

Regional Differences in Specific Health Examination Utilization and Medical Care Expenditures in Japan

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Abstract

Background: Despite having one of the most successful health systems in the world, annual medical expenditures in Japan have been increasing year to year. We sought to clarify regional differences in medical expenditures by analyzing the relationship between the specific health examination coverage and medical care expenditure by prefecture of Japan. **Methods:** We used data from the National Database of Health Insurance Claims and Specific Health Checkups (NDB) Open Data Japan (2015) and Overview of 2015 National Medical Expenses to compare medical care expenditure per capita and proportions of persons receiving specific health examination between Japan nationally and individual prefectures. **Results:** National medical expenditures were 42.3 trillion Japanese yen (JPY) (3851 hundred million dollars), with a national per capita rate of JPY347,219 (USD3156). Per capita medical expenditure rates by prefecture ranged from JPY290,900 (USD2645) in Saitama Prefecture to JPY 444,000 (USD4036) in Kochi Prefecture. The proportion of persons receiving specific health examinations was 49.0% for Japan overall and ranged from 39.3% in Hokkaido Prefecture to 63.4% in Tokyo Prefecture. We observed a significant negative correlation between per capita medical expenditures and the proportion of persons receiving specific health examinations ($R = 0.553$, $p < 0.001$). **Conclusion:** We found a significant negative correlation between per capita medical expenditures and the proportion of persons receiving health examinations: prefectures with lower expenditures tended to have higher rates of medical examinations. Interventions to increase the proportion of persons receiving specific health examinations by prefecture could reduce per capita medical expenditures and reduce prefectural disparities in expenditures.

Keywords

Medical Expenditures, Regional Disparities, Health Examinations

1. Introduction

Japan's health system implemented universal health insurance coverage in 1961 and is one of the most successful health systems in the world, despite having one of the highest life expectancies and the highest old-age dependency ratio among advanced economies [1]. However, annual medical expenditures per capita are increasing year by year, from JPY267,000 (USD2427) in 2007 to nearly JPY340,000 (USD3091) in 2017 (Figure 1) [2] [3]. To control rising healthcare costs, Japan's Ministry of Health, Labour and Welfare (MHLW) has established an ongoing Medium- and Long-Term Medical Care Expenditure Regulation Plan, which aims to improve prevention of lifestyle diseases and shorten hospital lengths of stay, with an emphasis on joint work between the national and prefectural governments (Figure 2) to address regional differences in costs [4].

Regional and community planning and implementation of health policies have been identified as an important component of maintaining the low costs and improving equity in healthcare [5]. In addition to central policies emphasizing patient-centered health interactions, local efforts tailored to the particular needs of each regional health system are needed to foster equity and address regional

