 doi:10.20944/preprints202107.0406.v1

Article

Japan's dental care under universal health coverage and challenges from population ageing: an analysis on health insurance claims data and dental hygiene survey

Etsuji Okamoto [1,*]

[1] University of Fukuchiyama
* Correspondence: okamoto-etsuji@fukuchiyama.ac.jp

Abstract: Although the universal health coverage (UHC) is pursued by many countries, not all countries with UHC include dental care as their benefits. Japan, with its long-held tradition of UHC, has covered dental care as essential benefit and majority of dental care services are provided to all patients with minimal copayment. Being under the UHC, the scope of services as well as prices are regulated by the uniform fee schedule and dentists submit claims according to the uniform format and fee schedule. The author analyzes the publicly available dental health insurance claims data as well as a sampling survey on dental hygiene and illustrates how Japan's dental care is responding to the challenges from population ageing.

Keywords: universal health coverage; health insurance claims; administrative data; claims database

1. Introduction

In most countries, dental care is not covered by public insurance or the coverage, if any, may not be universal. On the other hand, dental care is covered by Japan's universal health insurance with some exceptions (e.g., orthodontics). Under Japan's universal health insurance, the prices of each procedure as well as medicines are regulated by government as a form of national uniform fee schedule. Because of such generous coverage, it is technically feasible to grasp utilization of dental care services as national statistics.

Dentists submit itemized claims every calendar month for each patient. The submitted claims data are stored in the national claims database (NDB) and the itemized statistics in a month (typically every May) are published as the "Social Insurance Claims Survey (SICS)". Further, summary statistics of NDB also became availabe as "NDB open data (NDBOD)" after 2014. By combining NDB open data and SICS, one can illustrate the utilization of dental care services.

Also, the dental health status of the entire nation is surveyed through a sampling survey every five to six years, known as "Dental Hygiene Survey (DHS)". The author illustrates the situation of Japan's dental care analyzing claims data and dental hygiene survey.

2. Materials and Methods

2.1. Dental Hygiene Survey

To survey the dental status of the entire population, the Dental Hygiene Survey (DHS) is conducted as a sampling survey at the interval of five to six years as part of the National Health & Nutrition Survey. The author analyzed tooth-specific and age-specific survival comparing the latest 2016 results and 2005 results [1].

The sample was selected to reflect the dental health status of the entire population. A total of 150 National Census districts were selected and all residents were subjects of the survey. However, the sex-age distribution of the sample may not properly reflect Japan's population structure as shown in [Table 1,2].

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 July 2021 doi:10.20944/preprints202107.0406.v1

[Table 1] The number of subjects of the Dental Hygiene Survey

N of subjects (Dental Hygiene Survey)

	2005			2016		
	F	M	MF	F	M	MF
05～09	130	117	247	94	100	194
10～14	92	116	208	58	64	122
15～19	65	54	119	32	19	51
20～24	58	47	105	36	34	70
25～29	103	71	174	49	37	86
30～34	142	97	239	95	44	139
35～39	139	58	197	124	66	190
40～44	173	74	247	157	97	254
45～49	164	95	259	125	77	202
50～54	192	105	297	140	81	221
55～59	249	158	407	154	100	254
60～64	242	192	434	213	138	351
65～69	288	208	496	258	245	503
70～74	227	221	448	196	184	380
75～79	183	138	321	164	155	319
80～84	104	67	171	125	99	224
85～	46	26	72	72	64	136
TOTAL	2597	1844	4441	2092	1604	3696

[Table2] Age-distribution of the sample of the Dental Hygiene Survey vs. Population

Age distribution of the sample of Dental Hygiene Survey vs. Population

	Dental Hygiene Survey(2016)	Population pyramid(2015)
85～	136	3117257
80～84	224	4961420
75～79	319	6276856
70～74	380	7695811
65～69	503	9643867
60～64	351	8455010
55～59	254	7515246
50～54	221	7930296
45～49	202	8662804
40～44	254	9732218
35～39	190	8316157
30～34	139	7290878
25～29	86	6409612
20～24	70	5968127
15～19	51	6008388
10～14	122	5599317
05～09	194	5299787

