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Analysis of Drinking-related Socioeconomic Costs and Cost Effectiveness of Drinking Prevention Policy

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KiHASA Korea Institute for Health and Social Affairs

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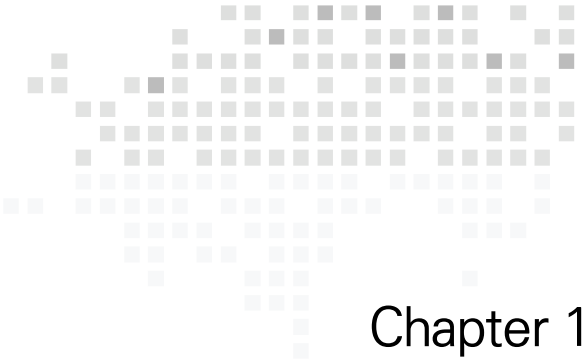


Chapter 1

Introduction

1 Introduction

Promoting public health is one of the critical enablers of not only better living standards and economic well-being on an individual household level but also in poverty reduction, economic growth, and long-term economic development on a national level. This is in line with the 2007 report by World Economic Forum, which argued that chronic ailment clearly constitutes one of the 23 global risks and chronic diseases, when compared with other risks, has considerably higher correlation with the severity of economic loss.[1)]

In Korea, disease-related socioeconomic cost is showing a continuous growth trend every year, acting as a socioeconomic burden to the nation (Jung Young Ho 2009)[2)3)]. Given growing expectation on higher living standards and life expectancy, growing burden from chronic ailment is likely to make prevention and medical treatment all the more important.

One study found out that the cost of illness originating from

1) World Economic Form, "Global Risks 2007", A Global Risk Network Report
2) Jung Young Ho Presentation material for the symposium of the Korean Social Security Association 2009
3) Korean public disease-related cost data by time series from 2001 to 2005 indicates that it is continuously growing, with figures of 39,834.8 billion won (2001); 41,332.4 billion won (2002); 42417.7 billion won (2003); 45,392.1 billion won (2004); and 49,290.9 billion won (2005)

drinking, among this disease-related socioeconomic cost, accounts for 8.58% of total cost of illness of the population of at least 20 years old (Jung Young Ho et. al., 2006)[4]. In other words, drinking (8.58%) is second only to smoking (9.12%) as the driver of the cost of illness resulting from various health risks like smoking, drinking, insufficient exercise, obesity, hypertension, high cholesterol, and environmental pollution. What this finding points out is that abstaining or drinking in moderation can help in saving drinking-related socioeconomic costs.

Monthly drinking rate in 2010 was 77.8% for men and 43.3% for women, which has continuously surged since 2005 for me n.[5] It is clear that drinking results not only in physical and psychological harm to an individual but also harm to the family, job, and economic activities of the entire society. The harm drinking inflicts is not only confined to health. It is the major culprit behind the loss in productive population from premature deaths caused by diseases; drinking-related accidents or crimes; productivity loss such as absences or inefficiency at workplace attributable to drinking; dissolution of family; domestic violence; and child abuse.

Against this backdrop, the government drafted and implemented 'The Blue Bird Plan 2010' in 2006, a strategy designed to cut damage from drinking on a national level. But it

4) Jung Young Ho et al. Analysis of determining factors of Korean national health. The Korean Institute for Health and Social Affairs; Health Promotion Team 2006

5) National Health Statistics(2010) 2011

has failed to be a viable initiative owing to insufficient administrative measures and resources available to actually put this policy into practice.[6)]

Socioeconomic damage from drinking is on the increase every year and there is a need to understand the precise cost involved in policy making. This report intends to lay the groundwork for the national strategy necessary to prevent drinking-related harm by estimating drinking-related socioeconomic costs and cost effectiveness of a drinking-related damage prevention project.

6) Blue Bird Plan 2010 Assessment, Alcohol Project Team 2010

Chapter 2

Drinking-related socioeconomic costs

2 Drinking-related socioeconomic costs

1. Method to estimate drinking-related socioeconomic costs

A. Types of drinking-related socioeconomic costs

In order to estimate drinking-related socioeconomic costs, the cost itself is defined first based on the study of existing literatures and broken down into different types. There are broadly three types of socioeconomic cost - direct cost, indirect cost and intangible cost. Here direct cost includes direct medical expenses from health insurance and medical benefits, indirect medical expenses like nursing costs and transportation expenses, drinking-related costs of traffic accidents, fires or crimes. Indirect cost is a cost associated with loss of work, loss of income caused by premature death, while intangible costs involves the pain and psychological anxiety experienced by a drinker and his family because of drinking.

This report has estimated socioeconomic cost using mostly the items presented in the table below, given the limitations in data and estimating and measuring subjective values.

〈Table 1〉 Types of Drinking-related socioeconomic costs included in the study

Costs	Cost types		Included in the study
Direct costs			
◦Medical costs	‣ Direct medical costs (disease)	◦Health insurance (hospitalization + outpatient)	○
		◦Medical benefits (hospitalization + outpatient)	○
		◦Medicine and medical supplies costs	○
	‣ Direct medical costs (accident)	◦Occupational health and safety insurance	○
		◦Automobile insurance	○
	‣ Indirect medical costs	◦Nursing costs	○
		◦Transportation costs	○
◦Prevention and Research			—
◦Property loss	‣ Traffic accidents		○
	‣ Fires		○
◦Crime related	‣ Crimes		—
	‣ Police administration and Litigation		—
	‣ Crime prevention	◦Insurance/alert system	—
Indirect costs			
◦Costs of premature death-related income loss	‣ Diseases		○
	‣ Accidents		○
◦Loss of work	‣ Absences from work		—
	‣ Lower productivity		○
Intangible costs (personal costs)			
◦Loss in quality of living	‣ Pains of a drinker and his family ‣ Deteriorated quality of living		—

B. Method estimating drinking-related costs of illnesses

1) Direct costs

Direct costs involving drinking-related diseases are the sum of total annual medical costs to treat the given disease, transportation spending for outpatient visits, and hospitalization-related nursing expenses.

Direct cost of drinking-related disease (Direct Cost) =

$$\left(\sum_a \sum_j \sum_i \left\{ \frac{E_{ij}^a}{(1-\alpha)} + \frac{OE_{ij}^a}{(1-\beta)} \right\} + \sum_a \sum_j \sum_i (O_{ij}^a \times M_j) + \sum_a \sum_j \sum_i (N_{ij}^a \times I) \right) \times PAR$$

Here,

i=0, 1, ⋯, n age, j=1, 2 sex, a=1, 2, ⋯, n by disease

α : Percentage of hospitalization expenses borne by the patient, β : Percentage of outpatient expenses borne by the patient

E_{ij}^a : Hospitalization cost, OE_{ij}^a : Outpatient cost

O_{ij}^a : Number of days of outpatient visit, M_j : Average round-trip transportation costs

N_{ij}^a : Number of days of being a hospitalized patient, I : Daily average nursing costs

$PAR_i = \frac{P_i(RR_i - 1)}{P_i(RR_i - 1) + 1}$ PAR: Population attributable risk

RR: Relative risk, i: Drinking level (Moderate drinking, Hazardous drinking, Harmful drinking)

2) Indirect costs

Indirect costs, among drinking-related costs of illnesses, are estimated by seeing it broadly as premature death-related loss of income and cost associated with loss of work. However, it is noteworthy to mention that what is used for this estimation is the gross loss output approach, which substitutes loss of income for drinking-related illness in this study with income lost from drinking-related sickness.

In other words, the method of calculating future expected income that a person can get for his life time if he does not die early and instead earn healthily until his life expectancy at birth was applied to convert future total labor income of the dead into a corresponding present value.

Cost of loss of work resulting from medical treatment of disease denotes the number of days of work lost for this patient when he is admitted to hospital for medical treatment and the cost associated with lost work output when he receives outpatient care. The calculation method used for this purpose is as follows:

$$Loss\ of \in comes\ as\ a\ result\ of\ premature\ death = \sum_{a}\sum_{j}\sum_{i}\left\{ F^{a}_{ij} \times \frac{Y_{j}^{t+\tau} \times p_{ij} \times e_{ij}}{(1+r)^{i}} \right\}$$

Here

i=0, 1, ⋯, n age, j=1, 2 sex, a=1, 2, ⋯, n by disease, t : Age at time of death, τ: Number of years

F^{a}_{ij} : Number of death, $Y_{j}^{t+\tau}$: Annual average expected income at t+τ,

p_{ij} : Labor force participation rate, e_{ij} : Employment rate, r : Discount rate,

$$Loss\ of\ work\ \cos t = \sum_{a}\sum_{j}\sum_{i}\{(N^{a}_{ij} + \delta \cdot O^{a}_{ij}) \times p_{ij} \times e_{ij} \times y_{ij}\}$$

Here

i=0, 1, ⋯, n age, j=1, 2 sex, a=1, 2, ⋯, n by disease

N^{a}_{ij} : Number of days of being a hospitalized patient , δ : Non-production rate from being an outpatient vs. a hospitalized patient

O^{a}_{ij} : Number of days of outpatient care, p_{ij} : Labor force participation rate e_{ij} : Employment rate, y_{ij} : Daily average income

3) Drinking related ailments

Cancer, cardiovascular diseases, and digestive system-related diseases are drinking-related ailments and diseases that were chosen mostly for their relative risk (RR) of over 1. Then, CDC

data produced from a meta analysis, and Bagnardi et al. (2001) along with Holman et al. (1996) have been employed to a greater extent to measure RR of drinking related illnesses.

〈Table 2〉 Drinking-related ailments

Category	Drinking-related sicknesses
Malignant neoplasm	Lips, mouth, pharynx, esophagus, stomach, colon, rectum, anus, liver, larynx, breast, prostate
Circulatory system-related diseases	Hypertensive disease, cerebrovascular disease
Digestive system-related diseases	Alcoholic liver disease, alcoholic pancreatic disease
Mental disease related	Mental and behavioral disorder caused by alcohol consumption

Source: CDC(2001), Bagnardi et al.(2001), Holman et al.(1996)

If it is RR〉1 (based on relative risk of 1), the probability of catching diseases grows in proportion to the amount of exposure to risks. Thus population attributable risk (PAR) = [Pe(Relative Risk -1)]/[1+ Pe(Relative Risk -1)][7] is calculated using the ailments whose risk to health with RR of more than 1 (RR〉1). Also the difference in the cost of illness from hazardous drinking and harmful drinking has been taken into account in this exercise.

