



Research Article

Global Perspectives of Different Healthcare Systems and Health: Income, Education, Health Disparity, Health Behaviors and Public Health in China, Japan and USA

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Abstract

Increasing national healthcare spending due to an aging population is a rising burden on society and the economy. Under pressure to improve healthcare systems, it is important to evaluate different healthcare systems including the national healthcare system in China, the universal healthcare system in Japan, and the mixed healthcare system in the USA. In the different health insurance

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frameworks, it is imperative to shift from a cost-based fee-for-service system to a capitation system. Health insurance is generally designed to mitigate financial burden, which leads to equality of healthcare service access and thus prevent health inequality. From a public health perspective, health education improves health knowledge and skill which is profoundly associated with an improvement of health literacy. An increase in health literacy levels is related to a healthy lifestyle, and then an increase in the health of the population and sustainable notional outputs.

This research attempts to address the problems that arise when changing health policies, i.e. healthcare system, on health considering the effects of difference in income, educational level, and health behaviors on health and health disparity.

Objective: The purposes of this study are: (1) to empirically identify decision-making preferences about preventative behaviors, i.e. breast cancer prevention by different health insurance framework; (2) to evaluate disparity of health outcomes, i.e. different healthcare financing; and (3) to investigate health outcome disparity based on income and education in the different healthcare systems among China, Japan and the USA.

Methodology and data: A Bivariate Probit model is used by controlling for socio-economic, demographic and healthcare financing factors to investigate health outcomes by different healthcare programs in China, Japan and the USA. The data comes from the China Economic, Population, Nutrition, and Health Survey 2011 Adult Questionnaire [about 30 thousand samples]; The Global Centers of Excellence (COE) Survey [about 5.5 thousand samples] conducted in 2011 by Osaka University in Japan; and Behavioral Risk Factor Surveillance System 2013, US [about 50 thousand samples]. Logit and OLS regression analyses were conducted to examine health and healthcare prevention behaviors and income and health disparity.

Results: The findings suggest that there is clear-cut evidence about behaviors of preventive care by different health insurance frameworks among the three countries; an objective measure of health behavioral outcomes (breast cancer prevention) is significantly influenced by different healthcare financing and policy; A nation with health disparity (general health) is based on income inequalities and different educational level causes health disparity. Healthy lifestyle stems from higher health knowledge and depends on involvement by a modern and market-oriented healthcare delivery among the three countries.

Conclusions/implications: A development of human capital, i.e. health stock, will reduce government healthcare spending. Insurance coverage is an important factor to increase the health of the population, i.e. longevity. Managed healthcare financing is a strategic policy to constrain ever-rising healthcare costs.

Keywords: Health behaviors; Health disparity and income; Healthcare systems; Public health

Introduction

The recent, steady increase in healthcare spending is a notable phenomenon in all countries. The phenomena in China [a national health insurance system], Japan [a universal health insurance system] and

the US [a mixed health insurance system] are no exception. Despite an increasing Gross Domestic Product, the steady increase in total expenditures on health as a percentage of GDP for the past two decades is remarkably evident in table 3. A rapid upsurge in the share of public health expenditures to national total health expenditures in Japan is a far larger share than those in China and the US. Higher spending appeared to be largely driven by the universal healthcare structure and the cost-based fee-for-service healthcare system in Japan. For the US, the relatively small share of public health expenditures as percentage of total health expenditures is due to the mixed healthcare system with a swift shift from the traditional fee-for-service of cost based to the managed care structure. The low government healthcare expenditures are due to an early stage of the national health insurance system with the cost-based fee-for-service system in China. Despite a large increase in healthcare expenditures and longevity in China, Japan and the US, health disparity among people and among nations persists [1-3].

Surprisingly however, the healthcare expenditures per capita illustrate similar trends in China, Japan and the US in table 1. The large per capita expenditures of the US are due to the high cost of medical innovation with technology and higher healthcare prices without the government intervention in the healthcare industry. Under the national healthcare system in China, a small amount of per capita healthcare expenditures is anticipated in its future expansion.

Increases in healthcare spending due to an aging society are an urgent issue to be resolved. The rapid increase of aging in three countries has seen a rise in the dependent elderly, population age 65 and over in table 2. This will especially cause a shortage of labor supply, a weakening of the national pension system, and expansion of the use for healthcare resources. Japan has almost 27% of its population age 65 and over in table 2. China demographically still has a young population structure and has had one for the past two decades. It has increased about 5 percentage points in China, while it is about 12 percentage points Japan. The US growth rate has been slow.

In aging, people are affected by chronic disease, and aging causes a loss of health stock. The loss of health stock includes losing physical strength and durability, a fast health depreciation of health, and a resultant loss of immunity. Older people in the US are the most likely to report one or more chronic condition. There are 31.5% of Americans with multiple chronic conditions. In addition, 68% of US adults age 65 or older have at least two chronic conditions [4]. China has also had similar experiences. Diabetes has been increasing in China and leads to heart related diseases. About 533 out of every 100,000 residents died from chronic disease in China and chronic disease caused 86.6% of death by cardio-cerebrovascular disease, cancer, and chronic respiratory disease [5,6]. Wang et.al, also proved the aforementioned general evidence by the survey with 1480 people (59.4% women and 40.6% men living in a rural community) aged 60 and over in Shandong Province. The overall prevalence of chronic multi-morbid disease is 90.5% [7]. It reveals a great prevalence of chronic conditions among the population in China.

Despite spending more on health care with advanced medical technology relative to China and Japan (Table 1), the US shows poor health outcomes with a relatively short life expectancy (Table 2). Healthcare expenditure in the US far exceeds that of China and Japan for the past decades (Table 1). Regarding the healthcare system, the US has a mixed health insurance system and the US people spend

more money on healthcare than China with the National Health Insurance system (NHI) and Japan with the Universal Health Insurance system (UHI) in table 1. In contrast, China dedicates a relatively small share of public health expenditure to total healthcare expenditures compared with the US and Japan (Table 3).

It is interesting to do cross-national comparisons to evaluate the performance of the US, Japanese, and Chinese healthcare systems, and to assess health behaviors and health outcomes among different health insurance programs, especially issues related to health disparity. But little is known about how the free-competitive economic system has sustained health and produced income disparity. Under the free-competitive economic system, the socio-economic system has generating an expansion of socio-economic disparity with economic development. The economic disparity, in turn, causes and/or creates health disparity in different healthcare systems [8].

Objectives of this study are threefold. (1) How is it possible to develop a sustainable health with in different healthcare scheme? (2) What are influential factors of health behaviors, i.e. preventive care in different healthcare systems among the US, Japan, and China? (3) How can we explain health disparity among people? A cross-national research is needed to better understand the relationship between healthcare systems, health behaviors, and socio-economic factors, as well as other health determinants such as healthy lifestyles and health literacy. It is imperative to profile health, to sustain good health, and to mitigate ever-increasing health disparities among countries and their population.

Background

USA Healthcare System

The present US healthcare financing consists of mixed methods: publicly funded programs of Medicare, for retired people, and Medicaid, for low-income people/indigent families; State Children's Health Insurance Programs for children; and a privately funded health insurance system [9]. There is no publicly funded long-term health insurance program. The following classification is the health insurance types operated by private health insurance organizations/firms (insurers).

Health Maintenance Organization (HMO) is a managed health insurance and the premium of HMO is a "capitation-base premium". There is a set fee for each enrollee, and the HMO receives a single annual amount for each enrollee regardless of the amount of care provided. Providers or management groups are responsible for providing health services to a specific group of enrollees in exchange for a set annual fee for each enrollee. The HMO is the restriction of access to providers by offering a network system. Enrollees must use a group of designated providers who are in the network system. Consumers pay a co-payment in addition to the premium paid. Co-payment levels may vary among plans (\$10-\$30 for example). All healthcare services are coordinated by a designated Primary Care Physician (PCP). A PCP acts as a gatekeeper before a patient visits a specialist. HMOs don't offer coverage for care from out-of-network healthcare providers. A preauthorization is required for a special treatment.

Preferred Provider Organization (PPO) plans are one of the most popular managed-care plans. The PPO plans generally allow visits to in-network physician and healthcare providers without a referral from a primary care physician to visit a specialist. A co-payment of about

\$10 - \$30 is required for services. Visiting an out-of-network provider will include a higher fee (co-insurance) and a separate deductible. The PPO is an arrangement in which a group of health providers agree to provide services to a defined group of patients at an agreed rate for each service.

Blue Cross and Blue Shield (BCBS) is a federation of 36 separate United States health insurance organizations and companies, providing health insurance in the United States to more than 106 million people. The BCBS is an independent licensee of the national association offering insurance plans within defined regions under one or both association's brands, since the Blue Cross (BC) is hospital service insurance and the Blue Shield (BS) is physician service insurance. A patient pays "a co-insurance" of 20% ~ 50%. The system is financed through retrospective fee-for-service insurance reimbursement which is cost-based. Unlike the managed health insurance, there is no

constraint to receive services from any physicians or hospitals without network system.