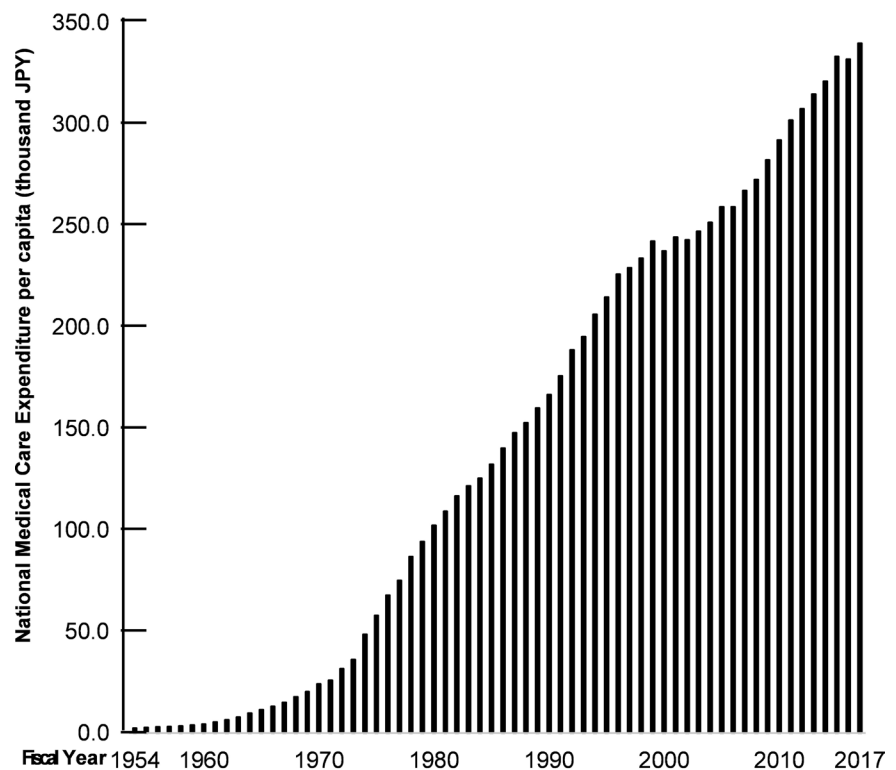


Figure 1. National medical expenditures per capita. JPY: Japanese yen.

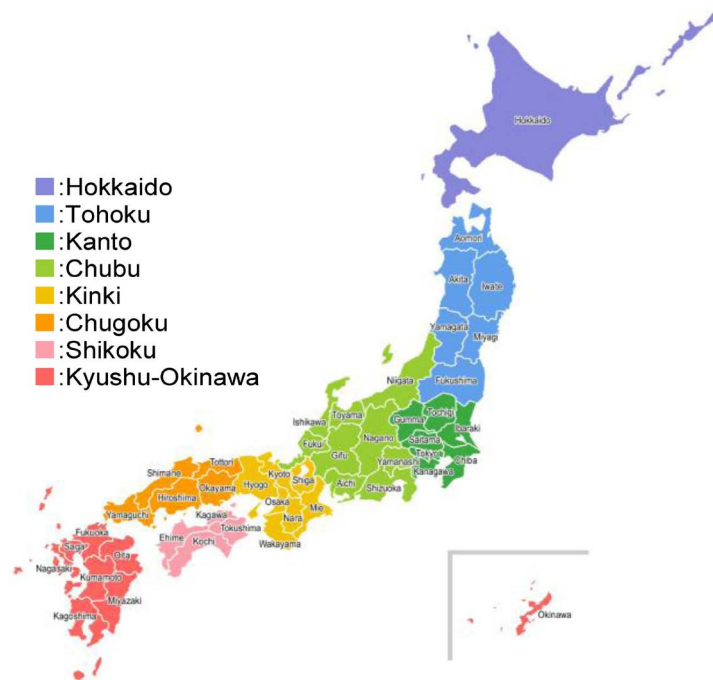


Figure 2. Map of Japan's prefectures. Eight regions: ■: Hokkaido (violet), ■: Tohoku (blue), ■: Kanto (green), ■: Chubu (light green), ■: Kinki (yellow), ■: Chugoku (orange), ■: Shikoku (pink), ■: Kyushu-Okinawa (red).

differences in quality, access, and costs of care. In an effort to further optimize expenditures, the Medium- and Long-Term Medical Care Expenditure Regulation Plan promotes regional difference analysis of medical expenditures.

To clarify regional differences in medical expenditures in Japan, we analyzed the relationship between the specific health examination coverage and medical care expenditure by prefecture of Japan using data from the National Database of Health Insurance Claims and Specific Health Checkups (NDB) Open Data Japan (2015) and Overview of 2015 National Medical Expenses.

2. Methods

The NDB was implemented in 2009 by the MHLW in order to plan health policies using national data. Additionally, the database is used for health research purposes. The NDB includes most of the administrative claims and health checkup data from insurers in Japan, covering approximately 98% of healthcare services in the country. The database contains information on prefecture, sex, age, dates of admission and discharge, and codes for diagnoses, procedures, and prescriptions [6].