7) Pe= The proportion of the population that is exposed

〈Table 3〉 Drinking-related sicknesses and their relative risks (RR)

Diseases	Moderate drinkers	Hazardous drinkers	Harmful drinkers
Mental and behavioral disorder caused by alcohol consumption	PAR 100%	PAR 100%	PAR 100%
Alcoholic liver disease	PAR 100%	PAR 100%	PAR 100%
Cancer of lips, mouth, pharynx	1.45	1.85	5.39
Esophageal cancer	1.80	2.37	4.26
Stomach cancer	1.10	1.20	1.30
Colon cancer	1.10	1.20	1.40
Cancer of the rectum, anus, etc.	1.10	1.20	1.40
Liver cancer	1.45	3.03	3.60
Larynx cancer	1.83	3.90	4.93
Breast cancer	1.09	1.31	1.68
Prostate cancer	1.05	1.09	1.19
Hypertensive disease	〈 1	1.27	1.79
Ischemic heart disease	〈 1	〈 1	〈 1
Cerebral hemorrhage	1.50	2.10	4.50
Ischemic stroke	〈 1	1.40	1.40
Apoplexy not listed as hemorrhage or stroke	〈 1	1.40	1.40
Other cerebrovascular diseases	〈 1	〈 1	1.79
Other liver diseases	1.20	1.40	2.00

Note: Relative Risk=Risk of disease or death in the exposed population/Risk of disease or death in the unexposed population
If it is RR〉1 (based on RR of 1), it means the chance of catching diseases increase with more exposure to risks. R〈1 denotes a value of relative risk of less than 1.
Population attributable risk (PAR) = [Pe(Relative Risk -1)]/[1+ Pe(Relative Risk -1)]
Pe=the proportion of the population that is exposed
Source: CDC (2001), Bagnardi et al. (2001), Holman et al. (1996)

4) Hazardous drinking vs. Harmful drinking

The level of adequate drinking amount is getting lower. For example, adequate drinking level was at 60g fifteen years ago but it was raised to 2 glasses (24g) for male and 1 glass (12g) for

female in 1995 (Song Hyun Jong et al. 2005).

〈Table 4〉 Hazardous drinking vs. Harmful drinking

	Definition	Definition proposed by
Moderate drinking	No more than 2 glasses a day, no more than 14 glasses a week	Doweson, 1995
	No more than 30g a day	Jones, 1982
	No more than 40g a day	Frimpong & Lapp, 1989
	No more than 60g a day	Camargo, 1989
	No more than 2 glasses a day for a man; no more than 1 glass a day for a woman	NIH
Hazardous drinking	At least 5 glasses a day for a man; at least 4 glasses for a woman	Wechsler et al, 1994
	More than 60g a day for a man; more than 40g a day for a woman	WHO, Australia, New Zealand
	No more than 64g a day	UK
Harmful drinking	More than 8 glasses a day for a man; more than 5 glasses a day for a woman	UK, WHO

Source: Song Hyun Jong et al. 2005

In this paper, hazardous drinking and harmful drinking are analyzed after dividing them based on the following criteria:

- Moderate drinker = A drinker who drinks at least once a month
- Hazardous drinker = A drinker who drinks 7 glasses of soju (Korean traditional alcohol) for a man and 5 glasses of the liquor for a woman at a drinking party and this kind of occasion takes place at least twice a week (National Health Statistics 2010 (2011))
- Harmful drinker = A drinker who drinks 7 glasses of soju

for a man and 5 glasses of the liquor for a woman at a drinking party and this kind of occasion takes place at least 4 times a week[8)]

〈Table 5〉 Hazardous drinking rate and harmful drinking rate applied to the study (2010)

(%)

		20-29	30-39	40-49	50-59	60-69	70+
Abstainer + Yearly drinker	Male	17.5	15.1	20.2	22.0	33.4	48.9
	Female	49.0	50.9	49.4	63.6	76.6	84.5
Moderate drinker	Male	82.5	84.9	79.8	78.0	66.6	51.1
	Female	51.1	49.1	50.6	36.4	23.4	15.5
Hazardous drinker	Male	18.0	27.7	26.8	25.3	13.9	8.6
	Female	7.8	8.4	6.7	2.5	0.3	0.4
Harmful drinker	Male	1.8	7.4	9.4	12.6	6.6	6.7
	Female	1.0	1.2	2.0	0.7	0.1	0.0

Note: Abstainer + Yearly drinker = Non drinker + A drinker who drinks no more than once a month in a given year
Hazardous drinker = Percentage(%) of risk drinkers in total respondents
Harmful drinker = Percentage(%) of high-risk drinkers in total respondents
Source: Raw data of National Health and Nutrition Examination Survey 2010 (adjusted for gender, age)

8) According to the Korea national health and nutrition examination survey of 1998, a heavy drinker is defined as a drinker who drinks 21 days or more a month. Lee Jung Kyu et al. (2005) defines such a drinker as a person who drinks at least 16 days a month (Lee Jung Kyu et al. Measuring the Korean public burden of heavy drinking-related sicknesses 2005).

C. Findings from the study of drinking-related cost of illness

1) Drinking-related medical benefits cost

In case of medical benefits recipients, medical benefits given to a person being hospitalized for drinking is approximately 214.3 billion won. The corresponding figure for men because of drinking amounts to 196.2 billion won and 18.1 billion won for women.

The cost of drinking-related hospitalization medical benefits of those who are 20 years old or older account for about 8.8% of the total medical benefits of this demographic group, and the corresponding figure for men is 15.85% of this total amount. The figure for women, which is 1.54%, is relatively lower than that of men.

〈Table 6〉 Medical benefits hospitalization costs due to drinking

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Moderate drinker	128	630	3977	5773	2988	2200	15,696
	Hazardous drinker	95	661	4077	4914	1695	477	11,919
	Harmful drinker	688	11246	59572	69397	20209	7475	168,587
	SubTotal	912	12537	67626	80084	24892	10152	196,201
Female	Moderate drinker	41	222	1127	1369	956	1522	5,238
	Hazardous drinker	18	114	387	254	31	255	1,059
	Harmful drinker	194	1708	4221	3730	1206	706	11,765
	SubTotal	253	2044	5736	5353	2194	2482	18,061
Total	Moderate drinker	169	852	5105	7141	3944	3722	20,933
	Hazardous drinker	113	775	4464	5168	1726	731	12,978
	Harmful drinker	882	12954	63793	73127	21415	8181	180,351
	Total	1,164	1,4581	73,362	85,436	27,085	12,634	214,263

〈Table 7〉 Share in medical benefits attributable to drinking-related hospitalization

(1 Million Won, %)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Drinker	912	12,537	67,626	80,084	24,892	10,152	196,201
	Total medical benefits for hospitalization of 20-year-olds or older	29,906	91,559	309,212	377,119	200,673	229,367	1,237,837
	%	3.05	13.69	21.87	21.24	12.40	4.43	15.85
Female	Drinker	253	2,044	5,736	5,353	2,194	2,482	18,061
	Total medical benefits for hospitalization of 20-year-olds or older	21,206	55,344	140,700	166,715	178,174	612,423	1,174,560
	%	1.19	3.69	4.08	3.21	1.23	0.41	1.54
Total	Drinker	1,164	14,581	73,362	85,436	27,085	12,634	214,263
	Total medical benefits for hospitalization of 20-year-olds or older	51,112	146,903	449,912	543,834	378,847	841,790	2,412,397
	%	2.28	9.93	16.31	15.71	7.15	1.50	8.88

Outpatient portion out of medical benefits incurred by recipients aged 20 or older for drinking stands at around 18.3 billion won. Here the figures for men and women are 15.4 billion won and 3 billion won respectively.

Costs involving drinking, out of total medical benefits for recipients who are at least 20 years old, is approximately 1.48%, of which 2.85% is for men and 0.43% is for women (kindly check this sentence again, the numbers don't match). What this finding indicates is that the impact of drinking is felt more on hospitalization than on outpatient treatment of medical benefits recipients.

〈Table 8〉 Outpatient medical benefits incurred by recipients due to drinking

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Moderate drinker	26	101	656	929	562	427	2,702
	Hazardous drinker	22	124	799	935	384	116	2,379
	Harmful drinker	41	551	3268	4092	1305	1020	10,278
	SubTotal	89	777	4723	5955	2251	1563	15,358
Female	Moderate drinker	17	91	428	386	238	218	1,378
	Hazardous drinker	8	52	169	95	12	63	399
	Harmful drinker	19	159	527	356	94	59	1,215
	SubTotal	44	302	1125	836	344	340	2,991
Total	Moderate drinker	43	192	1085	1314	800	645	4,079
	Hazardous drinker	30	177	968	1029	396	178	2,777
	Harmful drinker	60	710	3795	4448	1400	1079	11,493
	Total	133	1079	5848	6791	2595	1903	18,349

〈Table 9〉 Share of drinking-related outpatient medical benefits in total medical benefits expenses

(1 Million Won, %)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Drinker	89	777	4,723	5,955	2,251	1,563	15,358
	Total outpatient medical benefits of 20-year-olds or older	24,555	52,195	141,949	144,325	84,949	91,693	539,665
	%	0.36	1.49	3.33	4.13	2.65	1.70	2.85
Female	Drinker	44	302	1125	836	344	340	2,991
	Total outpatient medical benefits of 20-year-olds or older	20,572	47,214	120,939	123,536	135,638	254,477	702,375
	%	0.21	0.64	0.93	0.68	0.25	0.13	0.43
Total	Drinker	133	1,079	5,848	6,791	2,595	1,903	18,349
	Total outpatient medical benefits of 20-year-olds or older	45,127	99,409	262,888	267,861	220,587	346,170	1,242,040
	%	0.29	1.09	2.22	2.54	1.18	0.55	1.48

Drinking-related medical benefits costs total 232.6 billion won when expenses for hospitalization and outpatient care of medical benefit recipients who are 20 years old or older are all included. Here, the figures for male and female are estimated at 211.6 billion won and 21.1 billion won respectively. In addition, approximately 6.37% of medical benefits spent on the population of 20 years old or older could be explained to have been incurred by drinking.

