on health care compared with other similar countries in the sample, health care outcomes of the United States are worse than other countries. For example, the infant mortality rate for the United States was recorded as 6.5 per 100,000 live births whereas the average infant mortality rate for other countries in the sample was 3.97 per 100,000 live births, almost 40% lower than the U.S. Life expectancy also shows that

the United States has the lowest life expectancy among the selected industrial countries (79.1 years vs. 81.33 years).

There seems to be statistically significant difference in income inequality measured by Gini Index between the U.S. and sample countries (40.5 vs. 31.13,  $p < 0.01$ ). Almost every citizen in the sample countries is covered by some types of health insurances (99.83%) while only 89.6% of the U.S. citizen enjoy health coverage ( $p < 0.01$ ). Personal health behavior between these two groups also reveal a clear and significant differences; drug overdose death for sample countries is recorded as 2.09 per 100,000 whereas the corresponding information for the U.S. is 6.99 ( $p < 0.01$ ).

The most striking difference between these two groups is in gun related homicide; 0.25 per 100,000 in the sample countries vs. 3.61 in the U.S. ( $p < 0.01$ ), a 1,300% difference. Gun ownership follows very closely with gun related homicide; the U.S. has 112.6 guns per 100 households vs. 21.82 for the sample countries ( $p < 0.01$ ).

### Correlation matrix

In order to investigate a possible relationship between health outcomes and perceived associated variables, a correlation matrix is produced as shown in Table 2.

Table 2: Correlation Matrix between Health Outcomes and Explanatory Variables

	SP(\$)	SP(%)	GIX	CI(%)	DOD	GOP	GHP
IFM	0.591**	0.924**	0.821*	-0.795*	0.717*	0.749*	0.797*
LFE	-0.616**	-0.660**	-0.225	0.716*	-0.621**	-0.600**	-0.060**

\* $p < 0.01$ , \*\* $p < 0.05$

IFM: Infant Mortality, LFE: Life Expectancy, SP\$: Spending(\$), SP%: Spending (%), GIX: Gini Index, CI%: Covered Insured (%), DOD: Drug overdose death per 100,000, GOP: Gun Ownership per 100 residents, GHP: Gun related homicide per 100,000, T-statistics

- a. *Infant mortality rate*: Larger spending on health care does not seem to improve mortality rates either in absolute amount or percentage of GDP on health care ( $p < 0.05$  for both cases). As a matter of fact, the directional relationship between investment in health care and health outcomes in both cases is opposite to conventional belief. A further investigation on this relationship needs to be explored in multivariate statistical model next section. Income inequality measured by Gini index appears to negatively impacting infant mortality rates ( $p < 0.01$ ), but not on life expectancy. People in the low income tend to have less accessibility to health care facilities including neonatal care. A negative relationship is, therefore, expected. It is not too surprising to see a positive and significant relationship between infant mortality rates and drug related deaths ( $p < 0.01$ ), gun ownership ( $p < 0.01$ ) and gun related homicides ( $p < 0.01$ ). negative social behavior could create environment at home not conducive for health family formation that in turn may affect infant mortality. As expected, availability of covered insurance seems to reduce infant mortality rates as more pre-natal care is available for expectant mothers and new born babies ( $p < 0.01$ ).
- b. *Life expectancy*: Spending on health care seems to impact life expectancy as Table 2 illustrates either in terms of absolute dollars ( $p < 0.05$ ) or percent to the gross domestic product ( $p < 0.05$ ). Similar to infant mortality case, the negative signs in both cases pose an interesting interpretational challenge. The social determinant theory of health argues that spending on health care alone will not improve health outcomes. Reviewing the data (see appendix) between life expectancy and spending (absolute amount as well as percent to gross domestic product), in countries such as Austria, Germany, Netherlands and the U.S., these countries spend more than average on health care, yet their life expectancies are lower than the average (81.33 years) suggesting an inverse relationship. We are not quite certain with this inverse and significant relationship between these two variables. Perhaps multivariate statistical analysis

may shed some lights to this outcome. Nevertheless, this unexpected result seems to support the argument advanced by the social determinants of health to the extreme way, to the least; spending resources on health care alone does not improve health outcomes. Although statistically insignificant, income inequality appears to shorten life expectancy as the literature in general and social determinants of health in particular have argued for many years. People in lower income brackets lack many opportunities to improve the quality of life that may improve life expectancy. Drug abuse and gun violence appear to lower life expectancy as expected ( $p < 0.05$  respectively). Availability of health insurance seems to improve life expectancy as they have more resources for better health care services ( $p < 0.01$ ).