Using data from the NDB and the Overview of 2015 National Medical Expenses [7] [8] [9], we compared mean medical care expenditure per capita and mean proportions of persons receiving specific health examinations between Japan nationally and individual prefectures via One Sample t-test. To evaluate the relationship between per capita medical expenditures and the proportion of persons receiving specific health examinations, we calculated Pearson correla-

tion coefficients. A ratio of JPY110: USD1 was used to convert currency (2014 value).

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 26.0 (SPSS, Inc., Chicago, IL, USA). Statistical significance was set at $p < 0.05$. The study was approved by the Medical Ethics Committee of Ibaraki Prefectural University of Health Sciences (approval No. e211-r010620).

3. Results

National medical expenditures were 42.3 trillion Japanese yen (3851 hundred million dollars), with a national per capita rate of JPY347,219 (USD3156). Per capita medical expenditure rates by prefecture ranged from JPY290,900 (USD2645) in Saitama Prefecture to JPY444,000 (USD4036) in Kochi Prefecture (Figure 3).

Prefecture	Total (100 mio)		per capita (thousands)	
	JPY	USD	JPY	USD
Japan	423 644	3 851	347.2	3.15
Hokkaido	21 184	193	393.6**	3.58**
Aomori	4 469	41	341.7	3.11
Iwate	4 145	38	323.8**	2.94**
Miyagi	7 221	66	309.4**	2.81**
Akita	3 751	34	366.6**	3.33**
Yamagata	3 821	35	340.0	3.09
Fukushima	6 335	58	331.0*	3.01*
Ibaraki	8 826	80	302.6**	2.75**
Tochigi	6 008	55	304.3**	2.77**
Gunma	6 260	57	317.3**	2.88**
Saitama	21 139	192	290.9**	2.64**
Chiba	18 118	165	291.1**	2.65**
Tokyo	41 433	377	306.6**	2.79**
Kanagawa	27 186	247	297.9**	2.71**
Niigata	7 110	65	308.6**	2.81**
Toyama	3 557	32	333.7*	3.03*
Ishikawa	3 993	36	346.0	3.15
Fukui	2 635	24	334.8*	3.04*
Yamanashi	2 772	25	332.0*	3.02*
Nagano	6 756	61	321.9**	2.93**
Gifu	6 668	61	328.1*	2.98*
Shizuoka	11 414	104	308.5**	2.80**
Aichi	22 468	204	300.3**	2.73**
Mie	5 794	53	319.1**	2.90**
Shiga	4 222	38	298.8**	2.72**
Kyoto	8 994	82	344.6	3.13
Osaka	32 193	293	364.2*	3.31*
Hyogo	19 114	174	345.3	3.14
Nara	4 637	42	340.0	3.09
Wakayama	3 607	33	374.2**	3.40**
Tottori	2 000	18	349.1	3.17
Shimane	2 628	24	378.7**	3.44**
Okayama	6 960	63	362.1*	3.29*
Hiroshima	10 410	95	366.0*	3.33*
Yamaguchi	5 608	51	399.2**	3.63**
Tokushima	2 968	27	392.5**	3.57**
Kagawa	3 727	34	381.8**	3.47**
Ehime	5 202	47	375.6**	3.41**
Kochi	3 233	29	444.0**	4.04**
Fukuoka	19 353	176	379.3**	3.45**
Saga	3 269	30	392.5**	3.57**
Nagasaki	5 661	51	411.1**	3.74**
Kumamoto	6 954	63	389.3**	3.54**
Oita	4 619	42	396.2**	3.60**
Miyazaki	4 025	37	364.6*	3.31*
Kagoshima	6 705	61	406.9**	3.70**
Okinawa	4 495	41	313.5**	2.85**

Figure 3. Comparison of mean national medical care expenditure per capita between Japan and prefectures. * $p < 0.05$ vs. Japan; ** $p < 0.001$ vs. Japan. JPY: Japanese yen, USD: US dollar.

The proportion of persons receiving specific health examinations was 49.0% for Japan overall and ranged from 39.3% in Hokkaido Prefecture to 63.4% in Tokyo Prefecture (Figure 4).

We observed a significant negative correlation between per capita medical expenditures and the proportion of persons receiving specific health examinations ($R = 0.553$, $p < 0.001$) (Figure 5).