〈Table 10〉 Drinking-related medical benefits expenses of medical benefits recipients: hospitalization + outpatient

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Moderate drinker	154	732	4,633	6,701	3,549	2,627	18,397
	Hazardous drinker	117	785	4,875	5,849	2,079	593	14,298
	Harmful drinker	729	11,797	62,840	73,489	21,514	8,495	178,865
	SubTotal	1,001	13,314	72,349	86,039	27,143	11,715	211,560
Female	Moderate drinker	58	313	1,556	1,755	1,194	1,740	6,615
	Hazardous drinker	26	166	557	349	43	317	1,458
	Harmful drinker	213	1,867	4,748	4,086	1,300	765	12,979
	SubTotal	297	2,345	6,861	6,189	2,538	2,822	21,052
Total	Moderate drinker	212	1,045	6,189	8,456	4,744	4,367	25,012
	Hazardous drinker	143	951	5,432	6,198	2,122	910	15,756
	Harmful drinker	942	13,664	67,588	77,575	22,815	9,261	191,844
	Total	1,298	15,660	79,210	92,228	29,681	14,537	232,612

〈Table 11〉 Share of drinking-related medical benefits in total medical benefits expenses: Hospitalization + outpatient

(1 Million Won,%)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Drinker	1,001	13,314	72,349	86,039	27,143	11,715	211,560
	Total medical benefits of 20-year-olds or older	54,461	143,754	451,161	521,444	285,622	321,060	1,777,502
	%	1.84	9.26	16.04	16.50	9.50	3.65	11.90
Female	Drinker	297	2,346	6,861	6,189	2,538	2,822	21,052
	Total medical benefits of 20-year-olds or older	41,778	102,558	261,639	290,251	313,812	866,900	1,876,935
	%	0.71	2.29	2.62	2.13	0.81	0.33	1.12
Total	Drinker	1,297	15,660	79,210	92,227	29,680	14,537	232,612
	Total medical benefits of 20-year-olds or older	96,239	246,312	712,800	811,695	599,434	1,187,960	3,654,437
	%	1.35	6.36	11.11	11.36	4.95	1.22	6.37

2) Drinking-related health insurance medical benefits

This report has examined how much medical benefits covered by health insurance is attributable to drinking. First of all, 474.4 billion won of hospitalization medical benefits handed out from health insurance can be explained by hospitalization as a result of drinking. About 4.46% of total hospitalization medical spending on the demographic group of 20-year-olds or older is owed to drinking.

〈Table 12〉 Drinking-related health insurance medical benefits: Hospitalization

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Moderate drinker	845	3,617	14,094	30,160	30,069	21,540	100,324
	Hazardous drinker	590	3,552	14,067	24,574	15,168	3,924	61,875
	Harmful drinker	1,691	15,170	49,795	88,271	55,579	38,626	249,132
	SubTotal	3,126	22,339	77,956	143,004	100,816	64,090	411,331
Female	Moderate drinker	497	2,403	8,126	10,342	7,574	7,078	36,021
	Hazardous drinker	213	1,164	2,540	1,738	214	945	6,814
	Harmful drinker	875	3,830	7,096	5,222	2,047	1,178	20,248
	SubTotal	1,585	7,397	17,762	17,302	9,834	9,202	63,083
Total	Moderate drinker	1,343	6,020	22,220	40,502	37,642	28,618	136,345
	Hazardous drinker	803	4,716	16,607	26,311	15,382	4,870	68,689
	Harmful drinker	2,566	19,000	56,891	93,493	57,626	39,805	269,380
	Total	4,711	29,736	95,718	160,306	110,650	73,293	474,414

〈Table 13〉 Share of drinking-related medical benefits in total health insurance medical benefits expenses: Hospitalization

(1 Million Won, %)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Drinker	3,126	22,339	77,956	143,004	100,816	64,090	411,331
	Total medical benefits of 20-year-olds or older	26,2443	406,173	678,794	1,046,779	1,164,153	1,443,431	5,001,772
	%	**1.19**	**5.50**	**11.48**	**13.66**	**8.66**	**4.44**	**8.22**
Female	Drinker	1,585	7,397	17,762	17,302	9,834	9,202	63,083
	Total medical benefits of 20-year-olds or older	333,429	619,941	645,237	898,844	1,000,826	2,144,021	5,642,297
	%	**0.48**	**1.19**	**2.75**	**1.92**	**0.98**	**0.43**	**1.12**
Total	Drinker	4,711	29,736	95,718	160,306	110,650	73,293	474,414
	Total medical benefits of 20-year-olds or older	59,5871	1,026,114	1,324,030	1,945,622	2,164,979	3,587,452	10,644,069
	%	**0.79**	**2.90**	**7.23**	**8.24**	**5.11**	**2.04**	**4.46**

Expenses associated with drinking-induced outpatient care in total health insurance medical benefits total 137.9 billion won, which is around 1.48% of such benefit expenses. The corresponding figure for men is approximately 2.73% and for women 0.49%.

〈Table Ⅱ-14〉 Drinking-related health insurance medical benefits: Outpatient

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Moderate drinker	378	1176	3982	10051	10758	6074	32,420
	Hazardous drinker	265	1516	5500	10324	6424	1242	25,271
	Harmful drinker	393	2455	8718	21129	12864	9007	54,565
	SubTotal	1036	5148	18201	41503	30046	16322	112,256
Female	Moderate drinker	311	1658	5094	5226	2683	1244	16,215
	Hazardous drinker	129	877	1905	1210	118	281	4,519
	Harmful drinker	233	739	2140	1402	330	113	4,957
	SubTotal	672	3274	9139	7837	3131	1638	25,691
Total	Moderate drinker	689	2835	9076	15277	13441	7317	48,635
	Hazardous drinker	394	2393	7405	11533	6542	1523	29,790
	Harmful drinker	626	3194	10858	22530	13194	9120	59,522
	Total	1708	8422	27339	49340	33177	17960	137,947

〈Table Ⅱ-15〉 Drinking-related health insurance medical benefits: Outpatient

(1 Million Won, %)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Drinker	1,036	5,148	18,201	41,503	30,046	16,322	112,256
	Total medical benefits of 20-year-olds or older	336,113	519,834	706,562	900,811	886,996	767,495	4,117,811
	%	0.31	0.99	2.58	4.61	3.39	2.13	2.73
Female	Drinker	672	3,274	9,139	7,837	3,131	1,638	25,691
	Total medical benefits of 20-year-olds or older	435,475	675,160	871,631	1,137,267	1,020,379	1,061,316	5,201,228
	%	0.15	0.48	1.05	0.69	0.31	0.15	0.49
Total	Drinker	1,708	8,422	27,339	49,340	33,177	17,960	137,947
	Total medical benefits of 20-year-olds or older	771,588	1,194,994	1,578,192	2,038,077	1,907,375	1,828,812	93,19,039
	%	0.22	0.70	1.73	2.42	1.74	0.98	1.48

When expenditures associated with hospitalization and outpatient care are taken into consideration, such benefits incurred by drinking took up approximately 3.07% of all health insurance expenditures (5.74% for men and 0.82% for women).

〈Table Ⅱ-16〉 Drinking-related health insurance medical benefits: Hospitalization + Outpatient

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Moderate drinker	1223	4793	18076	40211	40827	27613	132,744
	Hazardous drinker	855	5068	19568	34897	21592	5167	87,146
	Harmful drinker	2083	17626	58512	109399	68443	47633	303,697
	SubTotal	4162	27487	96156	184508	130862	80413	523,587
Female	Moderate drinker	808	4062	13219	15568	10257	8322	52,236
	Hazardous drinker	342	2041	4445	2947	332	1226	11,333
	Harmful drinker	1108	4569	9237	6624	2376	1292	25,205
	SubTotal	2258	10671	26901	25139	12965	10840	88,774
Total	Moderate drinker	2032	8855	31296	55779	51083	35935	184,979
	Hazardous drinker	1196	7109	24013	37845	21924	6393	98,480
	Harmful drinker	3191	22194	67749	116023	70820	48924	328,902
	Total	6419	38158	123057	209646	143827	91253	612,361

〈Table 17〉 Drinking-related health insurance medical benefits: Hospitalization + Outpatient

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Drinker	4,162	27,487	96,156	184,508	130,862	80,413	523,587
	Total medical benefits of 20-year-olds or older	598,555	926,007	1,385,355	1,947,590	2,051,149	2,210,926	9,119,583
	%	**0.70**	**2.97**	**6.94**	**9.47**	**6.38**	**3.64**	**5.74**
Female	Drinker	2,258	10,671	26,901	25,139	12,965	10,840	88,774
	Total medical benefits of 20-year-olds or older	768,904	1,295,101	1,516,867	2,036,110	2,021,205	3,205,337	10,843,525
	%	**0.29**	**0.82**	**1.77**	**1.23**	**0.64**	**0.34**	**0.82**
Total	Drinker	6,419	38,158	123,057	209,646	143,827	91,253	612,361
	Total medical benefits of 20-year-olds or older	1,367,459	2,221,109	2,902,223	3,983,700	4,072,354	5,416,263	19,963,108
	%	**0.47**	**1.72**	**4.24**	**5.26**	**3.53**	**1.68**	**3.07**

3) Drinking-related direct medical costs

This paper has so far discussed medical expenses mostly centered on medical benefits and health insurance medical benefits. Now, this paper wishes to examine total medical expenses that include medical benefits, health insurance benefits, limited coverage, and health insurance exclusions. The finding from the survey on medical expenses of health insurance patients 2010 (2011) of the National Health Insurance Service is employed since the medical data provided by the National Health Insurance Service does not contain exclusion-related data. Here 20.4% of exclusion in hospitalization cost and 16.7% of exclusion in outpatient cost were applied to each disease. With respect to cancer and cerebrovascular diseases, they are the ailments that require relatively higher medical spending and the percentage of health insurance exclusion regarding these sicknesses can be found in the survey on medical expense of health insurance patients 2010 (2011). Thus 22.8% for cancer hospitalization and 19.1% for cerebrovascular disease-related hospitalization and 16.4% for cancer and 16.6% for cerebrovascular diseases on outpatient were applied.

It turns out that direct medical expenses incurred by drinking approximately total 1,361 billion won, of which 1,183.8 billion won and 177.3 billion won were spent on men and women respectively.