It should be noted, however, that not a single social determinant produces unexpected relationship with health outcomes. It is mystery why economic variables (health care spending) produced unexpected relationship with health care outcomes. Perhaps multivariate statistical model sheds some light to tis mystery.

### **Multivariate Statistical Analysis**

This study employs independent variables advanced by literature in this field of study to assess the degree of association between health outcomes (infant mortality rate and life expectancy) and related independent variables in bivariate analysis model (Table 2). Implications were drawn from the bivariate statistical model. However, health outcome is combination of multivariate factors that affect health status. For example, gun related homicide will be clearly related to gun ownership and insurance coverage implicitly related to income inequality (Gini index). Using

independent variables that may be related themselves in multivariate model may create unusually high multicollinearity that raises interpretational challenges. In order to minimize statistical distortion created by multicollinearity, this paper used a stepwise regression model to extract information on relationship between health outcomes (infant mortality and life expectancy) and associate independent variables. The final results are shown in Table 3A (Infant Mortality Rate) and Table 3B (Life Expectancy).

Table 3A: Stepwise Regression Model between Infant Mortality and Explanatory Variables

	Regression coefficient	Beta coefficient	t value	p value	VIF
Constant	14.364		2.134	.062	
Gini Index	.122	.531	2.804	.021	1.647
Insurance	-.142	-.462	-2.440	.037	1.647

R<sup>2</sup> = 0.80

Table 3B: Stepwise Regression Model between Life Expectancy and Explanatory Variables

	Regression coefficient	t value	p value
Constant	58.358	8.311	0.000
Insurance	.230	3.246	0.009

R<sup>2</sup> = 0.71

Only two independent variables appear to have significant impact on infant mortality rate; income inequality (Gini Index) and Insurance coverage. Variance inflation factor (VIF) indicates practically no multicollinearity between two independent variables. P-values indicate reliable relationship between these two independent variables and infant mortality rate ( $p < 0.05$  for both

cases). R-square indicates a respectable relationship ( $R^2 = 0.80$ ). Income inequality clearly increases infant mortality rate as many low income groups are unable to afford decent health care facilities. Such interpretation is supported by insurance coverage in the model. Consumers who have any types of insurance coverage seem to lower infant mortality rate as shown in Table 3A.

Only one independent variable (health insurance coverage) entered into the final stepwise regression model for life expectancy model. VIFs for initial model (not shown here) range from 32.045 (gun related homicide) to 36.794 (gun ownership). After several iterations removing unacceptable VIFs, the final model contains only Insurance Coverage as shown in Table 3B. There is a reliable relationship between life expectancy and insurance coverage ( $p < 0.009$ ) with  $R^2 = 0.712$ . The two multivariate models seem to support hypothesis advanced by proponents of social determinants of health. No economic variables (health care spending and % of health care spent on gross disposable product entered into the final model as relevant independent variables.

### **Implications of Statistical Findings**

The results from this study appear to support previous findings by Lalonde (1974), Bradley-Springer (2012) and Braveman and Gottlieb (2014) that social determinants impact health improvement far greater than medical intervention. Researchers and practitioners who advocate and support social determinants of health consistently argue that it is NOT how much one spends on health care that determines the nation's health outcomes. They argue that other areas in social services (social agent) have to be brought into the picture to assess comprehensive health outcomes of a nation. The results of this study appear to support such theory and arguments in cross country research framework. This study seems to suggest that it is not HOW much resource is spent on

health care. Rather it is WHERE such resources are being spent. Investment in medical devices, drugs and other medical areas that supposedly improve health outcomes have apparently failed to achieve such goals.

This study clearly points other areas of emphasis in improving nation's health. Mitigating income inequality measured by Gini Index poses a very complicated political challenge. Unprecedented economic growth since 2010 Great Recession has created many "millionaires" in this country. But this economic growth also produced unwanted and unexpected economics "classes"; have vs. have not, resulting in many people in our society "unhappy" that in itself affects nation's health emotionally as well as physically. Policy change may be needed to correct such income inequality.