2.2 National Claims Database open data

National Claims Database (NDB) is arguably one the largest administrative database in the world and started to accumulate the data of medical, dental and pharmaceutical claims since 2009 [2]. The dental data became publicly available as "open data" since 2014 and the data are aggregated by clinical diagnoses broken down by sex and five-year age groups. The limitation of the data is that it only provides the number of diagnoses and one claim may contain more than one diagnoses. Another limitation of the NDB is legal one: due to the strict privacy protection rule, data smaller than 10 are omitted (***one-digit suppression rule***). Therefore, one should be cautioned that the data provided by the NDB open data may underestimate the real figures.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 July 2021 doi:10.20944/preprints202107.0406.v1

2.3 Social Insurance Claims Survey (SICS)

Social Insurance Claims Survey (SICS) is another survey of claims data derived from NDB. The difference from the NDB open data is that 1) SICS contains a monthly data (typically May in the survey year) while the NDB open data provides annual data, 2) One-digit suppression rule does not apply. SICS contains data on the number of claims, the number of office visits and the monetary values for every clinical procedure.

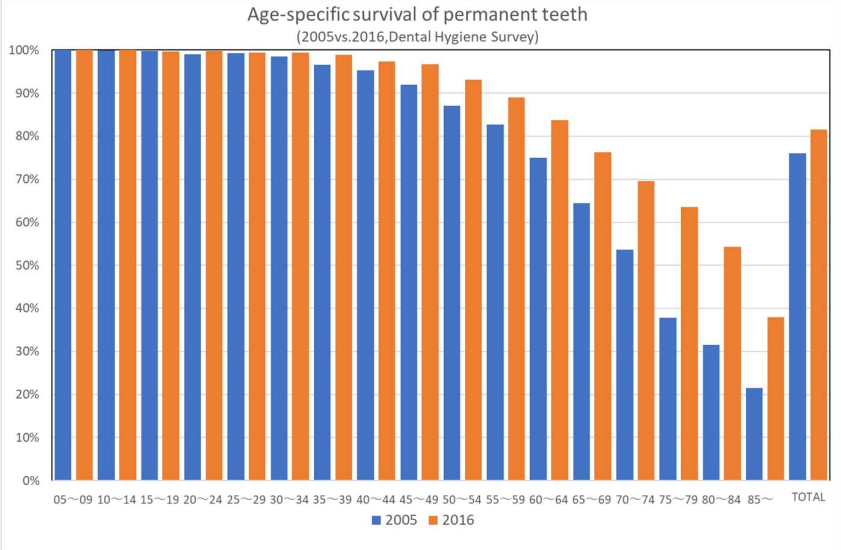
3. Results

3.1 Dental Hygiene Survey

3.1.2 Survival of teeth of the elderly

Survival of teeth of the elderly (65 years or older) has improved even during such a short period of 11 years. As shown in [Figure1], age-specific survival of permanent teeth has improved markedly between the 2005 and 2016 surveys. The improvement is more prominent in the older age groups. Japan Dental Association launched the "80-20 campaign" in 1989, which means "maintaining at least 20 teeth at the age of 80" [3]. According to the Dental Hygiene Survey in 1999, 80 year old persons had an average of eight teeth remaining and only 15% of them had 20 teeth or more remained. According to the Dental Hygiene Survey in 2016, 51.2% of the elderly aged 80 year old had 20 teeth or more remained.

[Figure 1] Age-specific survival of permanent teeth



3.1.3. Tooth-specific survival of the elderly

The DHS surveys for each tooth. The following table illustrates the tooth-specific improvement in survival for the elderly (>=65 year old). The most improvement in survival was found in the left lower second molar, which showed 1.54 fold improvement in survival (48.4% survivial in 2016 as opposed to 31.5% in 2005). On the other hand, the least improvement was right lower canine, which showed 1.16 fold improvement in survival over 11 years interval. Lower canines have the highest survivals in all teeth (82.5% for right and 84.1% for left remaining in the elderly in DHS 2016) and the improvement was inevitably limited.