Medicare and Medicaid

The BCBS insurers offer some form of health insurance coverage's in every state in the USA (Chart 1). They also serve as administrators of Medicare health insurance for retired people. The BCBS delivers coverage for employees of state and federal governments. Medicare enrollee premiums are only for Parts A and B. Medicare Part A is for hospital services and Medicare Part B is for physician services. Consumer and employer taxes fund Medicare, including the payroll tax, which is paid into the Hospital Insurance Trust Fund (part of the federal government). Medicaid program is the federal government transfer of funds to state governments for the federal share of the combined state-federal program. Beneficiaries pay no premiums, and direct consumer payments are minimal.

Year	Health Expenditures Per Capita (PPP Int'l \$)			Health Expenditures Per Capita (Current US \$)		
	United States	Japan	China	United States	Japan	China
1995	3788.31	1533.52	64.34	3788.31	2844.85	21.02
1996	3944.28	1567.23	76.68	3944.28	2455.15	26.32
1997	4116.25	1675.09	89.97	4116.25	2333.37	30.02
1998	4302.44	1724.97	104.89	4302.44	2195.84	35.4
1999	4521.69	1826.16	117.98	4521.69	2597.76	38.72
2000	4788.31	1973.95	133.25	4788.31	2838.6	43.63
2001	5140.23	2054.79	145.51	5140.23	2531.11	47.54
2002	5575.83	2137.32	168.27	5575.83	2450.73	54.47
2003	5995.08	2234.58	189.19	5995.08	2694.43	61.59
2004	6369.43	2359.95	208.47	6369.43	2927.43	70.62
2005	6471.03	2490.67	235.07	6471.03	2921.57	80.94
2006	7122.37	2604.02	263.57	7122.37	2791.22	94.05
2007	7511.96	2747.22	293.57	7511.96	2806.57	115.29
2008	7786.21	2879.79	346.84	7786.21	3255.56	157.68
2009	8023	3031.26	419.95	8023	3741.59	192.52
2010	8269.37	3232.16	450.34	8269.37	4110.46	220.08
2011	8523.89	3456.73	515.14	8523.89	4654.23	279.48
2012	8789.77	3621.58	588.36	8789.77	4748.92	328.66
2013	8987.9	3713.17	654.37	8987.9	3960.2	375.14
2014	9402.56	3726.68	730.52	9402.56	3702.95	418.73
2015	9499.79	4434.78	n.a.	9499.79	3757.68	n.a.
2016	9884.29	4520.21	n.a.	9884.29	4239.5	n.a.

Table 1: Health Expenditure Per Capita: US, Japan, and China.

Note: PPP stands for purchase power parity. The healthcare expenditures per capita illustrate similar trends in China, Japan and the US in table 1.

Sources:

- <http://wdi.worldbank.org/table/2.1>
- <https://www.cdc.gov/hepatitis/statistics/incidencearchive.htm>
- http://data.worldbank.org/indicator/SP.DYN.IMRT.IN?name_desc=true
- <http://www.mhlw.go.jp/english/database/db-hw/populate/dl/03.pdf>
- https://www.cdc.gov/heartdisease/docs/consumered_heartdisease.pdf
- <https://data.oecd.org/healthstat/deaths-from-cancer.htm>
- <http://www.stats.gov.cn/english/statisticaldata/AnnualData/>

Year	Population age 65 and above [over] in % of total			Life Expectancy at Birth (in years)		
	USA	Japan	China	USA	Japan	China
1995	12.593	14.393	5.851	75.8	79.5	69.9

1996	12.548	14.941	6.024	76.1	80.2	70.2
1997	12.492	15.498	6.184	76.5	80.4	70.5
1998	12.432	16.061	6.338	76.7	80.5	70.9
1999	12.372	16.622	6.492	76.7	80.6	71.3
2000	12.318	17.18	6.651	77	81	71.7
2001	12.296	17.703	6.83	77.2	81.4	72.2
2002	12.28	18.226	7.006	77.3	81.6	72.6
2003	12.275	18.755	7.178	77.5	81.2	73
2004	12.287	19.294	7.34	77.8	8.02	73.4
2005	12.321	19.847	7.492	77.8	81.9	73.8
2006	12.391	20.394	7.632	77.7	82.3	74
2007	12.485	20.958	7.771	78	82.5	74.3
2008	12.614	21.557	7.913	78	82.6	74.6
2009	12.789	22.215	8.069	78.4	82.9	74.8
2010	13.012	22.942	8.246	78.5	82.8	75
2011	13.291	23.587	8.446	78.7	82.6	75.2
2012	13.624	24.287	8.654	78.8	83.1	75.4
2013	13.997	25.009	8.889	78.7	83.3	75.6
2014	14.39	25.71	9.183	78.9	83.6	75.8
2015	14.786	26.342	9.551	78.8	83.8	75.9
2016	15.159	26.858	10.003	78.8	84	76

Table 2: Aging Population and Life Expectancy: US, Japan, and China.

Note: The rapid increase of aging in three countries has seen a rise in the dependent elderly, population age 65 and over in table 2.

Sources:

http://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS?name_desc=false

<https://www.cdc.gov/nchs/data/databriefs/db88.pdf>

<https://www.cdc.gov/nchs/products/databriefs/db267.htm>

<http://data.worldbank.org/indicator/SP.DYN.LE00.IN>

http://stats.oecd.org/viewhtml.aspx?datasetcode=HEALTH_STAT&lang=en#

<http://apps.who.int/gho/data/node.country.country-CHN>

<http://www.stats.gov.cn/english/statisticaldata/AnnualData/>

<http://www.mhlw.go.jp/english/database/db-hw/populate/dl/03.pdf>

Year	Total Expenditures on Health as a % of GDP			Public Health Expenditures as % of Total Health Expenditures		
	United States	Japan	China	United States	Japan	China
1995	13.09	6.62	3.53	45.16	82.32	50.5
1996	13.04	6.46	3.79	45.16	82.32	46.59
1997	12.96	6.73	4.02	44.98	81.33	44.24
1998	12.99	7.01	4.33	43.71	80.65	41.81
1999	12.99	7.34	4.49	43.22	80.49	40.88
2000	13.07	7.53	4.6	43.26	80.81	38.28
2001	13.73	7.75	4.56	44.24	81.29	35.57
2002	14.55	7.85	4.79	44.15	81.05	35.83
2003	15.06	8	4.82	43.95	80.3	36.23
2004	15.14	8.03	4.72	44.25	80.56	37.97
2005	15.15	8.18	4.66	4.36	81.37	38.77
2006	15.27	8.19	4.52	45.07	80.5	40.65
2007	15.57	8.25	4.32	45.07	81.41	46.93
2008	16.02	8.6	4.59	45.98	81.35	49.95
2009	17	9.51	5.08	47.15	81.5	52.5
2010	17.02	9.58	4.89	47.48	82.08	54.31
2011	17.06	10.07	5.03	47.34	82.59	55.89
2012	17.02	10.17	5.26	47.26	82.7	55.96

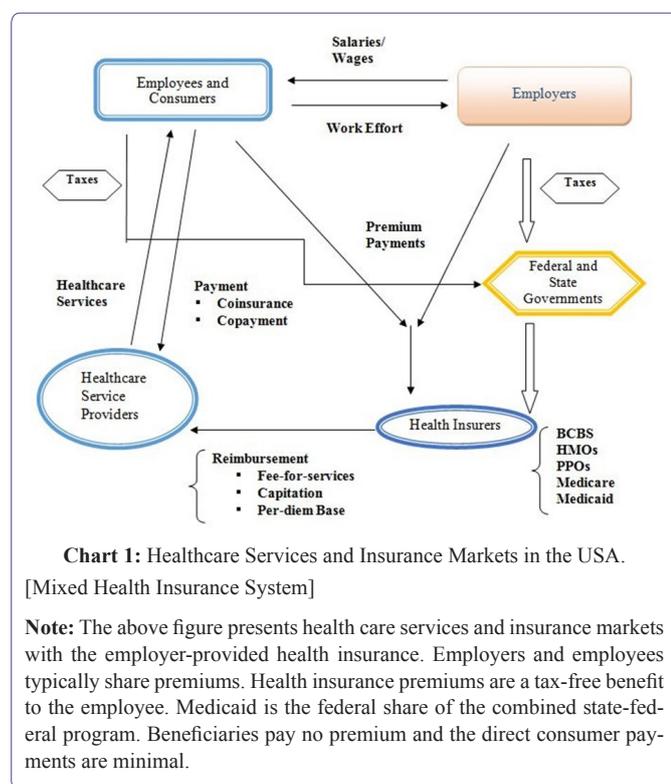
2013	16.19	10.25	5.39	47.61	83.22	55.81
2014	17.14	10.23	5.55	48.3	83.56	55.79
2015	16.9	10.9	n.a.	49.35	83.97	n.a.
2016	17.2	10.9	n.a.	49.13	84.11	n.a.