This study also reveals another significant variable that affects nation's health, insurance or lack of insurance coverage. Universal healthcare coverage has been issue for many years in this country. The Affordable Care Act (ACA) has made some inroad reducing many uninsured consumers. There is some evidence that emergency use has been reduced since the ACA was implemented. However, we have a long way to solve uninsured population as political debate on merit of this universal care has been never settled. This country has almost 10% uninsured population. Reducing this uninsured population to the level other economically advanced countries (99.83%) requires a bold political decision.

Study of other countries similar to ours but spend more resources on social aspects of life appears to have produced a better health outcome than the United States. Drug overdoses like we are currently experiencing with the opioid epidemic, gun violence in major cities unparalleled in our history, are some of the social ills that hamper quality of life in our society including health outcomes. Unless and until such obvious social issues are corrected, health outcomes may not be improved. As starter, the ratio of investment

in social services to the medical services should be raised to a minimum 2.0 like other industrialized nations. A national debate on this issue is well overdue.

### **LIMITATION AND CONTRIBUTIONS**

This study has an obvious limitation in that samples are limited to a few countries similar to the United States in economic characteristics as well as political systems. Many countries whose economic and political systems are dissimilar to ours are not included in this study such as Japan, China, India, etc. which may produce different outcomes. In addition, this study employed only a few variables that may impact health outcomes of a nation. Many important economic, political and social variables are not included in this study, such as nation's political system, quality of water/air, retirement systems, number of clinics, quality and quantity of transportation systems, etc. The outcomes may be different from what this study reveals if all of the above limitations are resolved.

Several similar studies have been published on this topic exposing social determinants as significant factors in improving health status. However, most studies use one sample space (country) as a major unit of study. Although such study framework may produce statistical outcomes easy to interpret and generalize, such study framework fails to provide generalized statistical results for policy makers to frame strategic decision to improve health outcomes. This study attempted to provide such missing link by including several similar countries in the study sample. Outcomes from this study, therefore, may be more practical and applicable.

Another contribution of this study includes specific factors that have been cited and supported by literature affecting health status. Income disparity, drug overdose, gun violence, gun ownership and

health care insurance coverage are some of the most pertinent factors that impact health status of a country. This study reveals not only directional relationship between them and health outcome, but also the degree of reliability or lack of reliability in a statistical model. Policy implication can be drawn from such relationship.

Finally, this study employs multivariate statistical model where interactions among independent variables were assessed and managed. As far as we understand, it is first attempt to use such statistical tool to unearth interrelationship among health outcomes and associated factors.

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### Appendix: Summary Statistics

CNT	PCP (\$)	GDP (%)	MRP	LFE	IGI	IC(%)	DOD	GOP	GHP
Australia	4,177.00	10	4.6	82.4	34.9	100	3.32	21.7	0.2
Austria	5,016.00	11.2	3.5	80.5	29.2	99.9	2.99	30.4	0.18
Belgium	4,611.00	10.6	4.1	80.3	25.9	98.8	1.64	17.2	0.33
Canada	4,506.00	11.1	5.1	81.4	33.7	100	2.29	30.8	0.5
France	4,367.00	11	4.3	81.8	33.7	99.9	1.08	31.2	0.2
Germany	5,119.00	11.4	3.7	80.8	31.1	99.8	1.34	30.3	0.06
Italy	3,202.00	8.8	3.5	82.3	31.9	100	1.5	11.9	0.71
Netherlands	5,343.00	10.5	3.8	81.3	28.7	99.8	0.63	3.9	0.2
Sweden	5,003.00	11.2	3	81.7	26.8	100	2.49	31.6	0.19
Swiss	6,787.00	11.4	3.9	81.7	32.7	100	1.84	24.5	0.18
UK	3,971.00	9.1	4.2	80.4	33.8	99.9	3.83	6.6	0.04
USA	9,024.00	16.6	6.5	79.1	40.5	89.6	6.96	113	3.61

\*Gini Index = 1 indicates perfect income equality

CNT: Countries, PC(\$): Per Capita Spending (\$), Percent to GDP (%), MRP: Mortality rate per 1,000 Live Births, LFE: Life Expectancy (years), IGI: Income Inequality (Gini Index)\*, IC(%): Insurance Coverage (%), DOD: Drug Overdose Death per 1,000 People, GOP: Gun Ownership per 100 Residents, GHP: Gun Related Homicide

Sources: Various United Nations Publications

## **Improving Costing Methodology Based on Commercial Bank Restructuring**

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Received Jun. 8, 2017, Revised Dec. 23, Accepted Dec. 29, 2017