[Table 3] Tooth-specific survival rate of the elderly and improvement over 11 years (2005-16)

Tooth-specific survival rate of the elderly (>=65) and improvement over 11 years (2005-16)

			2005(N=1508)			2016(N=1562)			2016/2005
			present[P]	missing[M]	P/(P+M)	present[P]	missing[M]	P/(P+M)	
lower	R	median incisor	890	617	59.1%	1173	387	75.2%	1.27
		lateral incisor	940	563	62.5%	1215	341	78.1%	1.25
		canine	1068	438	70.9%	1288	274	82.5%	1.16
		first premolar	872	636	57.8%	1148	414	73.5%	1.27
		second premolar	723	785	47.9%	983	576	63.1%	1.32
		first molar	508	999	33.7%	781	781	50.0%	1.48
		second molar	518	987	34.4%	741	820	47.5%	1.38
		third molar	148			187			
	L	median incisor	895	613	59.4%	1188	372	76.2%	1.28
		lateral incisor	955	551	63.4%	1225	333	78.6%	1.24
		canine	1070	436	71.0%	1314	248	84.1%	1.18
		first premolar	884	624	58.6%	1182	378	75.8%	1.29
		second premolar	718	789	47.6%	968	594	62.0%	1.30
		first molar	494	1014	32.8%	746	816	47.8%	1.46
		second molar	473	1030	31.5%	755	806	48.4%	1.54
		third molar	136			168			
upper	R	median incisor	760	748	50.4%	1059	502	67.8%	1.35
		lateral incisor	773	732	51.4%	1062	495	68.2%	1.33
		canine	868	640	57.6%	1158	402	74.2%	1.29
		first premolar	712	795	47.2%	1008	550	64.7%	1.37
		second premolar	662	845	43.9%	964	597	61.8%	1.41
		first molar	596	912	39.5%	861	701	55.1%	1.39
		second molar	561	946	37.2%	817	744	52.3%	1.41
		third molar	73			82			
	L	median incisor	728	780	48.3%	1048	514	67.1%	1.39
		lateral incisor	733	774	48.6%	1051	509	67.4%	1.39
		canine	843	664	55.9%	1139	422	73.0%	1.30
		first premolar	716	792	47.5%	988	571	63.4%	1.33
		second premolar	667	841	44.2%	919	642	58.9%	1.33
		first molar	638	870	42.3%	881	681	56.4%	1.33
		second molar	540	968	35.8%	805	754	51.6%	1.44
		third molar	67			75			
			21229	21389	49.8%	28979	15224	65.6%	1.32

3.1.4. Conditions of teeth of the elderly

Although, the survival of teeth showed a marked improvement over the 11 year interval, the conditions of teeth of the elderly (>=65 year old) did not show much difference over the same period. It is remarkable that the percent of complete dentures among the missing teeth declined from 50.7% in 2005 to 39.7% in 2016. Also remarkable was that the percent of implant increased from 0.3% of missing teeth in 2005 to 1.3% in 2016 [Table 4].

[Table 4] Status of teeth of the ederly

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 July 2021 doi:10.20944/preprints202107.0406.v1

Status of teeth of the elderly (>=65, Dental Hygiene Survey)		
	2005(N=1508)	2016(N=1562)
present teeth	21229 (100%)	28979 (100%)
sound teeth	8035 (37.8%)	11924 (41.1%)
with dental sealant	2 (0.0%)	5 (0.0%)
colored	366 (1.7%)	325 (1.1%)
not colored	7667 (36.1%)	11594 (40.0%)
filled teeth		
Crown, not bridge abutment	2411 (11.4%)	2677 (9.2%)
Crown, bridge abutment	6143 (28.9%)	6861 (23.7%)
Root cap		58 (0.2%)
filling	3165 (14.9%)	6101 (21.1%)
decayed teeth		
Caries incipient	774 (3.6%)	750 (2.6%)
Caries high grade	701 (3.3%)	608 (2.1%)
missing teeth	21389 (100%)	15253 (100%)
implant	62 (0.3%)	192 (1.3%)
bridges	1394 (6.5%)	1585 (10.4%)
no prosthesis	2341 (10.9%)	2646 (17.3%)
complete denture	10849 (50.7%)	6060 (39.7%)
partial denture	6743 (31.5%)	4741 (31.1%)
removal for orthodontics	0 (0.0%)	29 (0.2%)
	42618	44232

3.2 National Claims Database

3.2.1. N of diagnoses by diagnostic categories

The number of diagnoses contained in dental claims stored in NDB has increased steadily. However, one should be cautioned that the NDB stores only electronically submitted claims and the computerization of claims was not well developed in the early years. Also, the latest 2018 data include approximately213 million dental claims. There is an increasing trend in the number of diagnoses contained in a claim. The number of diagnoses per claim increased from 1.32 diagnoses per claim in 2014 to 1.63 in 2018 [Table 5].