Table 3: Health Expenditures: US, Japan and China.

Note: GDP stands for gross domestic product. A rapid upsurge in the share of public health expenditures to national total health expenditures in Japan is a far larger share than those in China and the US in table 3.

Sources:

<http://wdi.worldbank.org/table/2.1>
<https://www.cdc.gov/hepatitis/statistics/incidencearchive.htm>
http://data.worldbank.org/indicator/SP.DYN.IMRT.IN?name_desc=true
<http://www.mhlw.go.jp/english/database/db-hw/populate/dl/03.pdf>
<http://data.worldbank.org/indicator/SP.DYN.LE00.IN>
<https://data.oecd.org/healthstat/deaths-from-cancer.htm>
<http://www.stats.gov.cn/english/statisticaldata/AnnualData/>
<http://www.mhlw.go.jp/english/database/db-hw/populate/dl/03.pdf>



Japan Healthcare System

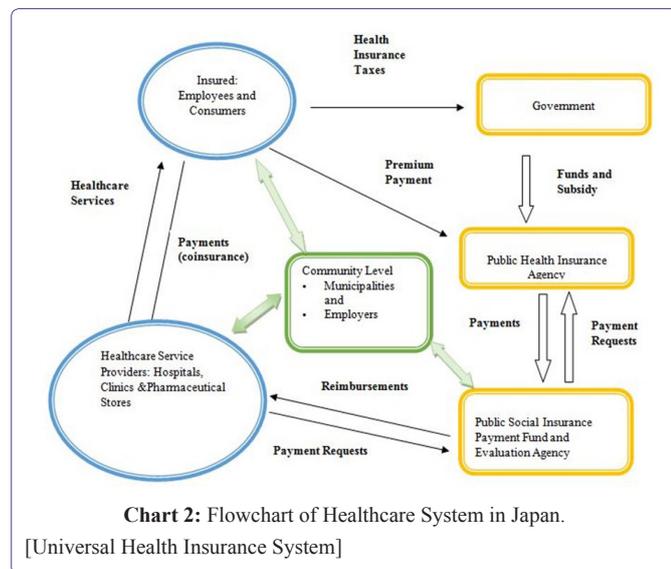
The Japanese Universal Health Insurance system (UHI) consists of five main types of health insurance programs: employees by firms, seaman for shipping related workers, daily workers, and mutual union for teachers and public officials, national health insurance for self-employed workers, farmers, and local and national representatives. There are three major characteristics of the UHI in Japan: (1) all people need to be covered under the UHI system; (2) the Japanese Government uses uniform national rates to regulate prices of medical services, pharmaceutical drugs at hospitals and clinics; (3) the UHI practices the cost-based fee-for-service reimbursement scheme [10].

For the employee health insurance, a health insurance premium is a minimum of \$53 year (assuming \$1=110 Japanese yen as of

September 2017) and the maximum cap of \$1,097. The tax rate slides as the income level goes up. The health insurance costs are shared with an employee and an employer by 50% each. The premium also depends on the number of family members. For the national health insurance, the number of family members is multiplied by \$29 with sliding adjustment by annual income level. The healthcare expenditures of the UHI are shared by patients (12%), employees (28%), employers (22%), national government (26%) and local governments (12%) in 2016 [11]. Medical and healthcare costs are responsible for the following percent: age of 6 and under [20%], age of 7~69 [50%], age of 70~74 (20%) and age of 75~ (10%). If a person of age 70 and over is a full-time worker, he or she needs to pay 30% of medical and healthcare costs. For example, assuming the medical and healthcare costs are \$10,000 and the income of patient is \$8,300 per month, a patient's actual responsibility with maximum limitation, which depends on the patient income level, is \$2,541.80 {=\$2,526 (income classification level)+[\$10,000-\$8420,000(social insurance block level)]x0.01(1% of weight)} [11].

The Japanese government has been implementing a price control on pharmaceutical drugs. The price control unquestionably affects the level of pharmaceutical drug innovation by Japanese pharmaceutical firms. On the other hand, the price control prevents a rapid increase in drug disbursement and pharmaceutical expenditures. This in turn lowers the cost of healthcare expenditures under the Universal Health Insurance (UHI) system. The Ministry of Health, Labor, and Welfare of Japan is responsible for pharmaceutical regulation. A total of 12,423 pharmaceutical drugs (11,242 of generic drugs and 1,181 brand-name drugs) are approved and listed under the UHI system [12].

In Japan, long-term care consists of four types of public institutional and privately qualified providers and they have different functions and objectives: (1) long-term healthcare facility, (2) long-term welfare care facility, (3) long-term less intensive care facility, and (4) community-based formal homecare services (Chart 2). The national and state level governments fund and subsidize the operating costs for long-term care services by the aforementioned facilities (1), (2) and (3). The elderly in the long-term care facilities are responsible for daily expenses; the costs are determined by their annual income. The community-based formal homecare services include doctor visits, nurse visits, home-help visits, bathing, meals, laundry services, house cleaning, equipment provisions and counseling [13].



Medical Insurance [URBMI] and the Rural New Cooperative Medical Scheme [RNCMS]. Private insurance also exists from for-profit companies and is primarily utilized by wealthier individuals to cover services not provided under public insurance. The UEBMI is financed mainly from employee and employer payroll taxes, with minimal government funding, and participation is mandatory for employees in urban areas. The urban resident basic medical insurance, which is voluntary at the household level, is utilized by self-employed individuals, children, students, and elderly adults. Both urban employment-based and urban resident basic medical insurance are administered by the Ministry of Human Resources and Social Security and run by local authorities. The URBMI is administered mainly by the National Health and Family Planning Commission and run by local authorities, is also voluntary at the household level representing a coverage rate of 98.9 percent of rural residents in 2014. The RNCMS is for urban resident basic insurance and the new cooperative medical scheme is financed mainly by government, with minimal individual premium contributions [15].

China Healthcare System

In the Chinese healthcare system, different medical services, such as prevention, primary care, tertiary care, and rehabilitative services are separated and lack coordination. The health insurance system is capitation based with many medicines such as foreign pharmaceuticals drugs not covered. The Chinese health insurance employs a cost-based, fee-for-service system. Since 2011, over 95% of the population has received coverage through publicly financed health insurance. There are three tiers in which the health service provisions are organized into based on location and intensity of care: the first tier by primary care facilities in villages or towns; the second tier by county hospitals and community health centers; and the third tier by tertiary hospital care in major cities [14].

The reimbursement rate is also different between major cities, counties, and villages. The State Council made major strides in establishing basic medical insurance to reduce out of pocket payments and increase accessibility and equity of health services. Publicly financed health insurance is the primary coverage source for most people, but private coverage provided by for-profit commercial insurance companies is still available to higher-income individuals and employers [14].

There are three primary forms of public insurance. Urban Employment Basic Medical Insurance [UEBMI], Urban Resident Basic

Coordination between tiers is weak between the different levels of healthcare provision, with each increasing tier offering more advanced and complex services at higher out of pocket costs. To help bridge the gap in coverage, cost, and quality of care between the rural and urban areas, China introduced a government-run voluntary insurance program known as the New Rural Cooperative Medical Scheme. Complementary private health insurance is purchased to cover deductibles, copayments, and other cost-sharing, as well as coverage gaps, in publicly financed health insurance, which serves as the primary coverage source for most people. Purchased primarily by higher-income individuals and by employers for their workers, private insurance often enables people to receive a better quality of care and higher reimbursement, to patients as some health services are very expensive or are not covered by public insurance. Growth in private coverage has been rapid, with some foreign insurance companies recently entering the market [16].

Over the past couple of decades, China has experimented with several different methods for financing their healthcare system. In 2014, China spent approximately 5.6% of its GDP on healthcare (Table 4). 30% of healthcare expenses were financed by the central government or local governments, 36% were funded by publicly financed health insurance, private insurance, or third-party donations, and 34% was funded by out of pocket payments. Social-insurance expenditures, government spending, and out of pocket payments are the main sources of financing for healthcare in China [15].

Variables	Coefficient	Standard Error	P> t	95% Conf. Interval
Independent variables				
Predisposing factor				
• Ageing	-0.003	0.001	0.045	-0.01-0.00
• Education	-0.015	0.006	0.0017	0.01-0.02
Enabling factor				
• Government health insurance	0.747	0.159	0	0.43-1.06
• Rural health insurance	0.224	0.144	1.12	-0.05-0.50
• Commercial health insurance	0.002	0.15	0.989	-0.29-0.29
• Urban employee basic health insurance	0.441	0.155	0.005	0.13-0.74
• Urban residential basic health insurance	0.321	0.163	0.05	0.01-0.64

Reinforcing factor				
• Chinese dietary government guidance	0.096	0.058	0.103	-0.01~0.06
• Living in urban	-0.255	0.088	0.004	-0.4~-0.1
Socio-Economic and health Behavioral factors				
• Activity	-0.029	0.046	0.531	-0.12~0.06
• Health status	-0.059	0.027	0.034	-0.1~-0.00
• Income	1.40E-07	1.10E-06	0.903	2e-06~2e-06
• Sedentary activities	0.035	0.028	0.211	-0.01~-0.90
Constant	1.146	0.283	0	0.58~0.17
Number of observations	646			
F[13,632]	5.3			
Prob>F	0			
R-squared	0.0984			
Adjusted R-squared	0.0798			

Table 4: Empirical results of preventive behaviors [breast cancer] of Chinese women, OLS.