4. Discussion

Substantial variation by prefecture exists in per capita medical expenditures and in the proportion of persons receiving specific health examinations. We found a significant negative correlation between per capita medical expenditures and the proportion of persons receiving health examinations: prefectures with lower per capita medical expenditures tended to have higher rates of specific medical

Prefecture	Number of subject persons of specific health examination (Estimated value) N	Number of persons receiving specific health examinations N	Proportion of persons receiving specific health %
Japan	53,960,721	27,058,105	49.0
Hokkaido	2,350,032	922,700	39.3**
Aomori	595,994	268,699	45.1**
Iwate	557,451	285,497	51.2*
Miyagi	974,459	561,160	57.6**
Akita	464,384	216,038	46.5*
Yamagata	482,012	289,226	60.0**
Fukushima	840,256	418,275	49.8
Ibaraki	1,276,424	636,193	49.8
Tochigi	861,134	413,788	48.1
Gunma	866,354	424,215	49.0
Saitama	3,108,260	1,582,268	50.9*
Chiba	2,645,989	1,400,292	52.9**
Tokyo	5,470,987	3,466,537	63.4**
Kanagawa	3,818,126	1,897,594	49.7
Niigata	1,003,950	538,130	53.6**
Toyama	477,372	266,700	55.9**
Ishikawa	500,464	272,148	54.4**
Fukui	338,269	165,479	48.9
Yamanashi	367,002	203,887	55.6**
Nagano	906,675	491,303	54.2**
Gifu	896,444	439,385	49.0
Shizuoka	1,612,803	852,695	52.9**
Aichi	3,120,031	1,611,190	51.6*
Mie	781,152	413,973	53.0**
Shiga	577,626	287,284	49.7
Kyoto	1,086,395	501,359	46.1**
Osaka	3,729,686	1,700,300	45.6**
Hyogo	2,366,766	1,101,017	46.5*
Nara	597,066	253,968	42.5**
Wakayama	432,368	175,696	40.6**
Tottori	243,173	111,613	45.9**
Shimane	294,217	157,303	53.5**
Okayama	803,606	360,190	44.8**
Hiroshima	1,208,282	546,760	45.3**
Yamaguchi	610,992	256,354	42.0**
Tokushima	330,213	153,535	46.5*
Kagawa	428,981	206,545	48.1
Ehime	610,560	263,397	43.1**
Kochi	317,589	148,141	46.6*
Fukuoka	2,089,860	946,910	45.3**
Saga	347,651	161,586	46.5*
Nagasaki	596,719	261,784	43.9**
Kumamoto	747,187	349,147	46.7*
Oita	497,130	258,714	52.0**
Miyazaki	474,944	211,850	44.6**
Kagoshima	693,963	334,845	48.3
Okinawa	559,721	272,435	48.7

Figure 4. Proportion of persons receiving specific health examination by prefecture, fiscal year 2015. * $p < 0.05$ vs. Japan; ** $p < 0.001$ vs. Japan. N: number of subjects.