〈Table 18〉 Drinking-related direct medical costs

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	Moderate drinker	2,346	9,017	34,362	70,763	67,322	45,954	229,765
	Hazardous drinker	1,782	11,662	45,479	73,837	42,864	10,397	186,021
	Harmful drinker	4,552	44,798	175,663	289,236	152,956	100,764	767,969
	SubTotal	8,680	65,477	255,504	433,837	263,143	157,115	1,183,755
Female	Moderate drinker	1,369	6,423	22,066	27,929	18,831	16,028	92,646
	Hazardous drinker	588	3,455	8,875	6,985	833	3,085	23,822
	Harmful drinker	2,191	9,905	22,004	17,615	5,972	3,136	60,822
	SubTotal	4,148	19,784	52,945	52,529	25,636	22,249	177,291
Total	Moderate drinker	3,715	15,440	56,428	98,692	86,153	61,983	322,411
	Hazardous drinker	2,370	15,117	54,354	80,822	43,697	13,482	209,843
	Harmful drinker	6,742	54,703	197,666	306,852	158,929	103,900	828,791
	Total	12,827	85,260	308,449	486,366	288,779	179,364	1,361,045

Note: Medical benefits + Health insurance (Hospitalization+ Outpatient + Pharmacy)

4) Drinking-related nursing and transportation costs

The following approach is taken to calculate nursing costs and transportation costs, direct non-medical expenses incurred by drinking. To get nursing costs, daily nursing cost is multiplied by the number of hospitalization days of a health insurance benefits recipient. Though hour of nursing care could vary depending on the severity of the disease involved, this study used 40,000 won for 12 hours of the service (the Korea Patient Helpers Society).

Then data from National Health and Nutrition Examination Survey of 2005 is adopted to calculate the traffic costs involved in outpatient visit in accordance with the formula of Lee Tae Jin et al. (2011)[9]. One-way transportation expense in 2005 was

1,981 won but it rose to 2,363 won in 2010 after adjusting for transportation price inflation. This number is then converted to that of round-trip expenses to perform this calculation.

Accordingly, nursing cost is 165.6 billion won and transportation cost is 21.1 billion won.

〈Table Ⅱ-19〉 Drinking-related nursing costs

(1 Million Won)

Age	20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	1,716	11,163	32,082	46,323	33,849	18,519	143,653
Female	743	3,023	5,701	5,565	3,233	3,668	21,934
Total	2,459	14,186	37,783	51,889	37,083	22,187	165,586

〈Table 20〉 Drinking-related transportation costs

(1 Million Won)

Age	20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	203	1,059	3,535	6,684	4,108	2,580	18,168
Female	90	275	926	985	380	295	2,952
Total	293	1,334	4,461	7,668	4,489	2,875	21,120

5) Loss of income as a result of premature death from drinking-related sickness

Loss of income from premature death as a consequence of drinking-related diseases is an approach to estimate future ex-

9) Lee Tae Jin et al. Method for the cost calculation in health medical field. National Evidence-based Healthcare Collaborating Agency 2011

pected income when a person realizes his/her life expectancy at birth and earns during his/her lifetime. The assumption that no income is generated after a person turns 70 is embraced to calculate the amount of loss in income from early demise.

According to this analysis, a person experiencing premature death from drinking-related ailment would suffer approximately 4,156 billion won in lost income. The figures for men and women are 3,956.5 billion won and 203.5 billion won respectively, showing loss of income for male is higher than the comparable number for female. But the figure for women is expected to grow if female domestic labor is quantified and included in this formula.

〈Table 21〉 Loss of income from premature death as a result of drinking-related disease

(1 Million Won)

Age	20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	46,519	454,896	1,738,674	1,476,437	239,937	-	3,956,463
Female	9,565	49,882	91,907	45,712	6,465	-	203,531
Total	56,084	504,778	1,830,581	1,522,149	246,402	-	4,159,994

6) Cost of production loss from drinking-related diseases

As has been mentioned previously, cost of production loss means cost associated with the number of days lost when a patient is admitted to a hospital to receive medical treatment and

the work hours lost when making outpatient visits. About 412.2 billion won in production cost is found to be spent on treating drinking-related ailments. The corresponding figures for men is around 390.2 billion won and for women is approximately 22 billion won.

〈Table 22〉 Amount of loss of production due to drinking-related disease

(1 Million Won)

Age	20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	2,542	35,124	127,772	175,265	49,526	-	390,230
Female	964	3,972	8,706	6,886	1,506	-	22,033
Total	3,506	39,096	136,479	182,151	51,031	-	412,263

6) Socioeconomic cost associated with drinking-related diseases

Socioeconomic cost resulting from drinking-related ailments, estimated based on the study made so far, is shown in the table below. Socioeconomic expenditures necessary for drinking-related ailments are believed to be around 6,120 billion won:

〈Table 23〉 Drinking-related health insurance medical benefits: Hospitalization + Outpatient

(1 Million Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Medical costs	Male	8,680	65,477	255,504	433,837	263,143	157,115	1,183,755
	Female	4,148	19,784	52,945	52,529	25,636	22,249	177,291
	Sub Total	12,827	85,260	308,449	486,366	288,779	179,364	1,361,045
Nursing costs	Male	1,716	11,163	32,082	46,323	33,849	18,519	143,653
	Female	743	3,023	5,701	5,565	3,233	3,668	21,934
	Sub Total	2,459	14,186	37,783	51,889	37,083	22,187	165,586
Transportation costs	Male	203	1,059	3,535	6,684	4,108	2,580	18,168
	Female	90	275	926	985	380	295	2,952
	Sub Total	293	1,334	4,461	7,668	4,489	2,875	21,120
Loss of income	Male	46,519	454,896	1,738,674	1,476,437	239,937	-	3,956,463
	Female	9,565	49,882	91,907	45,712	6,465	-	203,531
	Sub Total	56,084	504,778	1,830,581	1,522,149	246,402	-	4,159,994
Loss of production	Male	2,542	35,124	127,772	175,265	49,526	-	390,230
	Female	964	3,972	8,706	6,886	1,506	-	22,033
	Sub Total	3,506	39,096	136,479	182,151	51,031	-	412,263
Total	Male	59,660	567,719	2,157,567	2,138,546	590,563	178,214	5,692,269
	Female	15,510	76,936	160,185	111,677	37,220	26,212	427,741
	Total	75,169	644,654	2,317,753	2,250,223	627,784	204,426	6,120,008

By gender, socioeconomic expenses incurred by drinking are 5,692.3 billion won for male and 42.8 billion won for female. By age, the numbers are approximately 75.2 billion won for those in their 20s, 644.7 billion won for those in their 30s, 2,317.8 billion won for 40s, 2,250.2 billion won for 50s and 62.8 billion

won for those in their 60s. This statistics reveals that socio-economic cost associated with drinking-related ailments for those in their 40s and 50s, the most economically active and heavy drinking group of the national population, is high.

D. Findings from drinking-related accident cost study

1) Medical costs for drinking-related industrial accident and traffic accident costs

Industrial, traffic, and fire accidents broadly constitute drinking-related accidents. Industrial accident-related medical expenses and traffic accident-related medical expenditures are reviewed first to arrive at accident-related medical costs. Also the chronology of Industrial accident insurance projects published by the Ministry of Labor is used to calculate drinking-induced industrial accident-related medical expenses. 13.8%, a percentage of industrial insurance medical care costs attributable to drinking, is multiplied to this number for this purpose.

Then, for traffic accident-related injured person, total coverage; a sum of medical cost + damage of business suspension + lost income + compensation + other amounts, is divided by the number of the injured to calculate expenses associated with the person injured from traffic accident. It turned out that per capita coverage generated from this exercise is 1.731 million won.

51,364, the number of those injured from drunken driving, is multiplied to this number to derive the expenses for persons injured by drunken driving-related traffic accidents, which is 88,908 million won.

To calculate the cost for deaths from traffic accidents, total coverage, a sum of damage of business suspension + lost income + compensation + other amounts, is divided by the number of deaths. The result is 103.502 million won in coverage per person and the expenses caused by drunken driving-related traffic accidents spent on dead people is 80,835 million won, which is yielded by the result multiplied by the number of the drunken driving deaths.

〈Table 24〉 Medical costs and costs for deaths arising from drinking-related accidents

(1 Million Won)

〈Industrial accident〉	Industrial insurance medical care benefits		Drinking-related industrial accident medical costs		
	766,535		105,782		
〈Traffic〉	Death	Injury	Cost for death	Cost for injury	Total
Drunken driving	781	51,364	80,835	88,908	169,743
Total	5,505	352,458			

Source: 1) Ministry of Labor, 『Chronology of Industrial Accident Insurance Projects 2010』, 2011.
2) KoROAD, 『Estimation and Evaluation of Road traffic accident costs 2010』, 2010.
3) KoROAD, 『Traffic accident statistical analysis 2010』, 2011.

Total costs of loss in traffic accidents include vehicle damage and property damage costs. When the share of drunken driving-related accident of 12.6% in 2007 and 2010 is multiplied, the costs of loss of vehicle caused by DUI total 532,675 million won.

〈Table 25〉 Costs of vehicular losses as a result of drunk driving-related accident

(1 Million Won)

Vehicle damage (A)	Property damage (B)	Vehicle loss (A+B)	Cost of loss of vehicle from DUI
2,005,041	2,214,511	4,219,552	532,675

Source: 1) KoROAD, 『Estimation and Evaluation of Road traffic accident cost 2010』, 2010.
2) KoROAD, 『Traffic accident statistical analysis 2010』, 2011.

2) Drinking-related fire accident costs

Amount of fire accident-related property damage is contained in the data of the study of annual fire accidents released by the National Emergency Management Agency. Property damage from fire accidents in 2010 was 266,765 million won and the cost associated with drinking-related fire accidents, a figure calculated by applying 0.44, a number showing drinking's contribution to fire accident, proposed by Kim Gwang Ki et al. (2001)[10], is 117,377 million won.

10) Kim Gwang Ki et al. (2001), 『Informatization of alcohol consumption and drinking related damage statistics』, Inje University; Ministry of Health and Welfare, 2001.

〈Table 26〉 Cost of property loss from drinking-related fire accidents

(1 Million Won)

Year	Fire accident related property damage	Drinking-related fire accident cost
2009	251,853	110,815
2010	266,765	117,377

Source: National Emergency Management Agency, 『Study on fire accident』, 2009 & 2010

3) Loss of income as a result of premature death from drunk-driving accidents

The number of deaths from traffic accident for people in their 20s was around 6,242 in 2010, of which 4,552 are men and 1,690 are women.