### **ABSTRACT**

*Although many factors affect the bank's cost structure, the most important one is the indirect cost weight compared with the cost object. However, it is made clear that the banks cannot appropriately allocate their indirect costs to the cost of products and services, control those costs, and use the output for decision making as a result of a survey conducted for this paper. Therefore, this paper is to explore how to improve costing methodology based on commercial bank restructuring since traditional costing system is defined as the suitable method to solve this issue. The study will provide managers and policy makers with strategic insights and an important method to in commercial bank or similar settings.*

**Keywords:** Commercial bank cost structure, traditional and activity based costing system

## INTRODUCTION

In the recent years, there has been a decreasing tendency in the commercial banks' profitability. On one hand, this is due to the strong competition in the industry and increase in the operating costs. However, it is limited to increase their revenues by changing fees and commissions. Many factors affect the bank's cost structure, the most important one is the indirect cost weight compared with the cost object. These are urging the banks to control their costs in order to stabilize the profitability and firm performance (Bacon and McMillan, 2007; Lee & Lee, 2014).

This study is aimed to determine how the banks should control their costs using which costing method, and how they should implement it. It is made clear that the banks cannot appropriately allocate their indirect costs to the cost of products and services, control those costs, and use the output for decision making as a result of a survey conducted in this study.

## LITERATUR REVIEW

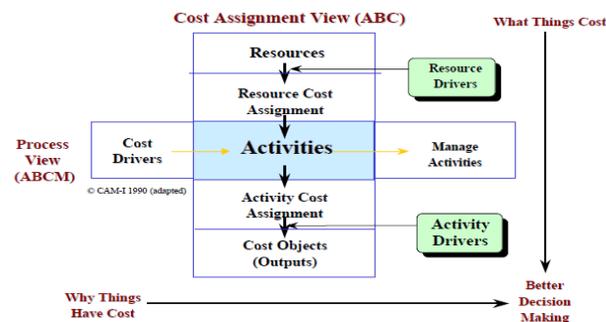
### **Modern trends of cost management**

Managerial accounting is the process of identifying, measuring, cumulating, analyzing information for the pursuit of forecasting, valuing, and controlling entity's operation. In addition to the process, it is a procedure that create documents and reports by consolidating and analyzing a data from business operations. Management uses this information for decision-making, and it affects the organization's strategy. Furthermore, management can control their cost by implementing their basic functions of forecasting, motivating, organizing, monitoring, and decision-making (Bakieva & Khashimova, 2017; Rossouw, 2016). Cost management is the process of controlling and planning the budget

of any activity. It aims to supply users with the highest quality products and services at the lowest cost. In order to achieve the goal, the following objectives must be met:

- Determining the costs of the resources required,
- Reducing the costs of the operations that are not adding value,
- Determining efficiency and effectiveness of the operation,
- Determining the operation of measuring performance, permanent improvement, and introducing and implementing new ideas.

Recently, management is continuously developing itself and implementing an innovative cost management method by improving the product's quality, performance, and lowering its cost. These management methods and initiatives are dependent on each other, and capable to support another. According to Tom Albright and Marco Lam (2006), these methods can be broadly classified into three groups: managing production flow, focusing on strategic management, and reducing process variation.



Source: CAM-I (Gary, 1999)

Figure.1 Information sources of cost

These methods are all connected and consolidated to each other by focusing on permanent and continuous improvement of its business operation. In addition, it seeks to monitor the cost, improve the quality, reduce the cost, and determine the true activity and process. Thus, the main elements of these methods are the activity and process, and these are the basic variables of the activity based costing management. Entity should analyze its activity, cost driver, and performance, and implementing activity based management, in order to continuously improving the entity's value.

### **Costing methods**

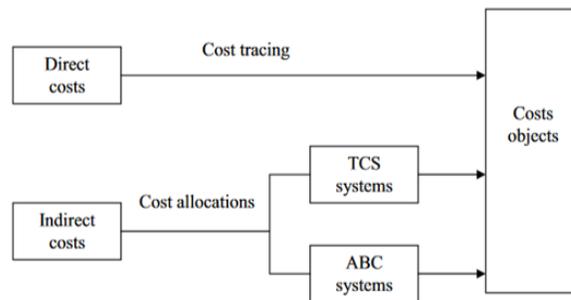
Costing methods are classified in to three groups by how it is allocating the indirect cost.