Assistant General Physicians (GP) represent 6.0% of all licensed physicians and assistant physicians. As opposed to village doctors and health workers in the village clinics, GP's usually work in a hospital with nurses and non-physician clinicians and not in partnerships or as solo practitioners. Village doctors and health workers in the village clinics receive income through reimbursement of public health services (e.g., immunizations and chronic disease screening) and clinical services, as well as through markups on prescription drugs and government subsidies. There are large differences in their incomes depending on what region they practice [17].

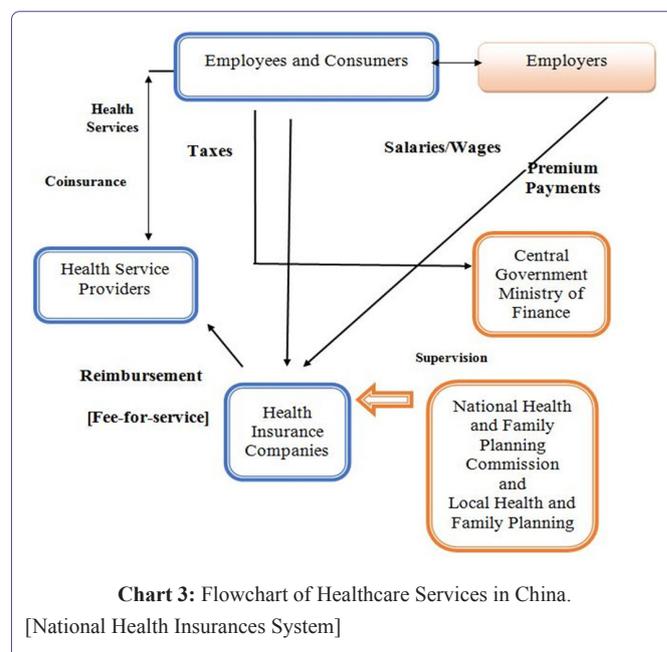
Publicly financed insurance covers primary care, specialist care, emergency department visits, hospital, mental health care, as well as prescription drugs and traditional medicine. A few dental services and optometry services are covered, but mostly such services are paid for completely out-of-pocket. Additionally, home care and hospice care are often not included either. Local health authorities define the benefit packages. Preventive services such as immunization and disease screening are included in a separate public-health benefit package funded by central and local governments. Coverage is person-specific; there are no family or household benefit arrangements. When it comes to cost-sharing and out-of-pocket spending, Inpatient and outpatient care including prescription drugs, are subject to different deductibles, coinsurance, and reimbursement ceilings (Chart 3). There are no annual caps on out-of-pocket spending [17].

How do we integrate healthcare to have better health outcomes to improve effectiveness, efficiency, accessibility, and equity?

In this section, we developed “integration of a basic healthcare framework” to have better health outcomes regardless of different healthcare systems, e.g. a mixed healthcare finance and delivery in the US; a nationally financing and delivering healthcare in Japan; and more socialized national health care program in China.

The following is the brief discussion about “effectiveness, efficiency, accessibility and equity” to sustain health and healthcare system. For (Figure 1), an integrated healthcare system consists of a high degree of collaboration and communication among health professionals and a framework of healthcare services. This integrated framework

should include the accessibility, the efficiency and the effectiveness of healthcare services. The primary goals of healthcare integration are (a) to challenge an ever-increasing rise in healthcare costs; (b) to provide instruments to restrain unnecessary service utilization; (c) to produce cost efficient healthcare delivery; and (d) to yield cost effective healthcare services as shown effective in (2) and (4) in “4-Quality of care,” and efficiency (3) in “5-Efficiency” in figure 1. The benefits of an integrated healthcare approach extend to patients, caregivers, providers, and the larger health care system. Thus, there are four components that dictate the quality of a healthcare system: cost effectiveness, efficiency of healthcare services, accessibility, and equity.



Effectiveness of care, (2) and (4), in “4-Quality of care” in figure 1 is organized into ten clinical areas: cancer, diabetes, heart disease, infectious disease, end stage renal disease, maternal and child health, respiratory disease, disparity in access, the disparity in quality, and disparity in health outcomes. The US healthcare system is largely

fragmented into different organizations. Thus, the integrated system is of fundamental importance. Figure 1 presents an integration of healthcare while accounting for behavioral health economic features. Furthermore, there are three healthcare services in (B) in Effectiveness section (4): functional status preservation and rehabilitation; supportive and palliative care; and patient safety.

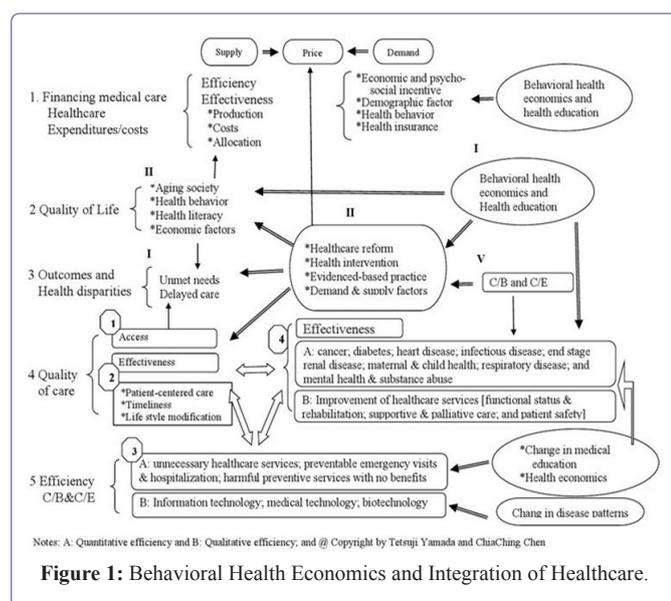


Figure 1: Behavioral Health Economics and Integration of Healthcare.

Efficiency as illustrated in (A) of (3) of “5-Efficiency” in Figure 1, represents quantitative efficiency, such as unnecessary healthcare services; preventable emergency visits and hospitalization; and harmful preventive services with no benefits. This study also notes that information technology; medical technology; and biotechnology are other types of vehicles which increase qualitative efficiency. For the cost-effective point of view, efficiency includes the overuse of healthcare services, preventable emergency visits and excess hospitalization, and harmful preventive services where the benefits have not materialized.

Accessibility causes disparities in healthcare access and outcomes, which can be found in (1) in “4-quality of care” and “3-Outcomes and Health Disparities” in figure 1. Disparity in health among the population and disparity of outcomes remain a significant issue. Disparities caused by external factors in healthcare are related to financial barriers, the usual source of healthcare, and health insurance status that often cause unmet needs and delayed healthcare. As a result, quality of access of external factors stems from financial barriers [e.g. out-of-pocket expenses]; unable to get or delayed in getting needed healthcare services; usual and specific source of healthcare; and health insurance status. For internal factors in “4 Quality of care” in 4, the supply side of healthcare is: patient-centered care; timeliness of healthcare; and lifestyle modification in (2) and are sources of health disparities. If services are available and there is an adequate supply of services, then the opportunity to obtain healthcare exists. Accessibility also depends on financial, organizational, and social or cultural barriers that limit the utilization of services. Utilization is also dependent on the affordability, physical accessibility and acceptability of services in figure 1.

Health equity is affected by two significant aspects as a minimum: (1) an individual’s ability to produce or sustain his or her health and (2) accessibility of healthcare services [18,19]. Accessibility of healthcare services, for example the relationship between a healthcare provider and a patient, is a vital factor that affects individual health equity. Financial and time costs are factors that have an influence on the amount of healthcare service used [20]. Accessibility of healthcare services is defined as an availability of private and public health insurance, and the ability to obtain and use health and healthcare knowledge, and other socio-economic and demographic characteristics. Differences in these factors create and enlarge the gap of health disparity [21].