〈Table 27〉 Number of overland transport accident deaths, 2010

(Person)

Age	20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	496	539	826	852	833	1,006	4,552
Female	110	93	175	248	356	708	1,690
Total	606	632	1,001	1,100	1,189	1,714	6,242

The table below indicates the cost of lost income from untimely deaths. This figure includes 12.6% share of DUI-related deaths in total number of deaths. In other words, loss of income from early deaths from drunk driving-related accident stands at approximately 324.3 billion won, of which 299.3 billion won are from men and 25 billion won are from women.

〈Table 28〉 Loss of income as a result of premature death due to DUI-related accidents

(1 Million Won)

Age	20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Male	88,105	79,729	82,337	40,469	8,652	-	299,293
Female	8,320	5,079	6,086	4,219	1,254	-	24,959
Total	96,425	84,809	88,423	44,688	9,906	-	324,252

E. Socioeconomic cost of drinking: Summary

Socioeconomic cost of drinking-related disease and accident is 7,369.8 billion won, of which 83.0% is disease-related and 17.0% is accident-related. This paper does not take into account costs associated with drinking-induced violence/crimes. Yet, if this cost is included, the conclusion would be that the society has to bear an even bigger socioeconomic cost.

〈Table 29〉 Socioeconomic cost of drinking

(1 Million Won)

			Total of 20-year-olds or older	%
Diseases		Male	5,692,269	77.2%
		Female	427,741	5.8%
		Subtotal	6,120,008	83.0%
Accidents	Industrial	Medical costs	105,782	1.4%
	Traffic	Deaths	169,743	2.3%
		Costs of vehicle loss	532,675	7.2%
		Income loss from premature deaths	324,252	4.4%
	Fire	Fire accidents	117,377	1.6%
	Subtotal	Subtotal	1,249,829	17.0%
Total			7,369,837	100.0%

The study has revealed that the socioeconomic cost of drinking is 7,369.8 billion won and that as suggested by Jung Woo Jin et al. (2006), was around 14.9 trillion won. What explains this difference is the different cost factors used to estimate socioeconomic cost. The comparison between the two methods, with varying cost elements, is presented in the table below.

This report also does not consider productivity reduction from hangover and only includes costs of production loss involved in treating drinking-related ailments. Jung Woo Jin et al. (2006) assumed that 25% of average wage of a daily drinking worker is productivity loss cost in order to calculate the reduction in productivity of an employee who drinks every day. Medical subsidies, which are not included in this paper, were considered as a cost in the study of Jung Woo Jin et al. (2006) after calculating it by multiplying the number of days of hangover a year with the price of hangover drink. Also Jung Woo Jin et al. (2006) included spending on alcohol consumption as socioeconomic cost and this cost was measured by viewing the liquor market size excluding that of liquor tax as such cost.

Elements of socioeconomic costs vary by researchers. With respect to the harm liquor consumption inflicts on our society, some may see the act of consuming alcohol itself is causing social damage while some may argue that some of the proper functions of alcohol may work to the benefit of the society. So the items that could be included in socioeconomic cost formula

may somehow differ to accommodate these discrepancies in viewpoints. Still there may be controversy over whether spending for alcohol consumption can be counted as socioeconomic cost. Even though productivity is lost from a daily drinker, more scientific ground is called for to understand the magnitude of this loss. In parallel, a close examination is necessary to know the duplications of productivity loss from absences or hospital visits a daily drinking worker makes who is sick and productivity loss during the daily routine at workplace from the same reason of the same person.

〈Table 30〉 Vs. previous studies

(1 Million Won)

			This study	Jung Woo Jin et al. (2006)1)	Remark	Lee Sun Mi et al. (2008)2)
Disease		Health insurance + medical benefits	1,361,045	288,000		520,400 (Health insurance) 144,300 (Medical benefits)
		Nursing+ Transportation	186,706	179,000		53,800(Transportation) 318,900(Nursing)
		Productivity reduction from treating sickness	412,263	1,010,500 (Including accidents)		8,265,500 (Including accidents)
		Income loss from premature death caused by drinking -related illnesses	4,159,994	2,983,900		5,411,100 (Including accidents)
			6,120,008			
Accident	Industrial	Medical costs	105,782	95,700		196,700
	Traffic	Deaths	169,743	86,200		211,000
		Costs of	532,675	193,900		108,500

			This study	Jung Woo Jin et al. (2006)1)	Remark	Lee Sun Mi et al. (2008)2)
		vehicle losses Income losses from early deaths	324,252	1,485,200		
	Fire	Fire accidents	117,377	50,500		86,200
	SubTotal	SubTotal	1,249,829			
Others		Medical subsidies	-	260,200	(130 mil days of hangover X 2,000 won in hangover drink)	2,800 (2,000 won spent on relieving hangover of a daily drinker)
		Alcohol consumption spending	-	3,003,700	Liquor market size-Liquor tax size	4,470,200
		Productivity reduction from hangover	-	5,274,000	Daily drinking worker Production reduction ×Average wage×25%	
		Administrative expenses (police + Insurance)	-	24,400		309,700
Total			7,369,837	14,935,200		20,099,000

Note: 1) Jung Woo Jin, Jeon Hyun Jun, Lee Sun Mi, Socioeconomic costs of drinking, the Korean Journal of Preventive Medicine, Ver. 39-1, 2006
2) Lee Sun Mi, Jung Woo Jin, Kim Il Soon et al. Socioeconomic costs of drinking, the Journal of the Korean Academy of Family Medicine 2008;29:201-212

Chapter 3

Cost Effectiveness Analysis of Drinking Damage Prevention Project: Focus on Brief Intervention

3 Cost Effectiveness Analysis of Drinking Damage Prevention Project: Focus on Brief Intervention

Growing social interest in preventing damage from drinking is spurring a discussion on prevention service supplied in the form of counseling, which affects health behavior, by primary health care providers of a local community. The damage from diseases or deaths from drinking can be minimized if brief intervention (BI) administered by a doctor can change alcohol consumption of a hazardous drinker into an adequate liquor consumption or abstinence.

Upon deciding to apply this specific sort of drinking policy, policy makers wish to embrace a cost effectiveness study to use it as the foundation to making a reasonable decision. The less budget there is for drinking policy, the more important the ground for cost effectiveness and the effectiveness of hazardous drinking prevention policy, among many interventions. Therefore, this ground can be adopted in deciding how to allocate limited budget. Economic evaluation allows choosing a strategy that helps increase currency value as it compares different policy alternatives, if there are at least two of them, in terms of cost and result (Gold et al., 1996; Drummond et al., 2005).

This report intents to analyze cost effectiveness when a primary health doctor opts for BI out of many drinking treatment

methods. To this end, this paper has looked at recent previous studies and their research methods. Markov Monte Carlo simulation model is constructed to make an economic evaluation of doctor's BI. Also the model's input parameters, like transition probability, drinking prevalence rate, and death rate, cost of drinking-related disease and medical treatment, utility scores of different Markov states are proposed here. This paper describes distribution function applied to transition probability and distribution function applied to cost and utility so that probabilistic sensitivity analysis (PSA) can be undertaken on this model. With that, study results obtained from the developed model and finally limitations to this report are discussed, followed by conclusions.

1. Previous cost effectiveness studies on brief intervention (BI) to prevent damage from drinking

There are several theses on the effectiveness of drinking treatments and their health benefits. For instance, Burke et al. (2003) and Lundahl and Burke (2009) offered this effectiveness by way of conducting a systematic review and meta analysis on a number of literatures on the effectiveness of socio-psychological drinking treatment method, like motivational interviewing (MI).

In other countries, there are many study results showing that problems associated with drinking can be addressed when

counseling for simple moderation in drinking or stopping drinking in primary health services is provided to drinkers (Fleming et al., 2002; Israel et al, 1996). Some researchers even summarize the effectiveness of BI by way of a systematic review and a meta analysis via a doctor's BI (Kaner et al., 2007; McQueen et al., 2009).

Studies to date have been mainly about the grounds of this effectiveness and the summary of such grounds but somewhat lacking in the grounds for the cost effectiveness of such treatment (Anderson and Baumberg, 2006; Anderson et al. 2009). Yet several attempts have been made in the last several years to understand the cost effectiveness of drinking policies. WHO Europe (2009), for instance, unveiled the outcome from the cost effectiveness analysis derived from applying the model of WHO's CHOICE (CHOosing Interventions that are Cost-Effective) in the EU. In here, a reduction in DALY was used as a parameter of how effective a given policy is. According to the study, brief intervention (BI) prescribed by a medical institution is cost effective ($6,256/DALY) but its cost effectiveness is second only to outlawing access to drinking ($2,475/DALY) and banning drinking commercials ($2,226/DALY).

The US Preventive Service Task Force (USPSTF) proposed 20 effective prevention services and among them recommends intervention in the form of screening out and counseling problematic drinkers in the primary medical stage as a way to cut

alcohol abuse. Granted, Solberg et al.(2008) tried to look into the cost effectiveness of screening and brief intervention (BI) and compared it with other effective preventive services. It was found from this exercise that its cost effectiveness is $1,755/QALY, indicating it is considerably more cost effective when compared to other prevention services.[11)]

Purshouse et al. (2012) performed a cost effectiveness study on alcohol screening and BI program commonly used in the primary health stage and the program was cost effective (£6900/QALY) when compared with no program is implemented at all. This study is the first of its kind that provided the foundation of cost effectiveness of this popular examination program employed in the UK by primary health providers. Also it recommended that policy makers implement conventional alcohol screening and BI program.

In Korea, there was a study on BI's effectiveness (Jung Jin Kyu 2005) but no study exists that controlled uncertainties in the model by introducing an economic evaluation model and a probabilistic sensitivity analysis (PSA) on cost effectiveness. Provided, this paper aims to develop BI's cost effectiveness model and analyze cost effectiveness using the Markov Monte Carlo simulation.

11) Cost effectiveness regarding alcohol abuse is thought to be at a similar level as that of colorectal cancer and hypertension screening and influenza prevention.