Which are:

- Production level – Only one incremental cost driver is used for allocating indirect cost, and typically direct labor is used in this level.
- Unit level – Cost drivers, that are suitable for segment's characteristics, are used for allocating incremental indirect cost. In this level, cost drivers are machine time, labor hours, and direct material cost. This level is more suitable method for commercial bank.
- Activity and operational level – Indirect costs are allocated by using activity, operation, process cost driver, and the cost drivers are allocated to the final products.

Organization can obtain accurate information about the product and service cost and implementating efficient cost management by choosing efficient cost accounting and costing methods.

In banking industry, traditional and activity based costing methods are used to estimate product cost by using cost drivers to allocate indirect costs into cost object, which is a product. Thus, commercial banks can choose most suitable costing methods among these two.



Source: (Fawzi, 2008)

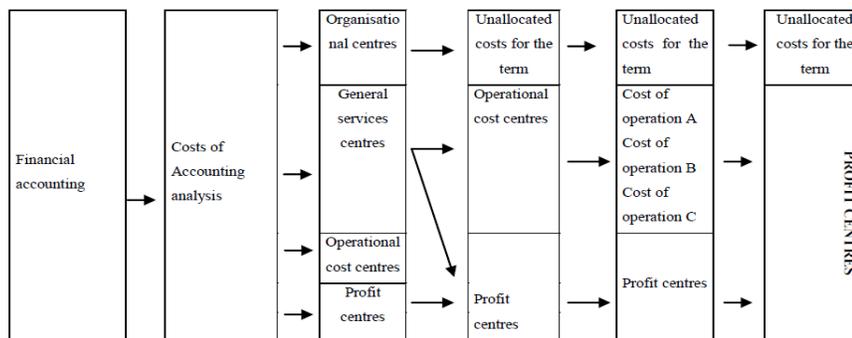
Figure 2. Costing system

### **Traditional costing system**

The process of allocating non-financial costs into different cost objects begins with deciding on which costs must be allocated to cost objects. This method can be classified into two types of approaches which are the partial and full costing system. The partial costing system allocates only a part of the cost, and the full costing systems allocates all the costs. In any of these alternative systems, the cost allocation process is usually a sequential process that consists of two stages. In the first stage, the different cost categories are added to the different intermediate cost objects, and in the second stage, costs are allocated to the final cost objects. Thus, coming back to the classification of transformation costs of banking institutions which differentiated between direct and

indirect costs, it is worth considering the use of partial or full cost systems in banking institutions

Managerial accounting in commercial banking institutions was introduced relatively later in comparison with other institutions in other sectors. This is the one of reasons of limited development in managerial accounting. For example, competition in the banking sector situation until the 1980s were not yet serve as an incentive for development of managerial accounting and management planning and control system. On the other hand, banking sectors' main function is considerably differing from other sector, because its function is heavily depended on domestic conditions and performance of companies. Such a transition would hinder the development of the financial sector and industry. In addition, this system explains why the financial institutions initiated full costing system relatively later in comparison with other sector (Carenys & Sales, 2008, p. 38), and bank needs profit analysis rather than absorbing costs (Mecimore & Cornick, 1982).



Source: (Carenys & Sales, 2008)

Figure 3. Traditional costing system

Similarly, a study, that covered banks of USA, criticized that instead of giving much attention on full cost, bank management gave full attention on cost management and direct costs. However, if the indirect cost increases, direct costing system will become insignificant in functions of planning and monitoring. Thus, this system's potential is limited for the companies (high indirect fixed cost) that have higher indirect cost level and many products. Finally, according to Carenys and Sales, using this system is not appropriate for the financial institutions (Carenys & Sales, 2008).

#### **Activity-based costing system (ABC)**

Increasing necessity for proper allocation of cost and narrowing production operation has created activity-based costing (ABC) system. During the 1980s, increasing overhead costs was main problem that institutions' production process has faced. There was no adequate method to manage increasing overhead costs more efficiently. Activity-based costing made a fundamental change in the accounting of overhead costs. In Germany, this method has developed under the name of "operating expense accounting" from 1989. In 1990, in US, Hewlett-Packard, John Deere, Siemens, GM, and other major companies started to focus more on measuring the cost and successfully developed. Japanese manufacturers have been widely used it for controlling cost, discount, restructuring land of production, and create a healthy environment for business.