Method

Empirical Framework and a Model

Based on aforementioned discussion in “How do we integrate healthcare to improve quality and efficiency?” we present an application of the health behavioral model, PRECEDE-PROCEED model (PP model) as shown in figure 2. We examine a cross-national comparison to evaluate the performance of the United States, Japan, and China under different healthcare systems, and assess health behaviors and health outcomes among different health insurance programs, especially issues related to health disparity. The line of research on health behavior and its policy implications originated from the PP model [22-24]. This offers some concepts and analytical tools to help analyze access, disparity, and health inequality by using the data from the China Economic, Population, Nutrition, and Health Survey 2011; the Global Centers of Excellence (COE) Survey in 2011 of Japan; and Behavioral Risk Factor Surveillance System 2013 of the US. The study applies the PP model to evaluate behavioral characteristics for breast cancer prevention among women in China, Japan and the United States and health inequality in Phases 2, 3 and 4 in Figure 2. Phases 2 show the assessment of the PP model in figure 2. The focus of this study is to assess three categories of influential behavioral factors (enabling, predisposing, and reinforcing factors) by controlling for socio-demographic factors in Phase 4. The study identifies behavioral influences on decision-making preferences about preventative behaviors, i.e. breast cancer prevention by different health insurance frame works (China, Japan, and the United States in Phase 4. This study evaluates disparity of health outcomes based on income, education, health literacy and different healthcare financing in Phase 8. Phase 5, the policy assessment section, represents the assessment of health promotion, and government policy and regulation on healthcare financing and delivery. In Phase 4, “enabling factors” involve the availability and access to media and school activities. In other words, they externally facilitate possible changes in behavior. The extended PP model (Figure 2) evaluates individual behavior and characterizes influential factors on behavioral assessment in health-education interventions.

“Predisposing factors” involve the personal motivations to change behavior. These motivations are based on subjective knowledge, awareness, personal attitudes, values, attitudes, beliefs, perceived values, perceived needs, perceptions, religion, ethnicity, cultural background, etc.

“Reinforcing factors” encompass the different types of feedback and rewards pertaining to good health behaviors and healthy life style. Reinforcing factors facilitate a person’s motivation for

behavioral change and can be altered through direct communication. For example, the intensity of communication with parents and friends, peer pressure, enactment of regulations, rules or laws, are related to reinforcing factors. For government policy and regulation as a measure, this study has considered taxes, income equality, social security, and the burden of healthcare expenditures.

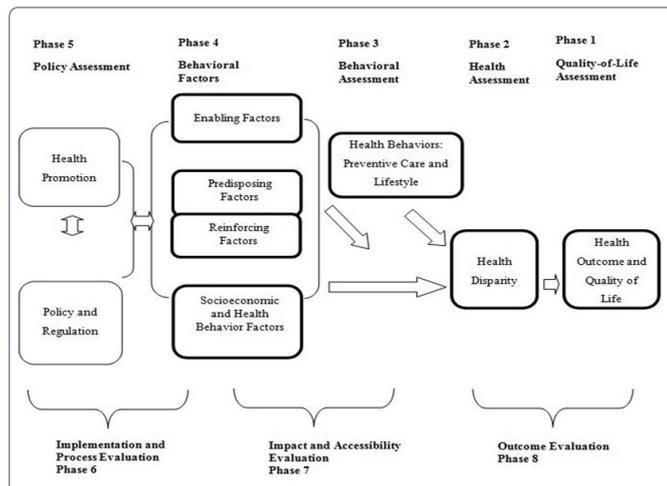


Figure 2: Application of PRECEDE-PROCEED model to examine health behaviors [preventive care and lifestyle], health disparity and health outcomes.

Note:

- Green & Kreuter, Health Promotional Planning, 4th ed., Mayfield, 2005.
- Glanz, Rimer, Lewis, Health Behavior and Health Education, 3rd ed., Jessey-Bass, 2002

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A model for health promotion should include three types of factors which are related to decision-making behavior: predisposing, reinforcing, and enabling factors. The conceptual model for a comparative health behavioral analysis is an application of the extended PP model on the effectiveness in different health insurance systems (a national health insurance system in China; a universal health insurance in Japan, and a mixed health insurance system in the United States), on preventative breast cancer behavior, and on assessing health disparity and outcomes by considering predisposing, enabling, and reinforcing factors. The basic structural model for this empirical analysis is:

$$HB_i = \beta_0 + \beta_1 PR_i + \beta_2 EN_i + \beta_3 RE_i + \beta_4 SE_i + e_i \dots \text{(Equation 1)}$$

Equation 1 represents the relationship between the health behavioral changes of women “i” for a preventive care and the decision-making behavior a woman faces, as seen in (Figure 3). The term “e” is an unobserved error, assumed to satisfy $E[e] = 0$. Enabling (EN), Predisposing (PR), Reinforcing (RE), and Socio-Economic (SE) factors will influence Health Behaviors (HB, i.e. preventive care for breast cancer). Similarly, health behaviors are incorporated in the extended PP model in order to observe decision-making health behavior and influential determinants [20,21]. In summary, multivariable regression analyses will be performed in order to evaluate the effectiveness of breast cancer prevention which is related to health outcomes and health disparity. A bivariate probit model is used by controlling for socio-economic, demographic and healthcare financing factors to investigate health outcomes by different healthcare programs in China, Japan and the USA.

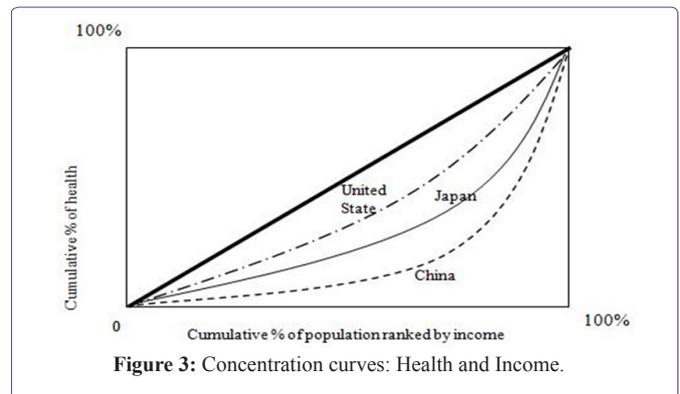


Figure 3: Concentration curves: Health and Income.

Life expectancy [health]	Concentration index	Standard errors
China	0.0159b	0.041
Japan	0.0085b	0.042
United States	0.0065b	0.043

Note:

Concentration index: concentration index using formula/covariance method.

T-statistics by standard error: standard errors of the concentration index using formula/covariance method. a, b, and c represent statistically significant levels of 99% level (a), 95% level (b), and 90% level (c) for a two-tailed test.

Various components, as well as the amount of time invested in health within the family/individual, influence a woman’s health status. The education level, income, health literacy level, and cultural aspects are associated with health behavior. Years of education represents the health capital which is related to the health knowledge that would lead them to raise health stock. Income is an important determinant of the health of women, as higher income implies a higher stock of health.

Optimizing the health of populations is a critical issue in the United States and worldwide. It is a complex problem that requires collaboration among diverse sectors: healthcare providers, government and its policymakers, education, media, and communities, to publicize the health of people. Socioeconomic disparities are deeply associated with mental and physical health outcomes. For physical and environmental domains, this study employs Grossman’s concept [18,19] about the separable impact of the education and income on women’s health in health capital factors. This study assumes that health is measurable and interpretable as a flow per unit of time because women need heterogeneous healthcare. Individual healthcare needs are attributed to the physical and environmental domains that are related to preventive healthcare.

Data

For the USA data, Behavioral Risk Factor Surveillance System [BRFSS] 2013, USA (about 50 thousand samples) is administered by CDC’s Population Health Surveillance Branch at the National Center for Chronic Disease Prevention and Health Promotion. The BRFSS is designed to measure behavioral risk factors for the non-institutionalized adult population of 18 years of age and older. The BRFSS includes smoking, alcohol use, diet habits, HIV/AIDS knowledge, exercise, immunization, health status, healthy days, healthcare access, sleep, hypertension awareness, chronic health conditions, socio-economic and demographic factors, etc.

The BRFSS conducts telephone-based surveys and interviewers, who have experience conducting telephone surveys with additional training, collect data from randomly selected adults in a household and manages state health departments which conduct interviewers. The state departments sample disproportionately from strata that correspond to sub-state regions to provide adequate sample sizes. The sample records use a disproportionate stratified sample design with a probability sample of all households. The high-density and medium-density strata contain telephone numbers that are expected to belong mostly to households. The data are then transmitted to the CDC for editing, processing, weighting, and analysis. Many questions are taken from established national surveys, such as the National Health Interview Survey or the National Health and Nutrition Examination Survey.

For the Chinese data, it comes from the China Economic, Population, Nutrition, and Health Survey 2011 Adult Questionnaire (about 30 thousand samples) [CEPNH]. The data survey was designed to cover public health risk factors, health outcomes, demographic and social factors at the individual, household and community levels. The data includes limited clinical information, drinking, smoking, physical activities, dietary intake, individual health-related data, living arrangement, use of health services, marriage, age, activities of daily living, occupation, income nutritional status, occupation, etc. The CEPNH sample was randomly selected and captured economic, health and demographic circumstances in eight provinces: Liaoning, Shandong, Henan, Jiangsu, Hubei, Hunan, Guizhou, and Guangxi from the north to the south in China. The data collection process was a multistage, random cluster process to draw the sample in each of the provinces. Ages ranges from 8 to 98 years old. The CEPNH contains the ability to capture heterogeneity of population and documents socio-economic, behavioral and health status variation/changes.