2. Cost effectiveness analysis of drinking damage prevention project

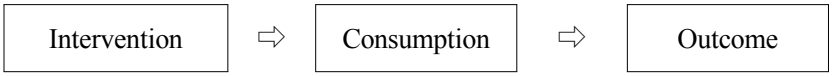
A. Analysis method

NICE Public Health Collaborating Centre in Sheffield University, Britain is establishing a model and performing an evaluation on cost effectiveness of the following subjects:

- Cost effectiveness of measures to monitor adult and teen's drinking
- Cost effectiveness of GP intervention to control adult and teen's excessive drinking
- Cost effectiveness of the intervention to better oversee British liquor market

It can be said that the Sheffield model (UK) is a model analyzing the impact of intervention on the types of alcohol consumption among demographic groups and the impact of changing liquor consumption pattern from a social benefit's perspective. This means the influence of a policy that can lower health risks by employing means like price change or GP intervention to cut alcohol consumption.

[Figure 1] Conceptual structure of Sheffield model



Consumption-to-harm model, regarding the damage on health from alcohol consumption, takes into consideration drinking's impact on the three realms - health (death + prevalence), crime, and labor productivity.

Here the intention is to mainly investigate how liquor consumption in Korea affects health using the analysis approach in the aforementioned Sheffield model.

This report has applied a probabilistic lifetime Markov model. This approach allows a cohort simulation by modeling the cost and result involved once certain event forces some of the population, if they are in Markov state, shift their course. A Markov model could be either a deterministic decision model or a Monte Carlo simulation based stochastic decision model. Uncertainties in the economic evaluation model can be dealt with only when a sensitivity analysis is carried out on its factors. Decision analysis should be structured in a way that it contains information that allows decision making even under uncertainties (Hunink et al., 2001; Weinstein and Fineberg, 1980). Meanwhile, NICE (2008) recommended that the impact of uncertainties be presented as a probabilistic sensitivity analysis (PSA). Here, the Monte Carlo simulation, a method that de-

fines random values for each factor in the cohort model in accordance with a probability distribution, is applied to take into account uncertainties involving the model's cost effectiveness. Microsoft Excel® macro, a software that runs in interface with Microsoft Visual Basic, is used to build the Markov model and the simulation.

〈Brief intervention in primary health care〉

Brief intervention(BI) involves structured advices of 5 minutes in minimum and 20~30 minutes at maximum in primary health service. BI is provided by the primary health provider in local community and it is sometimes offered by a team of doctors, nurses and professional counselors. This service is generally designed to encourage adequate drinking or reduce the amount of drinking to the medically recommended level, rather than to achieve no drinking at all. It is to cut the damage from drinking through early intervention and secondary prevention (ex. prevention of alcohol dependency) and to use medical resources cost effectively.

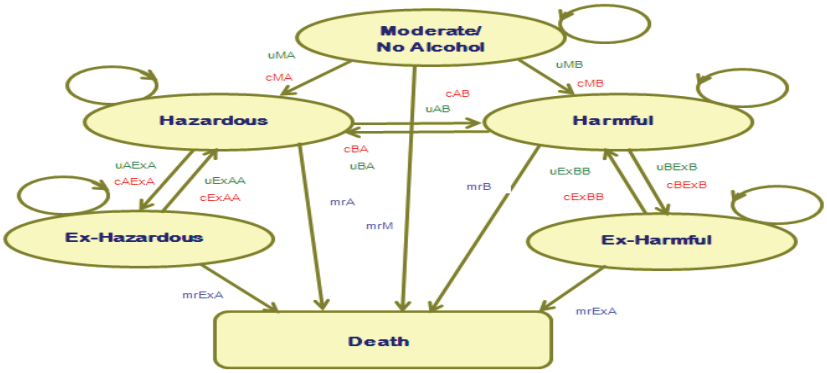
〈Conceptual layout of the analysis model〉

〈Figure 1〉 below is a conceptual framework of the model applied to this study. The ones in circle are Markov states and ar-

rows indicate the route linking various Markov states determined by a transition probability of each Markov cycle. At the end of Markov process lies death, an absorbing state, and all cohorts ultimately converge here.

There are five Markov states - Moderate/No Alcohol, Hazardous, Harmful, Ex-hazardous (ExA), Ex-harmful (ExB), and Death. Each state, as is indicated in arrows, moves in a transitional direction of each cycle. For example, Harmful moves to the next cycle of Ex-harmful. Ex-hazardous and Ex-harmful are included here to take into consideration that one of the characteristics of Markov model is memoryless, meaning not remembering previous incident. So ex-category is added to make up for this deficiency.

[Figure 2] Conceptual model structure



Transitions between states represented by the arrows
State cost variables shown in red
State utility variables shown in green

〈Table 31〉 Definition of Markov States and Transition Matrix

		Cycle t+1					
	Cycle t	Moderate (M)	Hazardous (A)	Harmful (B)	Ex-Hazardous (ExA)	Ex-Harmful (ExB)	Death (D)
Moderate (M)	Moderate	tpMM	tpMA	tpMB	—	—	tpMD+mr
Hazardous (A)	Hazardous	—	tpAA	tpAB	tpAExA	—	tpAD+mr
Harmful (B)	Harmful	—	tpBA	tpBB	—	tpBExB	tpBD+mr
Ex-Hazardous (ExA)	Hazardous drinking in previous cycle	—	tpExAA	tpExAB	—	—	tpExAD+mr
Ex-Harmful (ExB)	Harmful drinking in previous cycle	—	tpExBA	tpExBB	—	—	tpExBD+mr

Note: Moderate (Non-drinking or moderate drinking), Hazardous (Risk drinking), Harmful (High risk drinking)

This study compares the states where current condition is left intact and adopts BI. BI is applied to a harmful drinker or a hazardous drinker and the duration of this study is the entire lifetime until such a person's death[12] and its cycle is one year.

QALY score is applied to each cycle of the model and they are all added up and divided by initial cohort size to get average QALY. In order to compare QALY of control groups, QALY obtained relatively through BI is used to calculate incremental QALY. Then medical cost for drinking-related diseases is tallied to estimate per capita medical cost of each drinking type and cost for BI, if it is administered, is added to the model. Incremental cost is calculated using the same method as QALY

12) All are assumed to die once they reach 101 years old, t+1 cycle of 100 years old.

and their ratio, incremental cost effectiveness ratio (ICER), was derived consequently. Discount rate has to be applied to understand the present value of cost and effectiveness. The cost and effectiveness discount guideline proposed by NICE (2008) is both 3.5% and this guideline is adopted in this study.

〈Prevalent population and transition probability of Markov states〉

As is illustrated in 〈Figure 1〉, there are five Markov states - Moderate/ No alcohol, Hazardous, Harmful, Ex-hazardous(ExA), Ex-harmful(ExB) and Death.

Criteria of hazardous drinking is decided by combining drinking volume and drinking frequency as is in the Korea National Health and Nutrition Examination Survey (2010), and thus it is defined as drinking 7 glasses for a man and 5 glasses for a woman at a drinking party and such behavior takes place at least twice a week. Harmful drinking is defined as the same behavior occurring at least four times a week.

In terms of demographics by drinking type in Korea, 7.6% of males are harmful drinkers and 22.4% of males are hazardous drinkers which includes harmful drinkers. Female harmful drinkers stands at 1.0% and hazardous drinkers at 5.1% of total women population (Table 2).

〈Table 32〉 Distribution of Drinkers in Korean Population 2010

(%)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total
Abstainers	Male	17.5	15.1	20.2	22.0	33.4	48.9	22.2
	Female	49.0	50.9	49.4	63.6	76.6	84.5	59.1
Moderate	Male	82.5	84.9	79.8	78.0	66.6	51.1	77.8
	Female	51.1	49.1	50.6	36.4	23.4	15.5	40.9
Hazardous	Male	18.0	27.7	26.8	25.3	13.9	8.6	22.4
	Female	7.8	8.4	6.7	2.5	0.3	0.4	5.1
Harmful	Male	1.8	7.4	9.4	12.6	6.6	6.7	7.6
	Female	1.0	1.2	2.0	0.7	0.1	0.0	1.0

Note: Abstainer + Yearly drinker = Non-drinker + A drinker who drinks no more than once a month a year
Hazardous drinker = Percentage of risk drinkers in total respondents(%)
Harmful drinker = Percentage of high risk drinkers in total respondents(%)
Source: Raw data of Korea National Health and Nutrition Examination Survey 2010 (adjusted for age, gender)

Given that time series data is necessary to know the transition probability of the model, the Korea Health Panel can offer data on changing drinking patterns of drinkers. So this paper has employed 2009 and 2010 Korea Health Panel data to estimate the probability of a hazardous drinker in 2009 experiencing transition to a hazardous drinker, an ex-hazardous drinker or a harmful drinker in 2010. The same probability is applied to that of an ex-hazardous drinker reverting to a hazardous drinker and to that of a non hazardous drinker becoming a hazardous drinker. Transition probability of each drinking type is listed in 〈Table 3〉 below. The probability of a hazardous drinker(A) remaining in the identical state(A) is 48.3% and transition to harmful drinker (B) is 4.2%:

〈Table 33〉 Transition probability of each Markov state

		Cycle t+1					
		Moderate (M)	Hazardous (A)	Harmful (B)	Ex-Hazardous (ExA)	Ex-Harmful (ExB)	Death (D)
Cycle t	Moderate (M)	0.9084	0.0722	0.0194	—	—	tpMD+mr
	Hazardous (A)	—	0.4833	0.0421	0.4746	—	tpAD+mr
	Harmful (B)	—	0.1727	0.3933	—	0.4341	tpBD+mr
	Ex-Hazardous (ExA)	—	0.0722	0.0722	—	—	tpExAD+mr
	Ex-Harmful (ExB)	—	0.0194	0.0194	—	—	tpExBD+mr

Note: Moderate (Non-drinking and adequate drinking), Hazardous (risk drinking), Harmful (high risk drinking)
Hazardous (Risk drinking): Drink 7 glasses for a male and 5 glasses for a female at a drinking party with such occasion is at least 2 times a week
Harmful (High risk drinking): Drink 7 glasses for a male and 5 glasses for a female at a drinking party with such occasionsis at least 4 times a week
tpExAA=tpExAB, tpExBA=tpExBB
Source: Raw data of Korea Health Panel, 2009, 2010

〈Medical cost from drinking〉

Drinking-related diseases should first be chosen to arrive at drinking-related medical costs. Drinking-related sicknesses include cancer, cardiovascular and cerebrovascular diseases, and digestive system diseases and drinking-related ailments that were selected are mostly those with relative risk (RR) of more than 1. CDC data extracted from a meta analysis and Bagnardi et al. (2001), and Holman et al. (1996) are mainly used to measure RR of drinking related sicknesses.