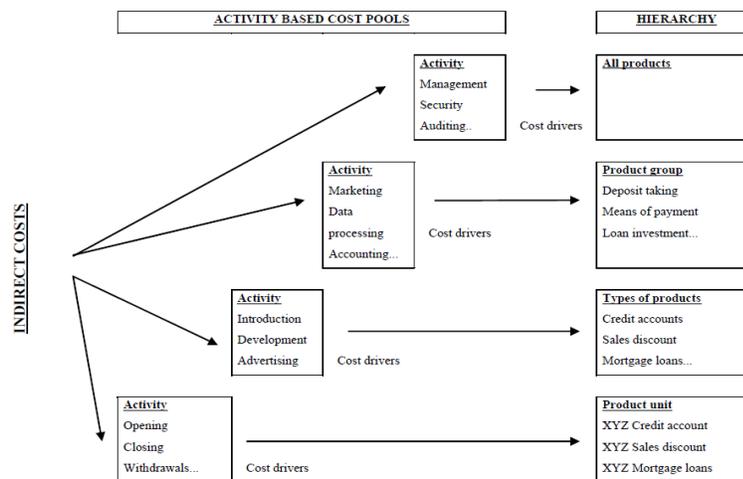
Since 1980s, researches had been conducted on introducing the ABC system into banking and financial sector. In 1988 Gadner and Lammers (Gadner M & Lammers L, 1988, p. 38) carried out a survey on commercial banks and credit and saving associations of USA in order to indicate current condition of the financial accounting and management control level. The survey result indicated that the intentional distribution of indirect

transformation cost to the product, service, and customers is important to make decisions by the management.

In 1997, Innes and Mitchel (Innes, Mitchell, & Sinclair, 2000, p. 360) carried out a survey on 31 biggest banks and financial institutions. The survey result indicated that the ABC system is significant for improving the accounting operation of management of bank and financial institutions.

In 2006, Carenys and Sales (Carenys & Sales, 2008) made survey on 26 savings bank of Spain and 40 commercial banks of USA, and reached the following conclusion as a result:

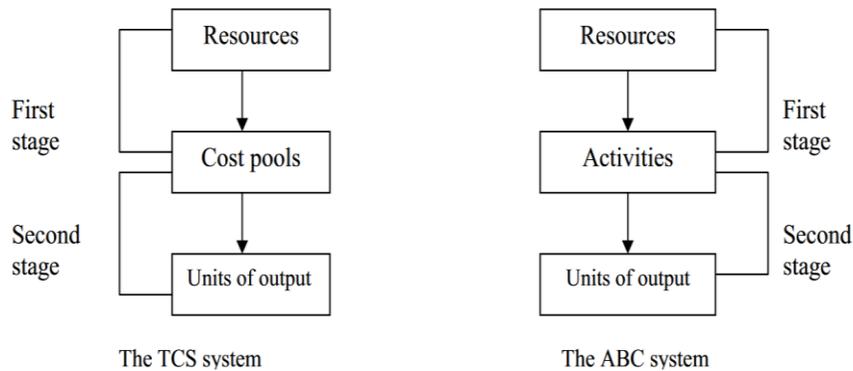
- It is appropriate to distribute the total costs to the product, service, and customers, not limiting with only direct costs
- Information on indirect transformation costs is significantly important for decisions of administration



Source: (Jan et al., 1994)

Figure 4. Activity-based costing system

ABC system was applied in monitoring and reducing the costs at that time and the common application of this system is seriously beneficial (Bert & Esther, 1994). Traditional and activity-based costing systems are not only differed by its allocating base, it also differs by the second stage cost allocation depending on the number of allocating base that are used. Typically, traditional costing system uses labor hours, machine time, and material (in amount) as allocating base, whereas activity-based costing system uses variety of allocation bases which can be repair time, order number, and number of issues resolved, etc. Thus, the activity-based costing system provides more reliable and accurate product cost than traditional costing system (Innes et al., 2000), (Kaplan, 1988), (Fawzi, A, 2008).



Source: Kaplan et al (1992)

Figure.5 Comparisons of costing systems

Even though commercial banks are measuring cost of branch, sub-branches, and product, the activity-based costing system on same level compromises the accuracy of the cost information. It is

necessary for accurate allocation of indirect costs into product or services because of increasing indirect cost due to increasing marketing cost, new technology, and usage of technology.