For the Japanese data, the Japanese Study of Aging and Retirement (JSTAR), the Global Centers of Excellence (COE) Survey (about 5.5 thousand samples) conducted in 2011 by Osaka University in Japan were used. JSTAR 2011-1st-wave-3-cities or/and JSTAR 2011-2nd-wave-3-cities is the current study has been using the following variables/factors: social aspects, economic aspects, demographic aspects health and mental aspects, behavioral aspects, and environmental

aspects. We just need the following additional information, illness history [experiences] and preventive care/health screening experiences to evaluate health behaviors. We evaluate breast cancer preventive behaviors of adult women and their life style/health in Japan.

The JSTAR was designed and carried out jointly by the Research Institute of Economy, Trade, and Industry and Hitotsubashi University in Japan, and the University of Tokyo. The JSTAR is a globally comparable data survey of the elderly, which is similar to the Health and Retirement Study (HRS) in the United States. The design of JSTAR is also similar to the Survey of Health, Ageing and Retirement in Europe (SHARE), and the English Longitudinal Study of Ageing (ELSA). The 2011 wave was conducted in September and October and collected data on individual living circumstances of 4,500 persons between 50 and 80 years in three municipalities: Hiroshima city in Hiroshima prefecture, Chofu city in Tokyo, and Tondabayashi in Osaka.

The survey has two units of observation: individual and household. A household is a single individual or individual with his/her spouse, whichever is applicable. Unlike the HRS, the JSTAR only interviews one respondent per household but the survey includes several questions to the respondent about the spouse. The JSTAR covers a wide range of information including: income, wealth, working status, family structure, relationship with family members and neighborhood, capacity of memory and cognitive, health conditions, medical care, and nursing care.

Results

Empirical Results

The descriptions of variables and elated statistics for China, Japan, and the US study are stated in China (Table 5), Japan (Table 6) and the US (Table 7). We use two models: the regression results for the logit model are in table 8 (the US) and table 9 (Japan), and the regression results of OLS are in table 4 (China). For the regression empirical results in Results I, the measure of behavioral health outcome is based on breast cancer prevention among women in China, Japan, and the US. In Results II, health outcomes are evaluated by “a concentration index approach”.

Variables	Min.	Max.	Mean	# of Observation
Dependent variable				
• Breast cancer prevention [1=breast cancer prevention at a hospital; 2=breast cancer prevention at a clinic; and 3=breast cancer prevention at other facilities]	1	3	0.25	2867
Independent variables Predisposing factor				
• Ageing [Age variable is an aging process of socio cultural maturity] unit of value is years.	18.03	98.94	52.28	44246
• Know about Chinese dietary guidelines (0=no, 1=yes) Enabling factor	0	1	0.114	50446
• Education, years of education	0	18	7.786	39929
• Government health insurance [0=no and 1=yes]	0	1	0.731	36966
• Rural health insurance [0=no and 1=yes]	0	1	0.611	38035
• Commercial health insurance [0=no and 1=yes]	0	1	0.039	37955
• Urban employee basic health insurance [0=no and 1=yes]	0	1	0.211	37978
• Urban residential basic health insurance [0=no and 1=yes]	0	1	0.143	37967
Reinforcing factor				
• Chinese dietary government guidance [1= a person does not know and 2= person knows the guidance]	1	2	1.885	50446
• Living in urban [0=no and 1=yes]	0	1	0.412	39963

Socio-Economic and health Behavioral factors				
• Activity: activities of preferences indicators [martial arts; gymnastics/dancing/acrobatics; track and field/swimming; soccer/basketball/tennis; badminton/volleyball; and ping pong/tai chi] [1=dislike very much ~ 5=like very much]	6	30	16.18	39929
• Health status [1=very bad, 2=bad, 3=fair, 4=good, and 5 very good]	1	5	3.508	26377
• Income [total annual individual income, yuan]	-1e+5	6e+5	29846	29846
• Sedentary activities [7 sedentary activities: TV watching, videotapes, watching movies/videos online, video games, surfing internet, participation in chat rooms, and playing computer games]	0	7	1.327	48707

Table 5: Descriptive statistics of variables used in the present study [China].

Variables	Min.	Max.	Mean	# of Obs.
Dependent variable				
• Brest cancer prevention [1=yes, otherwise=0]	1	2	0.327	2634
Independent variables				
Predisposing factor				
• Ageing [Age variable is an aging process of socio-cultural maturity] The unit value is years.	22	78	51.89	2634
• Education [Number of years].	9	19	11.995	2634
• Risk taker: 0~18 [0=highest risk and 18=most risk averse]	0	18	14.053	2634
Enabling factor				
• Private employment HI: Private employment health insurance [1=yes and 0=no]	0	1	0.365	2634
• Government employment HI: Government employment health insurance [1=yes and 0=no]	0	1	0.045	2634
• Self-employed HI: Self-employed health insurance [1=yes and 0=no]	0	1	0.112	2634
• Out-of-pocket: Out-of-pocket costs per outpatient visit [1=less than \$10, 2=\$10-\$20, 3=\$20-\$30, 4=\$30-\$40, 5=\$40-\$50, and 6=\$50 and more]	1	6	1.723	2634
Reinforcing factor				
• Marital status 1=yes married and 0=no	0	1	0.784	2634
• Health checkup by local municipality: Health checkup organized by local municipality: 1=yes and 0=no	0	1	0.278	2634
• Health checkup by employer: Health checkup organized by your employer: 1=yes and 0=no.	0	0	0.345	2634
Socio-Economic and health Behavioral factors				
• Anxieties: I have anxieties about my health. [1=strongly ~ 5=least anxiety of health]	1	5	2.885	2634
• Stress: I have feeling stressed lately. [1=strongest stress ~ 5=least stress]	1	5	2.749	2634
• Income [Approximately how much is the annual earned income of you before taxes, including bonuses and business income? [1=none; 2= less than 1million yen; 3=1millin~2million yen; 4=2million yen~4million yen; 5=4million yen~6million yen; 6=6million yen~8million yen; 7=8million yen~10million yen; 8=10million yen~12million yen; 9=12million yen~14million yen; and 10=14million yen and more.]	1	10	2.312	2634
• Smoke status: [0=I never smoke; 1=I used to smoke but I quit; 2=I hardly smoke; 3=I occasionally smoke; 4= I smoke about 1~4 cigarettes per day; 5=I smoke 6~10 cigarettes per day; 6=I smoke 11~20 cigarettes per day; 7=I smoke 21~30 cigarettes per day; 8=I smoke 31~40 cigarettes per day; 9=I smoke 41cigarettes more per day]	0	9	0.694	2634
• Exercise: How often do you exercise? [1=almost every day; 2=a few times a week; 3=about once a week; 4=about once a month; and 5=don't exercise at all.]	1	5	4.029	2634
• Alcohol drink: Do you drink alcoholic beverages? [1=don't drink at all; 2=hardly drink few times a month or less; 3=drink sometimes (a few times a week); 4=a can of beer (12oz)or its equivalent; 5=3 cans of beer (12oz x 3) or its equivalent; 6=5 cans of beer (12oz x 5) or its equivalent]	1	6	2.082	2634

Table 6: Descriptive statistics of variables used in the present study [Japan].

Variables	Min.	Max.	Mean	# of Observation
Dependent variable				
• Brest cancer prevention (1=no, 2=yes)	1	2	1.179	29959
Independent variables				
Predisposing factor				
• Ageing [Age variable is an aging process of socio-cultural maturity] 13 levels of age categories: 1=18-24; 2=25-29; 3=30-34; 4=35-39; 5=40-44; 6=45-49; 7=50-54; 8=55-59; 9=60-64; 10=65-69; 11=70-74; 12=75-79; 13=80 and over].	1	13	7.603	287321
• Education [What is the highest grade or years of school completed? 1= kindergarten or less; 2= grad 1 through 8; 3=9-11; 4=12-; 5= college 1 year to 3 years; 6= college 4 years or more].	1	6	4.853	289201
• Race:	0	18	14.053	2634

Race-White =1 otherwise=0;	0	1	0.781	290498
Race Hispanic=1, otherwise =0;	0	1	0.076	290498
Race-African American=1, otherwise=0;	0	1	0.081	290498
Other=1, otherwise=0.	0	1	0.062	290498
Enabling factor	1	6	1.723	2634
• Age 18-64 with healthcare coverage by health insurance, 0=no and 1=yes.	0	1	0.554	290498
• Medical bill [Currently have medical bills, 1=no and 2=yes]	1	2	0.611	207440
• Medical costs [Could not get medicine because of costs, 1=yes with problem otherwise=0]	0	1	0.081	207553
Reinforcing factor	0	0	0.345	2634
• Marital status 1=no and 2=yes	1	2	1.817	280442
• Metropolitan status [1=in the center city of an MSA; 2=outside the center city of an MSA but inside the county containing the center city; 3=inside a suburban county of the MSA; 4=in an MSA that has no center city; and 5=not in an MSA.]	1	5	2.921	222402
Socio-Economic and health Behavioral factors	1	5	2.749	2634
• Poor health [number of days of mental and physical health, not good, for the past month]	0	30	5.271	248663
• Income [Your annual household income from all sources: 1=less than \$10,000; 2=less than 15k; 3= less than 20k; 4=less than 25k; 5=less than 35k; 6=less than 50k; 7=less than 75k; 8=75k and more.]	1	8	5.586	242228
• Alcohol: number of drinking days per month 0~30 days.	0	30	4.557	281209
• Smokeless tobacco: Use of smokeless tobacco products [1=everyday; 2=some days; 3=not at all]	1	3	2.949	282457
• Salt intake: watching sodium or salt intake [1=yes and 2=no]	1	2	1.422	128150

Table 7: Descriptive statistics of variables used in the present study [the US].