[Table5]N of dental claims by major diagnostic categories

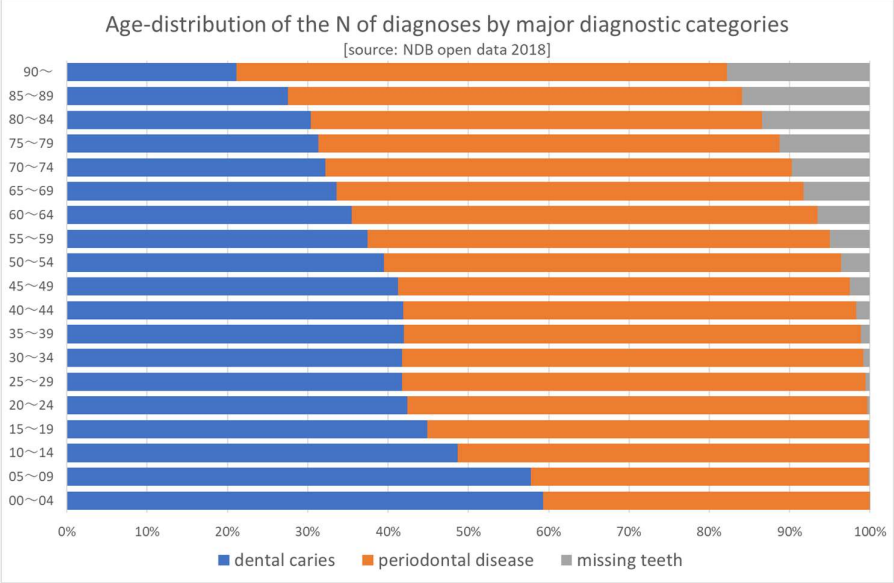
N of detanl claims by major diagnostic categories					
	dental caries	periodontal disease	missing teeth	total N of diagnoses	N of claims (*) N of diagnoses/claim
2014	107549905	140143615	16389285	264082805	200612846
	40.7%	53.1%	6.2%	100%	1.32
2015	128939230	169719402	19330067	317988699	204865945
	40.5%	53.4%	6.1%	100%	1.55
2016	130172602	174024015	19215128	323411745	210679509
	40.2%	53.8%	5.9%	100%	1.54
2017	132611007	184154163	19024386	335789556	212878244
	39.5%	54.8%	5.7%	100%	1.58
2018	134161234	193685587	18840620	346687441	212916550
	38.7%	55.9%	5.4%	100%	1.63

*N of claims: Medical Care Benefit Survey

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 July 2021 doi:10.20944/preprints202107.0406.v1

The following graph shows a declining share of dental caries with ageing possibly reflecting the declining number of remaining teeth. On the other hand, the share of periodontal diseases remains constant over ageing. However, one should be cautioned in interpreting the NDB data. According to the "one-digit suppression (numbers less than 10 will not be displayed)", the number of claims may be substantially underestimated [Figure 2].

[Figure2] Age-distrubution of the number of diagnoses by major diagnostic categories



When broken down by ICD10-level diagnoses, two diagnoses (periodontitis and dental caries) account for 57.2% of the total number and top ten diagnoses account for 82.8% of the total diagnoses [table 6].

[Table6] Ten most common diagnoses of dental claims

Ten most common diagnoses of dental claims

	N of diagnoses	% diagnoses	cumulative %
periodontitis	135915272	39.2%	39.2%
dental caries	62368855	18.0%	57.2%
gingivitis	15891362	4.6%	61.8%
missing teeth	13615550	3.9%	65.7%
pulpitis	13253313	3.8%	69.5%
chronic periodontitis	12653681	3.6%	73.2%
apical perodontitis	12303356	3.5%	76.7%
dental caries of 2nd degree	7958861	2.3%	79.0%
dental caries treated	7357028	2.1%	81.1%
acute purulent periodontiti	5868951	1.7%	82.8%
.	.		
.	.		
.	.		
TOTAL	346687441	100%	100%

source: NDB open data 2018

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 July 2021 doi:10.20944/preprints202107.0406.v1

3.3 Social Insurance Claims Survey (SICS)

The Social Insurance Claims Survey (SICS) has been conducted every year since 1957. It was conducted as a sampling survey when health insurance claims were submitted in paper form. Since 2012, it started to extract data from NDB and became a population survey instead of a sampling survey.