If RR〉1 (based on relative risk of 1), the chance of catching diseases increases with more exposure to risk factors. So alco-

hol-attributable fraction (AAF) = [Pe(Relative Risk-1)]/[1+ Pe(Relative Risk-1)] is calculated on the diseases whose RR negatively affects health is bigger than 1 (Pe=The share of population exposed to risk, Solberg, 2008). Since medical expenses incurred by hazardous drinking and harmful drinking are different, they were treated separately in this estimation.

〈Table 34〉 Drinking related ailments and their relative risks

Ailment	Moderate	Hazardous	Harmful
Mental and behavioral disorder caused by alcohol consumption	AAF 100%	AAF 100%	AAF 100%
Alcoholic liver disease	AAF 100%	AAF 100%	AAF 100%
Cancer of lips, mouth, pharynx	1.45	1.85	5.39
Esophageal cancer	1.80	2.37	4.26
Stomach cancer	1.10	1.20	1.30
Colon cancer	1.10	1.20	1.40
Cancer of rectum, anus, etc.	1.10	1.20	1.40
Liver cancer	1.45	3.03	3.60
Larynx cancer	1.83	3.90	4.93
Breast cancer	1.09	1.31	1.68
Prostate cancer	1.05	1.09	1.19
Hypertensive disease	〈 1	1.27	1.79
Ischemic heart disease	〈 1	〈 1	〈 1
Cerebral hemorrhage	1.50	2.10	4.50
Ischemic stroke	〈 1	1.40	1.40
Apoplexy not listed as hemorrhage or stroke	〈 1	1.40	1.40
Other cerebrovascular diseases	〈 1	〈 1	1.79
Other liver diseases	1.20	1.40	2.00

Note: AAF= Alcohol-attributable fraction
If RR〉1 (based on RR of 1), the chance of catching sickness grows with more exposure to risk. R〈 1 is a value whose RR is less than 1
Acohol-Attributable Fraction (AAF) = [Pe(Relative Risk -1)]/[1+ Pe(Relative Risk -1)]
Pe=the proportion of the population that is exposed
Source: CDC(2001), Bagnardi et al.(2001), Holman et al.(1996)

Korea national health insurance medical care expenses data of 2010 was used to calculate medical expenses originating from patients' drinking. Medical cost of drinking-related dis-

eases was presented, with AAF for each drinking type multiplied to this cost to identify medical cost resulting from individual type of drinking. Then the number was divided by the number of people in each state to get per capita drinking-related medical expenses. Cost involving an ex hazardous drinker and an ex harmful drinker can be estimated when the population of each group and relative risk cost of drinking-related diseases of these two categories of individuals are known. But limitations in data has given no other option for this paper but to apply RR of 1.1 to an ex. hazardous drinker and RR of 1.4 to an ex. harmful drinker to the medical costs of these two groups presented in the study of Klatsky et al. (1990). This means that the model is analyzed based on the level of an ex. hazardous drinker and an ex. harmful drinker, which is 0.786 of a hazardous drinker and a harmful drinker.

〈Table 5〉 below illustrates how much total medical costs is attributable to drinking-related medical expenses. Approximately 5.2% of total male medical cost is due to drinking and about 0.42% of total female medical cost is due to this same cause. Also for men, around 8.97% of hospitalization expenses is incurred by drinking.[13)]

〈Table 6〉 shows medical cost per person by each drinking category with a male hazardous drinker spending on average 70,000 won a year per person in medical costs. A harmful

13) See [Appendix 1] for medical expenses incurred from drinking by gender and age.

drinker, meanwhile, is found out to spend per capita medical cost an average of 336,000 won a year.

〈Table 35〉 Share of drinking-related medical costs in total medical expenses

(%)

	Male	Female
Inpatient	8.97	0.91
Outpatient	2.46	0.25
Pharmacy	3.72	0.01
Total	5.20	0.42

Note: Medical cost = Health insurance benefits + Limited coverage
Source: Health Insurance Medical Care Expenses Data 2010

〈Table 36〉 Annual per capita drinking-related medical cost

(1,000 Won)

	Male	Female
Moderate	16.20	6.28
Hazardous	70.29	9.55
Harmful	336.23	156.62
Ex-Hazardous	55.25	7.51
Ex-Harmful	264.28	5.90

Note: Population by drinking level = Drinking prevalence rate × Population
Per capita medical expenses =(Health insurance benefits + Limited coverage)/(Population by drinking level)

〈Number of drinking-related deaths and probability of death〉

Identical method, as has been used in estimating medical cost, is adopted to find out the number of drinking-related deaths. The number of persons dying from drinking-related sicknesses is calculated while AAF is applied to each age and gender to estimate the number of drinking-related deaths. This, then, is divided by the corresponding population to obtain the probability of death from drinking for each age group. The number of drinking related deaths is deducted from total number of deaths afterwards to get the number of non-drinking related deaths and its probability of death.

To understand the chance of death of an ex. problematic drinker, the study of Holahan et al. (2010), which claimed a hazard ratio after 20 years of 1.42 and the ratio of a problematic drinker thanks to drinking is 1.21, is applied. Probability of death is derived by applying the hazard ratio of a past problematic drinker, which is 0.85 lower than that of a hazardous drinker, on an ex. hazardous drinker and an ex. harmful drinker.

〈Table 37〉 Probability of Death by Markov state

Age	Male			Female		
	Hazardous (A)	Harmful (B)	Death (mr)	Hazardous (A)	Harmful (B)	Death (mr)
20-24	0.00000	0.00000	0.00055	0.00000	0.00000	0.00033
25-29	0.00000	0.00000	0.00075	0.00000	0.00000	0.00048
30-34	0.00001	0.00003	0.00084	0.00000	0.00001	0.00051
35-39	0.00003	0.00009	0.00115	0.00000	0.00002	0.00068
40-44	0.00006	0.00023	0.00178	0.00001	0.00003	0.00085
45-49	0.00013	0.00046	0.00280	0.00001	0.00005	0.00127
50-54	0.00016	0.00068	0.00402	0.00001	0.00005	0.00169
55-59	0.00024	0.00081	0.00591	0.00001	0.00003	0.00229
60-64	0.00021	0.00068	0.00939	0.00000	0.00002	0.00379
65-59	0.00031	0.00087	0.01617	0.00000	0.00003	0.00712
70-74	0.00012	0.00113	0.02856	0.00001	0.00002	0.01319
75-79	0.00017	0.00140	0.04751	0.00002	0.00002	0.02613
80-84	0.00023	0.00176	0.08277	0.00003	0.00002	0.05195
85+	0.00030	0.00230	0.14720	0.00004	0.00003	0.11584

Note: Moderate (Non-drinking and adequate drinking), Hazardous (risk drinking), Harmful (high risk drinking)
Hazardous (Risk drinking): Drink 7 glasses for a male and 5 glasses for a female at a drinking party with such occasion is at least 2 times a week
Harmful (High risk drinking): Drink 7 glasses for a male and 5 glasses for a female at a drinking party with such occasion is at least 4 times a week

〈Utility score〉

EQ-5D utility score for each drinking type has borrowed the findings of Barbosa et al.'s (2010) study. It has revealed that the score for a hazardous drinker is 0.6597, a harmful drinker 0.6349, an ex. hazardous drinker 0.7100 and an ex. harmful drinker 0.6600.

〈Table 38〉 Utility score

	Utility score	
	Utility	s. e.
Moderate	0.8950	0.03240
Hazardous	0.6597	0.02580
Harmful	0.6349	0.02450
Ex-Hazardous	0.7100	0.07591
Ex-Harmful	0.6600	0.04360

Source: Barbosa et al. (2010)

〈Effectiveness and Cost of BI〉

The benefits that can be obtained from BI in this study are calculated using the data of Ashenden et al. (1997).[14] Ashenden et al. (1997), through a systematic literature survey, measured the effect of BI prescribed by GP, which is aimed at changing patient's living habits. This study was performed on the age groups of 17 to 69 years old to understand the effect of GP's advice of simple drinking in moderation or stopping drinking altogether. The result was that 18.2%($p<0.001$) of men who are a hazardous drinker changed their behavior and 18.5%($p<0.05$) of women who are the same drinker changed their behavior. This finding is then incorporated into this analysis and subsequently a model is built in which approximately 18.2% of hazardous male drinkers experience a transition to ex. hazardous drinkers. Then sensitivity analysis is carried out on the ef-

14) Solberg et al. (2008) performed cost effectiveness analysis based on the effect of BI induced behavioral change of 17.4%.

fectiveness of BI that is in 16%~21% range.

This BI's effect does not last permanently of course. In other words, some of BI's effect may disappear after a certain period of time. Fleming et al. (2002) measured BI's effect for 4 years and argued that its effect remained a little bit even after then. Granted, this report has performed an analysis based on the assumption that BI, upon delivery, has its effect diminishing by 30% a year and it has executed a sensitivity analysis for the case where BI's effect is reduced to 20%~40%.

Costs associated with BI can be broken down into counseling fee of a primary health doctor and relevant documents. In UK, GP is £2.72 per minute and BI related document cost is £8.84. BI of 5 minutes costs £22.42 in total (Purshous et al., 2012).[15] In this study, base case is 20,000 won in 5 minute counseling by a doctor and 5,000 won in BI related documents, and thus assumption is that 25,000 won in total is needed. Using this as a base case, a sensitivity analysis is made on BI cost of 20,000 won ~ 30,000 won.

〈Simulation model〉

This report has also constructed a model that applies BI (treatment scenario) and that maintains the current state

15) If British pound is shown in Korean currency terms (applying exchange rate of 1 £=1,800 won) it costs 24,480 won for a 5-minute counseling by GP.

(standard scenario). Then a probabilistic sensitivity analysis is carried out to consider uncertainties that may exist in the result. Uncertainties are inherent if the model's parameters have definitive values. This nature generally calls for a sensitivity analysis and this analysis includes a univariate (or one-way) sensitivity analysis and a probabilistic sensitivity analysis (PSA).[16] Distribution function is applied to each individual parameter to undertake PSA and random value determined by distribution function is applied to perform a Monte Carlo simulation (Doubilet et al., 1985).