For the study of China, the number of observations in the sample size drastically declined because of missing values. However, the results do provide many interesting outcomes. As age increases, Chinese women are less likely to undergo breast cancer prevention at a hospital and tend to utilize cancer prevention at clinics or other facilities. The negative sign is not theoretically incorrect (see the definition in table 5). For American and Japanese women, the positive log it results are statistically significant as age increases; women are more likely to engage in breast cancer preventative behaviors (Tables 8 and 9).

Regarding education in China, an increase in knowledge through higher education, i.e. an increase in health literacy, with a statistically significant positive coefficient (0.015) encourages women to engage in breast cancer prevention. The outcome is theoretically correct. This is also true for Japanese women with a statistically significant coefficient (0.128) in table 9. A possible explanation for the negatively significant coefficient of women with higher education in the U.S. could be related to opportunity cost. This in turn means that women with higher education tend to have higher wages and a higher labor-force participation rate, which tends to reduce spare time for breast cancer examinations. Another potential explanation could be intangible barriers such as fear of a painful process or some embarrassment.

Interestingly, the Chinese Government's health policy of oriented guidance of health insurance is working to mitigate a rapid increase in healthcare expenditures. Women with government health insurance, urban employee health insurance, or urban residential health insurance tend to take breast cancer examinations at less costly places such as clinics and other facilities. Table 4 also demonstrates the fact that women who live in urban areas generally take breast cancer examinations at hospitals.

In the US, evidence shows that the aging process is related to socio-cultural maturity, with experiences influencing health behaviors and women's value of health. A healthier, longer life span with an increase in life expectancy needs to sustain a healthy stock of body

with breast cancer prevention [17]. This sustainable health durability is quality of life. Unlike China and Japan, there are different races in the U.S. Their socio demographic and cultural backgrounds also influence women's health behaviors. The variable "race" undoubtedly demonstrates the different health behaviors between races. White and African American women are more likely to engage in breast cancer prevention than Hispanic women.

The US health care system is a mixed healthcare service of delivery and financing. Since the implementation of the Affordable Care Act, the uninsured population has declined from about 45 million people in 2013 to 28 million people in early 2017. The variable, age18-64, in "Enabling Factors" shows that the result is statistically significant and insured women are more likely to engage in breast cancer prevention behavior than the uninsured women. The negative sign of "marital status" in "Reinforcing Factors" is theoretically correct. In general, married women have healthier behaviors than single individuals because of their spouses also care for their health.

Furthermore, the negative, statistically significant income coefficient of the U.S. women in table 8 differs from the respective coefficient from China and Japan. Women with high income are less likely to engage in breast cancer prevention because of their more valuable time in monetary terms. Commonly, a rational individual woman will choose her health utility which is derived through her prevention behaviors. The women allocate discretionary labor income and earnings to purchase healthcare services in the U.S. mixed healthcare system. Thus, an increase in income raises an accessibility of healthcare services. As a result, consumption of healthcare services increases. The negative effect tends to discourage woman's preventive healthcare activities because of the high opportunity cost. The aforementioned potential and logical applications also demonstrates the evidence among Japanese women in table 9.

For Japanese women, the primary parameter of interest in this study is the influence of educational attainment as a health literacy indicator, in addition to the effect of income on health behavior, i.e.

breast cancer prevention. Education increases both health literacy to have a sustainable healthy life as well as human capital, i.e. labor productivity. The Japanese evidence demonstrates this line of argument in table 9 as the Chinese women show the similar evidence in table 4.

The key parameter of “Enabling Factors” is health insurance. Women with government health insurance are more likely engage in breast cancer prevention. The government health insurance provides undeniably better health insurance coverage compared to “self-employed” or “private employment” health insurance coverage under the universal health insurance system in Japan. The coefficient of government health insurance is the only statistically and positively significant outcomes among the three types of health insurances. There are common outcomes among women in the three countries. Women with mental health problems, smoking behavior, alcohol intake, and physical weakness have a tendency to avoid utilizing cancer prevention services.

Health and Income Disparity

In this section, “health outcome, i.e. health disparity” is evaluated

by a concentration index approach. This study focuses on income and health disparity. The study utilizes the concentration index which shows that the curve represents the cumulative percentage of the population ranked by income from low level to high level on the horizontal axis. The vertical axis represents the cumulative percentage of general health in figure 4. If the concentration index takes a negative value, the concentration curve lies above the line of equality (a 45-degree line). It is a disproportionate concentration of health among poor income population. If the line lies below the equality of 45-degree line, health disproportionately improves among the poor population until the income level reaches a certain level [25,26]. (Figure 4) presents the concentration curves below the equality line (1 45-degree line). General Health in the US more equally distributed than Japan and China. The health of the Chinese population is heavily concentrated among the high-income population and China requires more equal income distribution [27]. The US had more equal income distribution with health than Japan and China.

Variables	Coefficients	Standard Error	P>Z	Conf. Interval 95%
Independent variables				
Predisposing factor	1	2	1.179	29959
• Aging	0.137	0.028	0	0.08–0.19
• Education	-0.123	0.061	0.043	-0.24–0.01
• Race				
Race-White	2.271	1.007	0.024	0.29–4.24
Race-African American	2.426	1.015	0.017	0.43–0.41
Race Hispanic [reference]	---	---	---	---
Other	2.179	1.047	0.017	0.12–4.23
Enabling factor	0	1	0.081	290498
• Age 18-64 with healthcare insurance coverage	0.386	0.153	0.012	0.08–0.68
• Medical bill	-0.263	0.125	0.037	-0.51–0.01
• Medical costs	-0.026	0.17	0.875	-0.36–0.31
Reinforcing factor	1	2	0.611	207440
• Marital status	-0.253	0.128	0.05	-0.5–0.00
• Metropolitan status	-0.048	0.033	0.154	-0.11–0.01
Socio-Economic and health Behavioral factors	1	2	1.817	280442
• Poor health	-0.001	0.007	0.818	-0.02–0.01
• Income	-0.108	0.032	0.001	-0.2–0.1
• Alcohol	-0.042	0.017	0.014	-0.1–0.0
• Smokeless tobacco	0.167	0.487	0.731	-0.78–1.12
• Salt intake	-0.108	0.122	0.736	-0.34–0.13
Number of observations	12225			
LR chi-square (21)	211.7			
Prob>Chi square	0			
R-squared	0.064			
Log likelihood	-1549.18			

Table 8: Empirical results of preventive behaviors [breast cancer] of the US women, Logit.

Variables	Coefficient	Standard Error	P>Z	Conf. Interval 95%
Independent variables				
Predisposing factor				

Ageing •	0.016	0.004	0.001	0.02~0.00
Education •	0.128	0.029	0	0.18~0.07
Risk taker •	0.006	0.013	0.612	0.03~-0.01
Enabling factor				
Private employment HI •	0.193	0.127	0.131	0.44~-0.5
Government employment HI •	0.92	0.237	0	1.38~0.45
Self-employed HI •	-0.014	0.161	0.927	0.30~-0.33
Out-of-pocket •	0.016	0.036	0.651	0.08~-0.05
Reinforcing factor				
Marital status •	0.594	0.122	0	0.83~0.35
Health checkup by local municipality •	1.526	0.109	0	1.74~1.31
Health checkup by employer •	1.035	0.115	0	1.26~0.80
Socio-Economic and health Behavioral factors				
Anxieties •	-0.09	0.054	0.098	0.01~-0.19
Stress •	-0.18	0.062	0.004	-0.1~-0.3
Income •	0.061	0.039	0.121	0.13~-0.01
Smoke status •	-0.167	0.036	0	0.13~-0.01
Exercise •	-0.114	0.033	0.001	-0.10~-0.2
Alcohol drink •	-0.025	0.043	0.554	0.05~-0.11
Number of observations	2634			
(LR chi-square (21	462.96			
Prob>Chi square	0			
R-squared	0.1389			
Log likelihood	-1434.5			

Table 9: Empirical results of preventive behaviors [breast cancer] of Japanese women, Logit.