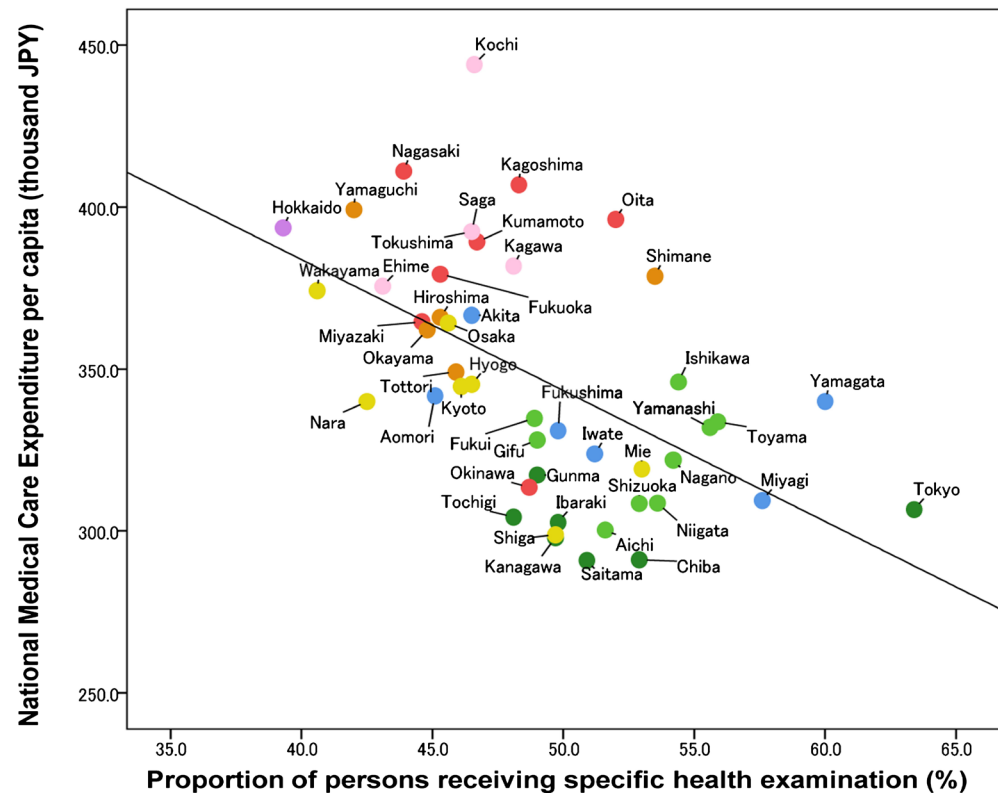


Figure 5. Relationship among national medical care expenditure per capita and proportion of persons receiving specific health examination. JPY: Japanese yen.

examinations.

It is possible that prefectures with high health awareness have high health examination rates and low expenditures. Health literacy is associated with healthy lifestyle, reduced lifestyle disease incidence, and participation in health screening and examinations [10].

Our findings suggest that increasing the proportion of persons receiving specific health examinations by prefecture would have a favorable impact on the medical care expenditure. Low health literacy is associated with less use of preventive services [11] and more unnecessary hospital admissions and emergency department visits [12]. Engagement in specific health examinations could reduce medical expenditures through early detection of risky lifestyle behaviors or lifestyle diseases and other diseases at earlier stages. Less expensive behavioral interventions as primary or secondary prevention can prevent costlier pharmacological interventions required to treat more severe disease. For example, physical inactivity is associated with increased medical expenditures due to increased hospitalizations, physician visits, and medications [13]. Relatively inexpensive lifestyle interventions targeting increased physical activity could prevent future costly treatments of disease sequelae, such as treatment for myocardial infarction related to physical inactivity and obesity. Likewise, lifestyle intervention in pre-diabetes reduces long-term medical expenditures [14], and progression from pre-diabetes to diabetes is associated with one-third higher medical expenditures

compared to patients who did not progress to diabetes [15].

The strengths of the present study include use of standardized nationwide data on the majority of healthcare services in Japan. The observed correlation between per capita medical expenditures and the proportion of persons receiving specific health examinations is a novel finding and suggests an area for intervention to re-duce medical expenditures and improve population health.

However, some limitations also warrant mention. Data for our analysis was collected 5 years ago, in 2015; an analysis of more recent data is forthcoming. While the NDB covers the vast majority of healthcare expenditures in Japan, some expenditures, such as workplace injuries and injuries covered by automotive insurance, are not included [6]. While administrative claims data are generally regarded as having high validity, they are subject to classification errors and provide limited information on potentially important confounders or covariates [16]. Caution is warranted in interpreting the present results.

5. Conclusion

This study suggests that interventions to increase the proportion of persons receiving specific health examinations by prefecture could reduce per capita medical expenditures and reduce prefectural disparities in medical expenditures.

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Ethical Approval

This study was approved by the Medical Ethics Committee of Ibaraki Prefectural University of Health Sciences (Ibaraki, Japan).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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