The SICS data covers only one month period (May in the survey year) and is therefore affected by seasonal variation. Also, one should be reminded that the latest data in 2020 is severely affected by the COVID19 epidemic.

The author focuses on home care because it reflects the population ageing. As shown in [Table 7], home care is provided mainly to the elderly population. The age distribution of home care services provision shows a sharp contrast to that of initial office visits.

[Table7] Age distribution of home care/visits and initial office visits

Age distribution of home care/visits and initial office visits (2019)

	dental home care management	Dental home visits	initial office visits
00～04歳	78	435	235314
05～09歳	155	638	518384
10～14歳	174	599	313197
15～19歳	301	1022	149726
20～24歳	786	2843	193072
25～29歳	1033	3564	238322
30～34歳	1420	4877	280451
35～39歳	1747	6174	327538
40～44歳	2753	10305	388877
45～49歳	3719	14451	428651
50～54歳	3849	15898	388702
55～59歳	4209	19526	370018
60～64歳	5316	27306	381468
65～69歳	8450	51278	465311
70～74歳	13690	88495	460625
75～79歳	25711	176696	398915
80～84歳	43829	313163	258361
85～89歳	60312	456971	131748
90歳以上	74662	526285	48203
total	**252194**	**1720526**	**5976883**

source: Social Insurance Claims Survey

3.3.1 Dental Home Visits

Dental home visits are provided to the patients who cannot visit dental clinics for physical handicap and the number of dental home visits is increasing steadily [Table 8]. For the elderly who are living in nursing homes or long-term care facilities, dentists can visit more than one patients at a time. Considering the time saving for such cases, the fee for dental home visits is set considerably lower for multiple patients in a building [11000 yen for one patient and 3610 yen for the second or more patients in a building. The fee is further reduced to 1850 yen for ten or more patients in a building].

[Table 8] The number of dental home visits

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 July 2021 doi:10.20944/preprints202107.0406.v1

The number of dental home visits

	one patient in a building	2～9 patients in a building	10 or more patients in a building	total
2012	205646	568505		774151
2013	175332	430464		605796
2014	228198	277838	421356	927392
2015	245716	356415	544678	1146809
2016	270419	382967	597183	1250569
2017	305904	430549	648807	1385260
2018	361446	628846	615724	1606016
2019	370991	667835	642843	1681669
2020	295306	467573	447467	1210346

source: Social Insurance Claims Survey

3.2.2 Dental home care management

Dental home care management (DHCM) is a surcharge to home visit fees. While home visit fees are reimbursed on every visit, dental home care management is considered to be professional services by dentists involving a planned, scheduled and long-term management of patients to maintain their oral health and nutrition. Therefore, DHCM is reimbursed once a month while home visits may be provided by any dental practitioners, dental home care management expects to be provided by specially designated dental clinics called "home care supporting dental clinics (HCSDC)".

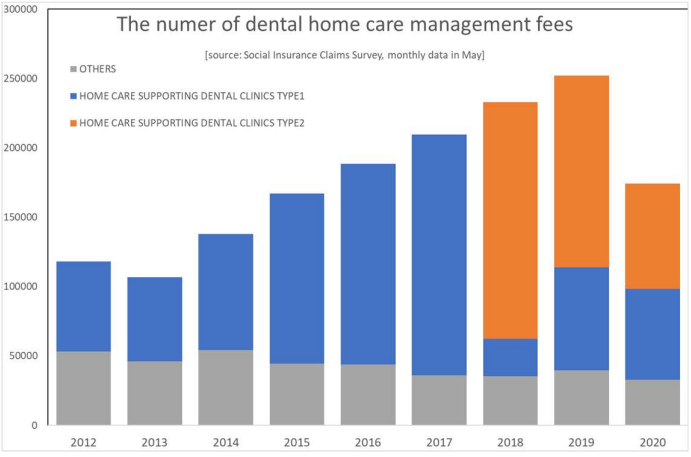
There are certain conditions for dental clinics to be designated a HCSDC. To qualify as HCSDC type1, the clinic must provide 15 times or more home visits per year, and for type 2, 10 times or more.