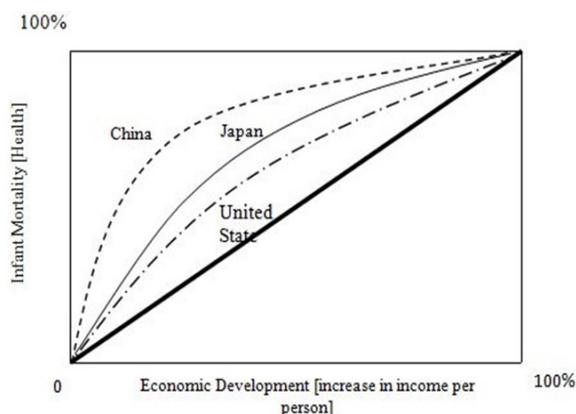


Figure 4: Concentration curves: Infant Mortality [Health] and an Economic Development [Increase in Income per Person].

Infant mortality [health]	Concentration index	Standard errors
China	-0.2666c	0.066
Japan	-0.1241c	0.059
United states	-0.0487c	0.052

Concentration Index: Increase in Income per Person and Infant Mortality [Health]

Notes:

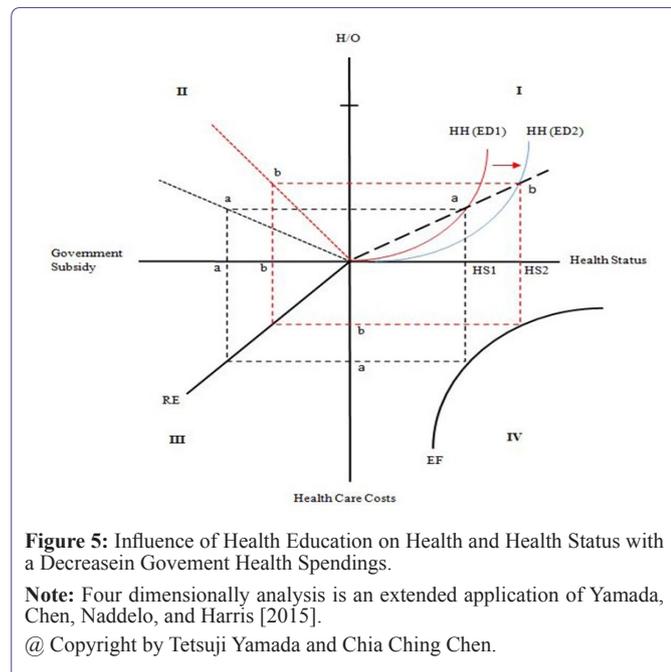
Concentration index: concentration index using formula/covariance method. T-statistics by standard error: standard errors of the concentration index using formula/covariance method. a, b, and c represent statistically significant levels of 99% level (a), 95% level (b), and 90% level (c) for a two-tailed test.

The infant mortality and income display the negative concentration curves. It again demonstrates that the US has a more equal infant mortality rate among population by income than Japan and China. However, the interpretation of disproportionate line indicates that China's infant mortality rapidly declines with an increase in income of population. Chinese government may need to subsidize the low income population to reduce infant mortality.

Discussion and Policy Implications

The rapid surge in national health care expenditures is a mounting burden on the governments of China, Japan and the US and its citizens. In addition, there are income and health disparities within and among the countries. This study addresses and evaluates behaviors of preventive care of women in different countries and under different healthcare systems (the national health insurance system in China, the universal health insurance system in Japan, and the mixed health insurance system in the US). The study identifies the importance of educational attainment for health behaviors as well as income earnings. Age-standardized breast cancer incidence and mortality rates have risen rapidly in China during the past 2 to 3 decades, making it the leading cancer among women [28]. The onset of the average age of breast cancer has recently become younger in China, Japan, and the US. Breast cancer is the number one leading cause of death among women in Japan, the 6th in China, and the 5th in the US.

The study proposes a diagrammatic presentation to describe how formal and informal health education is imperative to maintain a sustainable healthy life with increases in health stock. (Figure 5) presents the influences of health education on health disparity and on government healthcare spending.



Assumption of Figure 5:

The assumptions are that society consists of two identical individuals. An individual's preference and consumption does not affect other utility functions. The individual preferences are not necessarily homothetic. The individual function is homogeneous of degree 0 in income and prices. The relative prices of goods and services affect their consumption combination through changes in production mix. The general increase in cost level does not change the consumption bundle because the relative prices remain constant. Both individuals consume health goods, services, and a composite good. Both individuals produce health service goods and a composite good. Both individuals' health status changes by income level. The efficient production set is non-linear, and their capital labor ratios are different. Specifically, health goods are relatively more capital intensive than the composite good. Finally, there are no externalities in consumption and production.

Brief explanation of Figure 5:

The relative price of both goods raises HH (ED1) such that the unique price ratio of goods H and Q equals the marginal rate of substitution. For the EE curve in Quadrant IV, there are two ways to assess efficiency: efficient resource allocation and efficiency of technological development of delivery of healthcare services. An increase in health education attainment makes a shift in the HH line from ED1 to ED2 and raises health status from HS1 to HS2 along the health status axis. The health educational effect goes from quadrant IV through quadrant III. An increase in health status reduces healthcare costs from "a" to "b" on the vertical axis of healthcare costs. The chain reaction of this influence reduces the government subsidy for an individual from "a" to "b" on the horizontal axis of government subsidy in quadrant III.

Our empirical study shows educational attainment in a formal and informal form. The Chinese dietary government guidance, for example,

generally raises women's health knowledge and skill, as well as the promotion of breast cancer prevention. However, primary preventative care has received little attention in China, partly because of an insufficient knowledge of risk factors for breast cancer among Chinese women [24]. Although the US has the mixed healthcare financing and delivery system, there is a primary care doctor system which has a large influence on health behaviors in general. China and Japan do not have a primary physician system. It would be prudent to implement a primary physician approach to get informal health education from the primary physician who encourages patients to engage in preventive behaviors.

Another noteworthy finding about health disparity is that the concentration index study shows that income, health, and health disparity are generally exogenously determined. However, income influences health status and has a significant effect on health disparity. Health in China is disproportionately large and distributed towards the right on the horizontal axis as the form of cumulative % of population ranked by income. This result is different from Japan and the US. Improper income distribution with health exists among low income populations. However, it should be noted that China has been experiencing a rapid increase in life expectancy for the past decade. Thus, income level affects health and then health affects human stock, which is related to human productivity. If this process is disconnected, the proper process is terminated, and the result would be greater income disparity among individuals within a country and among countries in the world.

Health disparity not only stems from formal and informal health education, which are deeply interconnected to health literacy, but also from income, access to healthcare services, and a nation's healthcare system, etc. Findings for China, Japan, and the US reveal that different types of health insurance under the different healthcare systems have a great impact on preventive health behaviors. The government financed/organized healthcare financing have a more effective influence in China and Japan than in the US. The study also discloses that risky health behaviors (addiction, alcohol intake, and smoking) and mental health aspects are negatively associated with preventive healthcare behaviors. Mental aspects are partially triggered by the globalized economy and its competitive market environment. As a result, individuals suffer from stress, depression, anxiety, and loneliness.

Managed healthcare with a capitation-based system dominates the mixed healthcare system in the US while China, with the national healthcare system, and Japan, with the universal healthcare system, implement the cost-based fee-for-service healthcare system. Moving from the cost-based fee-for-service system to the capitation system is a viable option to mitigate ever-increasing healthcare spending and to have a sustainable welfare program.

Conclusion

The study is limited in that the Chinese data does not clearly state a variable for "breast cancer prevention", the observation size is reduced by large missing values, and shows a very significant amount of negative income which we are not familiar with. The study is implemented with our very limited knowledge of China's healthcare financing and delivery systems. We separated women from men in order to examine women's preventive health behaviors by focusing on breast cancer. In a behavior study such as this it might be better to

include more than a one-term cross sectional evaluation data, since this study focuses on a three-country comparison analysis on health and healthcare under different healthcare systems with different socio-cultural aspects. A development of human capital, i.e. health stock, will reduce government healthcare spending. Despite these limitations, this study has identified some issues and has made contributions to the existing literature regarding differing healthcare systems, differing health and health behavior, health and income disparity, and health and education. Insurance coverage is an important factor to increase the health and longevity of the population. Future studies would improve and scrutinize the complex nature of the various aspects of health and income disparities that influence health and income disparities in different healthcare systems in socio-culturally different countries. Managed healthcare financing is an effective alternative to curb ever-increasing healthcare costs.

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Author Contribution

Chia Ching Chen and Tetsuji Yamada conceived the idea of this research and designed the framework. Weihong Zeng evaluated the healthcare system of China, Japan and the USA drafted the manuscript. Tetsuji Yamada and Barret Levine analyzed the data and implemented econometric analyses. Chia Ching Chen approved the final manuscript. John Carter managed model and econometric method.

Conflicts of Interest

The authors declare no conflict of interest. The founding institution had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

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