### **CURRENT CONDITION OF MEASURING PRODUCT AND SERVICE COST OF COMMERCIAL BANK**

In commercial banking industry, increasing competition, developments in technology, changes in interest rate, and growth of financial market led to increase the cost of reserves and reduces profit. In addition, growth in industry operation and increasing numbers of customers have led increase in operating cost.

#### **Current Situation of Financial and Managerial Accounting System of Mongolian Commercial Banks**

##### **Commercial bank's financial and managerial accounting system:**

The survey was taken from 47 bank officers, who works in financial accounting, managerial account, and financial planning department, from 13 different banks by face-to-face with an in-person interview and questionnaire. The purpose of this survey was to evaluate commercial banks' current cost accounting and costing system and to determine current product costing system.

According to the survey result, current commercial bank's accounting operations are divided into 3 different types of structures (see Table 1).

Financial and accounting activities of commercial banks that operating in Mongolia have concentrated considerably on department of finance. Typically, the main functions of the department of finance are financial budgeting, planning, developing accounting policies and procedures, conducting

financial analysis, and providing financial reports to internal and external users.

Table 1. Banks' structures

No	Department	Bank name
Structure I	Financial accounting system and control processes are implemented by the departments of finance and accounting, which are under executive management.	Golomt bank
		TD bank
Structure II	Financial accounting system and control processes are implemented by the departments of finance and operation, which are under executive management.	Khan bank
		XAC bank
		State bank
Structure III	Financial accounting system and control processes are implemented by the department of finance under executive management.	Chinggis Khan bank
		Ulaanbaatar City bank
		Capital bank
		Capitron bank
		NI bank
		Arig bank
		Bogd bank
		Credit bank
Trans bank		

Source: Calculations by researcher

Financial accounting function is to provide financial reports and information by recording a day-to day transactions and summarizing those data; however, it cannot record some of the transactions that are related to activities and information.

According to the results of the study, the following common issues of commercial bank can be observed:

- Differences of commercial banks costing are dependable to their asset amount. Cost information necessity is comparatively higher for big and medium sized banks as opposed to small sized banks. With regard to this, big and medium sized banks are trying to estimate their service cost and to enhance the cost estimation accuracy.
- It seems that needs of the product cost information is increased due to the operational expansions for medium and large category banks.
- Banking sector still could not fully estimate their product cost.
- There is needs of improvement on traditional costing system that currently used in banking sector.

In the banks sector, there is a great need to improve and adjust costing system with market requirement; however, this issue has not fully studied yet. In addition, there is still no clear and complete understanding for function and necessity of cost accounting system.

**Commercial bank's accounting and information system framework:**

Commercial bank's programs and software are concentrated on information technology department. The information technology departments are responsible to provide reliable, secure, continuous and stable operations of hardware, software, internal and external server, and databases. In addition, the department is

also responsible for constantly updating and developing their programs and software, producing the standards, guidelines, procedures, and process of information technology.

The survey was taken from 28 bank officers, who works in information technology department and executive management, from 13 different banks by face-to-face with an in-person interview and questionnaire for determining the current trends of information technology system. Table 2 shows the programs of commercial banks that are using in 2015.

The accounting software produces reports of financial statements, cash flow statement, balance analysis, and reserve money supply. Management information system is a website based software, and it is used for providing necessary information to all managers and executives.

The principles of the system anticipate a user access to a system which describes the rights for each user actions and statements. The system creates historical data by downloading all account information and transactions related to the account data from basic bank accounting system, such as deposit, loans, collateral as well as off-balance sheet activity, etc.

This system has a several disadvantages:

- Currently system generated reports are based on data collected until previous day. In addition, system cannot forecast future based on historical data.
- It cannot calculate the changes on the other information, if one changes some variables. For example, system can produce information in the fastest 5-10 minute, and in some cases it took 15-20 days to generate.