In addition to the requirement for the number of home visits. The following conditions must be met [4]:

1) must have at least one dentist who completed a training course on geriatric dentistry as well as risk management for emergencies
2) must have at least one dental hygienist
3) provide patients and/or family members information on home visits in writing
4) must be affiliated with other HCSDCs for back-up
5) must have provided at least five home visits in response to the requests from long-term care facilities (nursing homes, care managers, visiting nursing stations, etc.)

As shown in [Figure3], the number of DHCM has been increasing. Since 2018, the HCSDCs have been divided into two categories: type 1 and 2. Type 1 HCSDCs are entitled to higher management fee (3200 yen per month per patient) than type 2 (2500 yen) because it must meet the more stringent conditions than type 2 HCSDCs.

[Figure 3] The number of dental home care management fees



Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 July 2021 doi:10.20944/preprints202107.0406.v1

3.2.3 Home visits by dental hygienists

A study analyzing the data on dental clinics and patients behavior demonstrated the importance of dental hygienists in influencing the patients' behavior [5] and tooth loss[6]. Home visits by dental hygienists are also covered by health insurance. Conditions for reimbursement includes: 1) dental hygienists must spend at least 20 minutes per visit and 2) reimbursement is capped at 4 times per month.

There has been a major revision in the fee schedule for dental hygienists in 2018. Until then, the fee for dental hygienists were two categories: simple (1200 yen) and complicated (3000 yen). However, 2018 and onward, the fee schedule was revised to the same structure of dentists: 3600 yen for the 1st patient in a building, 3280 yen for the 2nd to 9th patient in a building and 3000 yen for the 10th patient or more.

[Table 9] The number of home visits by dental hygienists

N of home visits by dental hygienists

	simple	complicated	one patient in a building	2~9patients in a building	10 or more patients in a building	total
2012	82621	224294				**306915**
2013	77292	190608				**267900**
2014	101178	225424				**326602**
2015	99210	270097				**369307**
2016	107608	299310				**406918**
2017	115556	333746				**449302**
2018			16961	54203	379964	**451128**
2019			17263	58139	415659	**491061**
2020			11165	35785	282732	**329682**

source: Social Insurance Claims Survey

3.2.4. Home oral rehabilitation services

Home oral rehabilitation was added to the health insurance benefit in 2016 as a surcharge to dental home visits. The fee is reimbursed when dentists provide oral rehabilitation services to the patients who are charged "dental home visits". The conditions for reimbursement is 1) patients must have eating disorder requiring a constant dental management, 2) dentists must develop long-term dental management plan and 3) dentists spend at least 20 minutes on site[7].

Since this fee is a surcharge to dental home visits, the fee is categorized by the number of teeth under management, and not by the number of patients in a building.

[Table 10] The number of home oral rehabilitation services

The number of home oral rehabilitation services

	<10teeth	10~20teeth	20=<teeth	total
2016	1931	952	1441	**4324**
2017	2696	1608	2392	**6696**
2018	4798	2541	3931	**11270**
2019	6352	3645	5686	**15683**
2020	4623	2891	4408	**11922**

4. Discussion

Oral health of the elderly population in Japan has improved considerably as evidenced by the Dental Hygiene Surveys. The share of the elderly who maintain 20 or

more teeth has increased from 15% in 1999 to 51.2% in 2016 [8]. Tooth-specific survival has improved by 32% over the eleven years interval.

The improvement is attributable to the increased health insurance coverage to home dental care services, which predominantly are consumed by the elderly patients. Since Japan has universal health coverage and dental care has been included in the benefit, it was possible to illustrate the utilization of dental services as well as the number of diagnoses contained in a claim particularly after the full computerization was achieved and a national database accumulating the claims data was established.

Reflecting the ageing of the entire population, the prevalence of major diagnostic categories has shifted gradually with increasing share of periodontal diseases while the share of missing teeth has decreased due to the improved survival of teeth of the elderly.

Japan's uniform fee schedule is revised every two years and serves as a policy implementation tool for the government. The government has increased the coverage home care services in both medical and dental care. Utilization of home care services has increased steadily in recent years and is expected to increase further reflecting the ageing population (there was a sharp drop in the year 2020. This reflects the impact of the COVID19 epidemic and may be viewed as a temporary phenomenon).