Dirichlet distribution is used to understand the transition probability distribution of the first cycle. Transition probability is not a yes or no kind of binomial choice and Markov states form multiple branches. Therefore, this distribution is the representative distribution applied to a case like this (Briggs et al., 2003). Dirichlet distribution is a process of normalizing beta distribution into multivariate and is often applied when an economic evaluation model is multinomial not a binomial chance.

Beta distribution is used for utility score. Maximum utility score for each drinking type (perfect health) is 1 and simulation is made using random variable of every individual utility score that is calculated by applying mean and standard deviation.

Gamma distribution is adopted for cost. It has a distribution from 0 to infinite in the plus range and it is good at capturing

16) One-way sensitivity analysis presents the result of each parameter individually

uncertainties that could be experienced when the distribution is skewed to one side, as in the case of medical spending.

〈Table 39〉 Type of Distribution function applicable to each parameter

	Distribution	Our studies
Transition probabilities	Binomial: Beta Mutinomial: Dirichlet Time to event (survival): Lognormal	Dirichlet
Cost	Gamma Lognormal	Gamma
utility	Gamma Lognormal Beta	Beta
All other parameters	Normal	Normal

Source: Briggs et al.(2006)

PSA provides the result that incorporates uncertainties of multiple parameter values and subsequent cost effectiveness acceptability curve (CEAC). This curve shows a probability distribution as to what extent certain intervention or treatment method is cost effective based on various willingness-to-pay. To determine which alternative is cost effective, cost effectiveness probability expected on a specific threshold (willingness to pay: $\lambda > \Delta C/\Delta E$) or net benefit ($NB=\lambda \times \Delta E-\Delta C>0$) is presented (Briggs et al., 2006).[17] This paper has executed 1,000 times of simulation in repetition on the Markov model and proposed cost effectiveness acceptability curve (CEAC).

17) UK NICE defines cost threshold per QALY as £20,000~£30,000 and ICER which is lower than this threshold is considered cost effective.

3. Analysis of Cost Effectiveness

〈Analysis of Deterministic Cost Effectiveness Model〉

Based on the baseline of a 40-year-old or older male, the treatment scenario involving doctor's BI costs more than the standard scenario with no BI by 324,000 won and its QALY grows by 0.071 in comparison. Calculation of incremental cost effectiveness ratio (ICER) for additional cost and effect incurred shows ICER of 4,563,000 won/QALY and it is cost effective.

〈Table 40〉 Cost effectiveness if BI is applied: Deterministic model

	Cost (unit: 1,000won)	QALYs
Base	1,909.23	14.9125
Treatment (BI)	2,232.85	14.9834
Difference	323.62	0.0709
ICERs: treat vs base	4,563 (per QALY)	

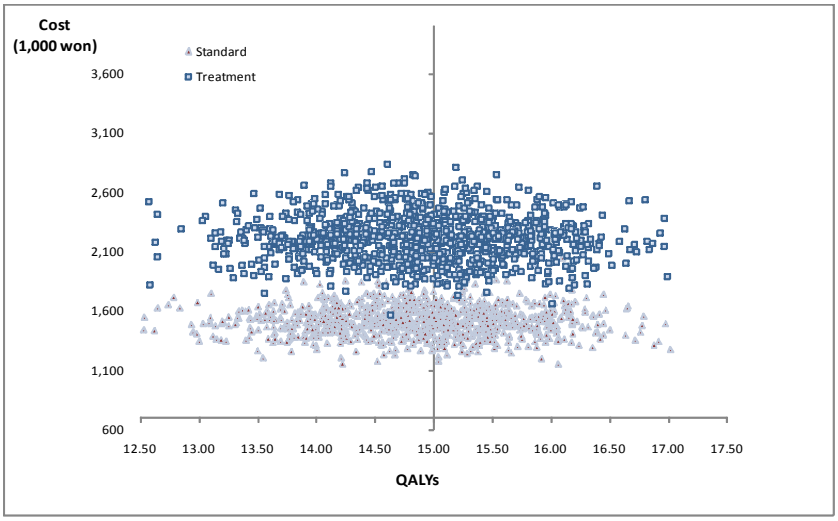
〈Findings from Probabilistic Sensitivity Analysis〉

〈Figure 2〉 demonstrates the plane representation of cost effectiveness for cost and effect yielded from 1000 times of Monte Carlo simulation. Effect can be lower though cost is higher should treatment of doctor's BI is applied against the standard of status quo. Or sometimes the treatment scenario is more effective though its cost is smaller than under standard scenario.

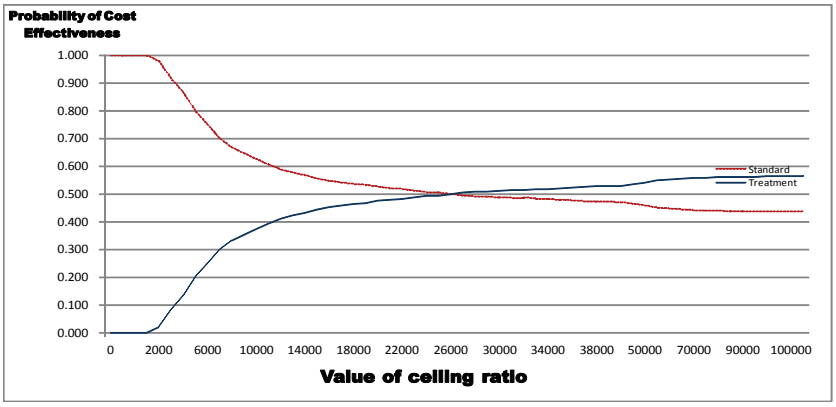
This matter can be interpreted properly when cost effective-

ness acceptability curve (CEAC) is applied. This curve is refers to willingness-to-pay to get further QALY. It shows that it is more cost effective to keep the current state than applying doctor's BI should a policy maker sets the threshold believing it has a value of 6 million won/QALY. However, if the policy maker is willing to pay over 26 million won to get additional QALY, the policy of preventing hazardous drinking through doctor's BI is more cost effective than maintaining the current condition. To elaborate, if it is 30 million won/QALY, meaning a policy maker says a unit of QALY has a value of 30 million won, then doctor's BI policy is more cost effective than the standard scenario when the probability of being cost effective is at 52% level.

[Figure 3] Cost Effectiveness Plane



[Figure 4] Cost Effectiveness Acceptability Curve



Chapter 4

Conclusions

4 Conclusions

When allocating health medical resources under a budget constraint, policy makers would try to maximize health results allowed within given resources. This study has showed that a 40-year-old male who is involved in hazardous drinking or harmful drinking requires more than 26 million won in cost to get additional QLAY. This amount is less than 36 million won of the cost effectiveness threshold (£20,000~£30,000; 36 million won~54 million won) accepted in the UK, and thus it is possible to say that it falls under the range of cost effectiveness. Granted, BI could be one of the policy alternatives that can be considered during a policy decision making process.

Yet foreign publications were referenced since there are not enough studies on the grounds for the effectiveness of BI in Korea. This report has only looked into the case of 5 minute BI and no cost effectiveness study is made on a 20~30 minute BI. If BI is to be actually implemented in Korea, more reliable analysis result is necessary and this result can be obtained if data could be secured from a pilot project specifically measuring the effectiveness of intervention methods.

Still this study has introduced a cost effectiveness analysis model that can be used to prevent the damage from drinking

and compared cost vs. effectiveness across the entire life cycle if a drinker adheres to doctor's brief intervention (BI). So the expectation is that this could be used as grounds that help making a decision on the policy that is to be implemented.

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Appendix

〈Table 1〉Per capita drinking-related medical cost (Male)

(1Mil Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Hospitalization	Harmful drinker	2,222	19,519	62,652	108,473	69,312	47,954	310,130
	Hazardous drinker	236	3,673	17,479	46,396	27,728	28,008	123,519
	Moderate drinker	35	630	3,277	9,288	5,022	4,405	22,656
	SubTotal	2,492	23,821	83,407	164,157	102,062	80,366	456,306
Outpatient	Harmful drinker	653	3,810	12,767	28,882	17,280	11,766	75,159
	Hazardous drinker	51	854	4,148	12,674	7,119	5,101	29,948
	Moderate drinker	19	239	990	3,178	1,801	1,219	7,446
	SubTotal	723	4,903	17,906	44,734	26,200	18,086	112,553
Pharmacy	Harmful drinker	241	3,816	18,030	43,167	22,798	17,213	105,266
	Hazardous drinker	37	1,217	6,629	17,691	8,900	7,318	41,791
	Moderate drinker	8	158	705	1,898	912	687	4,368
	SubTotal	286	5,191	25,365	62,756	32,609	25,218	151,425
Total	Harmful drinker	3,116	27,145	93,450	180,522	109,390	76,933	490,555
	Hazardous drinker	323	5,744	28,256	76,761	43,747	40,427	195,258
	Moderate drinker	62	1,027	4,972	14,364	7,734	6,311	34,470
	SubTotal	3,501	33,915	126,677	271,647	160,872	123,671	720,284

Source: Health Insurance Medical Care Expenses Data 2010

〈Table 2〉Per capita drinking-related medical cost (Female)

(1Mil Won)

Age		20-29	30-39	40-49	50-59	60-69	70+	Total of 20 or older
Hospitalization	Harmful drinker	1,142	4,848	8,279	6,451	2,689	1,581	24,990
	Hazardous drinker	90	399	2,174	1,487	279	0	4,429
	Moderate drinker	492	1,756	6,187	9,399	7,953	8,221	34,008
	SubTotal	1,724	7,004	16,640	17,337	10,922	9,801	63,427
Outpatient	Harmful drinker	371	934	2,141	1,796	499	186	5,928
	Hazardous drinker	132	401	1,040	1,046	130	355	3,103
	Moderate drinker	334	730	1,975	3,204	2,307	1,359	9,908
	SubTotal	837	2,065	5,155	6,045	2,937	1,900	18,939
Pharmacy	Harmful drinker	1	17	83	72	31	14	218
	Hazardous drinker	1	9	40	35	7	41	133
	Moderate drinker	3	11	58	85	76	95	327
	SubTotal	5	38	180	192	113	150	678
Total	Harmful drinker	1,514	5,800	10,503	8,319	3,220	1,781	31,136
	Hazardous drinker	223	809	3,253	2,568	416	397	7,665
	Moderate drinker	828	2,498	8,220	12,687	10,336	9,674	44,243
	SubTotal	2,565	9,106	21,976	23,574	13,972	11,851	83,045

Source: Health Insurance Medical Care Expenses Data 2010