Table 2. Main programs for accounting of the commercial bank accounting

№	Bank name	Main program	Information system	Supporting softwares for decision making and management
1	Khan bank	Banks program	Exist	Does not exist
2	Golomt bank	Infosys	Exist – Oracle BI	Does not exist
3	TD bank	Grapebank	Exist - Gramis	Does not exist
4	XAC bank	Flexcube	Exist	Does not exist
5	State bank	Grapebank	Exist - Gramis	Does not exist
6	Ulaanbaatar city bank	Grapebank	Exist - Gramis	Does not exist
7	Capital bank	Grapebank	Exist - Gramis	Does not exist
8	Capitron bank	Grapebank	Exist - Gramis	Does not exist
9	NI bank	Grapebank	Exist - Gramis	Does not exist
10	Credit bank	Grapebank	Exist - Gramis	Does not exist
11	Chinggis Khan bank	R-Style program	Exist	Does not exist
12	Arig bank	Grapebank	Exist - Gramis	Does not exist
13	Bogd bank	Grapebank	Exist - Gramis	Does not exist
14	Trans bank	Macro Opace 5.0	Exist	Does not exist

Source: Calculations by researcher

- Departments get information separately, but it might produce inefficient usage of time and salary cost when information gathered in same time and load increases.
- Downloading some report takes a lot of time. Some time they produce the report manually.
- Data of accounting system is used in banking level, but it cannot be merged or converted into other systems.

In addition, according to the survey results, current commercial banks are not using any software that can provide necessary information to support management and decision-making. Furthermore, the produced reports do not give predictions about future trends. The results of the study have collectively reached the following conclusions. Include:

- There is no united understanding about a cost.
- There is no appropriate costing system in current banking sector of Mongolia. Some of the banks are using costing system, but the using systems are incomplete to fully implement the costing system.
- Current financial accounting systems that are used in commercial banks of Mongolia can only produce information regarding to financial accounting activity; however, it cannot provide necessary information for costing.

There are vital needs of initiating appropriate costing system, which is the major part of managerial accounting system, by changing organizational structure and using appropriate software that can support costing system

## **APPROACHES FOR IMPROVING THE COMMERCIAL BANKS' COSTING SYSTEM**

Current financial accounting of commercial bank is providing an accurate information to the user, which is the main purpose of accounting, but it is not providing sufficient information for future operating budgets, planning, and management decision.

In addition, there is an important need of using costing system, and its purpose is to provide information regarding product and service costs to internal users of the organization. Cost accounting provides necessary information for conducting financial and managerial accounting; thus, it is a bridge between these two accounting. The main feature of the cost accounting is that it differs from financial accounting by incorporating quantitative and non-quantitative information at the unit level. Internal users of the commercial banks uses financial and cost information to conduct analysis and researches for future management decisions related to its operations.

Cost accounting can be a source of important information used in making management decisions, but it depends on how the cost information of commercial bank are developed.

### **Measuring cost**

Collecting data of the costs – Cost data are collected by classifications of financial and operational areas. General ledger, payroll, and purchase prices are classified in financial category, whereas reserve driver, operational driver, level, and quantity of output, etc., are classified in operational category. These collected two category data are then combined for preparing the cost base.

Allocating cost data – Allocation can be done in two phases. In the first phase, principles and concepts of the cost are determined.

In the second phase, the most suitable costing methods will be chosen among the costing methods, and then measures the cost.

### **Usage of cost information for supporting decision making**

Cost information is used in management decision-making processes, which can be controlling, valuing, forecasting, etc. There is an opportunity to reduce costs and increase profits by understanding the sources of costs and the possibility of controlling it, and this information can be obtained from cost information.

### **Processes of measuring cost**

Costing is a process of allocation all the costs into products and services based on consumptions of the resources. This also applies to the process of determining the amount of resources used for each cost objects.

Costing methodologies must adhere to the following principles:

- Accuracy – Product cost must be accurate and realistic. If the product cost is same as the source consumption, the costing method is more accurate and optimal for the entity.
- Efficiency – Another factor to choose costing is the cost related to using the system and its efficiency. If the costing system is more complex, it might be a relatively costly and efficient than simple systems.

Measuring product cost gives opportunity to determine its cost component. It is necessary to maintain a permanent record for using this information on management decision making.

## **CONCLUSION**

Currently commercial bank has no potential to produce

sufficient information that required for optimal decision making, future operating budget and planning. In order to fulfill this information needs, efficient and effective cost accounting and costing system is required. Commercial bank needs to choose appropriate costing system that is suitable for their operations, among the costing methods by implementing related analysis and investing required investment.

Traditional costing system allocates costs based on main cost. The traditional costing system is a less relevant to estimate, plan, and control product cost in the field of commercial banking activity due to its cost structure and characteristic.

ABC system creates sufficient conditions to provide accurate information to management by improving the process of indirect cost allocation to product. The intentional distribution of indirect transformation cost to the product, service, and customers is important to make decisions by the management.

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