The author analyzed publicly available data source including sampling surveys on dental status as well as health insurance claims data. However, one should be cautioned the limitations and drawbacks of the data. Although Japan's claims data are uniform and comprehensive, it lacks the information on socio-economic status of patients. For example, there are few data available as to the relationship between income and oral health.

Monitoring the socio-economic disparity in oral health status would be the future challenge for researchers.

5. Conclusions

Japan has covered dental care as benefit of its universal health coverage. Thanks to such generous coverage, people can receive dental care with a minimal copayment. The dental health status as measured by survival of teeth has improved considerably particularly for the elderly population. In response to the rapidly ageing population, an increasing trend of home dental care services for the elderly patients has been observed. Although, the overall performance of Japan's dental care for the elderly has been satisfactory, some questions such as socio-economic disparity remains unanswered and leaves room for future research.

Supplementary Materials: Tables and Figures (including figure's data) are available in Excel file [URL]

Funding: This research was funded by the Ministry of Health, Labour & Welfare as Health, Labour and Welfare Sciences Research Grants "Research on policies for global health issues(21BA1002)".

Institutional Review Board Statement: IRB review was not sought because this study relied solely on publicly available data.

Informed Consent Statement: Same as above.

Data Availability Statement:

・Dental Hygiene Survey
2005 Survey
https://www.e-stat.go.jp/stat-search/file-download?statInfId=000031411439&fileKind=0
https://www.e-stat.go.jp/stat-search/file-download?statInfId=000031411440&fileKind=0
2016 Survey
https://www.e-stat.go.jp/stat-search/file-download?statInfId=000031607230&fileKind=0

・NDB open data
2014 data: https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000139460.xlsx
2015 data: https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000177285.xlsx
2016 data: https://www.mhlw.go.jp/content/12400000/000347784.xlsx
2017 data: https://www.mhlw.go.jp/content/12400000/000711946.xlsx
2018 data: https://www.mhlw.go.jp/content/12400000/000539792.xlsx
・Social Insurance Claims Survey
https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00450048&tstat=000001029602

Conflicts of Interest: None to declare.

References

[1]Ando Y, Ikeda N, Nishi N, Tano R, Iwasaki M, Miura H. [Assessment of participation and its associated lifestyle factors in the 2016 National Survey of Dental Diseases: an analysis through record linkage with National Health and Nutrition Survey]. Nihon Koshu Eisei Zasshi. 2021 Jan 30;68(1):33-41.

[2] Suzuki S, Noda T, Nishioka Y, Imamura T, Kamijo H, Sugihara N. Evaluation of tooth loss among patients with diabetes mellitus using the National Database of Health Insurance Claims and Specific Health Checkups of Japan. ***Int Dent J***. 2020 Aug;70(4):308-315.

[3] Saito M, Shimazaki Y, Fukai K, Furuta M, Aida J, Ando Y, Miyazaki H, Kambara M. A multilevel analysis of the importance of oral health instructions for preventing tooth loss: The 8020 Promotion Foundation Study of Japanese Dental Patients. ***BMC Oral Health***. 2020 Nov 18;20(1):328.

[4] Ministry of Health, Labour & Welfare, Health Insurance Bureau. Directive No.3 on 4th March 2016 [https://www.ssk.or.jp/shinryohoshu/kiso/kiso_s/index.files/kiso_2017_04_03.pdf].

[5] Inoue Y, et al. Multilevel Analysis of the Association of Dental-Hygienist-Related Factors on Regular Dental Check-Up Behavior. ***Int. J. Environ. Res. Public Health*** 2021, *18*(6), 2816

[6] Saito, M. *et al.* A multilevel analysis of the importance of oral health instructions for preventing tooth loss: The 8020 Promotion Foundation Study of Japanese Dental Patients. ***BMC Oral Health*** **20,** 328 (2020)

[7] Ministry of Health, Labour & Welfare, Health Insurance Bureau. Directive No.3 on 4th March 2016 [https://www.ssk.or.jp/shinryohoshu/kiso/kiso_s/index.files/kiso_2017_04_03.pdf].

[8] Miura H, Tano R. Recent measures in geriatric oral health care in Japan. ***J of National Institute of Public Health***. 68(1):8-16.